

# General Surgery

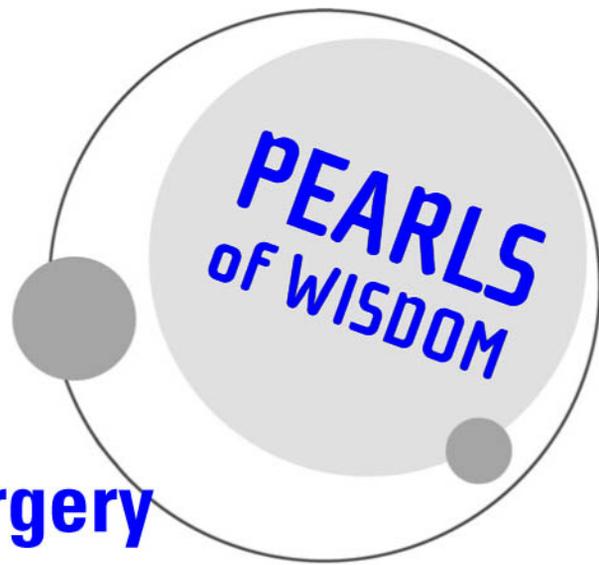
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● Fourth Edition

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Matthew J. Blecha



# **General Surgery Board and ABSITE Review**

**Fourth Edition**

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# INTRODUCTION

Congratulations! *General Surgery Board and ABSITE Review: Pearls of Wisdom*, fourth edition, will help you improve your knowledge base in surgery. Originally designed as a study aid to improve performance on the Surgery Boards and ABSITE exams, this book is full of useful information. A few words are appropriate in discussing intent, format, limitations, and use.

Since *General Surgery Board and ABSITE Review* is primarily intended as a study aid, the text is written in a rapid-fire question/answer format. This way, readers receive immediate gratification. Moreover, misleading or confusing “foils” are not provided. This eliminates the risk of erroneously assimilating an incorrect piece of information that makes a big impression. Questions themselves often contain a “pearl” intended to reinforce the answer. Additional information, not requested in the question, may be included in the answer.

Many questions have answers without explanations. This enhances ease of reading and rate of learning. Explanations may often occur in a later question/answer. If unclear about a question, be sure to look up the topic in one of the recommended/referenced surgical texts. Truly assimilating these disparate facts into a framework of knowledge absolutely requires further reading of the surrounding concepts. Information learned in response to seeking an answer to a particular question is much better retained than information that is passively observed. Take advantage of this! Use this book with your preferred texts handy and open.

*General Surgery Board and ABSITE Review* aggressively prunes complex concepts down to the simplest kernel to enhance learning—but the dynamic knowledge base and clinical practice of medicine are not like that! Furthermore, new research and practice occasionally deviates from that which likely represents the right answer for test purposes. This text is designed to maximize your score on a test. Refer to your most current sources of information and mentors for direction for practice. This book is also designed to be reused several times to allow memorization. A hollow bullet is provided for any scheme of keeping track of questions answered correctly or incorrectly.

The primary change in the fourth edition is the addition of board pertinent questions and the removal of superfluous and nonspecific questions. Areas of importance have been bulked in content, and less emphasized peripheral specialty questions have been trimmed down to the essential materials. This book is intended to be a supplement rather than a replacement for more thorough surgical text books. *Pearls of Wisdom* represents a concise, rapid review format for the important facts and concepts of surgical education.

We welcome your comments, suggestions, and criticism. Great effort has been made to verify these questions and answers. Some answers may not be the answers you would prefer. Most often this is attributable to variance between original sources. Please make us aware of any errors you find. We hope to make continuous improvements and would greatly appreciate any input with regard to format, organization, content, presentation, or about specific questions.

Best of luck with your studies and surgical careers!

*Matthew J. Blecha*

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# Abdomen Pearls: Liver, Gallbladder, Pancreas, and Spleen

- **What is the mechanism of hypotension in severe cases of acute pancreatitis?**  
Fluid sequestration in the intestine and retroperitoneum, systemic vascular effects of kinins and tumor necrosis factor (TNF), vomiting, and bleeding.
- **T/F: Idiopathic acute pancreatitis may be the result of occult biliary microlithiasis or biliary sludge.**  
True.
- **When and where is iatrogenic injury to the common bile duct most common?**  
During laparoscopic cholecystectomy at the triangle of Calot. Prevention is best done by ensuring lateral retraction of the gallbladder neck and retraction of the body of the gallbladder toward the right shoulder to open up the triangle. Dissection of the cystic duct should be done as close to the gallbladder as possible.
- **What is the most common type of lipid profile associated with pancreatitis?**  
Type V (increased triglycerides).
- **What is the optimal method of determining whether a pancreatic phlegmon is infected? What is the treatment if infected?**  
CT scan to look for retroperitoneal air and CT-guided aspiration of fluid. Infection of phlegmon is the primary indication for pancreatic necrosectomy with wide retroperitoneal drainage. Once infection is diagnosed, surgery should be performed as soon as the patient is stabilized to reduce the incidence of ARDS and systemic sepsis.
- **How does excess lipid promote pancreatitis?**  
By the toxic action of fatty acids released by lipase in the pancreas.
- **What is the role of abdominal ultrasound in pancreatitis?**  
Detection of biliary obstruction and evaluation of pseudocysts.
- **What percentage of common bile duct stones pass spontaneously?**  
90%.

○ **What should be the initial management of gallstone pancreatitis?**

Hospital admission, NPO status, and IV hydration. Observe bilirubin and pancreatic enzymes for evidence of stone passage (decreasing bilirubin) in first 24 to 36 hours. If no evidence of passage or evidence of cholangitis exists, then ERCP is the next step to relieve biliary obstruction. If the stone clinically passes (most frequent case), perform lap chole with cholangiogram. If pancreatitis is severe, operation should ideally be delayed until improvement unless biliary obstruction refractory to ERCP stone extraction is present.

○ **What are the management options for a common bile duct stone detected during laparoscopic cholecystectomy cholangiogram?**

Laparoscopic basket retrieval, Fogarty balloon retrieval, forcible saline injection to push out ampulla, postoperative ERCP, and laparoscopic or open common bile duct exploration.

○ **What are the Ranson's criteria for severity in nonbiliary pancreatitis at 48 hours?**

Fall in hematocrit greater than 10%, rise in BUN greater than 5% per mg/dL, serum calcium less than 8 mg/dL, PaO<sub>2</sub> less than 60 mm Hg, base deficit greater than 4 mEq/L, and fluid sequestration greater than 6 L.

○ **What are the Ranson's criteria for severity in biliary pancreatitis on admission?**

Age greater than 70 years, WBC greater than 18/mm<sup>3</sup>, glucose greater than 220 mg/dL, LDH greater than 400 U/L, and AST greater than 250 U/L.

○ **Should antibiotics be given empirically to patients with severe pancreatitis?**

Yes. Imipenem is the most popular choice.

○ **What is the mortality of acute pancreatitis?**

1% for those with 2 or less factors by the Ranson's criteria, 16% for 3 or 4, 40% for 5 or 6, and 100% for those with 7 or 8 factors.

○ **What are the primary cystic masses of the pancreas?**

Serous cystadenoma, mucinous cystadenoma, cystadenocarcinoma, intraductal papillary mucinous neoplasm, and pseudocyst.

○ **What features differentiate pancreatic pseudocysts from cystic neoplasms?**

Pseudocysts: history of pancreatitis in almost all, no septations in cyst on CT scan, high cyst amylase content, connection with pancreatic duct on ERCP in 70% of cases, and no epithelial layer histologically.

Cystic neoplasm: calcification, septations, or solid components on CT scan; epithelial layer to cyst; absence of pancreatitis history; connection with main pancreatic duct on ERCP in less than 5%; and elevation of cyst CEA, CA15-3, or mucin-like carcinoma suggest malignancy.

○ **What is the treatment of mucinous cystadenoma of the pancreas?**

Resection. These masses have potential for malignant transformation. They more frequently have septations than serous cystadenomas (typically observed) to help differentiate on CT scan.

○ **What are some differentiating features of mucinous cystadenomas from serous cystadenomas of the pancreas?**

Mucinous cystadenomas are typically larger with septations and peripheral calcifications on CT scan. Fluid in mucinous cystadenomas is positive for tumor markers (CEA, CA 19-9) and is low in glycogen (high in serous). Serous cystadenomas tend to have more central calcification with a “starburst” pattern of smaller cysts within a larger capsule.

○ **What are the features of intraductal papillary mucinous tumors (IPMT)?**

The classic presentation is a solitary cystic neoplasm near the head of the pancreas, with mucin seen in the ampulla on ERCP. There is a high rate of cyst malignancy, and oncologic resection is the treatment. Frozen section should be taken at the resection margin.

○ **What is the surgical treatment for a large (7 cm) pancreatic pseudocyst inducing pain that fails to regress after 12 weeks?**

Enteric drainage with cyst gastrostomy or cyst jejunostomy.

○ **What is the clinical presentation of familial Mediterranean fever?**

Bouts of fever and abdominal pain as well as intermittent chest and joint pain. Inheritance is autosomal dominant, and the condition is seen in patients of Eastern Mediterranean descent. Colchicine is effective in prevention, and anti-inflammatories should be used in an acute attack.

○ **What are the most common variants in origin of hepatic arteries?**

Right hepatic—Off SMA, 20%

Left hepatic—Off left gastric, 10%

○ **What are the structures in portal triad?**

Portal vein—Posterior

CBD—On the right anteriorly

Hepatic artery—On the left anteriorly

○ **What should be the steps when common bile duct injury is suspected in laparoscopic cholecystectomy?**

Cholangiogram to define anatomy and injury followed by CBD repair over a T-tube for partial transection or choledocojejunostomy for complete transection.

○ **What are the sonographic effects of gallstones on ultrasound?**

Acoustic shadowing behind the stones.

○ **What bacteria are the most common agents of biliary sepsis?**

*Escherichia coli* and *Klebsiella*.

○ **What artery is at risk in the crural dissection during laparoscopic Nissen fundoplication?**

When present an aberrant left hepatic artery arising off the left gastric artery.

- **T/F: The portal vein formed by the SMV and splenic VV sees highly regulated blood flow with its multiple valves.**  
False. The portal system is valveless.
- **What pleuropulmonary abnormalities may be seen in patients with pancreatitis?**  
Elevated hemidiaphragm, atelectasis, pleural reaction or effusion, hypoxemia, and acute lung injury, including ARDS.
- **What is the treatment of traumatic pancreatic transection with an intact ampulla of Vater?**  
Distal pancreatectomy with oversewing of the proximal pancreatic duct and drain placement. In stable patients consider ERCP first, with pancreatic duct integrity being the primary variable for attempted pancreatic preservation versus resection.
- **When should surgical drainage of pancreatic pseudocysts be considered?**  
In patients with large cysts (greater than 5 cm) and those with cysts that do not resolve or decrease within 6 weeks of onset. In addition, infected pseudocysts should be drained.
- **What is the appropriate treatment for patients with acute pancreatitis?**  
Supportive. IV fluid. Empiric ABX when severe. Nutrition via TPN or a jejunal feeding tube.
- **After cholecystectomy pathology reveals an adenocarcinoma. The Ca is confined to the mucosa (T1). What are the options?**  
Cholecystectomy is sufficient.
- **What is the treatment for a T3 adenocarcinoma of the gallbladder?**  
Cholecystectomy + regional lymphadenectomy and liver segment V removal, and portal triad skeletonization.
- **An arteriogram is done to work up hematuria. Hematuria consists of which triad?**  
GI bleed, jaundice, and RUQ pain. Embolization is the most useful treatment of the hepatic-arterial branch to biliary tract fistula.
- **What does Charcot's triad imply?**  
Fever, RUQ tenderness, and jaundice are indicative of cholangitis.  
Adding hypotension and mental status changes, i.e., Reynold's pentad.  
Tx: IV ABX, IVE, and emergent drainage of biliary tract.
- **What is the most common cause of biliary stricture?**  
Iatrogenic injury (lap chole).
- **What are the features of gangrenous cholecystitis?**  
Air in the gallbladder wall with severe edema and systemic sepsis. Secondary cholangitis can develop. Acalculous cholecystitis in the critically ill is a common etiology from biliary stasis. If a patient is too ill for surgery, percutaneous cholecystostomy can be performed.

- **What are the diagnostic measures and treatment for biliary stricture secondary to chronic pancreatitis?**  
ERCP to confirm diagnosis and obtain cytology to rule out malignancy and potentially stent if the patient is a poor operative candidate. Acceptable-risk patients should undergo choledocoduodenostomy or Roux-en-Y choledocojejunostomy because stents tend to reobstruct within 18 months.
- **What are the management principles of cystic duct stump leak after lap chole?**  
ERCP and stenting of CBD over cystic duct origin. Drainage of the biloma is indicated when there are signs of infection. Heida scan can help with the initial diagnosis.
- **What is the management of a leaking duct of Lushka off the gallbladder bed post lap chole?**  
Percutaneous drainage of the biloma with drain left in place and ERCP biliary stenting to decompress biliary system and aid fistula closure.
- **What should be the treatment for a 2-cm gallbladder polyp detected on ultrasound?**  
Open cholecystectomy. Laparoscopy is avoided because of the potential for seeding of malignant cells if cancer is present.
- **T/F: Periapillary adenocarcinoma has a higher survival than primary pancreatic adenocarcinoma.**  
True. Periapillary cancer (duodenal mucosal origin) presents at an earlier stage from biliary obstruction and thus has a higher associated survival.
- **What is the most common cause of cholangitis after choledocoduodenostomy or choledocojejunostomy?**  
Anastomotic stricture.
- **What are the dangers of porcelain gallbladder?**  
Risk of cancer is 30% to 65%. Therefore, mandatory cholecystectomy.
- **What are the features and treatment of a biliary cystadenoma?**  
A cystic mass with septations in the biliary tree most often presenting with obstruction. Treatment is surgical resection because of a high rate of malignant transformation.
- **T/F: Gallstones are more common in pregnancy than in the general population.**  
True. Increased serum cholesterol in the second and third trimesters is the etiology. Gallstones often resolve after pregnancy.
- **What should be the treatment for cholecystitis in a patient 16 weeks pregnant? 32 weeks?**  
Laparoscopic cholecystectomy before 20 weeks and open cholecystectomy after 20 weeks. Surgery for biliary colic in pregnancy should be reserved for severe colic refractory to observation. Biliary obstruction from gallstones should be treated with ERCP after organogenesis (safe radiation dose after 14 weeks).
- **Patient complains of RUQ pain yet has no gall stones. CCK stimulation reveals an EF <35%; what is the diagnosis?**  
Biliary dyskinesia and hence indication for cholecystectomy.

○ **What is Mirizzi's syndrome?**

A large gallstone in the neck of the gallbladder, compressing the common bile duct and inducing biliary obstruction. Type I involves biliary obstruction only. Type II involves cholecystic-biliary fistula. Treatment depends on patient condition. In the severely comorbid patient, biliary stenting can be therapeutic. Healthy patients should be treated with cholecystectomy and prn bile duct repair with T-tube or choledocojejunostomy when extensive devitalized tissue is present.

○ **T/F: In acute cholecystitis, lap chole should be delayed until acute inflammation resolves in 2 to 3 weeks.**

False. Early operation is associated with an easier dissection, as the edema aids in removal from the liver bed. Delaying surgery is complicated by adhesions and more firm scar, leading to higher conversion rates to open surgery and blood loss.

○ **What are the five types of choledochal cysts?**

Type I (most common)—fusiform extrahepatic. Treatment is resection and hepaticojejunostomy because of the high rates of recurrent pancreatitis and malignant transformation

Type II—diverticulum of common bile duct (local resection and repair)

Type III—periampullary

Type IV—intra- and extrahepatic

Type V—intrahepatic

○ **What is the rule of 10s for insulinomas?**

10% solitary

10% malignant

10% associated with MEN

10% ectopic

○ **What are the typical hemodynamic changes seen in cirrhosis?**

A hyperdynamic circulation with an increase in cardiac output (CO) and a decrease in systemic vascular resistance (SVR).

○ **Why is CO increased in patients with liver disease?**

Because of peripheral vasodilatation and arteriovenous shunting.

○ **What are the risk factors for Budd–Chiari syndrome (hepatic vein thrombosis)?**

Hypercoagulable conditions such as pregnancy, factor V Leiden mutation (resistance to activated protein C), hepatitis, liver abscess, polycythemia, malignancy, and other inherited hypercoagulable conditions.

○ **What is the most common presentation of Budd–Chiari syndrome?**

Hypercoagulable patient who presents with ascites and abdominal distention.

○ **What are the treatment options for Budd–Chiari syndrome?**

If the vena cava is present and hepatic function salvageable then portosystemic shunt is indicated. If only partial hepatic venous thrombosis is present then thrombolysis and stenting may be possible. Fulminant hepatic failure (FHF) requires transplantation.

- **What are the features of primary sclerosing cholangitis?**  
Unknown etiology with multiple dilations and strictures of intra- and extrahepatic biliary ducts (beading). 70% of cases are in men. There is an association with ulcerative colitis and retroperitoneal fibrosis. Liver biopsy may show onion skin changes. Hepatic transplantation is the definitive treatment.
- **What is the concern when recurrent variceal bleeding occurs after transjugular intrahepatic portosystemic shunting (TIPS)?**  
TIPS thrombosis. Duplex ultrasound can confirm this. Secondary TIPS can be placed and portosystemic shunt considered once the patient is stabilized.
- **What is the effect of cirrhosis on mixed venous oxygen saturation?**  
It is increased as a result of the above-mentioned shunting (as seen with sepsis).
- **What is the most common site of obstruction in gallstone ileus?**  
The terminal ileum. Air in the biliary tract and an SBO are the classic presentation.
- **What are the causes of hypoxia in patients with chronic liver disease?**  
Ventilation/perfusion (V/Q) mismatching, intrapulmonary and portopulmonary shunting, limitation of alveolar-capillary diffusion, loss of hypoxic vasoconstriction, and a rightward shift of the oxyhemoglobin dissociation curve.
- **T/F: Amebic abscess of the liver are treated with metronidazole.**  
True. *Entamoeba histolytica* is the most common amebic liver abscess. Intestinal infestation precedes hepatic involvement. Diagnosis is confirmed via fecal culture and amebic titers.
- **What is the treatment for pyogenic (bacterial) liver abscess?**  
Percutaneous or surgical drainage (when multiple/loculated). Etiologies are idiopathic, biliary infection, and portal venous spread.
- **What is the normal pancreatic anatomy in patients with pancreas divisum?**  
NL—Santorini = small; Wirsung = major.  
Divisum—Santorini = major duct.  
Divisum occurs in 5% pop and is an embryologic failure of fusion of ducts. These patients are prone to pancreatitis.
- **What gene is mutated in 90% of pancreatic cancer patients?**  
K-Ras.
- **What is the most common islet cell tumor?**  
Insulinoma.
- **What is the surgical treatment of insulinoma?**  
Enucleation.

○ **What is the appropriate management of the hepatorenal syndrome (HRS)?**

Recognition and correction of prerenal factors often improve the overall renal function.

○ **What are antithrombin III, protein C, and protein S? What is their importance in patients with liver disease?**

These are inhibitors of coagulation, deficiency of which may lead to thrombotic states. These are synthesized in the liver and may be decreased in patients with cirrhosis. However, these patients do not usually have a thrombotic state because of a concomitant decrease in coagulation factors.

○ **T/F: Regional anesthesia is contraindicated in patients with a coagulopathy.**

True.

○ **Why do cirrhotic patients develop prolonged apnea after succinylcholine administration?**

They have a decreased synthesis of pseudocholinesterase.

○ **Which shunts are appropriate for the treatment of patients with Budd–Chiari syndrome (hepatic vein thrombosis)?**

Side-to-side portocaval, mesocaval, and mesoatrial shunts.

○ **A 45-year-old cirrhotic patient undergoing portocaval shunt has profuse surgical bleeding. Transfusion of red blood cells (RBCs) and fresh frozen plasma (FFP) is in progress. The patient is hypotensive in spite of adequate replacement of intravascular volume. What is the most likely cause?**

Hypocalcemia.

○ **How is coagulopathy managed in patients scheduled for surgery?**

Administration of vitamin K and cryoprecipitate, infusion of FFP for an INR less than 1.5, and transfusion of platelets to levels above  $100,000/\text{mm}^3$ .

○ **What is the most appropriate treatment for a patient with choledocholithiasis 2 years after cholecystectomy?**

Endoscopic sphincterotomy and stone extraction.

○ **T/F: Intracranial pressure (ICP) is increased in patients with FHF.**

True.

○ **What drugs are effective if spasm of the sphincter of Oddi is suspected?**

Atropine, glucagon, naloxone, and nitroglycerin.

○ **How is venovenous bypass different from cardiopulmonary bypass?**

During venovenous bypass, blood from the lower part of the body and the portal circulation is returned to the axillary or jugular veins via a centrifugal pump. An oxygenator is generally not used, and heparinization is not required during venovenous bypass.

- **What type of gallstone is associated with cirrhosis and hemolysis?**  
Black-pigment stones (bilirubin).
- **Where is an accessory right hepatic artery found and what is its origin?**  
It can arise from the superior mesenteric artery and passes posterior to the head of the pancreas, to the right of the portal vein, and posterior to the common bile duct (seen in 15%–20% of patients).
- **When is it not safe to ligate the gastroduodenal artery?**  
When the gastroduodenal artery is the hepatic artery and arises from the superior mesenteric artery.
- **Which bifurcation occurs first in the hilum of the liver: hepatic artery, portal vein, or common hepatic duct?**  
The hepatic artery.
- **Is preservation of the hepatic veins important in hepatic resection?**  
Usually not. There are connections between the hepatic veins; as long as one of them is left open, the venous drainage of the remnant is generally adequate.
- **How is the diagnosis of amebic abscess confirmed?**  
By indirect hemagglutination.
- **What pathologic features of hepatocellular carcinoma (HCC) are associated with improved survival?**  
Tumors exhibiting the fibrolamellar variant, encapsulated tumors, and pedunculated tumors.
- **What is total vascular exclusion as used for liver resection?**  
Control and occlusion of the hepatic artery, portal vein, and supra- and infrahepatic vena cava to allow hepatic parenchymal transection in a bloodless field.
- **What is partial vascular exclusion as used for liver resection?**  
Control and occlusion of the inflow and outflow to the resected portions of the liver during hepatic parenchymal transection to reduce blood loss.
- **What is intermittent ischemia as applied to liver resection?**  
The inflow of the liver is periodically occluded for brief periods of time (typically 15–20 minutes). The liver is then reperfused for 5 minutes before the clamp is reapplied.
- **What factors increase the likelihood of curative liver resection for metastatic colorectal cancer to the liver?**  
Long interval between resection of the primary and discovery of the liver metastasis and ability to resect lesion(s) with a 1-cm margin of normal tissue.
- **What is the cure rate for resectable liver metastases from a colon primary?**  
30% five-year survival.

**What are the CT scan findings characteristic of focal nodular hyperplasia (FNH) of the liver?**

Contrast CT with immediate enhancement of mass with a central stellate scar. Without contrast the mass is a homogenous hypoattenuating feature. The mass consists of nodules of hepatocytes without central veins or portal tracts. Surgery is reserved for symptomatic masses, as there is no malignant transformation potential as in hepatic adenomas.

**T/F: Hepatic artery infusion of chemotherapy increases survival in patients with hepatic metastases from colon and rectal primaries.**

False.

**What is the appropriate treatment for a patient with a 6-cm calcified cystic lesion in the anterior right lobe of the liver with a positive Casoni test?**

Pericystectomy.

**What techniques are available to limit the number of patients subjected to operation who ultimately prove to have incurable and/or unresectable liver metastases?**

PET scan has become the standard. Other modalities include CT angiography, MRI, PET scan, laparoscopic ultrasound, and exploration.

**What drug is associated with hepatic adenomas and what is their treatment?**

Estrogen; surgical resection is Tx.

**How often does cancer arise in FNH?**

Virtually never.

**What is the 5-year survival rate following resection of HCC in a noncirrhotic liver?**

30%.

**What are the indications for surgery for patients with cavernous hemangioma of the liver?**

Pain caused by hemorrhage or rupture and development of a consumptive coagulopathy.

**If a hepatic cyst compresses the biliary tree or contains bile, how is the treatment of the cyst different?**

Sclerosis of the cyst should not be undertaken if there is evidence of involvement of the

**T/F: Cytology of hepatic cyst contents reliably predicts the presence or absence of tumor in the cyst lining.**

False.

**What is the treatment of choice for hydatid cysts of the liver?**

Radical removal of the cyst including the pericyst (sclerotic, fibrous reactive capsule).

**What is the Sigura procedure?**

An operation for bleeding esophageal varices in which division of the esophageal varices is accomplished by transection of the esophagus and reanastomosis, usually with an EEA stapler.

- **What is the proper treatment for bleeding gastric varices without esophageal varices?**  
Splenectomy for splenic vein thrombosis.
- **What are the key issues in management of patients with portal hypertension resulting from Budd–Chiari syndrome?**  
Patency of the IVC and quality of liver function.
- **What is the most common cause of portal hypertension in children?**  
Portal vein thrombosis.
- **What pressure defines portal hypertension and why?**  
12 mm Hg is generally accepted as portal hypertension. Below this level, bleeding from varices is rarely seen.
- **What substances are thought to be responsible for the hyperdynamic circulation seen in patients with cirrhosis and portal hypertension?**  
Prostaglandins, glucagon, nitric oxide, and TNF.
- **What is the role of TIPS in the management of variceal hemorrhage?**  
TIPS is a temporary shunt that functions as a small-diameter end-to-side shunt. The expected duration of the shunt is 6 months to 2 years. It is most suited to management of variceal hemorrhage in patients not responding to banding or sclerotherapy and those with gastric varices. It is an excellent bridge to transplantation for those who might not tolerate a surgical shunt and who are candidates for liver transplantation.
- **What are the characteristic laboratory findings in a patient with idiopathic thrombocytopenia purpura (ITP)?**  
A platelet count of less than 50,000/mm<sup>3</sup>, prolonged bleeding time, and a normal clotting time.
- **What is the treatment for ITP?**  
An initial 6 weeks' to 2 months' trial of steroids. If there is no response to steroid therapy, splenectomy is indicated.
- **What is the mechanism of portal hypertension caused by schistosomiasis?**  
Presinusoidal obstruction.
- **A 30-year-old female presents with acute onset of fever and purpura. Laboratory evaluation reveals anemia, thrombocytopenia, leukocytosis, and an elevated BUN and creatinine. What is the most likely diagnosis?**  
Thrombotic thrombocytopenic purpura (TTP).
- **When is splenectomy indicated in patients with myeloid metaplasia?**  
For control of anemia and thrombocytopenia and for symptoms of splenomegaly.
- **What are the characteristic blood smear findings of a postsplenectomy patient?**  
Howell–Jolly bodies, siderocytes, leukocytosis, and an increased platelet count.

- **What are the most common causes of spontaneous splenic rupture?**  
Complications of malaria and mononucleosis.
- **What is the appropriate management for patients with portal vein injury that cannot be repaired?**  
Ligation of the portal vein.
- **What are the most common causes of secondary hypersplenism?**  
Hepatic disease or extrahepatic portal vein obstruction.
- **T/F: Splenectomy is the treatment of choice for patients with hairy cell leukemia.**  
False. Splenectomy is reserved for patients who fail medical management.
- **What is the inheritance pattern of hereditary spherocytosis?**  
Autosomal dominant. This is the disease for which splenectomy is always curative.
- **What are the clinical manifestations of pancreatic exocrine insufficiency?**  
Steatorrhea and malabsorption.
- **What is the typical clinical course of sclerosing cholangitis?**  
Chronic, relapsing disease associated with jaundice, pruritis, pain, and fatigue.
- **What percentages of alcoholics develop chronic pancreatitis?**  
10% to 15%.
- **What is the significance of Gray Turner's syndrome/sign?**  
This represents dissection of blood from the retroperitoneum near the pancreas in patients with hemorrhagic pancreatitis. It results in flank ecchymosis on physical examination.
- **What would you expect the serum amylase level to be in a patient with acute pancreatitis?**  
Two to five times normal.
- **What veins are ligated during a distal splenorenal shunt?**  
The inferior mesenteric vein, coronary vein, and pancreatic branches of the splenic vein.
- **What is the most common finding on plain abdominal X-ray in a patient with acute pancreatitis?**  
Dilatation of an isolated loop of intestine adjacent to the pancreas (sentinel loop).
- **A 60-year-old male presents to the emergency room with acute pancreatitis. His WBC count is 14,000/mm<sup>3</sup>, blood glucose is 250 mg/dL, LDH is 400, and AST is 275. What is his mortality risk?**  
15% (three Ranson's criteria present).

- **What is the principal symptom in the majority of patients with chronic pancreatitis?**  
Abdominal pain, usually in the epigastrium and described as cramping, boring, or aching.
- **What are the most common complications of chronic pancreatitis?**  
Pseudocyst, diabetes mellitus (DM), and malnutrition.
- **Patient has severe ulcer, diarrhea, and gastrin >1000. In addition, secretin stimulation test results in elevated gastrin level. What is your diagnosis?**  
Gastrinoma.
- **What is the most common islet cell tumor in MEN-1?**  
Gastrinoma.
- **Where are 90% gastrinomas located?**  
Gastrinoma triangle—cystic/CBD junction—pancreas neck—third portion duodenum.
- **What medical conditions are associated with somatostatinoma?**  
Gallstones, steatorrhea, pancreatitis, and diabetes.
- **What skin condition is associated with glucagonoma?**  
Migratory necrolytic erythema.
- **What syndrome is associated with vasoactive intestinal polypeptide (VIP) oma?**  
WDHA syndrome = watery diarrhea, hypokalemia, and achlorhydria.
- **T/F: NGT and H2 blockers improve symptoms in gastrinoma and VIP oma?**  
False. These will improve gastrinoma symptoms only.
- **When should a lateral pancreaticojejunostomy (Puestow procedure) be performed?**  
When the diameter of the main pancreatic duct increases to 7 mm or more in a patient with chronic pancreatitis refractory to alcohol abstinence, pancreatic enzyme supplementation, and analgesics. This procedure results in long-term pain relief in two-thirds of patients.
- **When should pancreatic resection be considered in chronic pancreatitis?**  
For patients with severe pain, when the pancreatic duct is narrow or normal, patients who have recurrence following the Puestow procedure. Subtotal pancreatectomy with ampulla preservation is performed when celiac plexus nerve blockade is ineffective.
- **What is the best method to assess the risk of bleeding from esophageal varices?**  
The size of the varices when viewed endoscopically.

- **What type of cancer accounts for 90% of exocrine pancreatic tumors?**  
Ductal adenocarcinoma.
- **What is meant by a modified Whipple?**  
Preservation of the stomach and pylorus.
- **What is the most common benign neoplasm of the exocrine pancreas?**  
Serous (microcystic) cystadenomas.
- **What is the best test for confirmation of the diagnosis of insulinoma?**  
Demonstration of fasting hypoglycemia in the face of an inappropriately high level of insulin.
- **What percentage of gastrinomas are solitary adenomas?**  
25%.
- **What are the laboratory requirements for the diagnosis of gastrinoma?**  
Fasting hypergastrinemia (greater than 200 pg/mL blood) in the face of gastric acid hypersecretion (basal acid output greater than 15 mEq/h) with an intact stomach or greater than 5 mEq/h after ulcer surgery.
- **If a patient has a serum gastrin level of 200 to 500 pg/mL, what test must be done to confirm the diagnosis of gastrinoma?**  
The secretin provocative test.
- **What is the drug of choice for the treatment of gastrinoma?**  
Omeprazole.
- **What is the cause of most cases of WDHA?**  
An islet cell tumor of the pancreas that produces VIP.
- **What conditions are associated with annular pancreas?**  
Down's syndrome, duodenal atresia, and peptic ulcer.
- **A 53-year-old alcoholic patient presents to the emergency room with pancreatitis and five of Ranson's criteria. What is the initial treatment of this patient?**  
Gastric decompression and intravenous antibiotics. APO status and TPN as well.
- **What is the most appropriate treatment for a patient who presents with acute gallstone pancreatitis?**  
Initial ERCP with papillotomy and subsequent cholecystectomy.
- **What are the biochemical characteristics of pancreatic ascites?**  
Fluid amylase greater than serum amylase and fluid protein greater than 2.5 gm/dL.

- **What is the most appropriate treatment for a 55-year-old alcoholic with chronic pancreatitis, intractable abdominal pain, and no evidence of diabetes?**  
Lateral pancreaticojejunostomy if the pancreatic duct is dilated.
- **What is the most common type of biliary enteric fistula?**  
Cholecystoduodenal.
- **Which benign hepatic lesions are associated with exogenous estrogen use?**  
Hemangiomas, hepatic adenomas, and FNH.
- **A 27-year-old female undergoes exploration for a benign-appearing large, solitary hepatic cyst after experiencing progressive RUQ pain. Upon unroofing the cyst, frozen section of the cyst wall reveals a cuboidal epithelial lining. Is any further treatment indicated?**  
Yes. A wedge resection or lobectomy should be performed for definitive resection.
- **What is the most common clinical manifestation of decompensation in a cirrhotic patient?**  
Ascites.
- **What is the mortality rate for an initial variceal hemorrhage?**  
40% to 50%.
- **What benign hepatic lesion is characterized by the presence of Kupffer cells?**  
FNH.
- **What is the most common benign hepatic tumor?**  
Cavernous hemangiomas.
- **During laparoscopic cholecystectomy for a 32-year-old female, multiple thin adhesions are seen in the right upper quadrant to the surface of the liver and surrounding the fundus of the gallbladder. What is the presumed etiology?**  
Fitz–Hugh–Curtis syndrome (intra-abdominal dissemination of pelvic inflammatory disease).
- **T/F: There is an association between the presence of gallstones and the occurrence of gallbladder adenocarcinoma.**  
True. 70% of cases of gallbladder adenocarcinoma occur in patients with long-standing cholelithiasis.
- **What is the name for a cholangiocarcinoma that presents at the confluence of the right and left hepatic ducts?**  
A Klatskin tumor.
- **ERCP performed for a nonalcoholic patient with recurrent pancreatitis reveals that the predominant drainage of the pancreas is via the lesser duct. What is the most likely diagnosis?**  
Pancreas divisum.

**○ What is the common channel concept in relation to obstructive pancreatitis?**

A portion of the common bile duct is shared with the main pancreatic duct in 66% of the population. Passage of gallstones may obstruct at this level, leading to the development of acute pancreatitis with biliary reflux into the pancreatic duct, which is thought to be a contributing factor.

**○ What percentage of patients develop severe pancreatitis following routine ERCP?**

1%.

**○ A 60-year-old male presents with severe abdominal pain. He has a WBC count of  $18,000/\text{mm}^3$  and a serum glucose of 250 mg/dL on admission. Within 24 hours his hematocrit has dropped 10% and his serum calcium is 6 mg/dL. What is his estimated mortality from acute pancreatitis?**

40% (four Ranson's criteria).

**○ What is the pathognomonic finding for chronic pancreatitis on KUB?**

Pancreatic calcifications.

**○ A 47-year-old male presents with an epigastric mass, early satiety, and weight loss. His history is significant for an episode of alcohol-induced pancreatitis 6 months ago, and his serum amylase is normal. What is the most likely diagnosis and what is the optimal treatment?**

A pancreatic pseudocyst. Treatment is enteric drainage if unresolving or causing significant symptoms.

**○ What are the indications for surgical intervention for a patient with a pancreatic pseudocyst?**

Size greater than 5 cm, infection, gastrointestinal obstruction, hemorrhage, spontaneous rupture, and failure to resolve within 6 weeks, given adequate conservative management.

**○ A 57-year-old male with long-standing chronic pancreatitis gradually experiences relief of pain without medical intervention. What is the most likely diagnosis?**

Progressive fibrosis of the gland with complete pancreatic exocrine insufficiency.

**○ A 68-year-old male presents with vague, recurrent abdominal pain. What is the most sensitive and specific test for the diagnosis of chronic pancreatitis?**

ERCP.

**○ What are the surgical indications for chronic pancreatitis?**

Intractable pain with lifestyle changes, inability to work, and narcotic addiction.

**○ What are the indications for pancreatic resection versus pancreatic drainage?**

Drainage is an option if the pancreatic ducts are dilated beyond 8 mm. Resection is indicated if the ducts are small or if they are of normal caliber when an isolated portion of the gland is affected. Resection is also indicated after a failed drainage procedure.

- A patient has failed to get adequate pain relief from a Peustow procedure. What is the next procedure of choice?**

Pancreaticoduodenectomy. Consider celiac nerve block if multiple comorbidities.
- A 50-year-old female, who consumes ETOH occasionally, presents with a stricture of the CBD that appears as an abrupt termination of contrast on ERCP. What is the most likely diagnosis?**

Malignancy.
- A 58-year-old male develops a moderate amount of bleeding from a drain site 24 hours after a Whipple resection. What catastrophic complication does this represent?**

A necrotizing retroperitoneal infection with erosion into an exposed portal vein.
- In choosing a partial versus complete pancreatectomy, what is the rationale for total pancreatectomy for patients with an exocrine neoplasm of the pancreas?**

The eradication of residual disease at margins of resection and avoidance of pancreaticojejunostomy with risk of disruption.
- During a palliative procedure for unresectable pancreatic carcinoma, aspiration of the gallbladder returns clear fluid. What does this indicate?**

Complete cystic duct occlusion.
- A 33-year-old female presents with vague abdominal discomfort and a palpable abdominal mass. Imaging studies reveal a 10-cm mass in the tail of the pancreas with solid and cystic components. What are the most likely diagnosis and treatment?**

This is likely a cystadenoma and is treated with distal pancreatectomy with a 90% cure rate.
- What would the same scenario indicate in a 70-year-old female?**

A serous cystadenoma or cystadenocarcinoma. Treatment would also be resection.
- Which pancreatic exocrine neoplasm most closely resembles a pancreatic pseudocyst?**

Mucinous cystadenoma.
- What is the best method to find an elusive insulinoma when there is preoperative laboratory-based confirmation of its presence?**

Endoscopic ultrasound.
- What endoscopic finding is the hallmark of Zollinger–Ellison syndrome?**

Peptic ulcerations in an unusual site, including postbulbar and jejunal ulcerations.
- If a patient presents with severe refractory PUD and diarrhea, what test should be done to rule out gastrinoma?**

The secretin stimulation test.

○ **What is the appropriate treatment of a type I choledochal cyst?**

Cyst excision with Roux-en-Y hepaticojejunostomy.

○ **Where are primary bile salts converted to secondary bile salts?**

In the small intestine.

○ **What are the complications of total portosystemic shunts?**

Encephalopathy and hepatic failure.

○ **How is the endothelial lining of the hepatic sinusoid different from other capillaries and what is its significance?**

It has large fenestrations. Consequently, it has a permeability of approximately 30 times that of other capillaries. Thus, filtration through the sinusoid is much faster. In addition, there is a space on the tissue side of the sinusoid (the space of Disse), giving the hepatocyte a large surface for contact with the filtered fluid in the extravascular space.

○ **What are the elements of Charcot's triad?**

Jaundice, fever with chills, and biliary colic.

○ **What organisms are most commonly involved in bacterial cholangitis?**

*E. coli*, *Klebsiella*, *Pseudomonas*, enterococci, and proteus.

○ **What are the common complications of choledocholithiasis?**

Secondary biliary cirrhosis, acute pancreatitis, and intrahepatic abscesses.

○ **How is the caudate lobe different from the other segments of the liver, with respect to its vascular supply?**

It receives blood from the right and left hepatic arteries and the portal vein. Most of the venous blood drains directly into the vena cava.

○ **What percentage of normal persons has classic hepatic arterial anatomy (a single hepatic artery arising from the celiac axis and dividing into the left and right hepatic arteries)?**

50%.

○ **What are the risk factors for HCC?**

Aflatoxins, low protein intake, hepatitis B and C, and cirrhosis.

○ **How is alpha-fetoprotein (AFP) helpful in following patients with cirrhosis for the development of cancer?**

A rising AFP predicts development of HCC.

○ **How does cirrhosis affect the outcome of liver resection?**

The cirrhotic liver regenerates poorly and may not fully recover after extensive liver resection. Hepatic failure may ensue.

- **What is the value of PET scanning in the evaluation of patients with colorectal metastases to the liver?**

It may allow identification of additional lesions in the liver or outside of the liver that may render curative resection impossible.

- **What organisms produce hydatid cysts of the liver?**

*Echinococcus granulosus* and *Echinococcus multilocularis*. These should be treated with enucleation and avoidance of spillage of cyst contents to prevent anaphylaxis.

- **What is the advantage of a selective shunt over a nonselective shunt?**

A selective shunt will preserve hepatic blood flow and reduce the risk of portosystemic encephalopathy.

- **What is the first line of therapy for patients with bleeding esophageal varices?**

Endoscopic banding or sclerotherapy.

- **What is the role of propranolol in the management of patients with bleeding esophageal varices?**

It reduces the risk of rebleeding after a first bleed by decreasing the portal pressure.

- **What arterial supply is shared by the head of the pancreas and the second and third portions of the duodenum, necessitating en bloc resection of the duodenum with lesions of the pancreatic head?**

The inferior pancreaticoduodenal artery, from the superior mesenteric artery, collateralizes with the superior pancreaticoduodenal artery, arising from the gastroduodenal artery.

- **What is the only pancreatic enzyme secreted in active form?**

Amylase.

- **What are the most frequent complications following major hepatic resection?**

Hemorrhage and bile leak.

- **What vessels are contained within the gastrosplenic ligament?**

The short gastrics.

- **What is the primary pathophysiology in acalculous cholecystitis?**

Gallbladder stasis.

- **What are the clinical features of hereditary spherocytosis?**

Anemia, reticulocytosis, jaundice, and splenomegaly.

- **What are the indications for splenectomy in a patient with Felty's syndrome?**

Recurrent infections with neutropenia, patients requiring transfusion for anemia, profound thrombocytopenia, and intractable leg ulcers.

○ **What is the embryologic origin of the spleen?**

Mesenchymal differentiation in the dorsal mesogastrium.

○ **What are the normal splenic functions?**

Reservoir for circulating platelets, blood filter of old/damaged RBCs, bacteria and particulate antigens, phagocytosis and production of tuftsin, antibodies (especially IgM), opsonins, and properdin.

○ **What is the main chemical component of pigment gallstones?**

Calcium bilirubinate.

○ **A 23-year-old IV drug abuser presents to the emergency room with fever, chills, splenomegaly, and left upper quadrant abdominal tenderness. What is the most likely diagnosis?**

Splenic abscess. Treatment is splenectomy.

○ **What are the indications for operation in patients with splenic injury?**

Extrasplenic contrast blush on CT scan or persistent hemodynamic instability refractory to 2 L of crystalloid and 2u PRBC.

○ **What is the risk of overwhelming postsplenectomy sepsis in children? In adults?**

0.6% in children and 0.3% in adults.

○ **What are the principal anions in pancreatic juice?**

Bicarbonate and chloride.

○ **What is the anatomic relationship of the uncinate process of the pancreas to the portal vein and superior mesenteric vessels?**

It is posterior.

○ **What cells synthesize somatostatin?**

Delta cells.

○ **What is the embryologic etiology of an annular pancreas?**

Abnormal rotation and fusion of the ventral pancreatic primordium.

○ **What is the significance of the colon cutoff sign?**

It is caused by inflammation of the pancreas, which induces spasm in the adjacent colon.

○ **In what region of the pancreas do most pseudocysts occur?**

The body.

- **How long does it take for a pseudocyst to mature sufficiently enough for surgical resection?**  
4 to 6 weeks (unless the cyst arises during acute pancreatitis, in which case no waiting is necessary).
- **What is the classic diagnostic (Whipple's) triad for insulinoma?**  
Hypoglycemic symptoms produced by fasting, blood glucose less than 50 mg/dL during symptomatic episodes, and relief of symptoms with intravenous administration of glucose.
- **What is Courvoisier's sign and what does its presence suggest?**  
It is a distended and palpable gallbladder in a jaundiced patient. It suggests malignant obstruction.
- **What characteristic finding on ERCP suggests pancreatic cancer?**  
Constriction of the pancreatic and bile ducts in the head of the gland (the double duct sign).
- **Resection of which organs is included in the Whipple procedure?**  
The distal stomach, gallbladder, common bile duct, head of the pancreas, duodenum, proximal jejunum, and regional lymphatics.
- **What is the etiology of Zollinger–Ellison syndrome?**  
Gastric acid hypersecretion caused by excessive gastrin production.
- **What percentage of gastrinomas are associated with the MEN-1 syndrome?**  
25% (the most common islet cell tumor in MEN-1 syndrome).
- **What is the typical constellation of symptoms seen in patients with glucagonomas?**  
Migratory necrolytic dermatitis, weight loss, stomatitis, hypoaminoacidemia, and mild diabetes.
- **T/F: Cigarette smoking is the most strongly associated risk factor for adenocarcinoma of the pancreas.**  
True.
- **How many molecules of ATP does glycolysis generate for each molecule of glucose?**  
37, with one molecule being utilized for storage.
- **T/F: The falciform ligament demarcates the right hepatic lobe from the left hepatic lobe.**  
False. The gallbladder fossa and IVC are the landmarks.
- **When performing complex biliary procedures, where in the hepatoduodenal ligament would you expect to find the common bile duct?**  
The duct is most lateral, with the hepatic artery medial and the portal vein most posterior.
- **What is the primary indication for hepatic resection in cirrhotic patients?**  
HCC.

- **In evaluating ascitic fluid obtained from a patient presumed to have SBP, what laboratory findings are expected?**

A WBC count greater than  $500/\mu\text{L}$  with greater than 25% PMNs, a serum albumin:ascitic fluid albumin gradient greater than 1.1 g/dL, a serum lactic acid level greater than 33 mg/dL, or an ascitic fluid pH of less than 7.31.

- **What is the treatment of choice for hepatocellular adenomas?**

Surgical excision when the mass reaches 4 cm. There is potential for malignant transformation of these tumors.

# Esophagus, Stomach, Duodenum, and GI Physiology Pearls

- **What are the characteristic manometric findings in achalasia?**

Failure of the lower esophageal sphincter (LES) to relax completely, with swallowing associated with an absence of organized propulsive peristalsis, elevated resting LES pressure, and nonpropulsive simultaneous contractions (tertiary waves) on manometry.
- **What is the most common complaint of patients with a duodenal ulcer?**

Epigastric pain.
- **T/F: Elevated serum gastrin levels during fasting are typically seen in patients with a duodenal ulcer.**

False.
- **What findings on esophagogastroduodenoscopy (EGD) and upper gastrointestinal (UGI) contrast studies are associated with achalasia?**

The bird beak esophagus is the classic UGI finding in achalasia. The gastroesophageal (GE) junction should not appear strictured, and, except in end-stage cases, an adult endoscope should easily pass through the GE junction with steady pressure.
- **What does the parietal cell secrete?**

HCl and intrinsic factor.
- **What does intrinsic factor assist in?**

It binds to vitamin B12 and allows B12 absorption in the terminal ileum.
- **What are the treatment options available to an otherwise healthy patient with achalasia?**

Endoscopic balloon dilation and operative (Heller) esophagomyotomy. Myotomy is far more durable and should be the first-line option in patients of acceptable surgical risk.
- **An 80-year-old man with severe achalasia, caused by unrelated medical problems, who is not a candidate for surgery, requests treatment for his dysphagia. What is your recommendation?**

Endoscopic dilation or botulinum injection.

○ **What is involved in the Belsey procedure?**

Two layers of plicating sutures placed between the gastric fundus and the lower esophagus with subsequent creation of a 280-degree anterior gastric wrap and posterior approximation of the crura.

○ **What is the best test to diagnose GERD?**

24-hour pH probe.

○ **Which cells produce pepsinogen?**

The chief cells produce pepsinogen, which initiates gastric proteolysis.

○ **Which peptide activates the digestive cascade?**

Enterokinase, which then acts on trypsinogen to trypsin.

○ **A 70-year-old man with a 30-year history of achalasia presents with recurrence of his symptoms after a successful balloon dilation several years previously. What is the appropriate treatment?**

Esophagomyotomy after carcinoma is ruled out.

○ **A 45-year-old woman presents with manometrically documented primary achalasia. Her esophagus is massively dilated and contains a significant amount of undigested food. She has failed several prior attempts at modified Heller myotomies and has had several hospital admissions. What is the treatment of choice?**

Total esophagectomy.

○ **What are the potential intraoperative complications during transhiatal esophagectomy?**

Recurrent laryngeal nerve injury, tear in the membranous wall of the trachea, azygous vein disruption, hemothorax, and pneumothorax.

○ **T/F: Stage for stage, the survival rate after radical en bloc esophagectomy is better than that after transhiatal esophagectomy.**

False.

○ **A patient with severe reflux symptoms has virtually complete relief with proton-pump inhibitor therapy. The patient still requests an operation so that medication will not be required. Is the patient a candidate for surgery?**

Yes. Surgery for gastroesophageal reflux (GER) is an option for patients who are concerned about the inconvenience, cost, and long-term medical consequences of daily medication, provided the patients are medically fit for an operation.

○ **How is GER most objectively documented?**

By 24-hour esophageal pH monitoring.

○ **What is Barrett's esophagus?**

The presence of 2 to 3 cm of columnar intestinal epithelium along the esophageal mucosa. Intestinal metaplasia is diagnostic of Barrett's, regardless of its proximal extent. It is important to sample the tissue to ensure that high-grade dysplasia or malignancy is not concurrently present. Serial surveillance with EGD is critical in these patients.

- **What is meant by a highly selective vagotomy?**  
Division of individual branches of the nerve of Latarjet, preserving the crow's foot.
- **T/F: Esophageal manometry is a necessary part of the evaluation of a patient being considered for an antireflux condition.**  
True.
- **What is the classic metabolic abnormality associated with gastric outlet obstruction?**  
Hypochloremic, hypokalemic metabolic acidosis.
- **The best method of establishing the diagnosis of an esophageal leiomyoma is by what means, and what is the preferred treatment?**  
Dx: typical appearance on EGD; TX: enucleation, not esophagectomy.
- **What is the most common type of gastric polyp?**  
Hyperplastic polyps.
- **What is the criminal nerve of Grassi?**  
A proximal branch of the posterior vagus nerve, which can be missed during vagotomy and can lead to persistent gastric acid secretion.
- **What are the three main peptides that stimulate the parietal cell?**  
Acetylcholine, histamine, and gastrin, which, through calcium, activate protein kinase C, which then increases HCl secretion.
- **Which cells produce gastrin?**  
G cells. They are located in the antrum of the stomach. They are stimulated by amino acids and acetylcystine. These are inhibited by acid.
- **What cell hyperplasia is increase in gastrin levels associated with?**  
Enterochromaffin hyperplasia (precarcinoid lesions).
- **What is secretin stimulation test?**  
Test for gastrinoma. In normal patients, the gastrin level goes down with administration of secretin. In gastrinoma, there is a paradoxical rise in serum gastrin levels with secretin administration.
- **What is the effect of antrectomy for ulcer treatment?**  
Removal of the G cells, which are located in the antrum, and therefore remove stimulation of G cells.
- **What is the mechanism of omeprazole?**  
There is blocking of H/K ATPase of parietal cell with a secondary decrease in acid production.

- **A 50-year-old otherwise healthy patient, who has suffered from recurrent lobar pneumonia, is referred for antireflux surgery. Under what circumstances would you be willing to operate?**

When GER can be objectively demonstrated on a 24-hour esophageal pH study. Evidence of reflux into the proximal esophagus, presence of laryngeal inflammation, and a good response of pulmonary symptoms to a 3-month trial of high-dose proton-pump inhibitors also correlate with a good response to surgery. Other etiologies for pulmonary symptoms must be eliminated.

- **A patient who underwent a Nissen fundoplication 2 weeks ago continues to have trouble swallowing. What is your recommendation?**

Allow time for the edema to resolve; then re-evaluate.

- **T/F: Traction diverticula are associated with tuberculosis.**

True.

- **What is a Schatzki's ring?**

A dense annular band in the submucosa at the squamocolumnar junction.

- **What is the most potent stimulant for gastric acid secretion?**

Ingestion of a mixed high-protein meal.

- **A patient whose reflux symptoms resolved following a Nissen fundoplication presents several years later with recurrent symptoms. What is the diagnostic test of choice?**

UGI contrast study.

- **A 45-year-old patient with Barrett's esophagus, containing high-grade dysplasia on endoscopic biopsy specimens from the distal esophagus, is referred to you. What is the treatment of choice?**

Distal esophagectomy.

- **A 50-year-old woman with a known reflux-induced stricture of the distal esophagus presents with dysphagia. She had successful endoscopic dilatation 1 year previously and was free of dysphagia until now. Her symptoms of GER are mild and controlled with H2 blockers as needed. How should she be managed?**

Malignancy must be ruled out prior to undertaking any therapy. Assuming that her stricture is reflux induced, repeat endoscopic dilation should successfully treat her dysphagia. Refractory benign strictures should be treated with short-segment focal esophageal resection.

- **T/F: GER occurs in all patients with a sliding hiatal hernia.**

False.

- **What are the most common complications of type II hiatal hernias?**

Occult gastrointestinal bleeding, ulceration in the herniated portion of the stomach, and gastric volvulus.

- **A patient with a long history of reflux symptoms presents with a peptic stricture of the distal esophagus that cannot be dilated by flexible or rigid endoscopy. What is the treatment of choice?**  
Resection.
- **What is the most important predictor of stomach ulcer recurrence?**  
Slow healing of the initial ulcer (longer than 3 months).
- **T/F: Routine splenectomy improves survival in patients with gastric adenocarcinoma.**  
False.
- **An 80-year-old man presents with dysphagia that prevents him from adequately clearing his pharynx of food. He also notices gurgling in his neck when he swallows. What is the most likely diagnosis?**  
A Zenker's diverticulum.
- **What is the diagnostic test of choice for a Zenker's diverticulum?**  
Barium swallow.
- **What is the proper surgical approach for repair of a Zenker's diverticulum?**  
A left lateral neck incision.
- **What are the painful abdominal conditions that increased PTH is associated with?**  
Renal stones, pancreatitis, and gastritis/peptic ulcer disease (PUD).
- **What does somatostatin do?**  
Pan-GI inhibition. It inhibits gastrin, insulin, secretin, Ach, and pancreatic and biliary output. Its release is stimulated by acid in duodenum.
- **What is the most common complicating symptom post vagotomy?**  
Diarrhea.
- **What are the types of dumping and the treatment?**  
Early—because of hyperosmotic load, and fluid shifts.  
Late—because of increased insulin and decreased glucose.  
These both can usually be treated with dietary changes. 90% respond favorably to low carbohydrate loads.
- **What is peptide YY role and where is it released?**  
Released in terminal ileum and acts to inhibit acid secretion and GI motility.
- **What is treatment of gastric lymphoma?**  
This is an area of controversy for surgery versus primary chemotherapy. Hard indications for surgery as the primary treatment are an obstructing, perforated, or bleeding lesion. Small bowel lymphoma is always treated with surgery.

- **A 40-year-old patient with a known history of alcohol abuse presents with a 6-hour history of severe epigastric pain following an episode of emesis. What is the appropriate initial diagnostic study in this patient's evaluation?**  
UGI with water-soluble contrast.
- **The above patient's UGI study shows free flow of contrast from a perforation in the distal esophagus into the left pleural space. There are no other abnormalities. What is the treatment of choice?**  
Repair or replacement of his esophagus.
- **Under what circumstances is nonoperative management of an esophageal perforation appropriate?**  
Minimal signs of systemic sepsis, when the UGI shows no significant contamination of the pleural space, and a sealed perforation, with all extravasated contrast returning to the lumen of the esophagus.
- **An otherwise healthy patient with achalasia suffers from an esophageal perforation during endoscopic balloon dilation of the LES. What is the appropriate management of this patient?**  
Repair the defect in conjunction with a modified Heller myotomy. A fundoplication should also be performed.
- **A 65-year-old patient is undergoing dilation for a peptic stricture of the distal esophagus when the esophagus is inadvertently perforated. How will you proceed?**  
The stricture must be resected, preferably through a transhiatal approach, with a cervical esophagostomy.
- **A 50-year-old otherwise healthy male presents with a spontaneous distal esophageal perforation into the left pleural space. He states that his epigastric pain began after an episode of vomiting 48 hours prior to his presentation. You perform a left lateral thoracotomy, and the esophageal tissue around the site of perforation appears viable and will hold a suture. What is the treatment of choice?**  
Primary repair of his esophagus.
- **What is the best option for the above patient if, on exploration, the esophageal tissue is too friable to confidently repair primarily?**  
Resection of the esophagus with a high thoracic or cervical esophagostomy and distal feeding jejunostomy.
- **What is the most common malignant neoplasm of the esophagus?**  
Adenocarcinoma has surpassed squamous cell in the United States as the most common.
- **T/F: Nissen fundoplication can reverse the Barrett's metaplasia.**  
True. Initially thought to only halt the progression of Barrett's, there is emerging evidence that fundoplication can actually reverse metaplasia.
- **A 34-year-old female with documented GER and symptoms of severe heartburn, poorly controlled with proton-pump inhibitors, is referred for a Nissen fundoplication. On manometry, she has no peristalsis in the distal two-thirds of her esophagus and no identifiable LES. A UGI shows a moderately dilated esophagus with a patulous GE junction. She also complains of severe fatigue and very cold hands. What is the most likely diagnosis?**  
Scleroderma. This disease involves diffuse systemic fibrosis of connective tissue with esophageal involvement in 90% of cases. Characteristics of esophageal disease are dysphagia, a dilated esophagus, low LES pressure, low amplitude or aperistalsis, esophagitis, and esophageal strictures.

- **What is the most appropriate treatment for a septic patient with a 48-hour-old perforation of the thoracic esophagus and pneumohydrothorax?**  
Pleural drainage, esophageal exclusion, gastrostomy, and cervical esophagostomy.
- **What is the most common visceral complication secondary to cocaine use, which requires abdominal exploration?**  
Gastric or duodenal ulcer with perforation. Bowel ischemia secondary to vasospasm is also well reported.
- **What is the best modality to evaluate the T stage of esophageal and pancreatic tumors?**  
Endoscopic ultrasound (EUS).
- **What nonsurgical treatment options are most efficacious in the treatment of a patient with continuous bleeding from a Mallory–Weiss tear?**  
Endoscopic cauterization or epinephrine injection of the bleeding site. When endoscopic modes of treatment fail, other options such as balloon tamponade, angiographic embolization, or intravenous pitressin infusion should be tried.
- **What operation should be performed in a patient who continues to bleed from a Mallory–Weiss tear after endoscopic attempts to secure hemostasis have failed?**  
The site of bleeding is oversewn, from within the lumen, through a high gastrostomy.
- **What anatomic features of the esophagus render the transhiatal esophagectomy feasible?**  
The thoracic esophagus is situated between organs in the mediastinum that have firm fascial or fibrous boundaries and is surrounded by loose areolar tissue, facilitating blunt dissection.
- **What is the gastric output in patients with a duodenal ulcer?**  
Approximately 40 mEq/L.
- **Is postoperative NG tube after a low anterior resection of the rectum for adenocarcinoma beneficial?**  
No. Unless profound ileus develops in the postoperative period, routing NG tube postop is not necessary.
- **How does erythromycin stimulate the GI tract?**  
It acts on the motilin receptor and is prokinetic. Motilin is the key stimulatory hormone of the MMC.
- **Where does most water absorption occur?**  
Jejunum.
- **A 70-year-old patient has an early esophageal adenocarcinoma 39 cm from the incisors, involving only the submucosa. There is no apparent nodal involvement on EUS. He has an FEV1 of 0.7 but is otherwise in good health. Assuming that the remainder of his staging studies does not reveal disseminated disease, what is his best surgical option?**  
A transhiatal esophagectomy.

- A patient has an esophageal tumor invading the muscularis propria and all lymph nodes are free of tumor. What stage is this patient's disease?**  
Stage IIA.
- A 24-year-old female with known PUD has been managed adequately with H2 blockers when she finds she has become pregnant. What alterations in her medical therapy should be made?**  
Sucralfate is the recommended therapy for PUD in pregnancy, as it has minimal systemic absorption and acceptable healing rates of 80% in 6 weeks.
- What medication is contraindicated in the above patient?**  
Misoprostol.
- What are the indications for surgery for patients with PUD?**  
Perforation, hemorrhage, obstruction, and intractability.
- A 40-year-old female presents with nausea, palpitations, epigastric pain, and diarrhea within 20 minutes of eating. Her history is significant for a Billroth I procedure for PUD. What is the most likely diagnosis?**  
Early dumping syndrome.
- What is the treatment for patients with blind loop syndrome?**  
Appropriate antibiotic therapy frequently results in relief of symptoms within 1 week. The underlying etiology should be addressed if symptoms recur.
- What is the Heineke–Mikulicz procedure?**  
A longitudinal incision of the pylorus that is closed transversely.
- What conservative measures are appropriate for alkaline reflux gastritis?**  
H2-blockers, antacids, bile chelators, and dietary changes.
- What is the treatment of choice for alkaline reflux gastritis if conservative measures fail?**  
Creation of a Roux-en-Y anastomosis with a 50 to 60 cm Roux limb.
- How can severe bile reflux esophagitis, refractory to medical treatment, be surgically managed?**  
Gastric fundoplication.
- A 70-year-old man presents with an upper thoracic esophageal cancer that impinges on the trachea. There is no sign of disseminated disease on the CT scan or other staging studies. What is the optimal surgical approach for this patient?**  
Combined right thoracotomy and upper midline laparotomy.

- **T/F: Intrathoracic anastomotic esophagogastronomy leak post esophagectomy does not always mandate surgical exploration?**

True. If external drainage is maintained without signs of sepsis or local tissue necrosis, conservative treatment with a distal feeding tube (J) can be used.

- **How does the GB concentrate bile?**

Active reabsorption of Na and Cl with water absorption via osmosis. The bile pool is 5 g, and it is recirculated every 4 hours and we lose 0.5 g daily.

- **A 65-year-old man presents with squamous cell carcinoma of the esophagus extending from 34 to 40 cm from the incisors. On EUS there are several hypoechoic, nonhomogenous, sharply delineated paraesophageal lymph nodes within the mediastinum, which are 2 cm in diameter. There are no signs of disseminated disease on this or additional staging studies. What is the best surgical approach for this lesion?**

A left thoracoabdominal incision.

- **Which organ is most commonly used for reconstruction in the above scenario?**

The stomach.

- **What are the primary and secondary bile acids?**

Primary—cholic and chenodeoxycholic acid.

Secondary—deoxycholic acid and lithocholic acid.

- **What are the occurrences of dumping and ulcer recurrence in selective vagotomy, truncal vagotomy, and truncal vagotomy and antrectomy?**

	<b>Dumping (%)</b>	<b>Recurrence (%)</b>
SV	1	15
TV	10	10
TV + A	15	1

- **A patient who had previously undergone a vagotomy and antrectomy for PUD presents with a midthoracic esophageal squamous cell carcinoma. Assuming that the patient is a candidate for curative resection, what is the best choice for reconstruction?**

The colon.

- **A patient with an adenocarcinoma of the GE junction is seen on CT scan and EUS to have several suspicious lymph nodes surrounding the left gastric artery. Is this patient a candidate for curative resection?**

Yes.

- **During the course of a planned curative esophagectomy for an obstructing adenocarcinoma of the esophagus 38 cm from the incisors, malignant adenopathy is discovered in the hepatoduodenal ligament. The tumor does not involve any mediastinal structures on preoperative staging studies. Should esophagectomy still be considered?**

Yes.

- **What is the strongest cell layer in the esophagus?**  
The mucosa. (Remember there is no serosa layer in esophagus.)
- **What type of hiatal hernia is always managed surgically?**  
Paraesophageal.
- **What is the treatment of Zenker's diverticulum?**  
Myotomy and diverticulectomy.
- **What are the most common locations for an ectopic pancreas?**  
The gastric antrum or duodenum.
- **What is the most common malignant tumor of the duodenum?**  
Adenocarcinoma.
- **What is the initial procedure for a patient with Zollinger–Ellison syndrome and hyperparathyroidism?**  
Parathyroidectomy.
- **What are the GI manifestations of the autoimmune disease Sjogren's syndrome?**  
Atrophic gastritis, adult-onset celiac sprue, and chronic pancreatitis.
- **What is the incidence of dysphagia recurrence after pneumatic esophageal dilation for achalasia?**  
50%.
- **What are the normal components of bile?**  
Bile salts—80%.  
Lecithin—15%.  
Cholesterol—5%—patients with increased cholesterol concentration form stones.
- **What is the treatment for patients with locally extensive cancers of the cervical esophagus?**  
Surgery is usually required for effective palliation. It requires resection of the cervical esophagus and the larynx. Reconstruction involves a cervical tracheal stoma and completion blunt esophagectomy with a pharyngoesophagostomy.
- **A 65-year-old male with a known upper thoracic esophageal squamous cell carcinoma presents with paroxysmal coughing with meals. What is the most likely diagnosis?**  
Malignant tracheoesophageal fistula.
- **What is the best palliative treatment for the above patient?**  
Esophageal stenting.

- **What are the most important mediators of hydrochloric acid release?**  
Histamine, acetylcholine, and gastrin.
- **A 56-year-old male underwent resection of a midthoracic esophageal tumor through a combined right thoracotomy and midline laparotomy, and a high intrathoracic anastomosis was performed. He subsequently developed high fevers and right-sided chest pain. A gastrograffin swallow shows a small leak at the anastomosis. What is the appropriate treatment?**  
The right chest must be re-explored. If the conduit is viable, the leak may be buttressed with mediastinal tissue or an intercostal muscle flap and drained. If the conduit is ischemic or gangrenous, it must be resected, the intrathoracic esophagus oversewn, and a diverting cervical esophagostomy performed. Delayed reconstruction with colonic interposition can be performed if the patient recovers.
- **A patient with a locally extensive midthoracic esophageal squamous cell carcinoma has multiple pulmonary metastases on a CT scan of the chest. The patient has severe dysphagia and would like to be able to eat and drink again. What is the treatment of choice?**  
Endoscopic stent placement or laser therapy.
- **T/F: Adjuvant chemotherapy and radiation have no role in the treatment of esophageal tumors that are potentially resectable for cure.**  
False.
- **What are the manometric criteria for diffuse esophageal spasm (DES)?**  
Frequent simultaneous contractions associated with normal LES function and normal peristaltic contractions.
- **A patient has problem swallowing. A barium swallow is ordered showing a bird's beak and manometry is done showing lack of peristalsis and elevated LES pressures. What is your diagnosis? What is your treatment?**  
Achalasia. Treatment is laparoscopic or open Heller myotomy.
- **T/F: Barrett's esophagus is metaplasia from columnar to squamous cells.**  
False. Metaplasia from squamous to columnar.
- **What should be the initial treatment for a T4 esophageal adenocarcinoma with + lymph nodes by EUS?**  
Neoadjuvant chemoradiation with potential surgery if downstaging is successful.
- **What is the treatment for intractable GERD in a patient with poor esophageal motility?**  
Posterior partial (Toupet) fundoplication.
- **What is the Thal–Nissen procedure and what is its application?**  
Patients with a shortened esophagus and severe reflux. The procedure entails esophageal lengthening with the lesser curvature (stapled off tube), followed by total wrapping with the residual fundus.
- **During esophagectomy, which vessel do you not want to cut. It will serve as a blood supply to the pulled-up stomach?**  
Right gastroepiploic.

- **Under what circumstances is surgery warranted for DES?**  
Severe symptoms and failed nitrate or calcium channel blocker therapy.
- **What is the surgical treatment of DES?**  
An extended esophageal myotomy.
- **A 2-year-old male has a dime lodged in his esophagus at the level of the cricopharynx. What is the treatment of choice?**  
Endoscopic extraction.
- **After undergoing a seemingly uncomplicated laparoscopic Nissen fundoplication, a 42-year-old man develops shortness of breath in the recovery room. What surgical complication is most likely?**  
Iatrogenic pneumothorax. This is the most common operative complication of laparoscopic Nissen fundoplication. Other major intraoperative complications are splenic and liver laceration, and gastric/esophageal perforation.
- **What is the most appropriate treatment for symptomatic duodenal diverticula?**  
Surgical excision.
- **What is the treatment for a perforated gastric ulcer in a stable patient?**  
Resection of the involved stomach with biopsy and consideration of an acid-reducing procedure at the same time.
- **How should button batteries lodged in the esophagus be treated?**  
Emergency endoscopic removal. A UGI contrast study should be obtained the following day and within several weeks to assess for perforation and stricture formation.
- **A 65-year-old male has a large opacity in the anteromedial aspect of the right thorax on a routine chest X-ray. The opacity appears to have air within it. The patient is asymptomatic and has not had a previous chest X-ray. What is the most likely diagnosis?**  
A foramen of (anterior diaphragmatic) Morgagni hernia.
- **During the course of a radiologic contrast examination of the UGI tract, performed for abdominal pain, a 3-cm nonobstructing lesion, which appears to be a leiomyoma, is discovered. The patient denies chest pain, dysphagia, or heartburn. What is your recommendation?**  
Enucleation.
- **A 70-year-old female with dysphagia has a large epiphrenic diverticulum on an UGI contrast study. What is the treatment of choice?**  
Resection of the diverticulum with contralateral myotomy and fundoplication. If esophageal leak occurs after resection, repair the injured esophageal segment with an intercostal muscle-based flap.
- **What is the best initial treatment for a paraesophageal hiatal hernia?**  
Surgical repair, transabdominally; most surgeons will add a fundoplication and gastropexy to the diaphragm at the time of repair.

- **What is the initial workup for a patient who presents following recent ingestion of a caustic substance?**  
History and early endoscopy.
- **What are the indications for surgery in the acute setting of caustic ingestion?**  
Free air under the diaphragm, cervical crepitus, and full-thickness necrosis of the esophagus or stomach.
- **What are the four classifications of hiatal hernia?**  
Type I—elevation of the GE junction above the diaphragm only.  
Type II—herniation of a paraesophageal sliding component of the stomach (surgical repair recommended).  
Type III—herniation of both the GE junction and the stomach in direct continuity.  
Type IV—herniation of other abdominal organs in addition to the GE junction.  
Surgical repair involves reduction of the herniated contents, repair of the diaphragm, fundoplication (area of debate), and gastropexy. Surgery can be laparoscopic with the given expertise or can be open.
- **T/F: The majority of patients with hiatal hernias have clinically significant GER.**  
False.
- **What are the indications for esophageal resection in Barrett’s esophagus?**  
The presence of invasive cancer, carcinoma in situ, or high-grade dysplasia. When high-grade dysplasia is present, coexisting invasive cancer is found on definitive surgical specimen in 25% of cases.
- **What is the treatment of choice for traumatic disruption of the diaphragm?**  
Repair via abdominal approach.
- **What is the position of the GE junction when a paraesophageal hernia is present?**  
Below the diaphragm (normal position).
- **What is the treatment for Crohn’s disease with numerous strictures?**  
Multiple stricturoplasties when possible, the goal of surgery in regional enteritis is to conserve as much bowel as possible because of the relapsing/remitting nature of the disease along the entire GI tract.
- **What metabolite is found in the urine of patients with carcinoid syndrome?**  
5HIAA.
- **What factors make GI fistulas less likely to heal with nonoperative therapy (bowel rest, TPN, and octreotide)?**  
Foreign body  
Radiation  
IBD or infection  
Epithelization  
Neoplasm

Distal obstruction

Sepsis

### FRIENDS

In addition, short fistulas and gastrocutaneous fistulas are less likely to heal without surgery.

- **What are the most common complications of paraesophageal hernias?**  
Chronic blood loss anemia and gastric volvulus.
- **What disorders of the esophagus are associated with the development of esophageal carcinoma?**  
Lye ingestion, achalasia, Barrett's esophagus, and Plummer–Vinson syndrome.
- **What are the most important determinants of survival after resection of an esophageal carcinoma?**  
Depth of invasion, the presence or absence of lymph node metastases, and the presence or absence of distant metastases.
- **Which T stage does transmural involvement of an esophageal carcinoma suggest?**  
T3.
- **In addition to a CT scan of the chest and abdomen, what is included in the preoperative evaluation of proximal and upper mid-esophageal cancer?**  
Bronchoscopy.
- **What is the best surgical approach for resection of a bulky esophageal carcinoma 25 cm from the incisors?**  
The Ivor–Lewis approach (combined laparotomy, right thoracotomy, and cervical approach).
- **What is the most appropriate treatment for a patient with epidermolysis bullosa, mild chest pain, low-grade fever, and minimal mediastinal involvement?**  
Antibiotics, NPO, and parenteral nutrition.
- **What is the 5-year survival rate of a patient following complete resection of a stage II adenocarcinoma of the esophagus?**  
25%.
- **What are the complications of a prolonged chylous leak?**  
Lymphopenia, immunosuppression, malnutrition, loss of proteins, fats and fat-soluble vitamins, dehydration, and electrolyte loss.
- **What is the main risk of radiation therapy in patients with an unresectable mid-esophageal cancer that involves the left main stem bronchus?**  
The creation of a bronchoesophageal fistula.

- **T/F: Induction radiation therapy followed by surgery improves the survival of esophageal cancer over that obtained by surgery alone.**  
False.
- **What is the most significant prognostic variable for a small bowel leiomyosarcoma devoid of any evidence of metastasis?**  
Tumor grade.
- **What is the difference between the muscle layers of the proximal and distal stomach?**  
The smooth muscle of the proximal stomach is electrically stable, whereas the smooth muscle of the distal stomach shows spontaneous repeating electrical discharges. Pacesetter potentials originate along the greater curvature at a point in the proximal third of the stomach and fire at a rate of 3/min, initiating a peristaltic wave. There are no pacesetters or action potentials in the proximal stomach.
- **What is the most common location of a stomach ulcer?**  
The lesser curvature, near the incisura angularis (type 1).
- **What are medical options to assist in closing a nonhealing enteroenteric fistula secondary to Crohn's disease?**  
Anti-TNF antibody (infliximab) and octreotide.
- **What are the types of peptic ulcers, and which are associated with the highest level of hydrochloric acid production and *Helicobacter pylori* infection?**  
Patients with combined gastric and duodenal ulcers (type II) and with pre-pyloric ulcers (type III). Type I ulcers (lesser curvature), type IV (high lesser curvature of stomach), and type V (NSAID related) have normal acid levels. All five types are associated with *H. pylori* infection.
- **What is the incidence of colonization with *H. pylori* in the adult population?**  
At least 50%.
- **What are the clinical manifestations of a slipped Nissen fundoplication?**  
Recurrence of reflux symptoms. GI swallow can be diagnostic as can EGD. Reoperation is efficacious, but open repair is advised because of adhesions and increased technical difficulty of reoperative laparoscopy.
- **What is the treatment for a morbidly obese (BMI > 40) patient with GERD or Barrett's esophagus refractory to medical treatment?**  
Gastric bypass with Roux-N-Y gastrojejunostomy.
- **What are the indications for elective surgical treatment of a benign gastric ulcer?**  
Failure to heal within 12 weeks of medical therapy, recurrence after two initial courses of successful treatment, or inability to exclude malignancy.

○ **What are the surgical options for patients with a gastric ulcer?**

Vagotomy and drainage (pyloroplasty), vagotomy and antrectomy, vagotomy and subtotal gastrectomy, total gastrectomy, and selective vagotomy of antral branches.

○ **What is the technique for highly selective vagotomy?**

Division of the vagal branches to the antrum with the adjacent vascular pedicle and division of the criminal nerve of Grassi. The vagal innervation at the distal 5 cm of esophagus is preserved.

○ **What is the complication associated with exogenous photodynamic therapy (porphyrins) for Barrett's?**

Esophageal stricture.

○ **True/False: Proton-pump inhibitors cause regression of Barrett's esophagus.**

False. While effective at GERD symptom resolution, these medications have not been found to cause regression of metaplasia.

○ **When is vagal sparing esophagectomy feasible/indicated?**

For benign esophageal disease needing resection (benign stricture, high-grade dysplasia in Barrett's esophagus).

○ **What are the benefits of vagal sparing esophagectomy?**

Reduced rates of diarrhea and dumping syndrome.

○ **What are the risk factors for distal esophageal adenocarcinoma?**

Barrett's esophagus, long-standing GERD, p53 mutation on immunohistochemistry at biopsy, and smoking.

○ **What is the best treatment for alkaline reflux esophagitis?**

Fundoplication. If alkaline gastritis is severe and refractory to medical treatment (cholestyramine), antrectomy with Roux-N-Y reconstruction is indicated.

○ **What are the most prominent postgastrectomy syndromes?**

Diarrhea, dumping syndrome, and alkaline reflux gastritis are most frequent. Other syndromes include afferent loop, blind loop, malabsorption, recurrent ulcer, and bezoar.

○ **What is the drug of choice for the treatment of duodenal ulcers in pregnant women?**

Sucralfate.

○ **What is the most common side effect of misoprostol?**

Diarrhea.

○ **What is the effect of vagotomy on gastric acid output?**

It reduces acid secretion by approximately 80% in the immediate postoperative period and diminishes parietal cell responsiveness to gastrin and histamine.

- **T/F: routine intraoperative endoscopy reduces the rate of gastrojejunostomy leak in laparoscopic Roux-N-Y for bariatric surgery.**  
True. Leak rates less than 2% are observed in what should be a 15 to 30 cc pouch.
- **What is the leading clinical sign of gastrojejunostomy leak after bariatric procedure?**  
Tachycardia.
- **What complications led to the abandonment of the jejunal–ileal bypass?**  
Malabsorption/malnutrition, renal stones, arthritis, and liver failure.
- **What is the mechanism of failure after gastric bypass or gastric banding when the technical “repair” is still intact?**  
High-volume and high-calorie liquid dietary intake.
- **What are the criteria for definitive versus delayed repair of a perforated ulcer?**  
If there has been no preoperative shock or life-threatening coexisting medical illness and the perforation has been present for less than 48 hours, a definitive ulcer operation may be performed. If these criteria are not met, immediate primary closure with omental patching is usually safer.
- **What is the lifetime risk of obstruction from an untreated peptic ulcer?**  
10%.
- **What is the most common source of failure to eradicate *H. pylori* medically?**  
Metronidazole resistance. Addition of bismuth to the treatment regimen is recommended.
- **What is the treatment of choice for patients with alkaline reflux gastritis after antrectomy?**  
Roux-en-Y gastrojejunostomy with an intestinal limb of 50 to 60 cm. Adding a distal (Braun) enteroenterostomy between the afferent and efferent limbs of the gastrojejunostomy also decreases alkaline reflux.
- **What are the most frequent long-term postoperative complications of jejunioileal bypass?**  
Cirrhosis, cholelithiasis, nephrolithiasis, severe fluid and electrolyte abnormalities, and development of specific vitamin and micronutrient deficiencies.
- **What are the features of UGI Crohn’s disease?**  
Cobblestoning of the mucosa on EGD with granulomas on biopsy. Coexisting lower (ileal) GI Crohn’s is almost universal.
- **What is the most common clinical presentation of gastric adenocarcinoma?**  
Weight loss and vague epigastric pain that is often relieved by eating. An associated gastric ulcer will be present in 25% of cases.

○ **What is the most common site of GI lymphomas?**

The stomach. Gastric lymphoma often presents at an advanced stage with bleeding or obstruction. Diagnosis is confirmed by endoscopic biopsy. CT scan and PET scan can aid in staging once the diagnosis is confirmed.

○ **What is the most common sarcoma of the stomach?**

Leiomyosarcoma.

○ **What is the treatment of choice for gastric sarcomas?**

Gastric resection with negative margins. En bloc resection of involved adjacent organs should also be performed when anatomically feasible.

○ **What is the most common site of esophageal perforation in Boerhaave's syndrome?**

The left posterolateral esophagus, 3 to 5 cm above the GE junction.

○ **What is the most common factor predisposing patients in the critical care setting to stress gastritis?**

Decreased gastric mucosal blood flow because of inadequate perfusion via relative shunting of blood away from the splanchnic circulation.

○ **What is the incidence of malignancy in gastric ulcers?**

10% to 15%.

○ **What are the sources of elevated serum gastrin?**

Gastrinoma (ZE syndrome), short gut syndrome and postvagotomy G-cell hyperplasia, atrophic gastritis, and proton-pump inhibitor therapy and retained antrum after Billroth procedure.

○ **What are the clinical features of the Zollinger–Ellison syndrome of gastrinoma?**

Persistent ulcers despite adequate medical therapy and *H. pylori* eradication; duodenal ulcers are present 75% of the time. Jejunal ulcers are fairly unique to ZE syndrome. Most gastrinomas are located in the duodenum. Confirmation is done with the secretin stimulation test.

○ **What is the incidence of *H. pylori* infection in gastric ulcers?**

75%.

○ **In what pathologies does *H. pylori* infection play a role?**

Gastric ulcer, duodenal ulcer, gastric carcinoma, and gastric mucosa-associated lymphatic tissue (MALT) lymphoma.

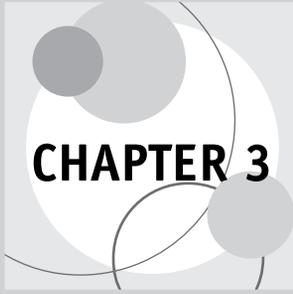
○ **What are the two classifications of gastric carcinoid, and what are their treatments?**

Type 1—sporadic gastric carcinoid. These should be treated as malignant with a wide resection margin.

Type 2—gastric carcinoid associated with ZE syndrome or chronic atrophic gastritis. These often resolve with antrectomy alone to reduce gastrin levels. Treatment is local excision of the mass and antrectomy.

- **What is the treatment for noninvasive gastric MALT lymphoma?**  
Eradication of *H. pylori* typically causes regression and is the initial treatment. Endoscopy should be performed 6 weeks after completion of *H. pylori* treatment to confirm regression. Initial staging is done with EUS. Chemotherapy is required for lesions invading the muscularis.
- **What is a Diulafoy's lesion?**  
A submucosal defect overlying an artery in the muscularis. Most commonly located along the lesser curvature of the stomach. Initial treatment is to attempt endoscopic control of bleeding with banding, epi injections, or cauterization. Surgery with wedge excision of the involved stomach is used for persistent hemorrhage.
- **What is the differential diagnosis for persistent ulcers or GERD symptoms after vagotomy?**  
Hyperparathyroidism, ZE syndrome, *H. pylori* infection, and alkaline intestinal/biliary reflux. Evaluation includes serum calcium, EGD, gastrin levels, and CLO test.
- **Which classification of ulcers responds best to vagotomy?**  
Types II (combined gastric and duodenal) and III (pre-pyloric, which needs truncal vagotomy).
- **T/F: Type I gastric ulcers are frequently complicated by hemorrhage.**  
False. However, type I ulcers have the highest associated malignancy rates.
- **How extensive should surgical margins be to decrease risk of recurrence in resection for gastric carcinoma?**  
5 or 6 cm. Gastric carcinoma is notorious for intramural spread not visible within mucosal inspection alone.
- **Histologically, what is the similarity between Chaga's disease and achalasia?**  
A decrease in the number of ganglion cells in Auerbach's plexus.
- **Which gastric neuroendocrine tumor is more commonly seen in patients with pernicious anemia (chronic atrophic gastritis)?**  
Carcinoid.
- **T/F: In resecting a gastric leiomyosarcoma, lymphadenectomy is routinely indicated.**  
False.
- **What is the treatment algorithm for bleeding esophageal varices?**  
Resuscitation, octreotide or vasopressin, B-blockade, urgent EGD with sclerotherapy, or banding. If bleeding persists then TIPS should be the next step. Exsanguinating hemorrhage can be treated with distal esophageal transection and reanastomosis (Sigura procedure).
- **T/F: Selective (i.e., splenorenal) shunts are associated with decreased encephalopathy rates relative to central (mesocaval and portocaval) shunts.**  
True.
- **Which patients should be considered for splenorenal shunts over TIPS?**  
Patients whose variceal bleeding has been controlled and are poorly compliant and will not follow up with the frequency (ultrasound and clinical evaluation) required for a TIPS, given the high rate of TIPS occlusion.

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## CHAPTER 3

# Small Intestine, Colon, Rectum, and Anus Pearls

- What structures are supplied by the superior mesenteric artery (SMA)?**  
The small bowel from the ligament of Treitz to the cecum, ascending colon, and transverse colon.
- Where is the SMA in relation to the pancreas?**  
Posterior.
- Which gut hormone is released from small bowel mucosa after contact with tryptophan and/or fatty acids and results in secretion of enzymes by pancreatic acinar cells?**  
Cholecystokinin.
- Where is the arc of Riolan?**  
Between the left colic artery and the middle colic artery (a collateral vessel).
- Where are bile salts reabsorbed?**  
In the ileum.
- What is Waldeyer's fascia?**  
The dense rectosacral fascia that covers the sacrum and overlying vessels and nerves.
- What is the energy source for active sodium transport in the colon?**  
Short-chain fatty acids.
- What is the strongest component of the small bowel wall?**  
The submucosa.
- What hormones inhibit colonic motility?**  
Glucagon and somatostatin.
- What are the most abundant organisms found in the colon?**  
Bacteroides and *Escherichia coli*.

- **What signs and symptoms are associated with alkaline gastric reflux?**  
Postprandial epigastric pain, nausea, vomiting, and gastric biliary reflux.
- **In which region of the colon does volvulus most frequently occur?**  
The sigmoid colon.
- **What is the presentation of sigmoid volvulus?**  
Distended patient with bowel obstruction. KUB reveals a large dilated loop of colon oriented to the right upper quadrant (“tire sign”). Barium enema reveals a bird’s beak tapering of the distal sigmoid colon.
- **What is the etiology of cecal volvulus?**  
Anomalous fixation of the right colon to the retroperitoneum.
- **What is the treatment for cecal volvulus?**  
Right hemicolectomy
- **Where do colonic diverticula most frequently occur?**  
In the sigmoid colon.
- **What are the most common presenting symptoms of acute diverticulitis?**  
Left lower quadrant abdominal pain that may radiate to the suprapubic area, left groin or back, and alteration in bowel habits (usually constipation).
- **An 83-year-old nursing home patient with Alzheimer’s disease presents with a 24-hour history of severe abdominal distention, without significant pain or tenderness. Abdominal X-rays reveal a large, air-filled right colon. What is the most likely diagnosis?**  
Ogilvie’s syndrome.
- **What is the treatment for colonic pseudo-obstruction (Ogilvie’s syndrome)?**  
Colonoscopic decompression and neostigmine (cholinesterase inhibitor) to increase parasympathetic function.
- **A 50-year-old male presents with his second episode of lower GI bleeding from diverticulosis, localized by colonoscopy to the sigmoid. What is the treatment of choice?**  
After controlling the hemorrhage, a sigmoid colectomy should be performed. 25% of patients with initial diverticular bleeding have a recurrence, and most patients continue to have recurrences without surgical intervention.
- **What is the test of choice to confirm the diagnosis of diverticulitis?**  
CT scan.
- **What test has the highest sensitivity in detecting colovesicular fistula secondary to diverticulitis?**  
CT scan with air in the bladder. Cystoscopy can also detect edema in the bladder at the fistula site in what are typically male patients with pneumaturia.

- **A 55-year-old male presents with diverticulitis and significant signs of inflammation. What is the treatment of choice?**  
Hospitalization, bowel rest, intravenous fluids, and broad-spectrum intravenous antibiotics. Conversion to oral antibiotics can be initiated with resolution of acute symptoms and improving leukocytosis.
- **T/F: After two bouts of diverticulitis colonic resection should be recommended in an adequate surgical-risk patient.**  
True.
- **In what population is right-sided diverticulitis most frequently seen?**  
Asian population. 15% of diverticulitis in this population is right sided. CT scan is helpful in differentiating from appendicitis with colonic inflammation visualized in the absence of a prominent appendix.
- **What are the most common complication of diverticulitis?**  
Fistula and abscess formation.
- **What is the treatment for diverticulitis-associated abscess?**  
Percutaneous CT-guided drainage and antibiotics followed by sigmoid resection after resolution of acute inflammation.
- **T/F: Routine intraperitoneal drain placement next to colonic anastomosis is of high utility.**  
False. Even if an anastomotic leak develops, the randomly placed drain will rarely provide adequate drainage and does not correct the underlying need for definitive bowel repair. Abscess will still form around the drain, and the colon must still be repaired.
- **Following diverticulitis, what is the most common cause of fistula formation between the sigmoid colon and the urinary bladder?**  
Sigmoid carcinoma.
- **What are the most common causes of massive colonic hemorrhage?**  
Diverticulosis and angiodysplasia.
- **In which region of the colon is angiodysplasia most common?**  
The cecum and the right colon.
- **What is the leading cause of small bowel GI hemorrhage?**  
Small bowel arteriovenous malformations. They can be localized with a tagged RBC scan if bleeding is occurring at a rate of 0.1 cc/min, whereas angiography requires a bleeding rate of 1 cc/min to be identified. They occur most frequently in patients with congenital AV malformation syndromes such as Osler–Weber–Rendu syndrome.
- **What is the definition of massive lower gastrointestinal hemorrhage?**  
Bleeding distal to the ligament of Treitz that requires transfusion of three units of blood for more than 24 hours.

- **What are the four primary small bowel cancers and where do they most frequently occur along the intestinal tract?**

Adenocarcinoma—proximal

Carcinoid tumor—distal (ileum and SMA distribution)

Lymphoma—throughout tract

**Gastrointestinal stroma tumors (GISTs)/sarcoma**—throughout tract

Treatment for all types is surgical resection.

- **What is the management of retroperitoneal air on KUB after an ERCP?**

Water-soluble contrast upper GI (UGI) study should be the initial step. If no contrast leak is seen and the patient is stable, bowel rest-NPO-NGT and antibiotics can be instituted. If there is a significant leak/duodenal fistula then operative exploration is mandated. Significant ampullary destruction necessitates pancreaticoduodenectomy.

- **What are the characteristic of Gluten enteropathy (celiac sprue disease)?**

Intolerance of gluten, which is found in wheat, barley, and rye. Ingestion typically results in diarrhea. The disease is associated with an increased risk of future GI malignancy, particularly small bowel lymphoma. SBO in a patient with a history of sprue and no hernias or prior abdominal surgery raises strong concern for obstructing malignancy.

- **What is the distinct advantage of selective mesenteric angiography for determining the source of colonic hemorrhage?**

Vasopressin can be infused through a specific mesenteric artery to stop the bleeding, as can distal small vessel mesenteric embolization.

- **What is the most common cause of ischemic colitis?**

Idiopathic.

- **How is ischemic colitis diagnosed?**

Colonoscopy. Angiograms are typically normal, as distal microvascular occlusion is the etiology. Ischemic colitis usually responds well to bowel rest and antibiotics. Surgery is reserved for persistent hemorrhage or transmural bowel necrosis.

- **What findings on contrast enema suggest the diagnosis of ischemic colitis?**

Submucosal hemorrhage, edema, and thumb printing of the involved colonic segment.

- **What is the anatomic distinction between internal and external hemorrhoids?**

Internal hemorrhoids are above the dentate line; external hemorrhoids are below it.

- **What is the normal function of hemorrhoidal tissue?**

It protects the underlying muscle during defecation and allows complete closure of the anal canal during rest.

- **What is a second-degree internal hemorrhoid?**

One that is prolapsed but reduces spontaneously.

- **What are the indications for excisional hemorrhoidectomy?**
  1. Large third- or fourth-degree hemorrhoids that cannot be treated on an outpatient basis.
  2. Mixed hemorrhoids with an external endoderm component that is not amenable to ligation.
  3. Acutely thrombosed or incarcerated hemorrhoids with severe pain and impending gangrene.
  
- **What is the most common complication of excisional hemorrhoidectomy?**

Urinary retention.
  
- **T/F: Most anal fissures occur anteriorly.**

False. 90% occur posteriorly in the midline.
  
- **A 33-year-old male presents with a brief history of severe, burning anal pain during and after bowel movements, accompanied by blood-stained toilet paper. What is the most likely diagnosis?**

An anal fissure. Initial treatment is stool softener, sitz baths, topical nitroglycerin, and local anesthetic creams.
  
- **What are the surgical options for rectal prolapse?**

Transabdominal resection of redundant sigmoid colon and colorectal anastomosis with rectopexy, simple transabdominal rectopexy, transanal mucosal stripping and placcation of musculature, and subcutaneous anal encirclement with a synthetic band.
  
- **What diagnoses must be entertained if an anal fissure occurs in an unusual location?**

Crohn's disease or tuberculosis.
  
- **What percentage of simple anal fissures are amenable to conservative management?**

90%.
  
- **What is the treatment of choice for anal fissures that do not respond to conservative therapy?**

Lateral internal sphincterotomy.
  
- **What is the optimal management of a chronic perianal fistula in a previously radiated field for rectal cancer?**

A muscle flap based on a vascular pedicle.
  
- **Which antibiotics are most frequently implicated in the development of pseudomembranous colitis?**

Clindamycin (most notorious), ampicillin, and cephalosporins.
  
- **Which organism is associated with pseudomembranous colitis?**

*C. difficile*.
  
- **What is the antibiotic of choice for *C. difficile* colitis?**

Intravenous or oral metronidazole or oral vancomycin (metronidazole contraindicated in pregnancy).

○ **What is the treatment for *C. difficile*-associated toxic megacolon?**

Subtotal colectomy with ileostomy. Even if some colon appears normal in the OR, it should all be resected.

○ **What is the treatment for neutropenic enterocolitis?**

Initial treatment is bowel rest, ABX, IVE, and CT scan to rule out perforation/necrotic bowel. Colon resection for peritonitis with signs of systemic sepsis. Suspect in abdominal pain for advanced cancer patients neutropenic from chemotherapy or advanced AIDS patients. Some patients will also require platelet transfusion. Neupogen (G-CSF) is also of benefit.

○ **What is the treatment for radiation proctitis?**

Formalin enemas are most effective in controlling bleeding.

○ **What is the most common protozoan that infects the colon?**

*E. histolytica*.

○ **Which form of *E. histolytica* causes infection?**

The cystic form (not the trophozoite).

○ **What is the treatment of choice for *E. histolytica*?**

Metronidazole.

○ **Why is <sup>99m</sup>Tc-pertechnetate used for radionuclide scanning of symptomatic Meckel's diverticula?**

The radioisotope is taken up by heterotopic gastric mucosa within the diverticulum.

○ **What is the most common clinical manifestation of Meckel's diverticulum in pediatric patients?**

Bleeding.

○ **What percentage of patients with AIDS develop cytomegalovirus (CMV) colitis?**

90%.

○ **What is the treatment of choice for CMV colitis?**

Gancyclovir.

○ **What is the etiology of Chaga's disease?**

*Trypanosoma cruzi*.

○ **What are the effects of Chaga's disease on the colon?**

Destruction of Auerbach's myenteric plexus, intramural fibrosis, loss of normal propulsive ability, functional obstruction, and proximal megacolon.

○ **What are the contents of the ischiorectal fossa?**

The inferior rectal vessels and lymphatics.

- **What is the result of abscess formation from cryptoglandular disease with a persistent infected tract?**  
Fistula-in-ano.
- **What is the treatment of squamous cell Ca of anal canal?**  
Nigro protocol: chemotherapy and radiation. Recurrence is treated with abdominoperoneal resection.
- **What is the treatment for a perforated small bowel diverticulum?**  
Resection of bowel if only minimal areas are involved with diverticular disease. If large amounts of small bowel have diverticula, resect only the perforated segment.
- **T/F: Familial adenomatous polyposis (FAP) develops polyps limited to colon.**  
False. They may have UGI polyps also, so evaluation of duodenum is also needed.
- **T/F: FAP is autosomal dominant and most patients get cancer by the age of 40 years; therefore, total prophylactic colectomy with mucosal proctectomy is recommended.**  
True.
- **What other cancers are associated with Lynch II (hereditary nonpolyposis colorectal cancer)?**  
Stomach  
Ovary  
Bladder  
Colonoscopy should start at the age of 20 years in these patients, as should screening for uterine and ovarian cancer. Type I has no associated increased rate of other malignancies.
- **Cancers in Lynch syndrome are typically on what side of the colon?**  
Usually right sided. There is no associated polyposis with this syndrome as in FAP. Polyps do precede the tumors, but there is no diffuse polyposis.
- **What genetic mutation are Lynch I and II syndromes associated with?**  
DNA mismatch repair gene.
- **What are the Amsterdam criteria for Lynch syndrome (HNPCC)?**  
Three first-degree relatives affected more than two generations.
- **What is the treatment of sigmoid volvulus?**  
Endoscopic decompression with sigmoidectomy the same hospital admission.
- **What is the treatment for ileoanal pouchitis?**  
Flagyl and short-chain fatty acid enemas.
- **What is melanosis coli?**  
A benign condition with hyperpigmentation of the colonic mucosa secondary to chronic hyperactivity. It is seen in patients with laxative abuse on occasion.

○ **What is the treatment for pyoderma gangrenosum?**

Dapsone and steroids; avoid operation unless erosion into vascular structures occurs.

○ **What is the most common manifestation of anal gland infection?**

Perianal abscess.

○ **What is the treatment of choice for a patient with an intersphincteric abscess?**

Internal sphincterotomy.

○ **Why are supralelevator abscesses not drained externally or through the ischiorectal fossa?**

They usually do not heal without a diverting colostomy.

○ **What percentage of patients with a perirectal abscess will have a recurrence?**

50%.

○ **What is Goodsall's rule?**

In the treatment of fistula-in-ano, if the anus is transected in a transverse fashion, external openings anterior to the incision will connect with an internal opening by a short, direct fistulous tract. Posterior fistulas take a more tortuous course.

○ **What is the appropriate management for patients with a horseshoe fistula?**

Incision and drainage of the postanal space and counterdrainage of the lateral ischiorectal spaces through separate incisions.

○ **Where is the opening in a high rectovaginal fistula?**

Near the cervix.

○ **What are the most common causes of midrectovaginal fistulas?**

Extension of an undrained ischiorectal abscess, Crohn's disease, surgical excision or fulguration of an anterior rectal tumor, radiation injury, and extensive childbirth trauma.

○ **What is the treatment of choice for patients with a midrectovaginal fistula?**

An endorectal advancement flap.

○ **What is a pilonidal cyst?**

A hair-containing sinus or abscess that involves the skin and subcutaneous tissues in the postsacral intergluteal region.

○ **What is the appropriate treatment for hidradenitis suppurativa?**

Wide excision, including the indurated overlying skin.

- **What is the most common cause of perianal pruritis in children?**  
*Enterobius vermicularis* (pinworms).
- **What is the etiology of lymphogranuloma venereum (LGV)?**  
*Chlamydia trachomatis*.
- **What is the typical presentation of a patient with chlamydial proctitis?**  
Anal pain, pruritis, rectal bleeding, or rectal discharge.
- **How is chancroid manifested?**  
With soft, multiple lesions that are very painful and friable.
- **What is the treatment of choice for chancroid?**  
Sulfonamides.
- **What is the treatment of choice for large warts caused by *Condylomata acuminata*?**  
Excision and electrocoagulation.
- **What layer(s) of the colon is/are affected by ulcerative colitis?**  
The mucosal layer only.
- **What is the treatment for atypia detected on colonoscopic biopsy in an active ulcerative colitis flare?**  
Re-biopsy when the flare resolves.
- **What is the treatment for dysplasia detected on colonoscopic biopsy in an ulcerative colitis patient?**  
Colonic resection, given the high coexisting malignancy and malignant potential.
- **What are the extraintestinal manifestations of ulcerative colitis?**  
Uveitis, iritis, episcleritis, keratitis, conjunctivitis, peripheral joint disease, arthralgias with progressive edema and erythema, ankylosing spondylitis, sacroiliitis, aphthous stomatitis, gingivitis, pyoderma gangrenosum, and sclerosing cholangitis.
- **Which of the inflammatory bowel diseases (IBDs) has a continuous distribution in the colon?**  
Ulcerative colitis.
- **What is the treatment for an isolated stricture secondary to suspected, but still undiagnosed, Crohn's disease of the small bowel?**  
Resection and reanastomosis.
- **What is the treatment for multiple Crohn's disease-associated symptomatic small bowel strictures?**  
Multiple stricturoplasties.

- What is the treatment for acute Crohn's colitis?**  
IV steroids, flagyl, and consideration of 6-MP or azathioprine. Surgery for signs of colon necrosis.
- T/F: TPN is superior to enteral diets in achieving remission of small intestinal Crohn's disease.**  
False.
- What are the hallmark maintenance medications in Crohn's disease?**  
Mesalamine (pentasa), sulfasalazine, and methotrexate.
- What are the primary medications for acute flares of Crohn's disease?**  
Steroids and infliximab (remicade).
- What is infliximab?**  
An antitumor necrosis factor antibody, which decreases steroid requirements in acute bouts of Crohn's disease and aids in the closure of perianal fistulas.
- What is the initial management of a Crohn's-associated intra-abdominal abscess with enteroenteric fistula?**  
Percutaneous CT-guided abscess drainage, antibiotics, and anti-Crohn's medications. Surgery for refractory symptomatic fistulas.
- What percentage of patients with Crohn's disease have rectal involvement?**  
50%.
- What is the most frequent gastrointestinal site of Crohn's disease?**  
The ileocecal region.
- What colonoscopic findings are associated with Crohn's disease?**  
Linear ulcerations, cobblestoning, asymmetric involvement, skip lesions, and aphthous ulcers.
- In which of the IBDs are strictures most common?**  
Crohn's disease.
- What are the morphologic characteristics of moderately severe ulcerative colitis?**  
Progression of mucosal disease with purulent discharge, diffuse ulceration and bleeding and, formation of pseudopolyps.
- What are the indications for surgery in patients with ulcerative colitis?**  
Active disease unresponsive to medical management, risk of cancer, and severe hemorrhage.
- What is the increased risk of colon cancer related to in patients with ulcerative colitis?**  
The extent of mucosal involvement and the duration of the disease. Patients with active UC for greater than 10 years should be considered for colectomy, given the high incidence of colon cancer.

- **What are the indications for surgery in patients with Crohn's disease?**  
Internal fistulas and abscesses, intestinal obstruction, toxic megacolon, and poor response to medical therapy.
- **What extraintestinal manifestations are associated with FAP?**  
Epidermoid cysts, dermoid tumors of the abdomen (Gardner's syndrome), osteomas, and brain tumors (usually gliomas and medulloblastomas).
- **What is the treatment for desmoid tumors associated with FAP?**  
Wide resection.
- **What is the mutated gene in FAP?**  
APC tumor-suppressor gene. Inheritance is autosomal dominant.
- **What gene is mutated in cases of familial colon cancer?**  
APC tumor-suppressor gene.
- **What percentage of patients with untreated FAP develop colon cancer?**  
100%.
- **What are risk factors for small bowel adenocarcinoma?**  
FAP, Lynch syndrome, IBD, and Peutz–Jeghers syndrome (although not from hamartomas). Small bowel adenocarcinoma tends to occur in the proximal intestine.
- **When should screening colonoscopy be initiated for family members of patients with FAP?**  
At 10 years of age.
- **What is the treatment of choice for patients with FAP and greater than 50 rectal polyps?**  
Total proctocolectomy, ileoanal pouch anastomosis, and an ileal reservoir.
- **What is the risk of developing colorectal carcinoma in a patient with a first-degree relative who has colorectal carcinoma?**  
Three to nine times that of the normal population.
- **What is the most accurate method of detecting polyps greater than 1 cm?**  
Colonoscopy.
- **What modality in conjunction with PET CT scan provides the highest sensitivity for detecting colorectal cancer metastasis?**  
CEA immunoscintigraphy. The most common sites of metastasis are regional lymph nodes and liver.
- **Why does rectal carcinoma metastasis sometimes “skip” the liver and present with lung metastasis?**  
Rectal venous drainage is systemic (iliac system), and, thus, the first hematogenous capillary bed-seeded cells encounter is the pulmonary vasculature.

- What is the standard colon cancer screening recommendation in a patient of normal risk?**  
Full colonoscopy at the age of 50 years, with repeat investigation every 7–10 years.
- Patients with which IBD have the greatest incidence of developing colon carcinoma?**  
Those with ulcerative colitis.
- What is the inheritance pattern of Peutz–Jegher’s syndrome?**  
Autosomal dominant with mutation of seronine threonin kinase (STK gene). This syndrome is associated with diffuse GI hamartomas, which have little potential for malignant transformation.
- What are the clinical manifestations of Peutz–Jegher’s syndrome?**  
Diffuse mucocutaneous pigmentation and multiple GI hamartomas. There is also an increased risk of colon, breast, uterine, small intestinal, and ovarian adenocarcinomas.
- T/F: Postmenopausal women with a strong family history of breast and ovarian cancer should undergo oophrectomy at the time of colon resection for cancer.**  
True.
- What is the treatment for a patient with a small bowel obstruction and portal vein gas on CT scan?**  
Immediate laparotomy.
- What is bacterial translocation?**  
Passage of viable bacteria from the intact gastrointestinal tract lumen to mesenteric lymph nodes and possibly the liver. Small intestinal integrity is impaired as a result of a variety of systemic injuries.
- How can the incidence of bacterial translocation be decreased?**  
By enteral feeding.
- What is the most common cause of gastrointestinal bleeding in childhood?**  
Meckles diverticulum.
- What is the treatment for a cystic mass at the base of the appendix in an adult patient?**  
Right hemicolectomy. Intraoperative examination and frozen section cannot differentiate a cyst adenoma from a cystadenocarcinoma. If the mass is not at the base then a simple appendectomy can be performed with delayed right hemicolectomy for tumors in which final pathology reveals cyst adenocarcinoma.
- What is the feared complication associated with mucous spillage from a cystadenocarcinoma in the abdomen?**  
Peritoneal spread of tumor cells and the development of pseudomyxoma peritonii (diffuse peritoneal surface metastasis).
- What is the increased risk of cancer in patients with a single juvenile polyp?**  
None.

- **What is the most common type of adenomatous colonic polyp?**  
Tubular adenoma (65%–80%).
- **T/F: Polypectomy decreases the risk of colon cancer.**  
True.
- **What percentage of patients with colorectal carcinoma have a synchronous polyp?**  
30%.
- **What preoperative testing should be done prior to colon resection for carcinoma?**  
Chest X-ray, CT scan of the abdomen, liver function tests, and a serum CEA level.
- **T/F: Semiannual fecal occult blood testing reduces colorectal cancer mortality.**  
True.
- **T/F: Supplemental dietary iron results in falsely positive fecal occult blood testing.**  
False.
- **What is the procedure of choice for a patient with carcinoma in the right colon?**  
A right hemicolectomy, including 10 cm of terminal ileum, with ligation of the ileocolic artery, right colic artery, and the right branch of the middle colic artery.
- **What margins of resection are required for colon carcinoma?**  
5 cm is ideal; however, a minimum of 2 cm on final pathology should be considered mandatory.
- **What factors are related to prognosis for patients with colon carcinoma?**  
Depth of invasion, lymph node involvement, and presence or absence of distant metastases.
- **What are the general adjuvant therapy recommendations for colorectal cancer?**  
Colon cancer: no role for XRT; adjuvant chemotherapy for stage III.  
Rectal cancer: neoadjuvant XRT for stage II and beyond with adjuvant chemotherapy for stage II and beyond.
- **What distal margin above the dentate line is needed to perform a low anterior resection (LAR) in favor of an abdominoperineal resection?**  
3 cm. Neoadjuvant XRT can occasionally downstage marginal tumors to LAR appropriate.
- **What is the benefit of preoperative XRT for T3 and T4 rectal cancer?**  
50% reduction in local recurrence rates, the ability to increase respectability in some patients, and a 10% to 15% 5-year survival advantage.

- T/F: Adjuvant XRT reduces local recurrence for T2 and greater rectal CA.**  
True.
- What percentage of locally recurrent rectal cancers are resectable?**  
40%. Sacral bone invasion, gross vascular invasion, and ureteral obstruction tend to indicate nonresectability.
- T/F: Transanal excision of T1 rectal cancer when low enough is appropriate treatment in favor of LAR.**  
True.
- What is the procedure of choice for patients with rectal carcinoma in whom the sphincter mechanism cannot be preserved?**  
Abdominal perineal resection (APR).
- A 38-year-old female presents with colonic perforation, secondary to toxic megacolon associated with ulcerative colitis. What is the appropriate surgical procedure?**  
Total abdominal colectomy with Hartmann closure of the rectum.
- If continuity can be restored without tension and without sacrificing the blood supply, what procedure should be performed for patients with rectal carcinoma?**  
An LAR.
- What is the appropriate operation for gallstone ileus?**  
Identification of the impacted gallstone in the small bowel followed by proximal enterotomy, with retrieval of the gallstone. Cholecystectomy should not be performed at the initial operation if the patient is acutely ill or exhibiting signs of sepsis. If the patient is in good condition then simultaneous cholecystectomy can be performed with duodenal repair.
- What is the overall incidence of clinically evident ischemic colitis following aortic reconstruction?**  
1% to 2%.
- What is the most significant factor related to improved outcome for ischemic colitis?**  
Early diagnosis.
- What is the treatment of choice for acute SMA thrombosis?**  
Mesenteric revascularization and resection of nonviable bowel, followed by a second-look laparotomy the next day.
- What are the angiographic criteria for nonocclusive mesenteric ischemia (NOMI)?**  
Narrowing at the origins of major SMA branches, irregularities of further branches with alternating dilation and constriction, spasm of peripheral arcades, and impaired filling of intramural vessels.

- **What is the most frequent angiographic finding of an SMA embolism?**  
A meniscus sign within the artery, 3–8 cm from its origin, where proximal jejunal branches fill promptly (distal jejunal, ileal, and colic branches do not fill).
- **What are the classic symptoms of chronic mesenteric ischemia?**  
Postprandial pain, weight loss, and fear of food. Occasionally, bloody diarrhea may be present.
- **What is primary mesenteric venous thrombosis?**  
Spontaneous thrombosis of the portal–mesenteric veins. Treatment is anticoagulation in the absence of signs of bowel necrosis.
- **Which recreational drug has been associated with ischemic colitis?**  
Cocaine.
- **How long should patients who have had an episode of acute mesenteric venous thrombosis and do not have a contraindication to anticoagulation be anticoagulated?**  
Lifelong.
- **What is the gender ratio for patients with celiac compression (median arcuate ligament) syndrome?**  
Females 4:1. Intermittent compression of the celiac artery by the diaphragm in expiration.
- **What peak systolic velocity criteria, by duplex scanning of the SMA, is suggestive of SMA stenosis >60%?**  
275 cm/sec.
- **What is the mortality rate of acute intestinal ischemia once intestinal infarction occurs?**  
70% to 90%.
- **Manipulation of the aortic arch during cardiac surgery may cause mesenteric ischemia by what phenomenon?**  
Cholesterol immobilization with embolization.
- **What is the single most important issue in managing patients with short gut syndrome following massive bowel infarction?**  
Optimizing nutritional status.
- **What is the conduit of choice during mesenteric revascularization when simultaneous bowel resection is required?**  
The saphenous vein.
- **What is the initial success rate of percutaneous transluminal angioplasty (PTA) for chronic mesenteric ischemia?**  
80% to 90%.

- What is the most common splanchnic artery aneurysm?**  
Splenic artery aneurysm.
- What classification of drugs are often associated with NOMI?**  
Vasopressor and alpha-adrenergic agonists.
- What percentage of patients with intestinal ischemia have mesenteric venous thrombosis as the etiology?**  
5% to 10%.
- What is the potential sequelae of ischemic colitis when it involves the muscular layer and when fibrosis occurs?**  
Late stricture formation.
- What antibodies may be present in patients with systemic lupus erythematosus, who develop intestinal ischemia?**  
Anticardiolipin and antiphospholipid antibodies.
- Which visceral aneurysms may arise as a complication of pancreatitis?**  
Pancreaticoduodenal, splenic artery, and gastroduodenal artery aneurysms.
- Acute mesenteric ischemia accounts for what percentage of the intra-abdominal complications of cardiopulmonary bypass?**  
Up to 33%.
- Which phenomenon leads to a sequence of events that, paradoxically, leads to tissue damage in patients with NOMI?**  
Reperfusion injury.
- Which two essential features of the management of mesenteric ischemia have significantly improved survival in NOMI?**  
Extensive use of arteriography and transcatheter intra-arterial papaverine.
- The migrating myoelectric complex (MMC), which occurs during the interdigestive period in the small intestine, is primarily under neurologic and humeral control via which intestinal hormone?**  
Motilin.
- Which gut hormone functions as a negative control for the release of virtually all other intestinal hormones?**  
Somatostatin.

- Which cells in the intestinal lumen are responsible for antigen uptake and transport to underlying lymphoid nodules?**  
M cells.
- What is Krukenberg's tumor?**  
An ovarian mass detectable on bimanual pelvic examination, which represents a drop metastasis or transcoelomic implantation of the ovary from an intra-abdominal site (classically the stomach).
- What are the features of GISTs?**  
Tumors are of mesodermal (interstitial cells of Cajal) origin. Clinical presentation is with bleeding or GI obstruction. Histological grade predicts clinical outcome (as with sarcomas). Primary treatment is resection of the tumor/involved GI segment. Recurrent disease involves the peritoneal surfaces and liver.
- What is the oncogene associated with GISTs?**  
C-kit oncogene.
- What is the adjunctive therapy of choice for GISTs?**  
Imitinab (gleevec). A monoclonal antibody to the tyrosine kinase receptor.
- What is the most frequent urologic complication of ileocolic Crohn's disease?**  
Ureteral obstruction.
- T/F: Resection margins for small intestinal Crohn's disease should be proven histologically negative by frozen section.**  
False.
- What is the appropriate operative approach for patients with Crohn's disease who develop nonhealing, symptomatic ileosigmoid fistulas?**  
Resection of the diseased terminal ileum and oversewing of the sigmoid colon, if grossly uninvolved with Crohn's disease.
- What are the most common indications for surgery for patients with small bowel leiomyomas?**  
Bleeding and obstruction.
- What is the 5-year survival rate following curative resection of adenocarcinoma of the jejunum or ileum?**  
Less than 20%.
- An elevated level of which chemical compounds is associated with malignant carcinoid syndrome?**  
5-Hydroxyindoleacetic acid (5-HIAA) and vanillylmandelic acid (VMA).

- **What is the surgical management for patients with duodenal diverticula imbedded deep within the head of the pancreas?**

Lateral duodenotomy, followed by invagination of the diverticulum into the lumen, excision of the diverticulum, and closure of both walls.
- **Where do the majority of duodenal malignancies occur?**

In the periampullary region.
- **What factors are associated with failure of spontaneous closure of small bowel fistulas?**

Disruption of greater than 50% of intestinal continuity, active granulomatous disease, cancer or radiation enteritis in the segment, distal bowel obstruction, foreign body, undrained abscess in relation to the fistula, and epithelialization of the tract.
- **In low-output small bowel fistulas, for what period of time should conservative therapy be continued?**

Up to 6 weeks.
- **What percentage of adults with small bowel intussusception do not have an associated underlying pathologic process?**

10%. A tumor is usually present in adult intussusception serving as a lead point.
- **What percentage of adults with intussusception have an underlying tumor?**

More than 65% are associated with benign or malignant tumors.
- **Patients with Crohn's disease, who have extensive terminal ileal disease or who have had previous ileal resections, are prone to what type of kidney stones?**

Oxalate stones.
- **What is the most frequent location for villous adenomas in the small intestine?**

The duodenum.
- **What is the 5-year survival after curative resection for localized leiomyosarcoma of the small intestine?**

40% to 50%.
- **What abnormality is immunoproliferative small intestinal disease (IPSID), which occurs in the Mediterranean Basin, associated with?**

Increase in the IgA heavy chain fragment in serum, secondary to diffuse infiltration of plasma cytoid lymphoma cells within the intestinal wall.
- **What is the appropriate therapy for localized primary lymphoma of the small intestine?**

Wide resection with en bloc lymphadenectomy.

- **What is the most common source of hematogenously spread malignancy to the small intestine?**  
Malignant melanoma.
- **A 65-year-old female presents with mild abdominal distention, nausea, and vomiting. A KUB indicates pneumobilia and paucity of air in the colon. What is the most likely diagnosis?**  
Gallstone ileus, caused by a fistulous communication between the gallbladder and the duodenum. Stones greater than 2.5 cm may become obstructed at the ileocecal valve.
- **T/F: A right hemicolectomy is the treatment of choice for a patient with a noninvasive 1.9 cm appendiceal carcinoid at the mid-portion of the appendix.**  
False. If the margins are negative, an appendectomy may be done for a carcinoid tumor at this site. If the carcinoid is greater than 2 cm, is invasive, or involves the base, a hemicolectomy should be performed.
- **What factors contribute to development of the blind loop syndrome?**  
Absence of the gastric acidic barrier, with increased introduction of bacteria to the small bowel, abnormal communication between the stomach and the intestine, anatomic etiologies, and motility disorders.
- **Which segment of the GI tract is the most common location for a Kaposi's sarcoma?**  
The duodenum.
- **What is the treatment for carcinoid crisis in the OR precipitated by tumor manipulation?**  
Octreotide, steroids, and ketanserin (serotonin blocker). Avoid vasopressors, as they may precipitate further serotonin release. If a patient is known to have a carcinoid tumor preoperatively, then octreotide can be given preoperatively to prevent carcinoid crisis.
- **A 39-year-old female presents with hypokalemia, a hypochloremic metabolic acidosis, and copious diarrhea. A polyp is found on colonoscopy. What is the most likely diagnosis?**  
A villous adenoma.

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# Appendix, Abdominal Wall, and Retroperitoneal Pearls

- **Where do the lymphatics of the lower half of the abdominal wall drain?**  
To the inguinal nodes, then to the iliac nodes.
- **What is the most common cause of a rectus sheath hematoma?**  
Rupture of the epigastric artery or vein secondary to trauma.
- **What are the clinical features of retroperitoneal sarcoma?**  
Presentation with asymptomatic abdominal mass, bowel obstruction, unilateral varicocele, or ureteral compression is possible. Long-term survival is dependent on tumor grade and resection margin. Resection of adjacent involved organs is commonly required to achieve adequate margin. Metastatic disease is treated with resection when anatomically feasible as chemotherapy is of minimal benefit.
- **What are desmoid tumors, and what is their treatment?**  
Desmoids are locally aggressive fibromatosis soft-tissue tumors. These lack the histological features of malignancy yet can be destructive to the abdominal contents when intra-abdominal. Treatment is wide resection. Medical adjuvants include NSAIDs, anti-estrogens, and chemotherapeutic agents.
- **Which abdominal abscesses respond best to percutaneous CT-guided drainage?**  
Appendiceal, diverticular, hepatic, and subphrenic. Pancreatic are more technically difficult with fistula association. Colonic abscess post resection and anastomosis should be treated surgically with bowel repair and drainage.
- **What is the treatment for a missed appendicitis presenting with an intra-abdominal abscess 1 week later?**  
Percutaneous CT-guided abscess drainage, antibiotics, and delayed (6 weeks) interval appendectomy.
- **What is the typical presentation of a patient with a rectus sheath hematoma?**  
Severe abdominal pain exacerbated by movement, tenderness over the rectus sheath, and voluntary guarding.
- **What structures define the semicircular line?**  
The lower edge of the posterior sheath (3–6 cm below the umbilicus).

- What is the blood supply to the rectus abdominus muscle?**  
The superior and inferior epigastric arteries.
- What is the composition of the posterior rectus sheath below the linea semicircularis?**  
The transversalis fascia.
- T/F: Mesh lowers the recurrence of ventral hernias by greater than 25% vs. primary fascial closure.**  
True.
- T/F: Interrupted suture closure of the midline rectus fascia is associated with decreased hernia formation relative to continuous running suture?**  
False.
- What is the most common solid omental tumor?**  
Metastatic carcinoma.
- What is the most common etiology of retroperitoneal fibrosis?**  
Idiopathic.
- T/F: A Spigelian hernia is easy to diagnose and not a true surgical hernia.**  
False. As they are deep to external oblique through the linea semilunaris and inferior to the linea semicircularis, diagnosis is difficult and the potential for bowel incarceration exists as in any hernia.
- What is the appropriate treatment for patients with an expanding rectus sheath hematoma?**  
Evacuation and closure without drains.
- What diagnostic findings are associated with retroperitoneal fibrosis on intravenous pyelography (IVP)?**  
Median deviation of the ureter, hydroureteronephrosis, and extrinsic ureteral compression.
- What vessels run within the transverse mesocolon?**  
Branches of the middle colic artery and accompanying vein.
- What are the most common malignant tumors of the mesentery?**  
Liposarcoma, lymphoma, and leiomyosarcoma.
- What is the most common cause of acute occlusion of the superior mesenteric artery (SMA)?**  
Emboli (usually from the heart).
- What are the goals of treatment for patients with retroperitoneal fibrosis?**  
Identification and management of potential causative agents, relief of ureteral obstruction, and reversal of the inflammatory-fibrotic process.

- **What percentage of patients with retroperitoneal fibrosis develop recurrent ureteral obstruction?**  
90%.
- **What are the clinical characteristics of mesenteric lymphadenitis?**  
Vague, migratory abdominal pain that is usually self-limiting.
- **Which visceral artery is most frequently affected by aneurysms?**  
The splenic artery.
- **What are the most common nonvisceral malignant tumors of the retroperitoneum?**  
Lymphoma, liposarcoma, and fibrosarcoma.
- **What is the predominant physical finding in patients with a retroperitoneal tumor?**  
A palpable abdominal mass.
- **What is the blood supply to the anterior abdominal wall?**  
The superior and inferior epigastric arteries, the lower intercostal arteries, and the circumflex iliac arteries.
- **What is the most frequent site of rupture of the appendix?**  
The antimesenteric border.
- **How should the skin and subcutaneous tissue wound be managed in cases of perforated appendicitis?**  
Do not completely close the wound. Delayed primary closure, wicking, or healing by secondary intention is recommended. Pediatric cases are treated by some with primary closure, although partial closure with wicks seems most reasonable.
- **In a pregnant woman in her third trimester, where is the pain of appendicitis most likely to occur?**  
In the epigastric region or in the right upper quadrant.
- **When should appendectomy be performed when an appendiceal abscess is identified and drained?**  
6 to 8 weeks after drainage, if appendectomy not performed initially.
- **How often is the appendix affected in endometriosis?**  
1%.
- **What percentage of all appendices harbor carcinoid tumor?**  
0.1%.
- **What is the distribution of carcinoid in the appendix?**  
71% at the tip, 22% in the body, and 7% at the base.

- What is the treatment for a carcinoid tumor that is less than 2 cm in size, is located at the tip of the appendix, and has no evidence of nodal spread?**  
Appendectomy.
- What is the treatment for a carcinoid tumor that is less than 2 cm in size, is located at the tip of the appendix, and has evidence of nodal spread?**  
Right hemicolectomy.
- What is the treatment for a carcinoid tumor of the appendix that is greater than 2 cm?**  
Right hemicolectomy.
- When does appendiceal lymphoid tissue reach its peak level?**  
In the teens.
- What is the treatment of adenocarcinoma of the appendix?**  
Right hemicolectomy.
- What is the most common cause of appendiceal lumen obstruction in children and young adults?**  
Lymphoid hyperplasia from submucosal follicles.
- What is the classic presentation of an obturator hernia?**  
Elderly woman with an SBO, medial thigh pain, and palpable mass on lateral rectal wall on rectal examination.
- What is the most common cause of recurrence following indirect hernia repair?**  
Inadequate repair of the inguinal floor.
- What percentage of appendicitis is associated with lymphoid hyperplasia?**  
60%.
- What systemic diseases can cause lymphoid hyperplasia in the appendix?**  
Gastroenteritis from *Shigella* and *Salmonella*, upper respiratory tract infections, infectious mononucleosis, and measles.
- What are the borders of the femoral canal?**  
The iliopubic tract superiorly and medially, Cooper's ligament inferiorly, and the femoral vein laterally.
- What percentage of appendicitis in adults is caused by a fecalith?**  
30%.
- During surgery for presumed appendicitis, the appendix is found to be normal. However, the terminal ileum has an appearance consistent with Crohn's disease. Should appendectomy still be performed?**  
Yes.

- **What is the hypothesized sequence of events in appendicitis?**  
Luminal obstruction → mucous accumulation → increased intraluminal pressure → local bacteria convert the mucous to pus → further increase in intraluminal pressure → lymphatic obstruction → edema of the appendix → diapedesis of bacteria → mucosal ulcers → venous obstruction → ischemia of the appendix → bacteria spread through the abdominal wall → acute suppurative appendicitis.
- **What is the typical core temperature seen in patients with acute appendicitis?**  
Normal to 38°C.
- **What percentage of patients with acute appendicitis have a normal WBC count?**  
30%.
- **What ultrasound findings are consistent with acute appendicitis?**  
Diameter greater than 6 mm, noncompressibility of the appendix, and presence of a complex mass.
- **What is the rate of perforation in appendicitis in children less than 1 year old? Less than 5 years old?**  
100% and 50%, respectively.
- **What is the overall negative laparotomy rate for suspected appendicitis?**  
Traditionally 20%, although this is decreasing with more frequent use of CT scanning.
- **What is the incidence of appendicitis in pregnancy?**  
One in 2000 pregnancies.
- **What percentage of patients with unperforated appendicitis have complications?**  
5%.
- **What are the most common organisms found in wound infections after appendectomy?**  
*Bacteroides*, *Klebsiella*, *Enterobacter*, and *E. coli*.
- **What is the most common cause of intestinal obstruction world wide?**  
Hernias.
- **What is the sex distribution of inguinal hernias?**  
Male:female is 7:1.
- **What is the course of the ileoinguinal and ileohypogastric nerves?**  
They penetrate transversalis and internal iliac muscles medial to ASIS and lie posterior to external oblique fascia. The ileoinguinal nerve is encountered just beneath the external oblique fascia upon opening the external ring in inguinal hernia repair.

○ **What is the treatment for an infected ventral or inguinal hernia mesh?**

Mesh excision and debridement of infected tissues. Secondary hernia repair can be delayed until sepsis is controlled. If local tissues are intact initial re-repair with a nonprosthetic biosynthetic fascial substitute (porcine derived, etc.) can be performed.

○ **What are the management principles of patients with umbilical hernia, hepatic failure, and large amounts of ascites?**

If no complications are present (cellulitis, leaking ascites, and bowel incarceration), observe the Child's B and C patient. If one of those complications exists, admit for antibiotics, medical optimization of ascites with diuresis and nutrition, and hernia repair once stabilized.

○ **What is the incidence of the different hernias?**

Inguinal hernias: 80%, umbilical hernias: 14%, and femoral hernias: 5%. The remaining is rare.

○ **What is the probability of having an inguinal hernia in a patient with a femoral hernia?**

50% in men and 10% in women.

○ **What is the difference between the linea semicircularis and the linea semilunaris?**

The linea semicircularis is the lower edge of the posterior rectus sheath, approximately 3–6 cm below the level of umbilicus. The linea semilunaris (line of Douglas) is the curved depression seen lateral to the rectus abdominis muscle.

○ **What is the obturator sign?**

Pain on internal rotation of the right hip.

○ **Where does a Spigelian hernia occur?**

Through the linea semilunaris, lateral to the rectus muscles and inferior to the linea semicircularis, and beneath the external oblique muscle.

○ **What is a Richter's hernia and why is it dangerous?**

One in which the contents include one side (usually the antimesenteric side) of the intestinal wall. This hernia strangulates without any evidence of intestinal obstruction and is, therefore, easy to miss.

○ **What is the mortality rate of ruptured appendices in the elderly?**

15%.

○ **What is a sliding hernia?**

One in which part of the wall of the sac consists of a viscus (e.g., urinary bladder, cecum, etc.).

○ **What is the leading cause of testicular atrophy after inguinal hernia repair?**

Thrombosis of the gonadal veins. Testicular ischemia from lack of arterial inflow is rare because of dual arterial supply to the gonad via the testicular artery and scrotal circulation.

- **What is the differential diagnosis for testicular pain after inguinal hernia repair?**  
Ileoinguinal nerve entrapment, ischemic orchitis, vas deferens thrombosis (associated with painful ejaculation, and a tender vas deferens (vasectomy therapeutic).
- **What is the triangle of doom?**  
The area between the vas deferens and the gonadal vessels seen on the laparoscopic approach where, for example, the iliac vessels are at risk of injury from staples.
- **What is a paraduodenal (Treitz) hernia?**  
An intra-abdominal hernia to the left of the SMV creating a closed-loop bowel obstruction. The defect is repaired after reduction of the bowel with closure of the left mesocolon and the duodenal folds of peritoneum.
- **What are the hallmarks of neuropathic pain after inguinal hernia repair?**  
Shooting pain with hyperesthesia. Intermittent burning and reproduction of pain with touching the inguinal area when nerve entrapment has occurred. Treat first with NSAIDs and consider intermittent nerve block secondarily. Refractory pain should be treated with re-exploration and nerve release or possible ligation.
- **What is Amyand's hernia?**  
The hernia sac contains a ruptured appendix. This is usually mistaken for a strangulated hernia.
- **What is the appropriate management for a ruptured appendix?**  
Drainage with prompt appendectomy or interval appendectomy if the appendix cannot be safely removed. In addition, perioperative antibiotics against aerobic and anaerobic bacteria should be continued until no evidence of infection or abscess is present.
- **What structures are derived from the external oblique muscle and its aponeurosis?**  
The inguinal ligament, lacunar ligament, and the superficial inguinal ring.
- **What is Littre's hernia?**  
An inguinal hernia with an incarcerated Meckel's diverticulum.
- **What are the boundaries of the internal inguinal ring?**  
Arching fibers of the transversus abdominis and internal oblique muscles superomedially and the iliopubic tract inferolaterally.
- **Why is the right side twice as prone to develop an inguinal or a femoral hernia compared to the left?**  
The right testis descends into the scrotum later than the left. The processus vaginalis is, therefore, patent for a longer period and atrophies later than the left side. In addition, the sigmoid colon on the left side protects against possible herniation.
- **What is the appropriate treatment for an incidental carcinoid tumor with tumor found at the surgical margins?**  
Right hemicolectomy.

○ **What are the boundaries of the superior lumbar triangle of Grynfelt?**

The superior border is the 12th rib, the inferior border is the internal oblique muscle, and the posterior border is the sacrospinalis muscle.

○ **What are the boundaries of the inferior lumbar triangle of Petit?**

The posterior border is the latissimus dorsi, the anterior border is the external oblique, and the inferior border is the iliac crest.

○ **What is the origin of the genital branch of the genitofemoral nerve and what does it supply?**

It arises from L1 and L2, supplies motor fibers to the cremasteric muscle, and is the sensory supply to the side of the scrotum and labia.

○ **What does the McVay repair for inguinal hernia entail?**

Approximation of the transverse abdominus aponeurosis to Cooper's ligament.

○ **What is the appropriate treatment of an appendiceal mucocele found during abdominal surgery?**

Appendectomy.

○ **Where is local anesthesia administered for inguinal hernia repair?**

For the ilioinguinal nerve block, the anesthesia is given 2 cm medial to the anterior superior iliac spine and the skin is then infiltrated along the line of incision. After opening the inguinal canal, further local anesthesia can be given at the following sites: around the internal ring, in the loose areolar tissue around the spermatic cord, near the internal ring, at the neck of the sac, and over the pubic tubercle.

○ **What is a Lichtenstein repair?**

A tension-free replacement of the transversalis fascia with nonabsorbable mesh. This is the standard repair in most common use today.

○ **What are the advantages of laparoscopic hernia repair?**

It is useful for bilateral or recurrent hernias and causes less pain, early return to work, and better cosmesis.

○ **What is a Tanner' slide?**

The relaxing incision in the transversus abdominis, superomedial to the inguinal canal, to relieve tension on the repair.

○ **What are the local complications of an inguinal hernia repair?**

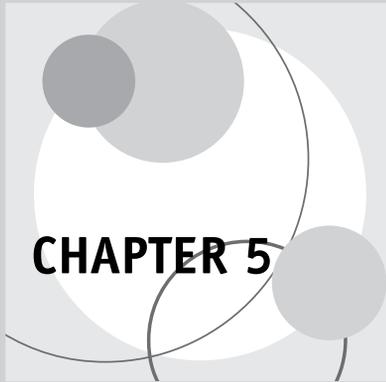
Wound infections, hematomas, sinus and fistula formation, orchitis, testicular atrophy, injury to the vas deferens, hydrocele, sensory and motor nerve damage, postoperative pain, vascular injuries to the femoral or testicular vessels, bladder or bowel injuries, and recurrence.

○ **What is the reported recurrence rate after an inguinal hernia repair?**

Classically, it is thought to be 5% to 10% for indirect inguinal hernias, 10% to 15% for direct inguinal hernias, and 30% for recurrent inguinal hernias; however, the addition of synthetic meshes has dramatically reduced these recurrence rates.

- **What is the recurrence rate after an incisional hernia repair?**  
30%; this also has been reduced to less than 10% with the advent of mesh.
- **What are the technical reasons for the high recurrence rate after incisional hernia repair?**  
Wound infection, inadequate dissection with poor exposure, closure under tension, and failure to include other hernial orifices adjacent to the main hernia.
- **What is the usual content of epigastric hernias?**  
Preperitoneal fat.
- **What is the relationship of a single midline decussation of rectus to abdominal hernias?**  
80% of the umbilical hernias and almost all epigastric hernias occur in patients who have a single decussation (30% of the population).
- **What are the signs of impending rupture of an umbilical hernia?**  
Discoloration, ulceration, or rapid increase in size.
- **What is the relationship between interparietal hernias and maldescent of the testis?**  
Interparietal hernias are almost exclusively right sided and 70% are associated with a maldescended or ectopic testis.
- **During an obturator hernia repair, where can the obturator membrane be incised to avoid injury to the obturator vessels?**  
At the inferior margin.
- **What is the sex ratio of obturator hernias?**  
Male:female is 1:5.
- **What is the Howship Romberg sign?**  
Pain passing down the inner side of the thigh to the knee in an obturator hernia with internal thigh rotation.
- **What are the three types of sciatic hernias?**  
Through the greater sciatic notch there are two variants: suprapiriformis (60%) and infrapiriformis (30%), and through the lesser sciatic foramen is the subspinous (10%).
- **What is a Cooper's hernia?**  
The hernia sac follows the femoral canal but tracks down to the scrotum, labia majorus, or the obturator foramen.
- **What is a prevascular hernia?**  
When the hernia is in front of the external iliac vessels within the femoral sheath.

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## CHAPTER 5

# Surgical Critical Care Pearls: Shock, Electrolytes, Nutrition, and Wound Care

- **What are the primary nutrition sources for the colon and small bowel?**  
Colon—short-chain fatty acids; small bowel—glutamine.
- **What is the major disadvantage of delivering TPN through a peripheral vein?**  
Limited concentration ability and subsequent reduced maximal caloric delivery.
- **What are the characteristics of the early anabolic (corticoid withdrawal) phase after extensive injury or trauma?**  
It follows the catabolic phase within 3 to 8 days and lasts for approximately 2 days. It is characterized by a sharp decline in nitrogen excretion and restoration of appropriate nitrogen balance.
- **Which vitamin reverses the negative effect of steroids on wound healing?**  
Vitamin A.
- **During the inflammatory phase of wound healing, what chemotactic factors attract neutrophils to the wound?**  
Complement component C5a and platelet-derived growth factor (PDGF).
- **When can feedings be started after placement of a jejunostomy tube?**  
In 12–18 hours.
- **How many kcal/g does carbs/protein/fat contain?**  
Carbs—3.4  
Protein—4  
Fat—9
- **What is the single best measure of nutritional status?**  
Serum albumin level. In the acutely ill, variables with a shorter half-life such as prealbumin and transferrin are also useful to evaluate nutritional status.

○ **What is the order of cells to a wound?**

Platelets—PMNs (neutrophils)—macrophages—fibroblasts.

○ **Wound contraction is mediated by what cells?**

Myofibroblasts.

○ **Where is vitamin D made and where is it activated?**

Made in the skin and is transported to the liver for 25-OH and then kidney for 1-OH where it becomes activated.

○ **When does the maturation phase of a normally healing wound occur?**

Approximately 3 weeks after injury.

○ **What is the ratio of Type I to Type III collagen in normal skin?**

8 : 1.

○ **How does PTH affect gut absorption of Ca?**

PTH potentiates vitamin D hydroxylation in the kidney (1-OH). This activated vitamin D augments intestinal Ca absorption.

○ **T/F: Urinary nitrogen excretion is proportional to resting energy expenditure (REE).**

True.

○ **What is the function of transforming growth factor-beta (TGF-beta)?**

It stimulates growth of fibroblasts and inhibits growth of epithelial cells.

○ **Where are branched-chain amino acids metabolized?**

Muscle.

○ **T/F: Compared to enteral feedings, administration of TPN is associated with an increased incidence of mucosal bacterial translocation.**

True.

○ **What are the products of platelet degranulation?**

TGF-beta and PDGF.

○ **What are the characteristics of Kwashiorkor (acute visceral protein depletion)?**

Edema, variable weight, and hypoalbuminemia.

○ **What is the primary cell regulating collagen synthesis?**

The macrophage.

○ **Match the following vitamin deficiency with the clinical presentation**

- |                  |                                               |
|------------------|-----------------------------------------------|
| 1. Zinc          | a. Decrease in vitamin C stores               |
| 2. Phosphate     | b. Anemia and neutropenia                     |
| 3. Copper        | c. Dermatitis, hair loss, and vision changes  |
| 4. Linoleic acid | d. Hyperglycemia and neuropathy               |
| 5. Vitamin A     | e. Perioral rash, hair loss, and poor healing |
| 6. Chromium      | f. Weakness and encephalopathy                |

1. e; 2. f; 3. b; 4. c; 5. a; 6. d.

○ **Which postsurgical or post-treatment patients would benefit from TPN?**

Generally, patients in whom prolonged bowel rest is indicated: those with massive small bowel resection, with severe radiation enteritis, on high-dose chemotherapy regimens or with a catabolic status lasting 5 to 7 days, and with enterocutaneous fistulas.

○ **What is the standard caloric distribution of TPN between protein, carbohydrate, and lipids?**

1 g/kg of protein a day. Then subtract the calories from the protein ( $4 \times$  g of protein) from the total desired calories: give this remaining caloric input via 30% lipid calories and 70% carbohydrate calories. Lipids contain 9 kcal/g and carbohydrates 3.4 kcal/g in solution. In patients with very high catecholamine levels (burn, shock, etc.), protein requirements may be increased.

○ **What cell secretes pro-alpha collagen chains?**

The fibroblast.

○ **Once glycogen stores are depleted, what is the secondary energy source in the body?**

Protein.

○ **How is serum protein maintained in fasting?**

By hepatic conversion of fatty acids to ketone bodies.

○ **T/F: When one reopens a week-old surgical incision the wound will heal slower than an incision in a virgin area.**

False. The matrix of wound healing cells is already laid down, so healing is faster.

○ **What is the dominant cell type during the inflammatory phase of wound healing?**

The macrophage.

○ **During prolonged starvation what fuel does the brain use?**

Ketones.

○ **What is the best measurement of marginal malnutrition?**

Retinal-binding prealbumin.

- T/F: TPN increases the spontaneous closure of intestinal fistulas.**  
True.
- What serum albumin level is associated with malnutrition?**  
Less than 3 g/dL.
- T/F: Epithelialization is more rapid under moist conditions than dry conditions.**  
True.
- T/F: Large doses of vitamin E enhance wound healing.**  
False.
- What serum protein concentration is associated with malnutrition?**  
Less than 6 g/dL.
- What electrolyte should be inspected if difficulty correcting patient's low Ca?**  
Magnesium.
- What metabolic complication occurs when excessive amounts of glucose are infused with the TPN solution?**  
Carbon dioxide retention.
- What preoperative laboratory abnormality is most predictive of morbidity and mortality?**  
Low serum albumin.
- What is the main difference between a keloid and a hypertrophic scar?**  
Keloids extend beyond the boundary of the original tissue injury, hypertrophic scars do not.
- What is the most likely cause of diarrhea in a patient receiving an elemental diet?**  
The high osmolarity of the TPN.
- What hormone normally regulates protein synthesis and breakdown?**  
Insulin.
- Which amino acid is a key fuel for rapidly dividing cells, including cancer cells?**  
Glutamine.
- Which serum proteins can be used to assess short-term nutritional status?**  
Transferrin (half-life of 8–9 days), prealbumin (half-life of 2 days), and retinal-binding globulin (half-life of 12 hours).

- **What factors can influence prealbumin levels?**  
Cirrhosis of the liver and hepatitis can reduce prealbumin levels. Renal disease can increase prealbumin levels.
- **What is the function of epidermal growth factor (EGF)?**  
It stimulates DNA synthesis and cell division in a variety of cells, including fibroblasts, keratinocytes, and endothelial cells.
- **T/F: Epithelialization produces a watertight seal within 48 hours.**  
True.
- **How many days of TPN are required to see a measurable response?**  
At least 7 to 14 days.
- **What TPN additive exerts trophic effects on intestinal mucosa and diminishes bacterial translocation across the gut?**  
Glutamine.
- **How are maintenance fluids adjusted for febrile patients?**  
They are increased by 10 mL/kg for each degree Fahrenheit more than 101°.
- **What cells produce GM-CSF?**  
Activated T lymphocytes.
- **T/F: Patients whose atrial fibrillation is rate controlled do not require anticoagulation.**  
False. The risk for atrial thrombus and embolization still exists.
- **How is the basal metabolic rate (BMR) calculated?**  
The modified Harris–Benedict formula is calculated as follows:  $BMR (kcal/d) = 666 + (9.6 \times \text{weight [kg]}) + (1.7 \times \text{height [cm]}) - (4.7 \times \text{age [years]})$ .
- **What is the predominant type of collagen in scar tissue?**  
Type I.
- **What cells cause contraction of wound edges?**  
Myofibroblasts.
- **T/F: During starvation, administration of at least 100 g of glucose exerts a protein-sparing effect mediated by release of endogenous insulin.**  
True.
- **What is the caloric content of 1 g of glucose?**  
3.4 kcal.

- What is the function of laminin?**  
It facilitates epithelial cell anchoring.
- What fraction of daily protein need can be expected from dietary sources?**  
25%.
- Should TPN be tapered in normoglycemic patients who become hyperglycemic after institution of TPN?**  
No. It is important to replete the caloric and fluid needs of the patient. Insulin should be added to TPN to control glucose levels.
- What is the role of glutamine in TPN and enteral solutions?**  
Glutamine is a nonessential amino acid that carries ammonia. At times of stress, it may become an essential amino acid. There is some evidence to suggest that the addition of glutamine in TPN or enteral formulations may increase nitrogen balance.
- If a central line used for TPN becomes clotted, must it be removed?**  
It may be possible to save the line by instilling urokinase or TPA.
- What are the characteristics of linoleic acid deficiency?**  
Dermatitis, hair loss, paresthesias, and blurred vision.
- What is the advantage of cyclic TPN?**  
Cyclic TPN can be given over a short period, for example at night, which allows the patient to pursue more normal activities during the day when the TPN is not running.
- What percentage of critically ill and injured patients are catabolic or hypermetabolic?**  
Nearly 100%.
- T/F: Immunocompetence and vital organ function are dependent on nutritional support.**  
True. Both are secondary goals of nutritional support.
- What measures can reduce lean body mass and protein loss in children with large surface area burns?**  
Synthetic testosterone (oxandrolone) and propranolol.
- With the onset of critical illness, what factors are thought to raise REE and protein turnover?**  
Catecholamines and cortisol.
- What are the serum half-lives of albumin and prealbumin?**  
Approximately 20 days and 2 to 3 days, respectively.
- Which two methods are frequently relied upon to assess nutritional status in critically ill patients?**  
Indirect calorimetry and nitrogen balance.

- **What is the mechanism of reperfusion injury?**  
Production of superoxide and hydroxyl free radicals.
- **What is the equation for nitrogen balance?**  
Nitrogen balance = (nitrogen intake) – (nitrogen loss) = (Protein [g]/6.25) – (urine urea nitrogen/0.8) + 3.
- **How much protein is required for a balanced diet in a healthy adult?**  
Approximately 0.6 g/kg ideal body weight/d.
- **What is the most common severe complication of enteral nutrition?**  
Aspiration.
- **What is the recommended starting point for protein replacement in hypermetabolic critically ill patients?**  
1.5–2.0 g/kg ideal body weight/d.
- **T/F: Lipid emulsions are useful in patients needing volume restriction or demonstrating carbohydrate intolerance.**  
True. Lipids are calorie-dense compared to dextrose solutions.
- **What minimum percentage of total calories should be supplied as lipid to prevent fatty acid deficiency?**  
5%.
- **How long does it take for nonstressed patients receiving lipid-free TPN to demonstrate evidence of essential fatty acid deficiency?**  
Within 4 weeks (hypermetabolic patients may do so within 10 days).
- **What cells produce interferon (IFN)?**  
Lymphocytes and fibroblasts.
- **When does tensile strength correlate with total collagen content?**  
For approximately the first 3 weeks of wound healing.
- **What clinical symptoms are seen with hypophosphatemia brought on by refeeding a malnourished patient?**  
Respiratory insufficiency, muscle weakness, and congestive heart failure.
- **What are the consequences of overfeeding (excessive calories)?**  
Hyperglycemia and increased CO<sub>2</sub> production, making weaning from the ventilator difficult.
- **Which inpatient trauma victims need low-dose heparin DVT prophylaxis?**  
All of them.

**What is the main energy source of enterocytes?**

Glutamine.

**Arginine, a semiessential amino acid, is considered to be vital to what hematologic function?**

The immune system.

**When should nutritional support be started?**

When a hypermetabolic state (e.g., trauma and sepsis), underlying malnutrition, or an expected delay in resuming an oral diet is recognized.

**What is the most common metabolic complication of chronic TPN administration in adults?**

Hepatic steatosis (almost always associated with glucose overload).

**Sepsis in burn patients is most likely secondary to what source?**

Transmucosal GI bacterial transmission.

**T/F: Early initiation of enteral feedings decreases septic complications in trauma patients compared to early parenteral nutrition.**

True.

**What are the characteristics of phosphate deficiency?**

Respiratory weakness, encephalopathy, and paresthesias.

**T/F: Preoperative nutritional support for malnourished patients has been shown to be effective at reducing postoperative morbidity.**

True. However, it is only effective for patients with severe malnutrition.

**In which patients is parenteral nutritional support indicated?**

When enteral access is unobtainable, enteral feeding contraindicated, or the level of enteral nutrition fails to meet requirements.

**In which patients is intravenous nutritional support unlikely to be of benefit?**

Patients expected to start oral intake in 5 to 7 days and those with mild injuries.

**T/F: Underfeeding can result in difficulty in weaning a patient from mechanical ventilation.**

True. Malnutrition can cause respiratory muscle weakness and ventilator dependence.

**What does a respiratory quotient (RQ) less than 0.7 indicate?**

Use of ketones as the source of fuel (lipolysis).

**T/F: TGF-beta enhances angiogenesis.**

True.

- **T/F: Patients with renal insufficiency should have their protein intake restricted.**  
False. Protein restriction is usually only necessary in patients who are unable to undergo dialysis.
- **What are the advantages of enteral nutrition when compared to parenteral nutrition?**  
Enteral nutrition is more physiologic, has a trophic effect on gastrointestinal cells, avoids the need for a central venous catheter, is associated with fewer complications, and costs less.
- **What does indirect calorimetry measure?**  
Gas exchange at steady state. Measured values include inspired and expired oxygen fractions, inspired and expired carbon dioxide fractions, and minute ventilation. Oxygen consumption and carbon dioxide production are calculated using these measurements.
- **Burn wound infection is best documented by what means?**  
Tissue biopsy with quantitative wound culture.
- **A previously healthy 20-year-old female is injured in a motor vehicle accident (MVA). The day following admission her serum albumin is noted to be 2.8 g/dL. Why is her serum albumin low?**  
Hypoalbuminemia in acute illness is because of the acute-phase protein response, hemodilution from resuscitation, and transcapillary escape of albumin to the interstitium.
- **What happens to nitrogen reserves after trauma?**  
They are mobilized because of accelerated protein catabolism.
- **TGF-beta acts as a chemotactic agent for what cells?**  
Fibroblasts, monocytes, and macrophages.
- **A critically ill patient's intravenous access is via a peripherally inserted central catheter. Can solutions with an osmolarity of greater than 900 mOsm be infused through it?**  
Yes. Although the insertion site is peripheral, the catheter tip is in a central vein, and, thus, there is no osmolarity restriction.
- **What minimum length of small bowel is required for enteral absorption of nutrients?**  
100 cm.
- **What are proven measures to reduce perioperative wound infections?**  
Preop (within an hour of incision) ABX, clipping rather than shaving hair, and avoiding hypothermia and hypoxia.
- **What is the essential fatty acid requirement of an adult?**  
2% to 4% of calories as linoleic acid.
- **What is the effect of vitamin C deficiency on wound healing?**  
Reduced collagen synthesis and procollagen polymerization.

**○ What are the clinical manifestations of hypomagnesemia?**

Anorexia, tachyarrhythmias, nausea, vomiting, lethargy, weakness, positive Trousseau's and Chvostek's sign, tremor, and muscle fasciculations.

**○ Which type of collagen is a crucial component of the basement membrane?**

Type IV.

**○ What is the best way to avoid intestinal villous atrophy in the critically ill?**

Enteral feeding.

**○ What percentage of most lipid emulsions are essential fatty acids?**

50% to 75%.

**○ When fat emulsions are administered, which patients should have monitoring of serum triglyceride levels?**

Patients with hyperlipidemias, acute pancreatitis, pulmonary insufficiency, hepatic failure, and sepsis.

**○ At what level of serum triglycerides should fat and glucose administration be decreased?**

If it exceeds 500 mg/dL.

**○ What is the most common organism associated with catheter sepsis from long-term TPN?**

*Staphylococcus aureus*.

**○ Which amino acid is the precursor for gluconeogenesis?**

Alanine.

**○ Which amino acid is most critical to immune function?**

Arginine.

**○ When ordering TPN, the concentrations of what electrolytes must be monitored to prevent precipitation?**

Calcium and phosphate.

**○ What is the leading cause of hospital-acquired bacteremia?**

Central line infection.

**○ What is the indication for increasing the acetate concentration in TPN solutions?**

Metabolic acidosis, usually nonanion gap acidosis in which bicarbonate loss is the cause of the acidosis.

**○ What nutritional deficiency should be considered if a patient has unexplained lactic acidosis?**

Thiamin.

- **What is the RQ for carb/protein/fat in indirect calorimetry?**  
Pure glycolysis—1  
Protein—0.8  
Lipolysis—0.7  
Lipogenesis RQ > 1
- **What is one of the earliest metabolic signs of systemic sepsis?**  
Glucose intolerance.
- **A patient on TPN has severe diarrhea. What trace element may need to be supplemented?**  
Zinc.
- **Name the features of hypophosphatemia.**  
Respiratory weakness (hypoventilation) and myocardial insufficiency. Hemolysis is possible from cell membrane instability. Hyperparathyroidism and refeeding syndrome are the most common etiologies.
- **What is the effect of parenteral lipid administration on cellular immunity?**  
It causes reticuloendothelial dysfunction and immune suppression.
- **T/F: Pulse oximeters detect carboxyhemoglobin with a decreased O<sub>2</sub> saturation reading.**  
False. The O<sub>2</sub> saturation levels remain normal.
- **An order is placed for multitrace elements as MTE-5. Which five trace elements are included?**  
Zinc, copper, chromium, manganese, and selenium.
- **Which vitamin deficiency can be caused by gastric or ileal resection?**  
Vitamin B12.
- **The stress of illness is associated with a decrease in serum iron and zinc. What happens to these trace elements?**  
They are sequestered in tissue, especially in the liver. There are also increased zinc losses in the urine.
- **Name some etiologies of metabolic alkalosis.**  
Diuretics, Cushing syndrome, NG suction, gastric outlet obstruction/emesis, Conn syndrome (hyperaldosteronism), and dehydration.
- **What is the most effective way to reduce ventilator-associated pneumonia?**  
Regular airway suctioning with closed catheters.
- **What is the goal for calculated nitrogen balance in a critically ill patient?**  
Positive 2–6 g of nitrogen per day.

- T/F: Immunoenhanced enteral diets in surgical oncology inpatients can reduce nosocomial infection rates.**  
True.
- What are the elemental deficiencies associated with gastric bypass surgery?**  
Iron deficiency from duodenal bypass causing microcytic anemia and vitamin B12 deficiency from lack of intrinsic factor via gastric resection.
- Which electrolyte deficiency is notorious for inducing post-CABG ventricular tachycardia?**  
Hypomagnesemia.
- Why is the use of transferrin as a marker of visceral protein stores limited?**  
Transferrin levels may be affected by factors other than nutritional status, such as iron-deficiency anemia, liver disorders, and neoplastic diseases.
- What are the untoward effects of overfeeding in a critically ill patient?**  
Increased carbon dioxide production, increased oxygen consumption, fluid overload, hepatic steatosis, and hyperglycemia. This can be evaluated with indirect calorimetry—which is the best determinant of caloric use at the bedside.
- What are the indications for tube feeding via the jejunostomy route?**  
Comatose patients, patients without a laryngeal reflex, and those in whom nasoesophageal, nasogastric, or nasojejunosomy tubes cannot be placed.
- T/F: Thromboxane A2 synthesis is increased during vascular injury and arteriosclerosis with endothelial denudation.**  
True.
- Which test can predict the need for stress dose steroids perioperatively in a patient with recent steroid use?**  
ACTH stimulation test.
- T/F: Tensile strength will reach original skin strength in 6 months.**  
False. Original strength is never regained.
- What is the most common cause of hyperphosphatemia?**  
Acute and chronic renal failure.
- What is the effect of prostacyclin on vascular smooth muscle tone?**  
It is inhibitory (relaxation).
- What is the role of chromium in metabolism?**  
Chromium promotes insulin action in peripheral tissues.

- **Do steroids, gut decontamination, and oral antifungals have proven survival advantages in adult respiratory distress syndrome (ARDS) patients?**

No.

- **Which hormones are influenced by the body's response to injury?**

Catecholamines, aldosterone, antidiuretic hormone, cortisol, and growth hormone.

- **T/F: In the first 12–24 hours after major trauma, blood glucose and insulin levels are expected to be high.**

False. During the initial ebb phase, blood glucose is elevated with low insulin levels. After 24 hours, the hypermetabolic phase predominates with elevated glucose and insulin.

- **At normal body temperature, what is the average daily insensible water loss?**

600–900 mL/d or 8–12 mL/kg/d.

- **Name some features of hypernatremia.**

When sodium levels exceed 160 and serum osmolarity 300 mOsm/kg, restlessness, ataxia, and tonic spasms can occur. Potential etiologies are diabetes insipidus, excessive bicarb in resuscitation, and hyperaldosteronism.

- **What are the etiologies of hyponatremia?**

Adrenal insufficiency, SIADH, renal failure, and pseudohyponatremia with hyperglycemia.

- **What are the features of hypercalcemia?**

Fatigue, weakness, depression, and muscle ache. Malignancy (inpatient) and hyperparathyroidism (outpatient) are the most common etiologies.

- **Name the hallmarks of hypokalemia.**

Respiratory impairment, paralysis, hyporeflexia, flattening of T waves, and depressed ST segments. Common etiologies are renal losses with insufficiency or diuretics, hyperaldosteronism, and metabolic acidosis.

- **What are the consequences of exceedingly rapid sodium replacement in hyponatremia?**

Central pontine myelinolysis (quadriplegia, dysarthria, and dysphasia).

- **What are the common causes of hyperosmolar hyponatremia?**

Hyperglycemia, mannitol, and radiologic contrast.

- **In what manner do patients with asymptomatic hyponatremia are best treated?**

Free water restriction.

- **What are the primary electrolyte effects of aldosterone?**

Sodium retention and urinary potassium and hydrogen ion loss.

○ **Which medications can increase serum K+?**

Beta blockers and ACE inhibitors.

○ **What is the electrolyte deficiency associated with acute pancreatitis?**

Hypocalcemia (this is a second 24-hour Ranson criteria).

○ **What are the treatments for hyperkalemia?**

Kayexalate, insulin,  $\text{Ca}^{2+}$  for arrhythmia, bicarb, and glucose; dialysis PRN.

○ **Name the treatment and most common cause of hypermagnesemia?**

Renal failure is the most common cause, and treatment should involve IV calcium to stabilize the myocardium in addition to saline IV.

○ **What is the most common etiologies of hyperphosphatemia?**

Renal failure; phosphate binding oral antacids are the treatment.

○ **Name the features and treatment of hypocalcemia.**

Hyperreflexia and perioral numbness (first symptom). Cardiac arrhythmia with shortened QT interval can occur. Treatment should be calcium supplementation and vitamin D.

○ **What are the treatments for hypercalcemia?**

Saline, Lasix, bisphosphonates, and calcitonin; PRN parathyroidectomy.

○ **What is the ECG finding with severe hyperkalemia? And what is the treatment?**

Peaked T-waves on ECG. Treat with Ca to stabilize the cardiac membrane. Bicarb and insulin are adjuncts to lower serum K+. Lasix and kayexalate can also be used, but they take longer to have an effect.

○ **What is the typical electrolyte abnormality associated with vomiting and NG suctioning?**

Hypokalemic, hypochloremic, and metabolic acidosis from the effects of GI loss and aldosterone. Urine chloride less than 10 predicts saline-responsive contraction alkalosis. Treat with saline + potassium.

○ **Name some etiologies of non-ion gap metabolic acidosis.**

Pancreatic fistula, enterocutaneous fistula, diarrhea, ATN-induced renal failure, and resuscitation with normal saline.

○ **What is the goal serum blood sugar in ICU patients?**

Less than 110 to reduce overall mortality; for ICU stays greater than 3 to 4 days.

○ **Can you name some features of banked packed red blood cells?**

35- to 40-day shelf life; 80% of RBC viable at 2 weeks storage time; banked blood is low in 2,3 DPG and calcium, while high in K+; and citrate in banked blood is converted to bicarbonate once transfused, thus potentially inducing metabolic alkalosis with massive transfusion.

○ **What is the preferred site for central venous catheterization?**

Controversial. All three major sites (femoral, internal jugular, and subclavian) have advantages and disadvantages that must be weighed. Avoid subclavian lines in patients with needs for future dialysis access. Femoral lines may have a higher infection rate (data conflicting).

○ **T/F: Femoral vein catheters have the highest infection rates and should not be used routinely.**

False.

○ **What are the components of LR and NS?**

LR = Na—130, K—4, Ca—2.7, and Cl—109 (similar to electrolytes in chem. 7).

NS = Na—154 and Cl—154

○ **T/F: Routine changing of central lines over a wire lowers infection rates.**

False. Line changes should be reserved for clinically suspected infection only, not empirically.

○ **T/F: Central lines should be flushed with heparin-containing solutions.**

False. Normal saline flushes have the same catheter occlusion incidence as heparin, and heparin is occasionally associated with problematic thrombocytopenia.

○ **T/F: Seeding via bacteremia is the most common source for central line infections.**

False. Overlying skin flora is the most common contamination source. To prevent infection, maximal sterile barrier precautions should be used at the time of line placement.

○ **What complications are post central line insertion tachycardia, hypotension, and distended neck veins concerning for?**

Tension pneumothorax or pericardial tamponade from right atrial rupture. The absence or presence of breath sounds on physical examination is the best initial guide as to which has occurred.

○ **What is the maximum intravenous potassium administration?**

40–60 mEq/h.

○ **What are the most common causes of SIADH?**

Malignancies (small cell lung cancer), pulmonary disease, CNS disorders, and drugs.

○ **What is the treatment for SIADH?**

Fluid restriction. Hypertonic saline will occasionally be required if symptomatic hyponatremia develops. Do not replace sodium more rapidly than 12 mEq/L in a 24-hour period to avoid cerebral demyelination.

○ **What are the features of diabetes insipidus post blunt head trauma?**

High urine output with a low urine osmolality. Elevated serum osmolality. Treatment is DDAVP (desmopressin) and free H<sub>2</sub>O replacement.

- **Overly rapid correction of hyponatremia and hypernatremia are associated with which cerebral complications?**

Hyponatremia—central pontine myelinolysis

Hypernatremia—cerebral edema

- **What is the metabolic abnormality associated with early sepsis?**

Respiratory alkalosis from hyperventilation and hyperglycemia.

- **What is the diagnostic test of choice to confirm hypoadrenal shock?**

The ACTH stimulation test with 250  $\mu\text{g}$  ACTH and expected 7  $\mu\text{g}/\text{dL}$  rise in cortisol at 60 minutes.

- **How is the fractional excretion of sodium (FeNa) calculated?**

$\text{FeNa} = [(\text{Una}/\text{Pna})/(\text{Ucr}/\text{Pcr})] \times 100\%$ . FeNa less than 1 is consistent with pre-renal azotemia.

- **What is the major cause of extrarenal potassium depletion?**

Diarrhea.

- **Supplementation with which amino acid has proven most beneficial in the surgical critical care patient?**

Glutamine has been associated with decreased septic complications and improved nitrogen balance to preserve muscle mass.

- **At what points during insertion and use of pulmonary artery (PA) catheters should the balloon be inflated?**

When it is in the superior vena cava (SVC). It should remain inflated during any forward movement of the catheter and should be deflated prior to any withdrawal. Once in place, the balloon should be inflated only to the minimum volume necessary to obtain a pulmonary capillary wedge pressure (PCWP).

- **What is the tumor lysis syndrome? And what is its treatment?**

Tumor lysis is the rapid spontaneous lysis of malignant cells with subsequent hyperkalemia and urate-induced acute renal failure. Treatment consists of hydration, urine alkalinization with IV bicarbonate, and PRN mannitol to maintain urine output. Hematological malignancies are the most common source.

- **Which patient populations are most likely to benefit from the use of the PA catheters?**

Multiple trauma patients, patients with myocardial infarction and shock, and those with shock refractory to volume loading. Perioperative management of patients undergoing cardiac or vascular surgery is also an indication. Particularly useful in patients with renal failure.

- **What is the formula for corrected Ca?**

$\text{Calcium} + 0.8 \times (4 - \text{albumin})$ .

- **What is the formula for corrected Na in hyperglycemia?**

$(\text{Glucose} - 100)/100 \times 1.6 + \text{Na}$ . Always be leary of this “pseudohyponatremia” in patients with low  $\text{Na}^+$ .

○ **What are the characteristics of dopamine?**

It is a dopaminergic and beta-1 agonist at low doses and an alpha agonist at higher doses.

○ **What are the major differences between dopamine and dobutamine?**

Dobutamine lacks alpha-1 effects.

○ **After extensive skeletal muscle trauma or ischemia, what are the clinical features and treatment of rhabdomyolysis?**

Clinical features: hyperkalemia, elevated CK level, metabolic acidosis, rising creatinine, urine dip positive for blood yet no RBC on examination. Treatment: volume loading with saline and  $\text{HCO}_3^-$  to alkalinize urine; mannitol and Lasix to maintain high urine output.

○ **How does dopamine promote diuresis?**

Low-dose dopamine ( $2-4 \mu\text{g}/\text{kg}/\text{min}$ ) binds to dopaminergic receptors and increases renal blood flow. It also directly inhibits sodium resorption in the proximal tubule. Even at those low doses, beta-adrenergic activation increases cardiac contractility, which also increases renal blood flow.

○ **How do inotropic agents increase myocardial contractility?**

By increasing intracellular calcium concentration and availability.

○ **What pressures can be measured by the PA catheter?**

Systemic vascular resistance (SVR), pulmonary artery pressure (PAP), and PCWP.

○ **What is meant by wedge pressure?**

Left ventricular end diastolic volume (LVEDV), a measure of the preload on the ventricle.

○ **What assumptions are made in using PCWP as a substitute for LVEDV?**

Most importantly, a stable relationship between LVEDP and LVEDV. Also, that the PCWP is equal to the left atrial (LA) pressure, which is equal to the LVEDP.

○ **What are the sources of error in these assumptions?**

PCWP can be different from LA pressure and LVEDP caused by pulmonary venous resistance, valvular abnormalities, positive pressure ventilation, positive end-expiratory pressure (PEEP), catheter placement in lung zones I or II, and abnormal ventricular compliance.

○ **T/F: Triple lumen catheters are associated with higher line infection rates than single lumen catheters.**

True.

○ **When is activated protein C (zygris) treatment indicated?**

In cases of severe sepsis. Monitoring for bleeding complications is necessary.

- **What is the most common cause of acute adrenal insufficiency?**  
Withdrawal of chronic administration of exogenous corticosteroids.
- **What are the gastrointestinal symptoms of hyperkalemia?**  
Nausea, vomiting, intermittent intestinal colic, and diarrhea.
- **What are the features of the “metabolic syndrome” associated with increased cardiovascular morbidity?**  
Blood sugar 110–130; low HDL and high LDL, particularly small particle LDL; elevated TG and blood pressure; and central obesity.
- **How does PA diastolic pressure compare to PCWP as a measure of left heart filling pressures?**  
Under normal conditions, the PCWP is usually within a few mm Hg of PA diastolic pressure. Conditions common to critical illness make them more disparate.
- **What is the cause of respiratory acidosis?**  
Retention of CO<sub>2</sub> and subsequent increased carbonic acid retention. This can be secondary to hypoventilation or impaired gas exchange (pulmonary pathology).
- **Where is the majority of intracellular water located?**  
In skeletal muscle.
- **What is the initial treatment for *Candida* in the urine for an ICU patient on multiple antibiotics?**  
Catheter removal; if symptoms persist or *Candida* sepsis occurs then start antifungals (diflucan).
- **How does PEEP affect PA catheter measurements?**  
Some degree of positive thoracic pressure is transmitted to the pulmonary vasculature and, therefore, is measured by the PA catheter. Placement in zone 3 will lessen but not eliminate the effect.
- **What parameter, measured by PA catheters, correlates with response to fluid challenge?**  
Right ventricular end diastolic volume (RVEDV) less than 140 correlates in a positive fashion with increased cardiac output (CO) upon fluid challenge.
- **What is the relationship of oxygen saturation of venous blood (SvO<sub>2</sub>) to oxygen delivery (DO<sub>2</sub>) and oxygen consumption (VO<sub>2</sub>)?**  
SvO<sub>2</sub> is a quick way of determining the adequacy of DO<sub>2</sub> and VO<sub>2</sub>. Assuming arterial oxygen saturation (SaO<sub>2</sub>) of 95% to 100%, the SvO<sub>2</sub> should be greater than 70% to 75%. Less than this indicates that the oxygen supply is suboptimal. SvO<sub>2</sub> levels less than 60 are specific to CHF. In some conditions, such as sepsis or cyanide poisoning, SvO<sub>2</sub> will actually be higher than normal, despite inadequate tissue oxygenation.
- **At or above which nerve root is respiratory failure worsened in spinal injuries?**  
C2.

- **What is the treatment for TTP?**  
Plasmaphoresis (not splenectomy).
- **For what conditions has alpha-2b IFN shown benefit?**  
Acute hepatitis and stage III melanoma.
- **What are the hemodynamic parameters associated with sepsis?**  
Low SVR, high CO, and normal PCWP.
- **What are risk factors for iodinated contrast nephrotoxicity?**  
Baseline renal insufficiency and diabetes are the greatest risk factors. Overall 15% of patients will experience at least a 25% rise in creatinine after angiographic procedures. Reduced risk is seen with the use of nonionic low osmolar contrast agents.
- **What are the best preventative measures against contrast-induced nephrotoxicity?**  
Pre-procedure IV hydration, with the use of bicarb in patients with baseline renal insufficiency. Mucomyst with doses of 600 mg po q12 ×2 before and after the procedure. Use of fenoldopam/low-dose dopamine has shown minimal utility.
- **What is the treatment for subcutaneous vasopressor infiltration?**  
Injection of 10 mg of phentolamine (1 mg/cc), which is an alpha blocker, into the affected subcutaneous space to reduce the incidence of soft-tissue necrosis.
- **What is the most common presentation of antithrombin deficiency, and what is the treatment?**  
DVT. Must give FFP, which contains antithrombin before heparinizing because heparin works by enhancing AT activity. Then can initiate coumadin as well.
- **What infectious syndromes can lead to ventilatory insufficiency?**  
Botulism, tetanus, campylobacter, polio, diphtheria, and Guillain–Barre’ syndrome.
- **T/F: Postoperative oxygen therapy has been shown to reduce wound infection rates after colon surgery?**  
True.
- **What is considered a normal Allen test?**  
Palmar blush within 7 seconds of ulnar artery release. Important to check before arterial line placement.
- **What are the typical PA catheter measurements in hypovolemic shock?**  
Low CO, high SVR, and low PCWP.

- **T/F: A 3 cc flush of 2 u/mL hepsaline for an IV lock can precipitate heparin-induced thrombocytopenia.**  
True. Trace amounts of heparin can precipitate the IgG ab, which cross reacts with platelet receptor 4 and can induce the thrombotic white clot syndrome. Treatment is cessation of all heparin-based products (including LMWH—lovenox). Anticoagulation should be conducted when indicated with a direct thrombin inhibitor and then coumadin once PTT is therapeutic.
- **T/F: PCO2 level is directly related to alveolar ventilation.**  
True.
- **What is the treatment for persistent empyema in the presence of a chest tube?**  
Surgical decortication.
- **Aminoglycosides are effective against what bacteria, and by what mechanism?**  
Aerobic Gram-negative bacilli (including *Pseudomonas aeruginosa*), enterococci, staphylococci, and streptococci. The mechanism is inhibition of ribosome function.
- **What risks are associated with the use of aminoglycosides?**  
Prolonged neuromuscular blockade, ototoxicity, and nephrotoxicity.
- **What is the mechanism of bacterial resistance to aminoglycosides?**  
Inhibition of active transport of the drug into the bacterial cell.
- **A Patient is undergoing a laparoscopic cholecystectomy and suddenly after insufflating the abdomen the patient becomes hypotensive with signs of right heart strain on telemetry. What is one immediate treatment?**  
In CO<sub>2</sub> air embolus, turn patient with left side down and attempt air aspiration with central line in RA.
- **What measures can be taken to minimize anemia in the critically ill?**  
Minimize blood draws, and empiric EPO can minimize transfusion requirements.
- **Vancomycin is effective against which bacteria and by what mechanism?**  
Gram-positive cocci, including methicillin-resistant *S. aureus* (MRSA), *Staphylococcus epidermidis*, enterococcus, diptheroids, and *Clostridium difficile*. The mechanism is by cell membrane binding and alteration.
- **What is the mechanism of bacterial resistance to vancomycin?**  
Altered bacterial cell walls.
- **What is Red Man's syndrome?**  
Flushing of the face and neck, pruritis, and hypotension associated with rapid infusion of vancomycin and subsequent release of histamine.
- **What problem with resistance has arisen with the use of vancomycin?**  
Development of vancomycin-resistant enterococci (VRE).

- **Which inherited disorder will always benefit from splenectomy?**  
Hereditary spherocytosis.
- **What agents are used to treat VRE?**  
Linezolid, chloramphenicol, novobiocin, synergid, teichoplanin, quinolones, and doxycycline.
- **What are the major intracellular anions?**  
Proteins and phosphates.
- **What are the feared reactions of silvadene, sulfamylon, and silver nitrate?**  
Silvadene—neutropenia  
Sulfamylon (mafedine acetate)—acidosis  
Silver nitrate—hyponatremia and hypochloremia
- **Burn patients develop a green slime infection on their burns, which smell sweet. What is the most likely offending organism?**  
*Pseudomonas*.
- **Which mitral valve abnormalities can lead to large v waves on the PA wedge tracing?**  
Mitral stenosis and mitral regurgitation. This is because of overfilling of the left atrium.
- **T/F: Total serum calcium increases by 0.8 mg/dL for every 1 g/dL increment of serum albumin above a normal value of 4 g/dL.**  
True.
- **How should ventilator-associated pneumonia be diagnosed?**  
BAL—bronchioalveolar lavage because blind suctioning cultures flora and colonized bacteria too often. Early responsible organisms are most frequently *H. flu*, *Pneumococcus*, *E. coli*, and MSSA. Late acquired pathogens are most commonly *Pseudomonas* and MRSA.
- **Name the ventilator parameters associated with successful extubation.**
  1. Rapid shallow breathing index less than 90 on CPAP. Calculated by respiratory rate/tidal volume in liters.
  2.  $PCO_2 < 50$  and  $PaO_2 > 70$ .
  3.  $TV > 5$  cc/kg on pressure support.
  4. NIF  $> 20$ .
  5. Minute ventilation  $> 5$  L.
  6.  $RR < 35$ .
  7. Vital capacity  $> 10$  cc/kg.
- **What measures are proven to reduce ventilator-associated pneumonia?**  
Strict hand washing, avoiding prolonged intubation, and continuous subglottic suctioning. Empiric ABX for nondocumented pneumonia is not preventative.

- **Are antibiotics indicated in aspiration to prevent bacterial infection in addition to chemical pneumonitis?**

No. Treatment should be directed toward maintaining oxygenation.

- **What is the usual cause of decreased lung compliance in patients with acute respiratory failure?**

A decrease in functional residual capacity (FRC).

- **How is PEEP beneficial in hypoxia?**

PEEP increases the capillary–alveolar interface via increased FRC to allow improved gas exchange surface area. Excessive prolonged PEEP can induce barotraumas and CO<sub>2</sub> retention via increased dead space, thus PEEP levels greater than 10 should be used sparingly in the most profoundly hypoxic patients.

- **What are the indications for steroids in the critically ill?**

Relative adrenal insufficiency as documented by an ACTH stimulation test, profound sepsis requiring vasopressor treatment for greater than 48 hours, and severe ARDS for greater than 5 days.

- **How do increases in heart rate (HR) alter the systolic and diastolic components of the cardiac cycle?**

As HR increases and cardiac cycle time decreases, systole time remains relatively constant while diastole time decreases, thereby increasing the ratio of systole/diastole.

- **What is the formula for O<sub>2</sub> delivery?**

CO × O<sub>2</sub> content.

- **What is the variables determining O<sub>2</sub> content?**

Hgb, O<sub>2</sub> sat, and PaO<sub>2</sub>.

- **What percentage of available oxygen is extracted by the heart?**

70%. Thus the coronary sinus has the lowest PO<sub>2</sub> of any vessel in the body.

- **What is the physiologic effect of CPAP?**

Increased FRC and vital capacity associated with decreased work of breathing.

- **What is the mortality rate for patients with multiple organ failure (MOF) complicated by acute renal failure?**

75% to 90%.

- **How much calcium should be administered to a patient receiving rapid blood transfusions?**

0.2 g for every 500 mL of blood transfused.

- **What is the acute compensation for metabolic acidosis?**

Respiratory (hyperventilation) alkalosis.

- **What is the role of pressure control ventilation (PCV)?**  
To minimize ventilator-associated barotraumas by delivering volume until a set peak airway pressure is reached. Of greatest utility in ARDS and requires paralysis with heavy sedation.
- **What is the pitfall of pancuronium as in ICU paralytic agent?**  
Hepatic metabolism and renal excretion make prolonged neuromuscular blockage a concern in patients with multisystem organ failure. Cisatracurium is metabolized by pseudocholinesterase and thus has become the ICU paralytic agent of choice.
- **What factors directly affect DO<sub>2</sub>?**  
Hemoglobin concentration, CO, and PaO<sub>2</sub>.
- **What is the predominant stimulus for activation of hypoxic pulmonary vasoconstriction?**  
Decreased alveolar oxygen tension.
- **What are the strongest indications for a Swan–Ganz PA catheter?**  
To direct fluid status in critically ill dialysis patients, acute heart failure, and complex aortic and cardiac surgery.
- **When does PADP exceed PCWP?**  
In patients with tachycardia or pulmonary hypertension associated with acidosis, hypoxia, pulmonary embolism (PE), or pulmonary parenchymal disease.
- **What are the most common causes of hypercalcemia?**  
Hyperparathyroidism and cancer with bony metastases.
- **How does PEEP affect respiratory dynamics?**  
It increases FRC and lung compliance.
- **Where does EDRF arise?**  
It is nitric oxide and is released from endothelial cells. NO precursor is arginine. NO is a smooth muscle relaxing factor and promotes vasodilation.
- **What is the mechanism of action of atrial natriuretic peptide (ANP)?**  
Sodium overload and retention result in volume overload that distends the atria. The atria then release ANP, which causes an increase in renal vasodilatation and natriuresis.
- **Which test indicates that the kidney is conserving sodium?**  
Low urinary sodium (< 20 mEq/L).
- **What is the role of prostaglandins in sodium homeostasis?**  
Prostaglandin synthesis is increased in states of absolute effective volume depletion and serves to maintain the glomerular filtration rate (GFR) and the excretion of salt and water. Inhibition of prostaglandin synthesis (e.g., NSAIDs) under these circumstances can lead to a decline in GFR and sodium overload.

○ **What are the classic signs of hypocalcemia?**

Perioral numbness/tingling, hyperactive deep tendon reflexes, Cvosstek's sign, and Trousseau's sign.

○ **By what mechanism does hypovolemia result in metabolic alkalosis?**

The kidney will resorb sodium and excrete hydrogen ions to maintain intravascular volume via the effect of aldosterone.

○ **Which hormones regulate potassium balance?**

Insulin, catecholamines, and aldosterone.

○ **What are the primary benefits of continuous venovenous dialysis (CVVHD)?**

Decreased blood pressure variability and minimal anticoagulation requirement.

○ **What are the primary advantages of autotransfusion with a "cell saver?"**

Avoidance of ABO incompatibility and viral transmissions.

○ **How is PEEP useful in the treatment of ARDS?**

It increases FRC, increases lung compliance, and re-expands alveoli.

○ **How does acute metabolic acidosis affect serum potassium?**

Serum potassium increases by 0.8 mEq/L for each 0.1 decline in pH. (Organic acidosis does not affect potassium.)

○ **In what patients is hypermagnesemia most commonly seen?**

Those with severe renal insufficiency.

○ **During which phase of the respiratory cycle should PA catheter measurements be made?**

At end-expiration.

○ **What is the effect of succinylcholine on plasma potassium?**

Muscle membrane depolarization results in leakage of potassium, producing an average increase of 0.5–1.0 mEq/L in serum potassium. However, when succinylcholine depolarizes muscle that has been previously traumatized or denervated, large increases in serum potassium can occur, causing life-threatening arrhythmias and cardiac arrest.

○ **How is the sodium deficit calculated?**

Sodium deficit = (normal sodium – observed sodium) × total body water. Total body water is  $0.6 \times \text{wt (kg)}$ .

○ **What are the hypertensive, hypokalemic syndromes?**

Primary hyperaldosteronism, secondary hyperaldosteronism, and Cushing's syndrome.

○ **What are the two relatively specific findings in PE on chest X-ray?**

Hampton's hump, an area of lung consolidation with a rounded border facing the hilus, and Westermark's sign, a dilated pulmonary outflow tract ipsilateral to the emboli, with decreased perfusion distal to the lesion.

- **What is the neuropathy of critical illness?**  
Primary axonal degeneration of motor and sensory fibers.
- **What is the most reliable measure of glomerular filtration?**  
Creatinine clearance.
- **What is thought to be the common pathophysiologic pathway in the development of ARDS?**  
Injury to the alveolar–capillary interface.
- **Patients on mechanical ventilation develop hypoventilation based on what factors?**  
Increased dead space, overdistention of the lungs, air leaks, and massive PE.
- **What is the diagnostic test of choice for the neuropathy of critical illness?**  
EMG.
- **What is the earliest sign of volume excess in the postoperative period?**  
Weight gain.
- **What are the clinical features associated with hypernatremia?**  
Weakness, twitching, lethargy, obtundation, irritability, seizures, and cerebral hemorrhage.
- **How is the free water deficit in a hypernatremic patient calculated?**  
 $\text{Free water deficit} = (0.6 \times \text{body weight [kg]}) \times (\text{known sodium concentration} - \text{normal sodium concentration}).$
- **What are the major criteria for the diagnosis of ARDS?**  
Hypoxia refractory to increasing FIO<sub>2</sub>, decreased pulmonary compliance, decreased FRC, increased dead space ventilation, and a diffuse interstitial pattern on chest X-ray with a normal PCWP. PaO<sub>2</sub> to FiO<sub>2</sub> ratio less than 200 is another diagnostic clue. Low tidal volume 6 cc/kg with low peak airway pressure (<30) maintenance is the ideal treatment for ARDS. Use PEEP to enhance oxygenation.
- **T/F: Beta-blockers affect the serum potassium concentration.**  
True. They inhibit uptake of potassium by skeletal muscle.
- **How can the work of breathing with mechanical ventilation, associated with intrinsic PEEP, be reduced?**  
Add CPAP, reduce tidal volume, reduce inspiratory time, and increase expiratory time.
- **What is the most common source of Gram-negative infections in patients with septic shock?**  
The urinary tract.
- **A 48-year-old male in the SICU has a serum sodium of 120 mEq/L and a blood glucose of 480 mg/mL. What is the treatment for the hyponatremia?**  
None. This is pseudohyponatremia and the glucose level should be treated aggressively.

- **How does pulmonary hypertension contribute to reduced CO?**  
Ventricular septum displacement (ventricular interdependence).
- **What are the characteristics of high-output renal failure?**  
Uremia without a period of oliguria and a daily urine output between 1000 and 1500 mL.
- **What are the characteristics of Class II hemorrhagic shock?**  
Loss of 15% to 30% of circulating blood volume, tachycardia, and a decrease in pulse pressure.
- **What is the most common cause of volume deficit encountered in surgery?**  
Loss of isotonic fluid.
- **What evidence of barotrauma can be observed on chest X-ray?**  
Pneumomediastinum, pneumothorax, pneumopericardium, subcutaneous emphysema, and pulmonary interstitial emphysema.
- **Under what conditions is CO<sub>2</sub> production increased?**  
Lipogenesis, fever, and hyperthyroidism.
- **What is the preferred FIO<sub>2</sub> for patients with ARDS?**  
The lowest that will maintain an oxygen saturation of approximately 90%.
- **Which class of hemorrhagic shock is consistent with a drop in systolic blood pressure?**  
Class III.
- **What is the preferred position for patients suspected of having an air embolism?**  
Left lateral decubitus.
- **What is the diagnosis if clotted blood is discovered during attempted aspiration for pericardial tamponade?**  
Either the ventricle was inadvertently entered or the pericardial hemorrhage was massive.
- **How much of the pulmonary vascular bed must be occluded to cause shock in the setting of PE?**  
Greater than 60% in patients with no prior cardiopulmonary disease.
- **What is the best initial fluid management for a patient with hemorrhagic shock?**  
Lactated Ringer's.
- **What are the signs of volume overload?**  
Distended veins, bounding pulse, functional murmurs, edema, and basilar rales.

- **What are the treatment options for patients with massive PE and acute cor pulmonale?**  
Volume resuscitation and vasopressors followed by heparin, thrombolytics, or surgical embolectomy.
- **Under what circumstances should surgical embolectomy be strongly considered?**  
Any hemodynamically unstable patient with documented massive PE and absolute contraindications to thrombolytic therapy.
- **What are the most common causes of cardiogenic shock in the setting of an acute MI?**  
Greater than 40% loss of LV myocardium, ventricular wall rupture, septal rupture, LV aneurysm and acute mitral regurgitation caused by papillary muscle rupture or dysfunction.
- **What is the suspected diagnosis if a patient's blood pressure drops significantly with administration of nitroglycerin in the setting of an acute MI?**  
Inferior wall MI with RV involvement.
- **How does an intra-aortic balloon pump (IABP) increase CO?**  
It decreases LV afterload and increases coronary perfusion.
- **An IABP increases cardiac output by how much?**  
10% to 20%.
- **What is the main determinant of the osmolarity of the extracellular fluid space?**  
Serum sodium concentration.
- **For patients at high cardiac risk, for how long does the benefit of perioperative B-blockage enhance survival?**  
For up to 2 years
- **What interventions have improved survival of patients with cardiogenic shock in the setting of an acute MI?**  
IABP and angioplasty.
- **What complications may occur following massive blood transfusion?**  
Electrolyte and acid–base abnormalities (alkalosis), changes in hemoglobin–oxygen affinity (decreased 2,3 DPG), hypothermia, and dilutional coagulopathy.
- **What percentage of deaths in patients with acute MIs are caused by ventricular wall rupture?**  
10% to 15%. Mortality approaches 100%.
- **What is the first-line treatment for a patient in cardiogenic shock as a result of RV infarction?**  
Aggressive volume replacement.
- **What an initial management of a tracheoinnominate fistula should consist of?**  
Hyperinflation of the tracheostomy tube cuff.

- **What are the prophylactic recommendations for avoiding dilutional coagulopathy in a patient receiving a massive blood transfusion?**  
Administration of one or two units of fresh frozen plasma (FFP) for every four to six units of transfused blood.
- **How is the optimal filling pressure determined for a patient in cardiogenic shock?**  
By obtaining a bedside Starling curve and plotting PCWP against CO after repeated small volume boluses or diuresis.
- **What are the characteristics of the systemic inflammatory response syndrome (SIRS)?**  
Absence of infection, body temperature greater than 38°C or less than 36°C, tachypnea or hypoventilation, leukocytosis or leukopenia, and tachycardia.
- **What is the best method to avoid ventilator-induced lung injury in ARDS?**  
Use smaller tidal volumes— $<6$  cc/kg.
- **What is the major risk factor associated with development of MOF?**  
Sepsis.
- **What are the major sources of tumor necrosis factor (TNF) following hypoperfusion?**  
The liver and gut.
- **T/F: The circulatory derangements of septic shock precede the metabolic abnormalities.**  
False. Hyperglycemia is seen early on, as can DIC.
- **How is VO<sub>2</sub> calculated (venous O<sub>2</sub> content)?**  
 $VO_2 = C(a - v)O_2 \times CO \times 10.$
- **Why has bicarbonate use been de-emphasized?**  
Because of its harmful effects, which include hyperosmolarity, alkalemia, hyponatremia, paradoxical CSF acidosis, and increased CO<sub>2</sub> production.
- **What is the treatment of choice for wide complex tachycardia of uncertain etiology?**  
Amiodarone or lidocaine.
- **In which type of patients is inverse ratio ventilation most useful?**  
Those with noncompliant lungs (ARDS).
- **A 49-year-old male develops tachycardia following successful resuscitation from cardiac arrest. Would you treat this postresuscitation rhythm?**  
If the patient has a pulse and is hemodynamically stable, no treatment may be necessary. If epinephrine is responsible for the tachycardia, it should resolve quickly. Sustained sinus tachycardia should not be allowed to persist, however, as it increases myocardial oxygen consumption.

- **A patient presents with an inferior wall MI. The patient is hypotensive with distended neck veins and clear lung fields. What is the most likely diagnosis?**  
RV infarct or ischemia.
- **What is the treatment of choice for hyperkalemia-induced cardiac arrhythmia?**  
IV calcium gluconate.
- **T/F: In metabolic acidosis and alkalosis, slow compensation occurs via renal mechanisms.**  
True, although the primary compensation for metabolic derangements is respiratory compensation (i.e., hyperventilation in times of metabolic acidosis—compensatory respiratory alkalosis).
- **What special considerations exist when cardiac arrest occurs in a pregnant patient?**  
During chest compression, a wedge under the right hip should be used to minimize aortocaval compression. For the pregnant patient who is unconscious because of airway obstruction, chest thrusts are performed rather than abdominal thrusts.
- **What are the risks of pericardiocentesis?**  
Hemothorax, pneumothorax, hemorrhage from myocardial or coronary artery laceration, and tamponade from this hemorrhage.
- **What are the features of SIRS?**  
Tachycardia, fever/hypothermia, leukocytosis, and tachypnea.
- **What is the normal dietary intake of potassium?**  
50–100 mEq/d.
- **What may be given via the intraosseous route?**  
Medications and fluids may be given via this route; it becomes useful in a hypovolemic child without adequate IV access.
- **T/F: In a spontaneously breathing patient with acute lung injury, intubation and the application of enriched FIO<sub>2</sub> and PEEP, sufficient to recruit collapsed alveolar units, decrease pulmonary vascular resistance.**  
True.
- **What processes cause the work of breathing to increase markedly in patients with COPD?**  
Increased dead space ventilation, decreased respiratory muscle efficiency, and increased airway resistance.
- **A patient has the following PA catheter readings: cardiac index (CI) of 2.0 L/min, CVP of 2 mm Hg, PA occlusion pressure (PAOP) of 7 mm Hg, and SVR of 1600 dyne/sec/cm<sup>2</sup>. What is the most consistent diagnosis and what is the appropriate therapy?**  
The patient is hypovolemic and would benefit from fluid resuscitation.

- **A patient's PA catheter readings reveal a CVP of 12 mm Hg, PAOP of 18 mm Hg, CI of 1.7 L/min, and SVR of 1650 dyne/sec/cm<sup>2</sup>. What is the most appropriate treatment?**

Echocardiography and inotropic support. However, this must be judiciously balanced against increasing myocardial oxygen demand. Depending on the patient's condition, an IABP may be lifesaving.

- **Provide a treatment algorithm for cardiogenic shock.**

First optimize fluid status with a goal PCWP of 20 to optimize preload, then institute PRN dobutamine or milrinone to improve CO. Ensure that electrolyte levels are within normal ranges.

- **What are the PA catheter findings in pericardial tamponade?**

Equalization of the atrial, ventricular, and PA pressures.

- **What are the names and mechanism of action of commonly used vasopressor medications used for hemodynamic support?**

Phenylephrine (neosynephrine)—alpha agonist to increase peripheral vascular resistance (PVR).

Norepinephrine (levophed)—primarily alpha agonist with some beta agonist activity to increase PVR and CO.

Dobutamine—primarily a beta-1 agonist to increase CO.

Dopamine—alpha agonist to increase PVR at low doses (<10 μg/kg/min), beta agonist (CO) at higher doses.

Amrinone (milrone)—inotrope (CO) and vasodilator (decreased PVR) via phosphodiesterase inhibition.

- **What are the absolute indications for invasive airway management?**  
Obstruction, apnea, hypoxia, and severe neck trauma.
- **A trauma patient presents with a decreasing level of consciousness and an enlarging right pupil. What is the most likely diagnosis?**  
Uncal herniation with oculomotor nerve compression.
- **Which cranial nerves are evaluated with the corneal reflex test?**  
The ophthalmic, trigeminal, and facial nerves.
- **What are the clinical signs of a basilar skull fracture?**  
Periorbital and retroauricular ecchymosis, otorrhea, rhinorrhea, hemotympanum, and cranial nerve deficits.
- **Which sensations are spared in anterior cord syndrome?**  
Position, vibratory, and, possibly, light touch.
- **T/F: Steroids and hyperventilation have a proven survival after blunt head trauma with a GCS <9.**  
False.
- **Name the management principles for blunt head trauma?**  
ICP monitor for GCS 8 or less. Intubation for GCS 10 or less. Maintain cerebral perfusion pressure greater than 70 (MAP—ICP), use mannitol and vasopressors as needed to do so. Monitor serum electrolytes (SIADH/DI both possible). Observe all patients on anticoagulation in hospital regardless of GCS score.
- **How much airway obstruction is required for inspiratory stridor to become clinically evident?**  
70%.
- **What method of airway control is indicated in a patient with severe maxillofacial trauma?**  
Cricothyroidotomy.

○ **What nerve should be avoided during pericardiectomy?**

The phrenic nerve.

○ **For a trauma patient intubated in the field who presents with absent left-sided breath sounds what is the differential diagnosis?**

Pneumothorax, right mainstem bronchus intubation, and hemothorax.

○ **A pneumothorax is suspected but does not show up on PA or lateral chest X-rays. What is the next step in evaluation?**

Expiratory films. CT scan is also more sensitive than CT scan for detecting a small PTX.

○ **What physical examination findings are concerning for acute SVC syndrome after a crush injury to the chest?**

Facial edema, distended neck and arm veins, and purple skin discoloration.

○ **What is the most likely cause of a new systolic murmur and ECG infarct pattern in a patient with chest trauma?**

A ventricular septal defect.

○ **What confirms the diagnosis of post-traumatic extremity compartment syndrome?**

Intracompartmental pressures  $>30$  mm Hg. Treatment is four-compartment fasciotomy when present in the calf.

○ **What plain film X-ray finding is most suggestive of traumatic rupture of the aorta?**

Deviation of the esophagus greater than 2 cm to the right of the spinous process of T4. (This requires nasogastric intubation to be demonstrated.)

○ **What are the late signs and symptoms of compartment syndrome?**

The compartment is tense, indurated, and erythematous, with slow capillary refill, pallor, and pulselessness. Pain with passive extension of the involved muscle groups is the most reliable physical examination sign.

○ **What signs and symptoms are associated with compartment syndrome involving the superficial posterior compartment of the leg?**

Pain on active and passive foot dorsiflexion and plantar flexion and hypesthesia of the lateral aspect of the foot (sural nerve).

○ **What is the treatment for ventricular fibrillation associated with hypothermia?**

Bertylium. Invasive rewarming techniques include gastric and colonic warm saline lavage and warm saline peritoneal or thoracic cavity lavage. External warming via blankets or warm tub.

○ **What is the proper approach for a diagnostic peritoneal lavage (DPL) in a trauma patient with a fractured pelvis?**

Via a supraumbilical incision. FAST ultrasound scan is rapidly replacing DPL in most major trauma centers.

- **In blunt trauma there is suspected diaphragm rupture. What is a quick and easy test?**  
Insert NGT and obtain an X-ray. If NGT in chest you have your answer.
- **What are the indications for thoracotomy for hemothorax?**  
1500 cc out initially, >200 cc/h × 4 hours, unstable, incomplete drainage after two functional chest tubes.
- **Define the landmarks for the zones of the neck?**  
I—below cricoid; II—cricoid to angle of jaw; III—above angle of mandible.
- **T/F: Immediate surgical amputation is necessary for frostbite-associated digital ischemia to prevent systemic sepsis from gangrene.**  
False. Sepsis from gangrene in this setting is exceedingly rare, and time should be permitted for clear demarcation of necrotic tissue. In fact, autoamputation is a safe treatment in most patients.
- **What findings represent a positive DPL in blunt trauma?**  
Greater than 100,000 RBCs/mm<sup>3</sup>, a WBC count greater than 500 cells/mm<sup>3</sup>, or the presence of bile, bacteria, or vegetable material.
- **What is the diagnostic test of choice for patients with a zone II penetrating neck injury?**  
Classically operative exploration; however, with the ready availability of CT scan at most trauma centers, these studies are often done with contrast in stable patients with zone II neck injuries in conjunction with a gastrograffin swallow evaluation and phary/laryngoscopy.
- **What percentage of cervical spine fractures are seen on lateral X-rays of the neck?**  
90%.
- **Delayed neurological deficit after blunt trauma raises particular concern for what injury?**  
Blunt carotid injury.
- **What is the management of blunt trauma-induced dissection of the descending aorta in a multisystem trauma victim?**  
Control of other life-threatening emergencies; maintaining BP <130 systolic; and operative or endovascular repair of the aorta once stabilized. Endovascular stent graft components are emerging as a first-line treatment for focal dissection or ulceration.
- **How much anterior subluxation is normal on an adult lateral cervical spine X-ray?**  
Approximately 3.5 mm.
- **What are the characteristics of spinal shock?**  
Sudden areflexia that is transient and distal, blood pressure of 80–100 mm Hg, and paradoxical bradycardia.

- **A 22-year-old male was involved in a high-speed motor vehicle accident (MVA). The patient has been stabilized, and secondary survey reveals blood at the urethral meatus. What is the diagnostic test of choice?**  
A retrograde urethrogram.
- **What is the surgical prioritization of a hypotense trauma patient refractory to resuscitation with a positive abdominal FAST scan and a widened mediastinum without distended neck veins or pericardial fluid?**  
Laparotomy followed by aortic evaluation with angiography or CTA.
- **Should all hypotensive blunt trauma patients receive a FAST scan or DPL in the trauma bay?**  
Yes.
- **Should all patients with a transabdominal gunshot wound undergo surgical exploration?**  
Yes.
- **Bacterial endocarditis, secondary to soft-tissue infections, is most commonly caused by what organisms?**  
*Staphylococcus aureus* and *Staphylococcus epidermidis*.
- **Which tarsal bone is most commonly fractured?**  
The calcaneus.
- **What percentage of patients with peripheral arterial injuries have palpable distal pulses?**  
Up to 20%; ABI however will be reduced with a significant proximal arterial injury.
- **Which pelvic fracture is most likely to result in severe hemorrhage?**  
AP compression fractures, particularly when SI joint disruption occurs. Pelvic fractures mandate ruling out bladder/urethral injury as well as rectal injuries.
- **Which associated injuries must be considered in the presence of calcaneal fractures?**  
Vertebral compression or burst fractures.
- **With regard to patients with traumatic hand injuries, what is the most important treatment to prevent infection?**  
Adequate debridement.
- **What is the appropriate method of transport of amputated digits?**  
They should be stored on saline moistened gauze, in a plastic bag and placed on ice.
- **T/F: Pregnant women are at a higher risk of developing disseminated intravascular coagulation (DIC) following trauma than nonpregnant women.**  
True.

- **How can hepatic hemangioma be differentiated from hepatic contrast extravasation in the trauma setting?**  
Delayed (20 minutes) scanning will show central enhancement of a hemangioma vs. pooling of a contrast blush. Hemangiomas have an initial peripheral enhancement with delayed central filling.
- **What are the treatment options for pancreatic head injury without ampullary disruption?**  
Wide drainage for all in conjunction with simple repair, serosal patch repair, or pyloric exclusion and gastrojejunostomy for extensive second portion of duodenum injuries. Whipple procedure should be reserved for those injuries with severe ampullary disruption.
- **What variables are vital in determining the viability of a mangled extremity?**  
Nerve integrity and neurological function, ability to achieve adequate revascularization, ability to provide soft tissue coverage of exposed bone, and overall estimated functionality after recovery.
- **What are the diagnostic and therapeutic principles of ureteral trauma?**  
Very rare for blunt trauma. Suspect with microscopic hematuria and penetrating trauma. When sectioned by bullet or stab wound, the ureter can be directly reanastomosed to itself over a stent with a drain unless >3 cm of devitalized tissue occurs. Distal ureteral injuries with large defects are best treated by reimplantation into the bladder. Large proximal and mid-ureteral injuries can be treated with transureteroureterostomy.
- **What factors indicate the need for an angiogram after penetrating trauma to an extremity?**  
Absent or diminished pulse, a cold extremity, difference in extremity systolic pressures, the presence of a bruits or thrills, and the proximity to major vessels.
- **What CT scan findings predict a salvageable traumatized kidney?**  
Parenchymal enhancement with IV contrast.
- **T/F: Blunt carotid injury presents with an acute neurological symptom is greater than 90% of cases.**  
False. Symptoms often present at greater than 24 hours.
- **What is the current screening modality of choice in a hemodynamically stable trauma patient with abdominal pain?**  
CT scan with PO and IV contrast.
- **What is the treatment for blunt carotid injury with dissection and a normal neurological examination?**  
Anticoagulation.
- **What injuries should be ruled out in patients with transverse compression (chance) fractures of the lumbar vertebrae?**  
Disruption of the terminal ileum and blunt pancreatic injury.
- **What percentage of gunshot-related arterial injuries are associated with concomitant nerve injury?**  
70%.

- **A 40-year-old male unrestrained driver in a high-speed MVA presents with multiple rib fractures and is in respiratory distress with paradoxical chest motion. What is the treatment of choice?**  
Immediate intubation with volume-controlled ventilation; this may require heavy sedation/paralysis.
- **What is the late amputation rate in patients with an open fracture associated with vascular or neurologic injury?**  
75%.
- **Seat belt sign across the neck in conjunction with ipsilateral ptosis and pinpoint pupil after MVA raise strong concern for what injury?**  
Blunt carotid injury/dissection with associated Horner's syndrome.
- **What should be the management of the hypotense patient with pelvic fracture identified as the bleeding source?**  
Resuscitation, ED stabilization via bedsheet, and emergent angiography.
- **Injury to what structure is most commonly responsible for persistent hemorrhage requiring a thoracotomy?**  
An intercostal artery (great vessel injuries are more often fatal before the opportunity for thoracotomy).
- **What percentage of patients with blunt chest trauma and a flail chest also have a pulmonary contusion?**  
Greater than 90%.
- **What is the treatment for persistent bronchoplural fistula? Bronchocutaneous fistula?**  
Bronchoplural fistula can be corrected by stapling off the injured lung parenchyma when peripheral. Central bronchial disruption requires bronchus repair with soft-tissue muscle flap (intercostals) coverage. Bronchocutaneous fistula is best treated with myocutaneous closure of the chest wall defect in conjunction with treatment of the underlying pulmonary disruption.
- **What is the most common route of successful suicide?**  
Self-inflicted gunshot wound.
- **What valvular abnormality is most commonly seen in patients after blunt chest trauma?**  
Aortic insufficiency.
- **How is systemic air embolus secondary to pulmonary-vascular fistula post trauma diagnosed and treated?**  
Transesophageal echo with intravascular or cardiac air identified. Treatment is surgical repair of the interface.
- **What is the most common site of blunt esophageal rupture?**  
The distal third.
- **What is the best surgical approach for patients with proximal thoracic esophageal injuries?**  
A right posterolateral thoracotomy.

- **What is a second-degree corrosive esophageal burn?**  
A transmucosal burn without muscle involvement.
- **A 19-year-old female presents with a stab wound to the left fifth intercostal space and hypotension, and the water-bottle sign is seen on chest X-ray. What is the most likely diagnosis?**  
Pericardial tamponade.
- **What is the surgical approach for the diagnosis of acute diaphragmatic rupture?**  
Laparotomy. Diagnosis is made by CT scan or KUB/CXR with NGT/stomach in the chest. Delayed diagnosis may be best treated via thoracotomy caused by dense intrathoracic adhesions.
- **What are the initial cardiovascular effects of increased intracranial pressure (ICP)?**  
Bradycardia and hypertension.
- **What are the clinical features and treatment of reflex sympathetic dystrophy (causalgia) after extremity trauma?**  
Hypersensitive extremity with severe pain after relatively minor manipulation. Resolution of symptoms with sympathetic nerve block confirms the diagnosis. If persistent Sx and responsive to nerve block then surgical sympathectomy can relieve symptoms to some extent in up to 80%.
- **T/F: All grade III liver lacerations mandate surgical exploration.**  
False. Hemodynamic instability is the criterion mandating exploration. Hemodynamically stable patients can be observed in the absence of free venous contrast extravasation on CT scan. Conservatively managed patients should be observed in the ICU setting with frequent hemoglobin checks. Transfusion requirement in excess of 4 u PRBC makes exploration necessary.
- **What are the clinical manifestations of the postpericardiotomy syndrome?**  
Fever, chest pain, pericardial effusion, and a pericardial rub. Initial treatment is NSAIDs/anti-inflammatory medications.
- **T/F: Prolonged external loss of chyle can lead to severe malnutrition, electrolyte loss, and T-cell suppression.**  
True.
- **What are the hard signs of extremity arterial injury necessitating surgical exploration?**  
Clear ischemia/pulselessness, expanding hematoma, pulsatile hematoma, and active external hemorrhage. Stable patients in whom an ABI less than 1 is detected can undergo angiogram before surgery.
- **What injuries are most commonly missed by CT scans?**  
Injuries to a hollow viscus, the pancreas, and the diaphragm.
- **What is the most commonly injured organ secondary to penetrating trauma to the abdomen?**  
The small bowel.

- T/F: ERCP is the next step after a blunt pancreatic injury and evidence of IV contrast extravasation on CT scan.**

False. The contrast leak is evidence of significant vascular injury/bleeding necessitating laparotomy. ERCP can evaluate ductal integrity and safety of conservative management in blunt injury, but it is secondary to the control of bleeding in this case.
- T/F: In the management of patient with colon injuries, the incidence of postoperative intra-abdominal sepsis is higher in patients undergoing primary repair versus those undergoing colostomy.**

False.
- T/F: A 21-year-old male presents with a stab wound to the abdomen. The secondary survey reveals rectal blood. A negative proctoscopy rules out rectal injury.**

False.
- What are the important factors in the management of patients with penetrating rectal injuries?**

Diversion, drainage, and debridement.
- How long after traumatic devascularization can a kidney be successfully revascularized and salvaged?**

6 hours.
- What percentage of patients with pancreatic injuries have associated intra-abdominal injuries?**

Greater than 90%.
- T/F: Serum amylase is a useful marker for ruling out pancreatic injury.**

False.
- How do the initial trauma management principles in pregnant trauma victims differ from nonpregnant patients?**

They should not vary at all. The initial ABCs should be performed. FAST scan used to evaluate the abdomen with the potential to evaluate fetal movements can be used. Vaginal bleeding raises concern for traumatic placental abruption.
- What are the clinical hallmarks of abdominal compartment syndrome necessitating decompressive laparotomy?**

Oliguria, elevated peak airway pressures (>35), and decreased cardiac output. Diagnosis is confirmed with a bladder pressure greater than 30.
- What is the emergency treatment for a patient with a tension pneumothorax?**

Needle decompression at the second intercostal space in the midclavicular line followed by thoracostomy tube.
- What is the treatment of choice for a patient with a pancreatic transection distal to the superior mesenteric artery (SMA)?**

Distal pancreatectomy.

- **What injury is suggested by retroperitoneal gas on plane abdominal radiograph, along the right psoas margin, or over the right pole of the kidney?**  
A duodenal injury.
- **In what manner are patients with small duodenal lacerations best treated?**  
A two-layer transverse primary closure.
- **T/F: An acceptable means of mobilizing the pancreas, in order to inspect the gland for trauma, is to ligate the inferior mesenteric vein.**  
True.
- **When is cryoprecipitate or FFP indicated in trauma resuscitation?**  
Only when documented coagulopathy with prolonged clotting times (FFP) and low fibrinogen (cryo).
- **What is the most reliable test to identify patients with cardiac contusion who are at risk of complications?**  
ECG.
- **What is the treatment for patients with a pancreatic contusion, without ductal injury?**  
Wide drainage.
- **What are the indications for pancreaticoduodenectomy in abdominal trauma?**  
Massive hemorrhage from the head of the pancreas or adjacent vascular structures, severe ductal injury in the head of pancreas, and combined injuries of the duodenum and head of the pancreas.
- **What is the procedure of choice for a patient with a pancreatic injury to the right of the SMA, without injury to the ampulla?**  
Oversewing of the proximal pancreas, with a Roux-en-Y pancreaticojejunostomy, to the distal pancreas or ductal ligation with wide drainage.
- **What is the initial treatment for a patient with a duodenal hematoma?**  
Observation and nasogastric suction.
- **When is primary closure of the duodenum contraindicated?**  
In patients with gunshot injuries of greater than 50% of the duodenal circumference or when an associated bile duct injury is present.
- **What injury does blunt chest trauma followed by holosystolic murmur and distended neck veins raise concern for?**  
Tricuspid valve disruption and right-sided heart failure.
- **What has become the diagnostic modality of choice to evaluate traumatic aortic injury?**  
CT angiogram, with a sensitivity approaching 99% and the ability to define anatomy for definitive repair.

- **What therapy do penetrating trauma to the chest and evidence of pericardial fluid on fast scan necessitate?**  
In the stable patient OR sternotomy and in the unstable patient ED sternotomy or left anterior thoracotomy with PRN clamshell incision across the sternum.
- **After blunt trauma in a stable patient with evidence of pericardial fluid on FAST scan, what is the minimal intervention?**  
Pericardial window.
- **T/F: Traumatic hemothorax large enough to create a visible effusion on CXR should always be drained with tube thoracostomy?**  
True. To prevent the need for decortication, blood should always be drained from the thorax.
- **Anomalous origins of the common hepatic and right hepatic arteries frequently arise from what artery?**  
The SMA.
- **What are the potential sources of bleeding in the unstable trauma patient?**  
Intrathoracic, Intra-abdominal, pelvic Fx, extremity fracture with external bleeding, and long bone Fx (least common).
- **What is the indication for the Pringle maneuver?**  
To demonstrate that hepatic hemorrhage is coming from the hepatic artery or portal vein inflow, as opposed to the posterior extrahepatic veins or inferior vena cava.
- **What is the treatment of choice for patients with a complex bile duct injury?**  
A Roux-en-Y choledochojejunostomy or a hepatojejunostomy.
- **What is the most appropriate treatment for an unstable patient found to have a liver injury during exploratory laparotomy?**  
Perihepatic packing.
- **What are the management principles for persistent pancreatic fistula after blunt trauma and drainage?**  
ERCP can evaluate main ductal integrity with the potential to stent main duct disruptions. In general, large ductal injury predicts failure of conservative management, which consists of octreotide and postampullary enteral feeding. A completely disrupted pancreatic duct necessitates surgical ligation or pancreatic resection.
- **What is the most frequent indication for exploratory laparotomy following blunt trauma?**  
Splenic injury.
- **What percentage of splenic injuries in children can be managed expectantly?**  
Greater than 90%. Contrast blush on CT scan is a contraindication to nonoperative therapy.
- **What organisms are most commonly associated with overwhelming postsplenectomy sepsis (OPS)?**  
*Pneumococcus*, *Meningococcus*, and *Haemophilus influenzae*.

- **What are the clinical manifestations and treatment for scorpion bites?**  
Neurotoxic effects are possible with hyperesthesia, cardiac arrhythmia, muscle spasm, and seizure with incontinence. Calcium IV should be used for muscle spasms. Anti-venin as treatment.
- **What is the appropriate management of an acute penetrating colon injury?**  
Direct repair with perioperative antibiotics. Resection and reanastomosis when there is extensive colon devitalization. Delayed diagnosis with extensive intra-abdominal sepsis makes temporary colostomy a safe treatment pattern. Antibiotic coverage should be continued for 24 hours post-trauma.
- **What is the clinical triad indicating that damage control laparotomy with delayed re-exploration is best?**  
Hypothermia, coagulopathy, and acidosis. Technique should involve stapling off perforated viscus, packing of venous bleeding, and temporary abdominal closure. ICU resuscitation should then commence with correction of clotting factors and rewarming.
- **T/F: Mandibular condyle fractures are usually adequately treated with closed reduction.**  
True.
- **What are the contraindications for the use of laparoscopy for evaluation of the abdomen in a trauma patient?**  
Multiple previous operations, shock, or head injury with elevated ICP.
- **What is the most commonly missed injury with use of laparoscopy for evaluation of the abdomen in trauma patients?**  
A hollow viscus injury.
- **What are the most rapid means of assessing intravascular volume status?**  
Level of consciousness and pulse.
- **What are the soft signs that indicate a possible arterial injury?**  
Neurologic deficit, history of hypotension, nonpulsatile hematoma, and injury in proximity to a major artery.
- **A 33-year-old male presents with hematemesis and jaundice 3 weeks after having sustained a gunshot wound to the liver. What is the most likely diagnosis?**  
Hemobilia. GI bleed, jaundice, and RUQ pain is the triad.
- **What is the treatment for hemobilia?**  
Endovascular hepatic arterial branch embolization.
- **What is the treatment for intraperitoneal biliary leak after blunt liver trauma?**  
Percutaneous drainage and ERCP to identify and potentially stent the leak source. If drain output persists with a liver parenchymal disruption etiology, surgical hepatic ligation may be necessary. Extrahepatic ductal injuries refractory to stenting should be repaired over a t-tube if possible or hepaticojejunostomy if direct repair is not possible.

- **Name some confirmatory measures of brain death.**  
No flow above the foramen magnum on transcranial Doppler. No flow above skull base on cerebral angiogram. Apnea testing with failure to breath after PCO<sub>2</sub> rises above 60 after preoxygenation and ventilator discontinuation.
- **What are the general management principles of venomous snake bites?**  
Resuscitation, antivenin if septic signs develop, tetanus toxoid, and antihistamines.
- **What are the principles of tetanus immunization?**  
Tetanus toxoid provides immunization, typically given over three doses. “Booster” is toxoid. Someone with an acute at-risk wound is also given antitetanus immunoglobulin as well as toxoid because they may not yet be immune.
- **What injuries are associated with inflation of air bags?**  
Corneal abrasions, keratitis, face and neck abrasions, and cervical spine fractures.
- **A patient presents to the emergency department after an MVA with neck hyperextension injury unable to move or feel the upper extremities, yet the lower extremities remain intact. What is the most likely diagnosis?**  
Central cord syndrome.
- **What is the single most important determinant of outcome in patients following pancreatic injury?**  
Presence of a pancreatic ductal injury. In general, major ductal injury necessitates resection.
- **What movements of the lower extremity are possible in a patient with transection of the sciatic nerve?**  
Flexion and adduction of the thigh.
- **What serious complication may result from delay in reduction of a dislocated hip?**  
Avascular necrosis of the femoral head.
- **What is the most common mechanism of burn to children less than 5 years of age?**  
Scalding.
- **What percentage of total body surface area (TBSA) burn requires hospitalization?**  
15% second-degree or 5% third-degree burns.
- **What factors increase the mortality rate of burned patients?**  
Children less than 4 years of age, size of burn, inhalation injury, concomitant injury or disease, and prolonged time from burn to admission.
- **What is the most common cause of early instability in burn patients?**  
Severe inhalation injury.

- **What is the Parkland formula for burn patient fluid resuscitation?**  
Total volume 4 cc/kg/% TBSA to be given (LR) in the first 24 postburn hours. 50% of this volume should be given in the first 8 hours post burn (not hospital admission), and the remainder for the next 16 hours. Example: 100 kg man with 30% BSA burns— $100 \times 4 \times 30 = 12,000$  cc of crystalloid total; 6000 cc in the first 8 hours and 6000 cc for the next 16 hours. More fluid should be given PRN to maintain UO >0.5 cc/kg/h in adults and 1 cc/kg in children.
- **What concern does tense abdomen after major burn and resuscitation with ventilatory difficulty raise?**  
Abdominal compartment syndrome.
- **When does capillary permeability return to normal in a burned patient?**  
During the second 24 hours post burn.
- **What is the best way to determine adequate fluid resuscitation in a burn victim?**  
Urine output.
- **What should the goal urine output be for a patient who has suffered an electrical burn and has reddish urine?**  
100–150 mL/h.
- **What is the best measure of intravascular volume capacity and the ability to infuse additional fluid to a burned patient?**  
Pulmonary capillary wedge pressure (PCWP).
- **What serious associated injury is the most frequently seen in burn patients?**  
Inhalation injury.
- **At what point in resuscitation of burn patients should pharmacologic adjuncts be administered?**  
If the patient remains oliguric with a CVP >12 or PCWP of 18–20 mm Hg.
- **What is the proper location for escharotomy in patients with circumferential full-thickness extremity burns?**  
The mid-medial and mid-lateral lines, down to and just through the subdermal fascial attachments.
- **What is the mechanism of increased pulmonary vascular permeability in burn patients?**  
Activation of the complement system, resulting in chemotaxis and sequestration of neutrophils within the pulmonary capillaries and subsequent hydroxyl radical formation.
- **What histological findings are associated with inhalation injury?**  
Edema, progressive tracheobronchitis with pseudomembrane formation, and airway obstruction.
- **What is the major cause of hypoxia in fire-related deaths in urban areas?**  
Carbon monoxide poisoning.

- **What is the most accurate diagnostic test for inhalation injury?**  
Bronchoscopy.
- **What are the management principles for inhalation injury as identified with a PaO<sub>2</sub> to FiO<sub>2</sub> ratio less than 200?**  
Low tidal volume ventilation with set maximal peak airway pressures. Maintain O<sub>2</sub> sats at greater than 92%. Empiric ABX to avoid pneumonia is not indicated—treat only documented infections.
- **At what time post inhalation injury is pulmonary edema at its maximum?**  
Within 24–48 hours.
- **What are the indications for mechanical ventilatory support in the burn patient with an inhalation injury?**  
PaO<sub>2</sub> less than 60 mm Hg on an FIO<sub>2</sub> of greater than 0.4, PCO<sub>2</sub> greater than 50 mm Hg, and respiratory distress.
- **What are the most common signs of burn wound infection?**  
Dark brown or violaceous discoloration of the wound and hemorrhage into the subeschar tissue.
- **What type of infection are peripheral hemorrhagic infarcts of ecthyma gangrenosum specific for?**  
*Pseudomonas*.
- **What are the most common fungal organisms that cause burn wound sepsis?**  
Phycomycetes and *Aspergillus*.
- **What is the single most important sign of burn wound infection on biopsy?**  
The presence of >100,000 microbial organisms per gram in non-necrotic, viable tissue.
- **What topical antimicrobial agent does not penetrate eschars?**  
Silver nitrate.
- **What are the major mediators of the hypermetabolic response in burn patients?**  
Catecholamines.
- **What is the best method of confirming inhalational lung injury in burn patients?**  
Bronchoscopy within the first day after admission.
- **What is the treatment for burn wound infection?**  
Surgical excision of infected tissues.
- **T/F: Thermal injuries suppress thyroid hormone.**  
True.
- **What are the predominant cytokines that promote wound healing and amplify the hypermetabolic response?**  
IL-1, IL-6, TNF, and IFN-gamma.

- **What is the best source of nonprotein calories for a burn patient?**  
Carbohydrates.
- **What is the daily caloric requirement for a 75-kg male with a 20% TBSA burn?**  
2675 kcal (25 kcal/kg + 40 kcal per percent TBSA burn).
- **T/F: Wound infection is the most common cause of mortality in burn patients.**  
False. Pneumonia is more common.
- **What is the incidence of stress ulceration of the stomach or duodenum (Curling's ulcer) in a patient with 35% or greater TBSA burn?**  
20%.
- **What is the hallmark of an electrical injury?**  
Extensive deep tissue damage that is far out of proportion to the visible cutaneous burn. It is important in high-voltage injuries to rule out myocardial damage (ECG/troponin), obtain a baseline ophthalmologic examination because of the high incidence of subsequent cataracts, and rule out large muscle group necrosis (CK levels and urine myoglobin).
- **What are the hallmarks of lightning injury?**  
Tree-like pattern of erythema on the skin. Neurologic deficits that often resolve spontaneously within 24 hours.
- **What are the mechanisms by which hydrofluoric acid produces toxicity?**  
Hydrogen ions induce protein coagulation, and free fluoride ions cause liquefaction and penetrate deeply to form salts with magnesium and calcium.
- **What is the most effective treatment for patients with hydrofluoric acid burns?**  
Administration of calcium gluconate to the burn wound.
- **What is the treatment of choice for skin that has come into contact with phenol?**  
A 50% solution of polyethylene glycol followed by copious water irrigation.
- **Why are alkaline burns usually more invasive than acid burns?**  
Alkaline burns cause damage by liquefaction necrosis. Thus, a barrier of coagulated protein does not form.
- **How is the diagnosis of burn wound sepsis confirmed?**  
Presence of greater than 100,000 organism/g of tissue on quantitative wound culture.
- **What is the immediate treatment for patients with chemical burns?**  
Irrigation with large amounts of water.
- **T/F: An adult hemorrhaging trauma victim who refuses blood products for religious purposes can be forced into accepting transfusion to prevent mortality when it is in their best interests despite personal beliefs?**  
False.

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# Surgical Infection and Complications Pearls

- **What perioperative factors are associated with an increased risk of postoperative wound infection?**  
Long preoperative hospitalization, no preoperative shower, early shaving of the operative site, hair removal, and prior antibiotic therapy.
- **T/F: Central line sepsis is best prevented with full sterile precautions and draping including surgical caps for line insertion.**  
True.
- **What is the leading cause of bacteremia in hospitalized patients?**  
Line sepsis/infections. Incidence is not reduced by empiric changing of lines. Catheter-associated central venous thrombosis is associated with infection.
- **By what mechanism does vancomycin-resistant *Enterococcus* achieve resistance?**  
Altered cell wall binding site for the vanco. The GI tract is the most common flora location of VRE followed by the skin.
- **What is the standard prophylactic antibiotic class for colon surgery?**  
Second-generation cephalosporins (cefotetan and cefoxitan) because of the combined Gram-negative and anaerobe coverage.
- **What is the standard prophylactic antibiotic for gastric surgery?**  
First-generation cephalosporin (cephazolin).
- **What is the antibiotic of choice for Gram-positive bacteremia in the inpatient setting?**  
Vancomycin because of the very high rate of MRSA for inpatients until sensitivities are available.
- **Which metabolic conditions make pulse oximetry (photoplethysmography) inaccurate?**  
Carboxyhemoglobinemia (carbon monoxide poisoning) and methemoglobinemia. Other sources are vascular occlusive disease in the digits and a decreased accuracy overall once O<sub>2</sub> saturation falls beneath 75%.

- **What factors can impair phagocytosis of bacteria?**  
Bacterial encapsulation, uremia, prematurity, leukemia, and hyperglycemia.
- **What is the toxic portion of the endotoxin lipopolysaccharide protein complex?**  
Lipid A.
- **What is the mechanism of action of quinolones?**  
They inhibit DNA gyrase, which is needed to package DNA into dividing bacteria.
- **What is the best time to begin prophylactic antibiotic therapy for elective surgery?**  
Within 1 hour prior to the operation.
- **What is the incidence of wound infections with primary closure in clean, clean contaminated, contaminated, and dirty cases?**  
Less than 2%, 10%, 20%, and 40%, respectively.
- **T/F: Closed suction drainage decreases the incidence of wound infection in clean cases.**  
False.
- **What is the most common cause of fascial dehiscence other than poor surgical technique?**  
Intra-abdominal sepsis.
- **What percentage of people have allergy to the natural proteins in latex rubber?**  
1% to 2% of the population overall, up to 15% of health-care workers. Symptoms range from urticaria to anaphylaxis.
- **What factors suggest failure or recurrence following percutaneous intra-abdominal abscess drainage?**  
Persistent low-grade fevers, persistent leukocytosis, and continued or increased volume of drainage.
- **A 50-year-old female alcoholic is admitted to the hospital with the diagnosis of acute pancreatitis. She is readmitted 2 weeks after discharge with complaints of abdominal pain and fever. Laboratory evaluation reveals a decreased hematocrit and an increased WBC count. What is the most likely diagnosis?**  
A pancreatic abscess or infected pseudocyst.
- **What is the most common fatal infection in burn patients?**  
Pneumonia.
- **What are the most common inciting bacteria for burn wound infections?**  
*S. aureus* in the first week and Gram-negative (*Pseudomonas*) and fungal after a week of hospitalization. Diagnosis is made by quantitative wound cx of infected-appearing, yet still viable (not necrotic) tissue.

- **What percentage of in-hospital septic fatalities are secondary to fungemia?**  
40%.
- **How is intra-abdominal pressure measured?**  
The direct method requires placement of a cannula into the peritoneal cavity. Indirect methods include measurement of inferior vena cava pressure, gastric pressure, or urinary bladder pressure. Bladder pressure is the most commonly employed technique.
- **48 hours postoperatively, a patient develops severe pain in the midline wound, skin bullae, crepitus, irregular blanching at the wound margins, and a fever of 104°F. What diagnosis must be considered?**  
Clostridial gas gangrene. Treatment is penicillin G or clindamycin in the PCN allergic patient in conjunction with emergent surgical debridement. In addition, monitoring the urine for signs of hemolysis is important—maintaining UO with fluids, mannitol, and alkalinization is critical when hemolysis does occur.
- **What is the proper treatment for iatrogenic transection of the CBD?**  
End-to-end anastomosis (EEA) over a T-tube stent when a portion of the CBD is injured or choledocojejunostomy for complete CBD transection.
- **What factors increase mortality in patients with esophageal perforation?**  
Delay in diagnosis and treatment, severe underlying esophageal disease, need for a major extirpative procedure, and an intrathoracic site of perforation.
- **A 25-year-old multiple-trauma patient develops bright red upper gastrointestinal bleeding on SICU day 6. What is the first step in management?**  
Upper endoscopy to identify the source of bleeding.
- **What are the clinical features of spontaneous bacterial peritonitis (SBP) in patients with ascites?**  
Abdominal pain and clinical signs of sepsis. Overall mortality is 50%. Typically bacteria are those of GI flora (*E. coli*, *Enterococcus*, and *Klebsiella*) origin, and bacterial counts in peritoneal fluid may not always be high. Low protein in the ascites predisposes to SBP. Antibiotics should be continued until peritoneal fluid bacterial neutrophil concentration is below 250 PMN/cc.
- **T/F: Patients who have received a full tetanus vaccination in the past with three toxoid treatments will never need tetanus immunoglobulin when suffering an at-risk wound?**  
True. Toxoid booster, however, is required if none have been given in the previous 5 years.
- **A postoperative patient with coffee ground nasogastric aspirates is found to have diffuse gastritis on upper endoscopy. What is the most appropriate initial therapy?**  
Medical treatment with antacids, H2-blockers, or sucralfate and correction of any coagulation defects.
- **T/F: Anaphylactic shock may follow intraperitoneal rupture of a hydatid cyst.**  
True.

○ **What are the leading causes of pyogenic liver abscess?**

(1) Cryptogenic (unknown source), (2) biliary tract infection, and (3) infection via portal circulation drainage of GI tract/pancreas. Surgical or percutaneous drainage is necessary. Mortality is high, particularly for patients with signs of hepatic dysfunction (elevated INR, bilirubin, and creatinine).

○ **Which structure is most commonly injured if the triangle of Calot is not identified during cholecystectomy?**

The right hepatic artery.

○ **A 69-year-old male develops sudden onset of fever, chills, tachycardia, and hypotension 4 days following placement of a percutaneous endoscopic gastrostomy (PEG) tube. Physical examination reveals abdominal distension, and plain abdominal films show a large amount of free air. What is the most likely diagnosis?**

Gastric leakage secondary to necrosis.

○ **T/F: The treatment of choice for a patient with an amebic liver abscess is surgical drainage.**

False. Metronidazole is Tx.

○ **What is the most common cause of early small bowel obstructions?**

Small bowel adhesions.

○ **A 60-year-old female presents with severe weight loss and steatorrhea following extensive small bowel resection. What is the most common cause of her symptoms?**

Resection of the ileum with resultant insufficient bile salt absorption.

○ **What is the initial therapy for *Clostridium difficile* colitis?**

Oral metronidazole or vancomycin. For patients with severe ileus, intravenous metronidazole and vancomycin enemas may have some merit. Metronidazole is contraindicated in pregnancy.

○ **What is the appropriate surgical therapy for toxic *C. difficile* colitis with toxic megacolon?**

Total colectomy and end ileostomy. Clinical signs are colonic pneumatosis, portal circulation gas, peritonitis, and sepsis.

○ **What factors increase the risk of complications after major surgery in a patient with liver cirrhosis?**

Encephalopathy, hypoalbuminemia, malnutrition, prolonged PT, and performance of a partial hepatectomy.

○ **What bacteria is commonly reported as the sole cause of nonclostridial necrotizing soft-tissue infection?**

Group A beta-hemolytic *Streptococcus*.

○ **What is the treatment for a diabetic foot abscess with osteomyelitis, ascending cellulitis of the lower leg, and systemic signs of sepsis?**

Guillotine amputation below the leg.

- **What is the best predictor for the development of SBP in cirrhotic patients?**  
The amount of protein in the ascitic fluid. Patients with an ascitic fluid protein concentration of 1 g/dL are 10 times more likely to develop SBP than those with a level of less than 1 g/dL.
- **What is the treatment of choice for patients with acute, progressive saphenous thrombophlebitis of the upper thigh with signs of sepsis?**  
Ligation of the greater saphenous vein at the saphenofemoral junction and excision of the thrombosed vein. Patients will usually respond to NSAIDs and compression Tx. Anticoagulation is reserved for progression of thrombus into the deep veins via the saphenofemoral junction.
- **What is the initial treatment for patients with lung abscesses?**  
Culture of the sputum, appropriate antibiotics, and regular bronchoscopy to maintain drainage.
- **What organisms are most commonly associated with peritonitis in patients receiving peritoneal dialysis?**  
*S. aureus* and *S. epidermidis*.
- **What characteristic is common to clavulanate, sulbactam, and tazobactam?**  
They are all beta-lactamase inhibitors.
- **T/F: The dose of metronidazole must be modified for patients with significant liver disease.**  
True.
- **What are the clinical features of aspergillosis?**  
Fungal infection occurring exclusively in the immunosuppressed, which always initiates in the lungs. Transmission is airborne. Once infection is established in lungs, dissemination with bone and soft-tissue necrotizing effect can occur.
- **How long should antibiotics be continued in a patient with penetrating abdominal trauma and multiple organ injuries?**  
Antibiotics limited to the perioperative period (12–24 hours) are adequate, provided it was started preoperatively (within 3–4 hours of injury).
- **What antibiotics may be used to treat clostridial perfringes if the patient is penicillin-allergic?**  
Clindamycin or erythromycin.
- **What is the significance of *Candida endophthalmitis*?**  
It is usually diagnostic of hematogenous infection and may lead to blindness if left untreated.
- **Under which specific situations would fluconazole be equivalent to amphotericin B in the treatment of patients with candidemia?**  
In patients who are not severely immunocompromised. Use of fluconazole or caspofungin avoids the nephrotoxicity of amphotericin.

**What constitutes adequate tetanus immunization for an adult?**

Three injections of toxoid followed by a routine booster of adsorbed toxoid every 10 years.

**What is the treatment for a patient with tetanus?**

Excision and debridement of the wound, antibiotics, and 3000–6000 units of human tetanus immune globulin.

**What is the latency period for developing antibodies to hepatitis C?**

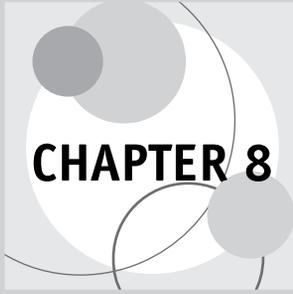
Up to 4 months.

**What is the latency period for seroconversion following exposure to the HIV virus?**

6–12 months.

**What are the symptoms of acute HIV infection?**

Typically within 2 weeks of infection the development of mononucleosis-type symptoms with fever, malaise, lymphadenopathy, pharyngitis, and night sweats.



## CHAPTER 8

# Surgical Endocrinology Pearls

- **What percentage of T3 is derived from conversion of T4?**  
80%.
- **What is the major thyroid hormone-binding protein?**  
Thyronine-binding globulin (TBG).
- **What percentage of T4 and T3 are bound?**  
Greater than 99.5%.
- **What is the major cause of a decreased T3 concentration in patients with a critical illness?**  
Impaired peripheral conversion of T4 to T3 secondary to inhibition of the deiodination process.
- **What factors decrease TSH secretion?**  
Acute and chronic illness, adrenergic agonists, calorie restriction, dopamine and dopamine agonists, surgical stress, and thyroid hormone metabolites. Minor decreases occur with carbamazepine, clofibrate, opiates, phenytoin, and somatostatin.
- **A patient with a history of radiation exposure as a child was found to have an enlarged lymph node on physical examination. The lymph node is removed, and there is normal-appearing thyroid tissue in the lymph node. What is the diagnosis?**  
Papillary thyroid cancer. Treatment is total thyroidectomy, ipsilateral modified radical neck dissection, and postoperative ablative I-131 therapy. Bilateral neck dissection is reserved for clinically apparent bilateral nodal disease.
- **Name some negative prognostic variables for papillary thyroid carcinoma.**  
Age >70 years, vascular/lymphatic tumor invasion, high-grade tumor, and extrathyroid capsular extension.
- **What is the embryologic origin of the thyroid gland?**  
From median downgrowth of the first and second pharyngeal pouches in the area of the foramen cecum.

○ **What is the embryologic origin of the parafollicular cells?**

From the ultimobranchial bodies of the fourth and fifth branchial pouches. Neuroendocrine cell lineage.

○ **What is the effect of pressor doses of dopamine on TSH regulation?**

It decreases TSH levels to normal in patients with preexisting hypothyroidism.

○ **What accounts for the low T<sub>4</sub> state seen in critically ill patients?**

A decrease in the binding of T<sub>4</sub> to serum protein carriers, decreased TSH level, decreased production of T<sub>4</sub>, and an increase in the nondeiodinative pathways of T<sub>4</sub> metabolism.

○ **What is the free T<sub>4</sub> index (FTI)?**

FTI = total T<sub>4</sub> × T<sub>3</sub> resin uptake.

○ **What genetic mutation is associated with medullary thyroid cancer?**

RET proto-oncogene.

○ **What is the first test after H+P to evaluate a thyroid nodule?**

Fine needle aspiration (FNA).

○ **Can radioactive iodine be given safely in pregnancy?**

No.

○ **What signs and symptoms are associated with hypothyroidism?**

Decreased mental acuity, hoarseness, somnolence, cold intolerance, dry skin, brittle hair, weight gain, hypothermia, generalized edema, hypoventilation, sinus bradycardia, and, possibly, hypertension.

○ **T/F: Cardiac output (CO) is decreased in hypothyroidism.**

True.

○ **What are the causes of alveolar hypoventilation in myxedematous hypothyroid patients?**

Respiratory center depression with decreased CO<sub>2</sub> sensitivity, defective respiratory muscle strength, and possible airway obstruction caused by tongue enlargement.

○ **What laboratory abnormalities are associated with hypothyroidism?**

Hyponatremia, hypoglycemia, hypercholesterolemia, and a normochromic normocytic anemia.

○ **What hormone should uniformly be given with thyroid replacement in the hypothyroid myxedematous patient?**

Hydrocortisone.

- **When calcium is difficult to replace post parathyroidectomy with vitamin D and calcium alone, what electrolyte abnormality should be sought?**  
Hypomagnesemia. Low magnesium induces skeletal muscle resistance to PTH.
- **What electrolyte ratio is pathognomonic for hyperparathyroidism?**  
Serum chloride to phosphate ratio >30.
- **What are the hemodynamics of thyroid storm?**  
Tachycardia, increased CO, and decreased systemic vascular resistance (SVR).
- **What muscle of the larynx is not innervated by the recurrent laryngeal nerve?**  
Cricothyroid—innervated by superior laryngeal nerve.
- **What artery do all the parathyroids typically receive their blood supply from?**  
Inferior thyroid.
- **Which oncogene is hyperparathyroidism associated with?**  
Prad oncogene.
- **What is the utility of intraoperative parathyroid hormone assays?**  
A 50% drop in serum PTH at 5 minutes post offending gland removal vs. preoperative value confirms therapeutic resection.
- **What bone finding is pathognomonic finding for hyperparathyroidism?**  
Osteitis fibrosa cystica.
- **T/F: Hyperparathyroid is most commonly associated with four-gland hyperplasia.**  
False. Solitary parathyroid adenoma is the most common etiology.
- **What are the ophthalmologic signs of hyperthyroidism?**  
Exophthalmos, lid lag, lid retraction, and periorbital swelling.
- **What laboratory findings are associated with hyperthyroidism?**  
Hypercalcemia, hypokalemia, hyperglycemia, hypocholesterolemia, microcytic anemia, lymphocytosis, granulocytopenia, hyperbilirubinemia, and increased alkaline phosphatase.
- **What is the initial treatment of thyroid storm?**  
Intravenous fluids, hypothermia, acetaminophen, propranolol, propylthiouracil (PTU), and iodine.
- **What are the CNS manifestations of myxedema?**  
Depression, memory loss, ataxia, frank psychosis, myxedema, and coma.

○ **What is the mechanism of hyponatremia in hypothyroidism?**

Impaired water excretion related to decreased delivery of sodium and volume to the distal renal tubules secondary to decreased renal blood flow.

○ **What are the common causes of hypothyroidism?**

Cessation of thyroid medication, autoimmune thyroid disease, decreased TSH, radioactive and surgical ablation, and iodine deficiency/excess.

○ **What is the first thyroid function test abnormality seen in patients with hypothyroidism?**

TSH elevation (usually associated with a low T<sub>4</sub>).

○ **What single test would allow for the differentiation of thyrotoxicosis from acute destructive viral thyroiditis?**

A radioactive iodine uptake (RAIU) test.

○ **Why is the pulse pressure wide in patients with thyrotoxicosis?**

Increased blood flow and vasodilatation.

○ **What inhibits the release of TSH?**

Elevated circulating levels of T<sub>3</sub>, T<sub>4</sub>, and somatostatin.

○ **A 45-year-old female presents with a 2-year history of diffuse, tender thyroid enlargement; lethargy; and a 20-pound weight gain. What is the most likely diagnosis?**

Hashimoto's thyroiditis.

○ **What is the appropriate treatment for the above patient?**

Thyroid replacement therapy.

○ **How is TSH deficiency diagnosed?**

Simultaneous measurement of basal serum TSH and thyroid.

○ **What test is used to distinguish a hypothalamic defect from a pituitary defect in a patient with hypothyroidism?**

The TRH stimulation test.

○ **What is the appropriate treatment for patients with thyroglossal duct cysts?**

Excision of the entire cyst, as well as the thyroglossal tract to its origin, at the foramen cecum, including the central portion of the hyoid bone.

○ **What is the venous drainage of the thyroid gland?**

The superior and middle thyroid veins drain into the internal jugular vein and the inferior thyroid veins drain into the innominate vein.

- **What is the result of unilateral injury to the recurrent laryngeal nerve?**  
Hoarseness.
- **What is the most common location of the recurrent laryngeal nerve?**  
In the tracheoesophageal groove.
- **What is the result of bilateral injury to the superior laryngeal nerve?**  
Swallowing disorders.
- **What is the mechanism of action of PTU?**  
PTU interferes with the incorporation of iodine into the tyrosine residues of thyroglobulin, preventing oxidation of iodide to iodine. It also inhibits the peripheral conversion of T4 to T3 and is contraindicated in pregnancy.
- **What is the definitive, nonsurgical treatment for Grave's disease?**  
I-131 radioablation.
- **FNA of a 6-year-old child with a solitary thyroid nodule is benign. What is the next recommended step?**  
Open surgical biopsy given the high false-negative rate of FNA in children, in whom 50% of cold nodules are malignant.
- **What are the indications for surgical treatment of Grave's disease?**  
Extremely large glands, presence of nodules, women of childbearing age, and patients who are opposed to radioiodine.
- **What is the preferred treatment for patients with toxic multinodular goiter?**  
Thyroid resection (lobectomy to total thyroidectomy) because I-131 treatment often requires repeated doses, does not reduce goiter size, and may even cause acute enlargement. Surgical resection avoids airway obstruction, esophageal dysfunction, recurrent nerve compression, SVC syndrome, and malignant transformation.
- **A 35-year-old female presents with a diffuse, slowly growing goiter, weight gain, fatigue, and cold intolerance. What is the most likely diagnosis?**  
Hashimoto's thyroiditis.
- **What is the single most important test in the diagnostic workup of a patient with a solitary thyroid nodule?**  
FNA.
- **For which thyroid malignancy does radiation exposure increase the incidence?**  
Papillary cell CA.
- **What is Hurthle cell carcinoma?**  
A variant of follicular cell CA. Size is the only predictor of malignancy when Hurthle cells are seen on FNA (resection is Tx). Malignancy is defined by histological invasion of cells into thyroid capsule or vessels. Hurthle cell CA is associated with a history of Hashimoto's thyroiditis.

- **A 44-year-old male presents with a 5-cm thyroid nodule. FNA returns fluid, the nodule disappears, and the cytology is benign. What is the next step in management?**  
Total thyroid lobectomy with isthmusectomy should be considered because there is an increased chance of malignancy in large cysts of this size (>3 cm).
- **A 56-year-old male with no risk factors presents with a thyroid nodule. The FNA is nondiagnostic (follicular cells). What is the treatment of choice?**  
Thyroid lobectomy with isthmusectomy. If final pathology reveals follicular carcinoma, secondary surgery for completion total thyroidectomy with postoperative ablative I-131 is indicated.
- **What percentage of patients with usual papillary carcinoma (greater than 1 cm) are found to have multicentric disease on pathologic examination of the entire thyroid?**  
70% to 80%.
- **What percentage of patients with papillary carcinoma have cervical lymph node involvement?**  
30%.
- **What factor best correlates with the presence of lymph node metastases in papillary carcinoma?**  
Age.
- **What is the treatment of choice for patients with papillary thyroid cancer without clinical evidence of lymph node metastasis?**  
Total thyroidectomy.
- **A patient is noted to have a very high calcium and a palpable rock hard neck mass. What is your diagnosis?**  
Parathyroid adenocarcinoma; Tx: wide excision with en block resection of adjacent thyroid tissue.
- **Classify the MEN syndromes.**  
MEN 1—PPP—pancreatic neuroendocrine tumors, pituitary adenoma, hyperparathyroidism (four gland hyperplasia, not adenoma)  
MEN 2a—medullary thyroid, pheochromocytoma, and hyperparathyroidism  
MEN 2b—medullary thyroid, pheo, and mucosal neuromas/marfan syndrome  
All three exhibit autosomal-dominant inheritance. MEN 1 is associated with a chromosome 11 tumor-suppressor gene mutation and is also associated with an increased risk of carcinoid tumors.
- **Characterize carcinoid tumors.**  
Neuroendocrine cell etiology. Can occur throughout the GI tract or bronchi. Carcinoid syndrome characterized by flushing, diarrhea, and right-sided heart failure most commonly occurs with metastatic disease and mid-gut tumors. Treatment for syndrome or metastasis is octreotide. Isolated mets can be resected.
- **A 36-year-old female presents with a 3-cm papillary carcinoma and no clinical evidence of lymph node involvement. She was treated with a total thyroidectomy. What adjuvant therapy is indicated?**  
TSH suppression with thyroid hormone, radioiodine ablation with I-131, follow-up scan 6 months after ablation with thyroglobulin levels, and physical examination.

- **Follicular carcinoma metastases occur primarily by what route?**  
Hematogenous dissemination to the lungs, bones, and other peripheral tissues.
- **How is the pathologic diagnosis of follicular thyroid carcinoma confirmed?**  
Identification of vascular or capsular invasion by the tumor from histologic sections.
- **What are the indications for adjuvant thyroid hormone in patients with well-differentiated thyroid carcinoma?**  
All patients with well-differentiated carcinoma should be treated with thyroid hormone to suppress TSH for life, regardless of the extent of their surgery.
- **What is the surgical treatment for medullary thyroid carcinoma (MTC)?**  
Total thyroidectomy with central node dissection, lateral cervical lymph node sampling of palpable nodes, and a modified radical neck dissection, if positive.
- **A germline defect in what gene is responsible for multiple endocrine neoplasias (MEN 2a and 2b) and familial medullary thyroid carcinoma (FMTC)?**  
The RET proto-oncogene. Patients with this mutation should undergo prophylactic thyroidectomy before the age of 10 years.
- **T/F: Exposure to low-dose radiation therapy is considered a risk factor for thyroid carcinoma.**  
True.
- **What are the histochemical characteristics of MTC?**  
Congo red dye positive, apple-green birefringence consistent with amyloid, immunohistochemistry positive for cytokeratins, CEA, and calcitonin. Parafollicular C cells are the precursor to tumor cells.
- **A patient with MTC has a high urinary vanillylmandelic acid (VMA) and an enlarged left adrenal gland. What is the next step in management?**  
Medical management with alpha- and beta-blockers, if necessary, followed by resection of the left adrenal gland. This should be performed before the thyroid surgery.
- **What is the embryological origin of the parathyroid glands?**  
The inferior parathyroid glands originate from the third pharyngeal pouch, and the superior parathyroid glands originate from the fourth pharyngeal pouch.
- **What is the arterial blood supply to the parathyroids?**  
It is usually from the inferior thyroid artery. Occasionally, it can arise from the superior thyroid artery, thyroid ima artery or arteries in the larynx, esophagus, or mediastinum.
- **Where are the inferior parathyroids located?**  
They are usually more ventral than the superior glands and lie close to or within that portion of the thymus gland that extends from the inferior pole of the thyroid gland into the chest. They are typically located inferior to the junction of the inferior thyroid artery.

○ **What are the etiologies of hypercalcemia?**

Hyperparathyroidism, paraneoplastic syndrome, metastatic CA, bone metastasis, milk–alkali syndrome, and sarcoidosis.

○ **What is the effect of PTH on the intestinal absorption of calcium?**

PTH stimulates vitamin D hydroxylation in the kidney and increases intestinal absorption of calcium.

○ **Where is calcitonin produced?**

In the parafollicular cells (C cells) of the thyroid.

○ **What are the laboratory findings in familial hypocalciuric hypercalcemia?**

Low urine calcium (normal or high in hyperparathyroidism), hypermagnesemia, hypercalcemia. Associated with autosomal-dominant inheritance.

○ **A 48-year-old male has a serum calcium of 13 mg/dL and a serum PTH of 400 mEq/mL. What is the most likely diagnosis?**

Primary hyperparathyroidism.

○ **A 35-year-old female has a serum calcium of 8.5 mg/dL, a serum PTH of 400 mEq/mL, and a serum creatinine of 5.6 mg/dL. What is the most likely diagnosis?**

Secondary hyperparathyroidism.

○ **What are the indications for parathyroid exploration in patients with asymptomatic or minimally symptomatic hyperparathyroidism?**

1. Age less than 50 years.
2. Markedly elevated serum calcium.
3. History of an episode of life-threatening hypercalcemia.
4. Decreased creatinine clearance.
5. Nephrolithiasis.
6. Markedly elevated 24-hour urinary calcium excretion.
7. Substantially decreased bone mass.
8. The patient requests surgery.
9. Poor follow-up expected.
10. Coexistent illness complicating conservative management.

○ **T/F: After successful surgical treatment of parathyroid pathology, renal stone formation rate returns to that of patients with a history of idiopathic renal stone formation history (30%).**

True.

○ **What percentage of patients with primary hyperparathyroidism have a single adenoma?**

80%.

- **During exploration for primary hyperparathyroidism, three normal parathyroid glands are found but the fourth cannot be identified. What is the next step in management?**  
Extend the exploration through the existing incision, to include the central neck between the carotids, posteriorly to the vertebral body, superiorly to the level of the pharynx and carotid bulb, and inferiorly into the mediastinum.
- **What intraoperative modality may assist in locating an intrathyroidal parathyroid gland?**  
Ultrasound.
- **What is the appropriate management if the fourth parathyroid gland cannot be located by intraoperative ultrasound?**  
Terminate the operation for localization studies.
- **What voice problem will a patient have if there is injury to external branch of superior laryngeal nerve?**  
Loss of high-pitched tone.
- **What is the most reliable method of differentiating a parathyroid adenoma from parathyroid hyperplasia?**  
Visual inspection of all four parathyroid glands.
- **What are the components of the MEN 1 syndrome?**  
Parathyroid hyperplasia (90%), islet cell neoplasms (30%–80%), and pituitary tumors (15%–50%).
- **What is the treatment of choice for patients with hyperparathyroidism associated with MEN 1 or MEN 2?**  
Subtotal (three and a half gland) parathyroidectomy or total parathyroidectomy with autotransplantation in the forearm.
- **What is the treatment of choice for patients with parathyroid carcinoma?**  
Radical resection of the involved gland, the ipsilateral thyroid lobe, and the regional lymph nodes.
- **What preoperative studies should be performed prior to reoperation for persistent or recurrent hyperparathyroidism?**  
A 24-hour urinary calcium excretion to rule out familial hypocalcemic hypercalcemia. Sestamibi is the localization study of choice.
- **A 25-year-old pregnant female, in her second trimester, presents with hyperparathyroidism and a serum calcium of 12 mg/dL. What is the treatment of choice?**  
Prompt parathyroid exploration.
- **What is the surgical treatment of choice for patients with secondary hyperparathyroidism?**  
Subtotal (three and a half) parathyroidectomy or total parathyroidectomy with autotransplantation in the forearm.
- **What is the first-line therapy for patients with marked hypercalcemia and/or severe symptoms?**  
Intravenous hydration followed by furosemide.

- **What are the indications for calcium supplementation after thyroid or parathyroid surgery?**  
Circumoral paresthesias, anxiety, positive Chvostek's or Trousseau's sign, tetany, ECG changes, or serum calcium less than 7.1 mg/dL.
- **What is the immediate treatment for patients with acute symptomatic hypocalcemia?**  
Intravenous calcium gluconate.
- **In a nonacute setting, what is the maximum useful amount of calcium supplementation?**  
2 g of calcium/d.
- **What is the appropriate calcium supplementation if the maximum amount of calcium has already been given and the patient is still hypocalcemic?**  
Calcitriol or other vitamin D preparations should be added, if necessary.
- **What are the phenotypic abnormalities seen in patients with MEN 2b?**  
MTC, pheochromocytoma, mucosal neuromas, ganglioneuromas, and a marfanoid habitus.
- **What zone of the adrenal gland is spared in autoimmune adrenal disease?**  
The medulla.
- **Secretion of which adrenal hormone is not impaired by secondary adrenal insufficiency?**  
Aldosterone.
- **What is the most common cause of chronic primary adrenal insufficiency (Addison's disease)?**  
Autoimmune disease.
- **What are the most common causes of acute secondary adrenal insufficiency?**  
Steroid medication withdrawal, Sheehan's syndrome (postpartum pituitary necrosis), bleeding into a pituitary macroadenoma, and head trauma.
- **What diseases produce a slow, insidious progression to primary adrenal insufficiency?**  
Autoimmune diseases, tuberculosis, systemic fungal infections, CMV, Kaposi's sarcoma, metastatic carcinoma, and lymphoma.
- **What does the posterior pituitary secrete?**  
ADH and oxytocin.
- **What does the anterior pituitary secrete?**  
Growth hormone (GH), adrenal corticotropin hormone (ACTH), TSH, leutinizing hormone (LH), follicle-stimulating hormone (FSH), and prolactin.

- **What vision changes will lead one to suspect a pituitary mass?**  
Bilateral hemianopsia.
- **What therapy should be instituted prior to obtaining the results of an ACTH stimulation test in a critically ill patient?**  
An empiric stress dose of dexamethasone.
- **How can the ACTH stimulation test be normal in secondary adrenal insufficiency?**  
If the gland has not yet atrophied, it retains the ability to be stimulated.
- **What is the basis of the insulin-induced hypoglycemia test for patients with secondary adrenal insufficiency?**  
Hypoglycemia induced by 0.1 units of insulin/kg stimulates the entire hypothalamus–hypophyseal–adrenal axis (HPA) and the sympathetic nervous system. Plasma cortisol levels should exceed 20 g/dL.
- **What is the short metyrapone test?**  
Metyrapone inhibits adrenal 11-hydroxylase. Normally the cortisol precursor, 11-deoxycortisol, increases to at least 7 g/dL. This is in response to the decreased production of cortisol and loss of the negative feedback of cortisol to the HPA axis, hence stimulation of ACTH. This is indicative of secondary adrenal insufficiency only in the setting of a previously measured cortisol level of 8 g/dL.
- **After an endocrinologic diagnosis has been established by hormonal studies, what is the radiologic study of choice to assess for a pituitary or hypothalamic tumor?**  
MRI with analysis of the sagittal and coronal sections. A CT scan can be helpful if bony invasion is suspected.
- **What is the emergent steroid replacement for patients with adrenal insufficiency?**  
50–100 mg of intravenous hydrocortisone every 8 hours.
- **What type of patients should receive fluorocortisone?**  
Those with primary adrenal insufficiency.
- **What is the characteristic hemodynamic pattern of adrenal insufficiency?**  
Decreased SVR. Clinically, hypotension with a high CO, normal filling pressures, and hypoglycemia are seen.
- **When do the serum corticotropin and cortisol concentrations return to normal following routine surgery?**  
Within 24–28 hours.
- **What diagnostic test is the best predictor of adrenal adequacy in patients previously receiving steroids, who are scheduled for surgery?**  
The peak cortisol level after administration of corticotropin.

○ **What are the adverse effects of excessive cortisol dosing for high stress situations?**

The catabolic effects on muscle, impaired wound healing, inhibition of insulin, and the anti-inflammatory effect on active infection.

○ **What are the current recommendations for stress doses of cortisol in patients with suspected adrenal insufficiency?**

Minor stress, 25 mg/d; moderate stress, 50–75 mg/d; and major stress, 100–150 mg/d.

○ **What is the flow phase of the metabolic response to stress?**

It occurs approximately 24 hours after injury and is characterized by a rise in CO, temperature, oxygen consumption, and serum insulin levels.

○ **A 45-year-old male develops hypotension and lethargy and has a hemoglobin of 12 g/dL and a blood glucose of 34 mg/dL 24 hours after colectomy. His history is significant for a renal transplant 3 years ago. What is the most likely diagnosis?**

Addisonian crisis.

○ **What inhibits GH secretion?**

Somatostatin.

○ **Where does aldosterone exert its primary effect?**

On the distal tubules and collecting ducts of the kidney.

○ **What is the effect of aldosterone on the kidney?**

It increases the absorption of sodium from the urine in exchange for potassium, thereby aiding in water retention and restoring intravascular volume.

○ **What are the metabolic effects of catecholamines during periods of stress?**

Increased glycogenolysis, gluconeogenesis, lipolysis and ketogenesis, and inhibition of insulin use in peripheral tissues.

○ **What are the functions of angiotensin II?**

Vasoconstriction, cardiac stimulation, and stimulation of ADH, aldosterone, and thirst.

○ **What stimuli cause release of ADH (vasopressin)?**

Plasma osmolality greater than 285 mOsm/L, decreased circulating blood volume, catecholamines, the renin–angiotensin system, and opiates.

○ **What inhibits release of LH in the adult male?**

Androgens synthesized by the testes.

- **What is the function of FSH in the adult female?**  
It stimulates maturation of the Graafian follicle and production of estradiol.
- **What limits the secretion of ACTH and corticotropin-releasing factor (CRF)?**  
Circulating levels of ACTH.
- **GH is released in bursts at what specific times?**  
3–4 hours after meals and during stage III and IV sleep.
- **What inhibits the release of prolactin?**  
Dopamine.
- **What is the main physiological stimulus for prolactin release?**  
Suckling of the breast.
- **Which drugs interfere with release of dopamine into the pituitary portal circulation and enhance prolactin secretion?**  
Metaclopramide, haloperidol, chlorpromazine, and reserpine.
- **What signs and symptoms, related to enlargement of the gland, are associated with a pituitary neoplasm?**  
Visual field defects (bitemporal hemianopsia), abnormal extraocular muscle movements, and spontaneous CSF rhinorrhea.
- **What characteristics of pituitary apoplexy are caused by hemorrhage?**  
Severe headache, sudden visual loss, meningismus, decreased sensorium, bloody CSF, and ocular palsy.
- **What is included in the differential diagnosis of a sellar or parasellar tumor?**  
Pituitary adenoma, craniopharyngioma, parasellar meningioma, sarcoidosis, metastatic lesions, and gliomas.
- **In evaluation of a patient with an ACTH deficiency, what test will distinguish a hypothalamic CRH deficiency from a pituitary ACTH deficiency?**  
The CRH stimulation test.
- **What is the diagnosis if there is absence of ACTH responsiveness to CRH?**  
A pituitary corticotropin deficiency.
- **What is the ACTH stimulation test used to evaluate?**  
The capacity of the adrenal glands to secrete cortisol.
- **What two tests will stimulate the entire HPA?**  
The insulin-induced hypoglycemia test and the glucagon test.

- **What condition is defined by a relative or absolute insufficiency of vasopressin secretion from the posterior pituitary?**  
Diabetes insipidus (DI).
- **How is the diagnosis of central DI confirmed?**  
By the water deprivation test.
- **What is the treatment of choice for central DI?**  
Administration of exogenous vasopressin.
- **T/F: Vasopressin aids in the treatment of renal DI.**  
False.
- **What are the clinical characteristics of Sheehan's syndrome?**  
Postpartum failure to lactate, postpartum amenorrhea, and progressive signs and symptoms of adrenal insufficiency and hypothyroidism.
- **What are the most common types of pituitary adenomas?**  
Prolactin-secreting and null-cell (chromophobe adenoma).
- **What is the most common functional pituitary tumor?**  
Prolactinoma.
- **What is the most common presenting symptom of prolactinomas in females?**  
Secondary amenorrhea.
- **What percentage of patients with a prolactinoma and secondary amenorrhea have an associated galactorrhea?**  
50%.
- **What pharmaceutical agent is effective in reducing serum prolactin, reducing tumor mass, and inhibiting tumor growth?**  
Bromocriptine (a dopaminergic agonist).
- **What is the etiology of Cushing's disease?**  
Hypersecretion of ACTH by the pituitary.
- **What is the most likely diagnosis in a patient with Cushing's syndrome and a low plasma ACTH level?**  
An adrenal tumor.
- **T/F: Most patients with Cushing's disease harbor microadenomas that lend themselves to complete surgical resection.**  
True.

- **What is the etiology of post-traumatic persistent hyperglycemia?**  
Persistent high cortisol levels.
- **What is the most common cause of excess GH secretion?**  
A GH-secreting pituitary adenoma.
- **What metabolic manifestations are associated with acromegaly?**  
Hypertension, diabetes mellitus, goiter, and hyperhidrosis.
- **What test confirms the diagnosis of acromegaly?**  
The glucose suppression test. (An oral administration of 100 g of glucose fails to suppress the GH level to less than 5 ng/mL at 60 minutes.)
- **What is the treatment of choice for patients with a GH-producing pituitary adenoma?**  
Surgical excision.
- **What is the appropriate treatment for a patient with a GH-producing pituitary adenoma who cannot withstand the surgical procedure?**  
Long-term treatment with octreotide.
- **What are the most important hormones to evaluate, prior to surgical excision of a pituitary adenoma, to avoid potential perioperative catastrophe?**  
Cortisol and thyroid levels.
- **What is the best surgical approach to the pituitary?**  
The transnasal, trans-sphenoidal approach.
- **What is the most common cause of surgical death with the transnasal, trans-sphenoidal approach?**  
Direct injury to the hypothalamus, with delayed mortality attributed to CSF leaks and their attendant septic complications or secondary to vascular injury.
- **What are the contraindications to the trans-sphenoidal approach?**  
Extensive lateral tumor herniating into the middle fossa with minimal midline mass, ectatic carotid arteries projecting toward the midline, and acute sinusitis.
- **What is the standard dosing regimen of glucocorticoids given to all patients undergoing surgical excision of a pituitary tumor?**  
40 mg of intravenous methylprednisolone (or 10 mg dexamethasone) every 6 hours, usually starting the day prior to surgery and continuing for 1 or 2 days postoperatively, followed by a tapering dose regimen.
- **A 55-year-old female is in the ICU 1 day after pituitary tumor resection when she suddenly develops loss of vision. What is the treatment of choice?**  
Emergent trans-sphenoidal re-exploration.

- **What is the treatment of choice for a patient with a pituitary tumor who is a poor surgical candidate?**  
4000 cGy radiation therapy.
- **What is the recurrence rate of pituitary tumors treated with radiation therapy?**  
50%.
- **A 51-year-old male presents with asymmetric visual field defects, optic atrophy, and facial sensory deficits and has a tumor attached to the dura mater. What is the most likely diagnosis?**  
Meningioma.
- **A 45-year-old male is in the ICU after sustaining blunt head trauma. He suddenly begins to produce an excessive volume of urine, is markedly thirsty, and has an increase in his plasma osmolality. What is the most likely diagnosis?**  
DI.
- **What hormones are synthesized and secreted by the adrenal cortex?**  
Cortisol, aldosterone, adrenal androgens, and estrogen.
- **What hormones are synthesized and secreted by the adrenal medulla?**  
Epinephrine, norepinephrine, enkephalins, neuropeptide Y, and corticotropin-releasing hormone.
- **What is the pathophysiology of Cushing's syndrome?**  
Adrenal corticosteroid hypersecretion.
- **What is the most likely diagnosis of a patient who presents with palpitations, headaches, emesis, a pounding pulse, and retinitis?**  
Pheochromocytoma.
- **What is the embryologic origin of the adrenal cortex?**  
Coelomic mesothelial cells.
- **What is the embryologic origin of the adrenal medulla?**  
Ectodermal neural crest cells.
- **What is the diagnostic algorithm for adrenal cysts?**  
First evaluate functional status with serum electrolytes, cortisol levels, and urine metanephrines. If functional then resect. If nonfunctional then CT-guided aspiration with cytological analysis is indicated. Indications for resection of nonfunctional cysts are bloody aspirate and abnormal cytology.
- **What is the primary neurotransmitter of sympathetic postganglionic fibers?**  
Norepinephrine.

- **What are the glands of Zuckerland?**  
Ectopic adrenal medullary cells located lateral to the aorta, near the origin of the inferior mesenteric artery.
- **What is the arterial supply to the adrenal glands?**  
The superior suprarenal artery, inferior suprarenal artery, and a branch from the inferior phrenic artery.
- **What is the innervation of the adrenal medulla?**  
Preganglionic sympathetic neurons from the celiac and renal plexuses via splanchnic nerves.
- **What is the drainage of the right adrenal vein?**  
The posterior inferior vena cava.
- **Most circulating plasma cortisol is bound to what protein?**  
Cortisol-binding globulin (CBG), although small amounts are bound to albumin and other plasma proteins.
- **What conditions cause low levels of plasma CBG?**  
Liver disease, multiple myeloma, obesity, and the nephrotic syndrome.
- **What is the effect of glucocorticoids on insulin and glucagon?**  
It stimulates production of glucagon and inhibits secretion of insulin.
- **What are the physiologic actions of aldosterone?**  
Reabsorption of sodium and excretion of potassium, hydrogen, and ammonia from the renal tubules. It also stimulates active sodium and potassium transport in epithelial tissues (i.e., sweat glands, gastrointestinal mucosa, and salivary glands).
- **What is the most common cause of Cushing's syndrome?**  
A pituitary microadenoma.
- **What tumor most commonly causes ectopic ACTH secretion?**  
Small cell carcinoma of the lung.
- **What is the expected result of the dexamethasone suppression test in a patient with an ectopic source of ACTH secretion?**  
Dexamethasone should fail to suppress cortisol secretion.
- **Where are the sex steroids produced?**  
In the zona reticulosa of the adrenal cortex.
- **What is the initial evaluation of a patient suspected of having Cushing's syndrome?**  
A urinary-free cortisol level (markedly elevated) and a low-dose dexamethasone suppression test (no suppression of cortisol).

- **What is the most likely diagnosis of a patient with elevated free cortisol levels, an elevated plasma ACTH, and persistent elevation of free cortisol after low- and high-dose dexamethasone administration?**  
An ectopic source of ACTH.
- **What tests are useful in differentiating hypercortisolism caused by pituitary sources of ACTH from those caused by ectopic sources of ACTH?**  
The dexamethasone suppression test and the metyrapone test.
- **What is the most common cause of primary hyperaldosteronism?**  
A solitary adrenal adenoma.
- **What enzymatic deficiency is associated with most cases of the adrenogenital syndrome (congenital adrenal hyperplasia)?**  
21-Hydroxylase.
- **What are the characteristics of Nelson's syndrome?**  
Marked hyperpigmentation of the skin and visual disturbances.
- **What is the most common cause of acute adrenocortical insufficiency?**  
Withdrawal of chronic steroid therapy.
- **What is the most common cause of spontaneous adrenal insufficiency?**  
Autoimmune destruction of the adrenal glands (greater than 80%).
- **What is the most commonly associated disorder in patients with autoimmune adrenocortical insufficiency?**  
Hashimoto's thyroiditis.
- **What is Waterhouse–Freiderichsen syndrome?**  
Acute adrenal hemorrhage secondary to sepsis (classically meningococcal).
- **What is the most useful test to evaluate a patient suspected of having adrenocortical insufficiency?**  
The rapid ACTH stimulation test.
- **What is the treatment for patients with acute adrenocortical insufficiency?**  
Intravenous hydrocortisone (100 mg every 6 hours for 24 hours), correction of volume depletion, dehydration, hypotension, hypoglycemia, and correction of precipitating factors.
- **What is the test of choice to distinguish hyperplasia from an adenoma as the cause of primary hyperaldosteronism?**  
Measurement of plasma aldosterone concentration after change in posture. Only patients with an adenoma experience a postural decrease in aldosterone.

- **What are the classic clinical manifestations of primary hyperaldosteronism?**  
Hypertension with spontaneous hypokalemia.
- **What is the treatment of choice for patients with a functional aldosteronoma?**  
Adrenalectomy.
- **What is the treatment of choice for patients with idiopathic hyperaldosteronism (adrenal hyperplasia)?**  
Medical management with spironolactone, a competitive antagonist of aldosterone (200–400 mg/d in divided doses).
- **At what size should a nonfunctional incidentally identified adrenal mass be resected?**  
5 cm.
- **What are the serum abnormalities seen with a functional cortisone-secreting adrenal adenoma?**  
High 24-hour urine cortisol; low ACTH level.
- **Are ACTH levels suppressed by dexamethasone when there is an ectopic (lung CA) source for the ACTH?**  
No.
- **What stimuli cause adrenal secretion of catecholamines?**  
Hypoxemia, hypoglycemia, changes in temperature, pain, shock, CNS injury, local wound factors, endotoxin, and severe respiratory acidosis.
- **T/F: Malignant pheochromocytomas are more common in men.**  
False. They are three times more common in females.
- **What is the diagnostic test of choice to confirm the clinical suspicion of a pheochromocytoma?**  
Urine metanephrines.
- **Under what conditions should a patient who is undergoing resection of a pheochromocytoma be given preoperative alpha-blockers?**  
If the systemic blood pressure is greater than 200/130, if they have frequent and severe uncontrolled hypertensive attacks, or if there is a pronounced decrease in plasma volume.
- **What is the incidence of neuroblastoma in children?**  
Neuroblastoma represents 7% of all childhood cancers. It is the third most common malignancy in childhood (behind brain tumors and hematopoietic-reticular endothelial cell malignancies).
- **What is the most common location of a neuroblastoma?**  
Intra-abdominal or retroperitoneal (60%–70%).

○ **What is a Stage III neuroblastoma?**

One that extends in continuity beyond the midline with bilateral lymph node involvement.

○ **Complete cures with surgical resection can be obtained for neuroblastomas of what stage(s)?**

Stages I, II, and IV-S.

○ **What is the treatment of choice for a Stage III neuroblastoma?**

Radiation and chemotherapy followed by delayed resection.

○ **What are the classic electrolyte findings of hyperaldosteronism?**

Hypernatremia and hypokalemia.

○ **What syndromes are associated with pheochromocytomas?**

MEN 2a, MEN 2b, von Recklinghausen's disease, tuberous sclerosis, and Sturge-Weber disease.

○ **What hormones are secreted by the posterior pituitary?**

Oxytocin and vasopressin.

○ **What is the action of oxytocin?**

It stimulates uterine contraction during labor and elicits milk ejection by myoepithelial cells of the mammary ducts.

○ **What are the anatomic and histologic features of pancreatic neuroendocrine tumors?**

The only hypervascular pancreatic neoplasms on angiography. This applies to liver metastasis when present as well. Immunohistochemistry defines functionality.

○ **What is the clinical picture of insulinoma?**

Fasting glucose <45 and relief of symptoms with glucose. High N and C terminus of insulin in blood (exogenous insulin with C terminus only). Insulinoma is the most common islet cell tumor and is benign in 90% of cases.

○ **What is the optimal mechanism to localize an insulinoma intraoperatively?**

Intraoperative ultrasound.

○ **Characterize gastrinomas.**

High malignant potential and the most frequent islet cell tumor in MEN syndrome. Localization techniques include endoscopic ultrasound, MRI, and somatostatin-labeled scintigraphy. High serum gastrin levels and severe peptic ulcer disease are characteristic. Most are located in the gastrinoma triangle between the common bile duct/cystic duct junction, third portion of the duodenum, and gallbladder.

- **What is the order of sympathetic blocking medication administration preoperatively for pheochromocytoma?**  
Alpha blockade preoperatively (phenoxybenzamine) with PRN periop B-blockade as a secondary measure.
- **What is the best predictor of pheochromocytoma malignancy?**  
Tumor size (10% malignant).
- **What is the localizing study for pheochromocytoma?**  
MIBG scan. Other modalities include MRI with bright mass on T2-weighted imaging.

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○ **What are the risk factors for breast CA?**

Family history, history of previous breast Bx, Hx of LCIS on breast Bx (10×), Hx of ADH on breast Bx (4×), early menarche, late menopause, and BRCA gene mutation. Patients at the highest risk (BRCA) benefit from prophylactic tamoxifen therapy (50% reduction at 5 years).

○ **What Chromosomes are the BRCA 1 and 2 genes located on?**

BRCA1—13; BRCA2—17. BRCA 1 has a particularly strong association with ovarian cancer as well.

○ **T/F: Accessory breast tissue in the axilla is usually bilateral.**

True.

○ **T/F: Batson's plexus is a route of metastasis for breast cancer.**

True, vertebral veins without valves allow for metastatic “reflux” to the brain.

○ **T/F: Premenopausal women with node-positive breast cancer have improved survival rate with the use of adjuvant chemotherapy.**

True.

○ **What is the significance of the Her-2 (erb-2) positivity of a breast tumor?**

Increased tumor aggressiveness. Her-2 is a tyrosine kinase for epidermal growth factor. A monoclonal antibody to this receptor (Herceptin) has been developed and is beneficial in strongly (3–4+) Her-2 tumors with advanced stage/metastasis.

○ **What toxicities have been seen with Herceptin (trastuzumab)?**

Cardiac toxicity when combined with doxorubicin (Adriamycin) and cyclophosphamide (Cytosan).

○ **What is the role of p53 in breast CA?**

Mutation of this tumor-suppressor gene results in unrestricted propagation of cells with mutated DNA (cancer cells). This allows for overexpression of apoptosis inhibiting oncogenes such as bcl-2 in breast CA.

- **Your patient has LCIS with a positive margin on excisional breast biopsy. What is the next step?**  
Re-excision is not necessary. LCIS is a marker for increased risk of breast cancer in both breasts with a subsequent incidence of 1% per year. Close follow-up with the patient is necessary.
- **What are the most common adverse effects of methylene blue and isosulfan, respectively, for sentinel lymph node biopsy?**  
Isosulfan can cause allergic reaction with intraoperative hypotension. Methylene blue can cause skin necrosis if injected intradermally.
- **When should screening mammograms be obtained?**  
Starting at the age of 40 years every 1 to 2 years and annually after the age of 50 years.
- **What should be done after a positive sentinel lymph node biopsy for breast cancer?**  
Completion axillary dissection.
- **What is the initial treatment of tender, firm, cord mass on lateral aspect of breast?**  
Mondor's disease is thrombophlebitis of superficial vein on the breast. Tx: NSAID.
- **DCIS is found in breast mass. What is the definitive treatment?**  
Lumpectomy + RT. Radiation has been shown to dramatically reduce recurrence.
- **What is the Van Nuys Scoring System for DCIS and how does it guide therapy?**  
Three variables, grade, size, and margin of excision, are scored 1–3. Total scores 1–3 are safely treated with lumpectomy alone. Scores greater than 3 benefit from adjuvant XRT. Scores greater than 7 are best treated with mastectomy and sentinel lymph node Bx.
- **T/F: Neoadjuvant chemotherapy has a survival advantage vs. postoperative (adjuvant) therapy for stage III breast CA.**  
False.
- **What is the treatment for high-grade DCIS in multiple quadrants of the breast without any invasive carcinoma per se?**  
Mastectomy with sentinel lymph node biopsy. Immediate reconstruction can be offered.
- **What is the treatment for a 4.5-cm focus of DCIS?**  
Excision with margin *and* sentinel lymph node Bx; postoperative breast radiation.
- **Does tamoxifen have a role for DCIS?**  
Yes, after excision of DCIS in addition to XRT, tamoxifen reduces DCIS recurrence an additional 30%.
- **What is the sensory innervation of the breast?**  
The lateral and anterior cutaneous branches of the second through sixth intercostal nerves.

- **What is the treatment for a subareolar abscess in a 35-year-old woman?**  
Needle aspiration. *Staphylococcus* is the most frequent etiology. Abscesses refractory to aspiration and ABX can be surgically drained.
- **Where are Rotter's nodes located?**  
In the interpectoral region.
- **What are Level II lymph nodes?**  
Those located behind the pectoralis minor muscle.
- **Positive supraclavicular lymph nodes in breast cancer confer what stage?**  
Stage IIIC (formerly stage IV).
- **T/F: Adolescent males often experience bilateral gynecomastia.**  
False; it is usually unilateral.
- **How much radiation is delivered per mammogram?**  
0.1 rad.
- **When is radiation therapy after mastectomy beneficial?**  
T3 and T4 primary tumors and greater than four positive axillary lymph nodes. XRT reduces local recurrence in these settings and has a small survival advantage as well.
- **When T4 breast cancer is downstaged with neoadjuvant chemotherapy, are postoperative chemotherapy and hormonal therapy still necessary?**  
Yes.
- **What mammographic findings are suggestive of cancer?**  
Fine, stippled calcium in an occult or suspicious lesion, architectural distortion, duct dilatation, asymmetry, and fibronodular densities.
- **What is the true-positive rate of mammography when conducted in an optimal environment?**  
Greater than 90%.
- **Which genetic mutation is associated with male breast cancer?**  
BRCA2. Male breast cancer is typically ER+ and tends to present at advanced stage because of a lack of awareness of breast CA potential.
- **What percentage of patients with clinically detected breast cancer have positive axillary nodes at diagnosis?**  
Greater than 50%.

- **What percentage of patients with mammographically detected breast cancer have positive axillary nodes at diagnosis?**  
Less than 20%.
- **How does the treatment of invasive lobular carcinoma and invasive adenocarcinoma of the breast differ?**  
In no way. Treatment is identical stage for stage.
- **What are the ultrasound features of invasive breast CA?**  
Disrupted tissue and fascia planes, hyperechoic border to the mass, and displacement of surrounding breast tissue.
- **What tumor markers are negatively associated with outcome in breast CA?**  
Estrogen receptor negative, Her-2 Neu positive, and progesterone receptor negative.
- **What is the role for prophylactic mastectomy in patients without breast cancer?**  
Primarily for patients with the BRCA genetic mutations who will invariably develop breast cancer. Breast reconstruction is typically performed at the same time.
- **What is the role of MRI in detection of breast cancer?**  
MRI has increased sensitivity in detecting breast CA relative to mammography and US, yet the lack of specificity and high cost make routine screening with MRI less advantageous. Its role in screening is unclear. However, it is valuable in detecting metastasis to the vertebral bodies and musculoskeletal system.
- **What is the primary indication for ductography?**  
Evaluation of bloody nipple discharge. While intraductal papilloma is the most common cause of bloody nipple discharge, the presence of a mass with bloody nipple discharge makes ruling out cancer essential.
- **What is the treatment for a mammary fistula with recurrent subareolar abscess?**  
Probe-guided fistulectomy.
- **What is the appropriate initial diagnostic procedure for identification of a palpable breast mass?**  
Fine needle aspiration (FNA).
- **Core biopsy reveals atypical ductal hyperplasia. What is the next step?**  
Excisional breast biopsy.
- **What is the current technique for localizing nonpalpable breast masses?**  
Mammographic needle localization.
- **Stereotactic core biopsy reveals lobular carcinoma in situ. What is the next step in management?**  
Needle localization excisional breast biopsy.

- **A 42-year-old female presents with a palpable breast mass. Mammogram is BIRADS 2 (low risk for CA), and FNA reveals benign cells without dysplasia. What is the next step in management?**  
Excisional breast biopsy.
- **Stereotactic core biopsy of a BIRADS 4 lesion reveals benign cells. What is the next step in management?**  
Needle localization excisional breast biopsy.
- **What is the treatment for a 0.9 cm invasive breast CA (T1b)?**  
Wide excision, SLNBx, and XRT. Antiestrogens if ER+. The role of chemotherapy is minimal for this stage.
- **What organisms are most frequently recovered from the nipple discharge of a patient with an infected breast?**  
*Staphylococcus aureus* and streptococci.
- **What is the treatment for hypercalcemia associated with metastatic breast CA?**  
Calcitonin (inhibits osteoclasts), IV fluid, Lasix, and bisphosphonates (bind hydroxyapatite).
- **What fungal infections most frequently affect the breast?**  
Blastomycosis and sporotrichosis. Infantile feeding is the most common cause of these infections.
- **What are the borders of a formal axillary dissection?**  
Latissimus dorsi, chest wall, and axillary vein; thoracodorsal nerve.
- **Which nerve innervates the muscle responsible for arm adduction?**  
The thoracodorsal, which innervates the latissimus dorsi.
- **Which nerve is responsible for sensation to the medial aspect of arm?**  
Intercostobrachial.
- **Poland syndrome consists of what congenital abnormalities?**  
Hypoplastic shoulder  
Amastia  
Absence of pectoralis muscles
- **What is the appropriate management of patients with Mondor's disease?**  
Salicylates, warm compresses, restriction of range of motion, and shoulder and brassiere support.
- **When is fibrocystic disorder associated with an increased risk of breast cancer?**  
When there is an associated dysplasia.
- **T/F: The risk of developing breast cancer increases with age.**  
True. Risk in the fifth decade is less than 2%. Risk increases with age to a lifetime risk approaching 10%.

○ **What are the side effects of tamoxifen?**

Increased endometrial CA, increased DVT risk, and cataracts; inhibits the p450 system, thus increasing relative levels of Coumadin, Ca<sup>+</sup> channel blockers, etc.

○ **How long after treatment for breast cancer is a woman recommended to wait before becoming pregnant?**

24 months, if no evidence of residual disease exists.

○ **What should recurrent breast abscesses in the same location necessitate?**

Dermal biopsy.

○ **What is the next step in management following drainage of a large, clear, fluid-filled breast cyst?**

Send fluid for cytology, reassurance if no malignant/atypical cells seen.

○ **T/F: Male breast cancer, stage for stage, has a worse prognosis than adenocarcinoma of the breast in a female.**

False, male breast cancer tends to present at a later stage (and later age), but the stage-specific survival is similar to that of women. Male breast cancer should be treated with adjunctive tamoxifen when ER+.

○ **What is the leading risk factor for TRAM flap dermal necrosis?**

Active smoking at the time of operation.

○ **What is the appropriate treatment following drainage of a cyst that contained bloody fluid?**

Cyst excision.

○ **What is the etiology of skin dimpling in women with breast cancer?**

Glandular fibrosis and shortening of Cooper's ligaments.

○ **What is the effect of adjuvant radiotherapy following mastectomy for breast cancer?**

It decreases the local recurrence rate.

○ **T/F: Atypical hyperplasia is associated with a 10-fold increased risk of breast cancer.**

False, it is approximately 4× greater though, the only finding in fibrocystic disease associated with increased CA rate.

○ **What are the characteristics of sclerosing adenosis?**

Lobulocentric changes causing distortion and enlargement of lobular units and an increased number of acinar structures and fibrous changes.

○ **What is the current recommended therapy for patients with Stage I and II breast cancer?**

Wide local excision with axillary sentinel node biopsy/axillary dissection PRN and radiation therapy.

○ **What is the typical clinical presentation of ductal ectasia?**

A perimenopausal woman with palpable lumpiness beneath the areola and nipple discharge.

- **T/F: Gynecomastia in a male is associated with an increased rate of future breast cancer.**  
False. It is a benign disease typically symmetric and located beneath the nipple. Peak onset is adolescence at which time it should be observed. If persistent, beyond puberty it can excise. Second peak incidence late in life, caused by relative testosterone deficiency.
- **What is the characteristic gross appearance of a fibroadenoma?**  
Sharp circumscription with smooth boundaries and a glistening, white cut surface.
- **T/F: Fibroadenomas are invariably related to estrogen sensitivity.**  
True.
- **What is the most frequently employed hormonal manipulation in patients with breast cancer?**  
Estrogen blockade (tamoxifen—receptors; arimidex/anastazole—synthesis).
- **What is the most common initial site of metastases in breast cancer?**  
The bone.
- **Is there a benefit to resecting isolated breast CA metastasis detected 36 months after treatment of the primary tumor?**  
Yes, isolated mets, as proven by PET/CT scanning, can be resected with 30% to 40% 5-year survivals.
- **How much does tamoxifen therapy reduce the incidence of recurrent breast cancer when used for 5 years?**  
50%.
- **Do premenopausal women, with node-positive breast cancer, benefit from radiation therapy after receiving wide excision with negative margins, axillary dissection, and chemotherapy?**  
Yes, local recurrence rate in this patient subgroup is reduced from 30% to 15%.
- **What is the most common cause of bloody nipple discharge?**  
Intraductal papilloma. A filling defect on galactography will be visualized. Treatment is excision.
- **What type of breast cancer most frequently presents with a palpable mass?**  
Infiltrating ductal carcinoma.
- **What primary ductal carcinoma presents with a chronic, erythematous, oozing, and eczematoid rash involving the nipple and areola?**  
Paget's disease of the breast.
- **T/F: Use of combined oral contraceptives increases the risk of breast cancer.**  
False.
- **What is the initial treatment for inflammatory breast cancer?**  
Chemotherapy, followed by surgical excision and XRT. Dermal lymphatic invasion of tumor cells on skin biopsy is the diagnostic key for inflammatory breast CA.

- Which type of breast cancer is inflammatory breast carcinoma a variant of?**  
Infiltrating ductal carcinoma.
- What is the most common primary sarcoma of the breast?**  
Cystosarcoma (phyllodes tumor). Treatment is wide excision without lymph node biopsy as sarcomas spread hematogenously.
- What percentage of cystosarcomas are malignant?**  
10%.
- T/F: Women with a history of ovarian cancer are at increased risk of breast cancer.**  
True.
- What is the appropriate treatment for a patient with a small, localized phyllodes tumor?**  
Local excision without lymph node biopsy.
- What percentage of breast carcinomas occur in men?**  
1%.
- What is the most important prognostic indicator for recurrent breast cancer and metastatic disease in women with breast cancer?**  
Nodal status at the time of initial diagnosis.
- What is the average age at diagnosis of invasive breast cancer?**  
60 years.
- What percentage of invasive lobular carcinomas are estrogen sensitive?**  
90%.
- What is the treatment for an involuted nipple?**  
If an underlying mass or mammographic abnormality is present strong suspicion for CA must exist with appropriate oncological surgery. If congenital and no mass present than simple release of hypoplastic ducts can improve cosmesis.
- What is the distinguishing feature of LCIS?**  
Cytoplasmic mucoid globules.
- What are the most common complications of breast cancer radiation therapies?**  
Skin erythema and desquamation. Lymphedema after axillary therapy. Secondary malignancy from the XRT itself is rare (1% of patients).
- What is the medical treatment of radiation mastitis?**  
Trenal (pentoxifylline).

# Skin, Soft-Tissue, and Miscellaneous General Surgical Pearls

- **What are the clinical manifestations of necrotizing fasciitis/soft-tissue infection?**  
Clinical sepsis, subcutaneous crepitus, SQ air on X-ray/CT, skin bullae, intense swelling and erythema, and rapid progression of clinical signs.
- **What is the treatment for necrotizing fasciitis?**  
Antibiotics and emergent surgical debridement with quantitative tissue culture and skin grafting after infection controlled in a few days when Gram stain reveals fewer than 10,000 organisms per high-powered field.
- **What are the most common pathogens inducing necrotizing soft-tissue infection?**  
Group A beta hemolytic *Streptococcus* and *Clostridium perfringens*.
- **What are the most common organisms isolated from diabetic foot ulcers?**  
Gram-positive cocci; however, infections are typically polymicrobial. Antibiotic coverage should be directed at Gram positives, negatives, *and* anaerobes.
- **What is the treatment for animal bites with soft-tissue damage?**  
Wound healing by secondary intention after irrigation, oral penicillin to cover *Pasteurella* bacteria, and PRN debridement.
- **How are full-thickness (third degree) burns managed?**  
Full-thickness dermal excision once resuscitated and stabilized with skin grafting.
- **How are burns with blistering (second degree) best treated?**  
Topical antibiotics/moisturizer.
- **What is the etiology of decubitus ulceration?**  
Dermal ischemia from capillary occlusion.
- **What is the standard thickness of a split thickness skin graft? For ultrathin grafting to cover large tissue defects?**  
12/1000th (0.012) of an inch and 6/10000 of an inch (0.006).

- **What is the predictive value of a test?**  
The percentage of positive results that are true positives.
- **What are the manifestations of gastrointestinal autonomic neuropathy?**  
Intractable diarrhea and steatorrhea.
- **Name the principles of diabetic foot ulcer care?**  
Necrotic tissue debridement, culture of involved bone, revascularization PRN, ABX, and wound care with protective shoe removing pressure from ulcer site.
- **How long do nonsteroidal anti-inflammatory drugs (NSAIDs) inhibit platelet function?**  
Aspirin inhibits platelet function for the life of the platelet (7 days). Most other NSAIDs affect platelet function only while the drug has significant serum levels (i.e., 1 or 2 days).
- **Why are beta-blockers not used alone in the perioperative care of patients with a pheochromocytoma?**  
Unopposed alpha stimulation may provoke a hypertensive crisis.
- **What hypertensive medications classically cause withdrawal hypertension and, therefore, should *not* be stopped prior to surgery?**  
Beta-blockers and clonidine.
- **When is the risk of rebound hypertension from propranolol withdrawal the greatest?**  
4 to 7 days after the drug is discontinued.
- **What percentage of contaminated wounds will become infected when closed primarily?**  
30% to 40%.
- **When is delayed wound closure safe?**  
When quantitative wound culture reveals fewer than 100,000 bacteria per high-powered field.
- **T/F: Steroid injections can be efficacious in treating keloids early in development.**  
True.
- **Of Goldman and Eagle's perioperative risk factors, which has been shown to be the most significant?**  
NYHA class IV congestive heart failure (CHF).
- **For which malignancies has sentinel lymph node biopsy become a standard diagnostic measure?**  
Breast cancer, melanoma, and penile/vulvar cancer.
- **When should a patient quit smoking to have the greatest decrease in perioperative pulmonary complications?**  
8 weeks before the planned procedure.

- **What percentage of patients requiring amputation of the lower extremity are diabetic?**  
60%.
- **What is the accepted stress dose of corticosteroids for patients undergoing major procedures?**  
Hydrocortisone, 100 mg, the night before the procedure with repeat administration every 8 hours until the stress has passed.
- **T/F: Perioperative blood sugar control has a proven effect on reducing postoperative infection.**  
True.
- **What is the advantage of administering a blood transfusion the day before a planned procedure as opposed to the day of the surgery?**  
Transfused blood is low in 2,3-DPG (less oxygen delivery). In addition, there may be fewer problems with volume shifts and fluid overload.
- **What is the incidence of thrombocytopenia in HIV+ patients and those with AIDS?**  
13% and 43%, respectively.
- **When should oral hypoglycemics be discontinued prior to surgery?**  
24 hours.
- **Following which type of burn injury does “ferning” of the dermis occur?**  
Lightening strikes.
- **How is the creatinine level affected by age?**  
As age increases muscle mass declines. Creatinine production is directly linked to muscle mass. However, since glomerular filtration rate (GFR) declines with age, creatinine remains about the same. Thus, identical creatinine levels may reflect vastly different GFRs.
- **What cardiac problems almost always mandate a delay of elective surgery?**  
Recent myocardial infarction (MI), unstable or severe angina, decompensated CHF, high-grade atrioventricular block, symptomatic ventricular arrhythmias, and severe valvular disease.
- **What factors are important in predicting perioperative morbidity and mortality in patients with cirrhosis?**  
Serum bilirubin and albumin, elevated creatinine, elevated INR, ascitis, and encephalopathy.
- **T/F: Brown recluse spider bites with subcutaneous ulceration are best managed with initial debridement to control infection.**  
False. Oral and topical dapson are the initial treatments. The bites present with a bulls eye wound appearance.
- **T/F: Outpatient surgery is reserved for ASA class I and II patients.**  
False.

- **At what serum potassium level should elective surgical procedures be aborted?**

More than 6 mEq/L or below 3 mEq/L.

- **What should be the diagnostic measure to rule out melanoma in a lesion with a 7-mm diameter? 30-mm diameter?**

For lesions less than 1 cm in diameter an excisional full-thickness dermal biopsy is appropriate. For lesions greater than a centimeter in diameter punch biopsy is appropriate.

- **What are the margin of resection recommendations and lymph node investigation recommendations for malignant melanoma?**

TIS to 1 mm depth—1 cm margin

> 1 mm depth—2 cm margin

All excisions should be performed to the facial level. Preoperative lymphoscintigraphy should be used to identify the draining lymph node basin and to aid with isosulfan blue sentinel lymph node biopsy.

- **What is the treatment for a malignant melanoma with a depth of 2.1 mm?**

Wide excision down to the level of the muscle fascia with 2 cm margins radially. Sentinel lymph node biopsy should precede the excision and should be preceded itself by lymphoscintigraphy/radioisotope injection.

- **T/F: There is a clear survival advantage to sentinel lymph node biopsy over complete regional lymph adenectomy in melanoma patients?**

False, although morbidity rates are dramatically lower with SLN biopsy vs. empiric complete lymph node resection.

- **T/F: Melanoma SLN biopsy accuracy is improved for radiolymphoscintigraphy and isosulfan dye in combination vs. radionucleotide alone?**

True.

- **What is the false-negative rate of melanoma sentinel lymph node biopsy?**

Less than 5%. Skip lesions are the source of false negative.

- **What is the recommendation following positive sentinel lymph node biopsy for melanoma?**

Completion regional lymphadenectomy.

- **What are the most common systemic complications of isosulfan blue dye used for sentinel lymph node biopsy?**

Hypotension from anaphylactic reaction. Interference with pulse oximetry reading if absorbed systemically.

- **What is the treatment for isolated pulmonary or hepatic metastasis of soft-tissue sarcoma?**

Surgical resection. Isolation can be documented with CT scan.

- **What variables predict local recurrence of soft-tissue sarcoma?**

Higher histological grade and nerve sheath tumor source.

- **When should warfarin therapy be discontinued prior to surgery?**  
96–115 hours (four doses).
- **What is the primary benefit of completion lymphadenectomy in malignant melanoma after positive sentinel lymph node biopsy?**  
Local/regional control with associated reduced morbidity. Minimal effect on overall survival.
- **What factors increase the risk of postoperative pulmonary embolism (PE)?**  
Age greater than 40 years, history of lower extremity venous disease, hypercoagulable condition, malignancy, CHF, trauma, and paraplegia.
- **What electrolyte abnormality is a risk factor for precipitating digitalis toxicity?**  
Hypokalemia.
- **What are the indications for preoperative hemoglobin testing?**  
Anticipated major blood loss, pregnancy, suspicion of anemia, renal insufficiency, malignant disease, recent immigration, institutionalized patients more than 75 years of age, DM, and cardiac disease.
- **What is a Merkel cell carcinoma?**  
A neuroendocrine tumor from dermal “pressure receptors” presenting in sun-exposed areas as a purple nodule or plaque. Wide local excision is recommended with sentinel lymph node biopsy. Local recurrence is a frequent problem.
- **What neuroendocrine receptors do Merkel cell carcinomas have?**  
Somatostatin receptors in almost 90%. This allows for radiolabeled scintigraphy to identify tumor burden and potential metastasis.
- **T/F: Merkel cell carcinoma patients have a higher rate of adenocarcinoma at multiple sites (breast, colon, prostate, and uterine).**  
True.
- **What are the indications for preoperative determination of serum potassium levels?**  
Diuretic therapy, diarrhea, DM, renal disease, inability to provide a history, and patients older than 60 years of age.
- **What are the indications for preoperative liver function testing?**  
Known liver disease, history of hepatitis, and malignant disease.
- **Which classification of medications is most notorious for inducing toxic epidermal necrolysis? And what is the treatment?**  
Sulfa-based ABX most commonly induce this exfoliative dermal and mucous membrane desquamation between the dermis and the epidermis that is best managed with biological dressings and topical antibiotics. Treatment should be analogous to burn wound management with debridement for superinfection.

- **What is the significance of MRSA toxoid-associated toxic epidermal necrolysis relative to type I TEN?**  
Mucosal desquamation with GI bleeding can occur in the former as well as conjunctival involvement.
- **What are the advantages of a thallium stress test over an exercise stress test?**  
The thallium stress test can better identify the location and extent of myocardial ischemia.
- **Up to how many hours prior to scheduled anesthetic induction may children have unlimited clear liquids?**  
2–3 hours.
- **T/F: Individuals who take clear liquids close to their time of surgery are at a greater risk of aspiration than those who remain NPO.**  
False.
- **In emergency surgery following trauma, what organisms are most likely to cause serious sepsis?**  
Gram-negative bacteria.
- **What pre-existing conditions can alter host resistance to infection?**  
DM, endogenous or exogenous steroids, and hospital admission prior to surgery.
- **How is vitamin A associated with natural immunity?**  
It is a component of a complete inflammatory reaction and an adjuvant in the development of specific antibodies.
- **T/F: The operating room team is the primary source of perioperative infection.**  
False. Patient skin flora is the most common source.
- **By what organisms are wound infections that occur in clean operations most commonly caused?**  
Staphylococci.
- **What is considered a clean-contaminated wound?**  
One in which the alimentary, respiratory, or genitourinary tracts are entered under controlled conditions and without unusual contamination, minor break in technique, or mechanical drainage.
- **How do hematomas increase the risk of infection?**  
They prevent fibroblast migration and capillary formation.
- **What is the incidence of a wound infection in wounds that contain greater than 100,000 bacteria/g of tissue?**  
Greater than 50%.
- **What is the expected rise in cortisol after an ACTH stimulation test?**  
>7  $\mu\text{g/dL}$  1 hour after 250  $\mu\text{g}$  of ACTH (corticotropin) is normal. Less of a response indicated adrenal insufficiency. Adrenal insufficiency in the critically ill presents with a septic picture of tachycardia, hypotension, but with hyperkalemia as well.

- **What is the platelet transfusion threshold in thrombocytopenia?**  
For preoperative patients, a goal of 50,000/ $\mu$ L should be obtained for surgery. Nonoperative patients need to maintain only 10,000/ $\mu$ L unless spontaneous bleeding develops.
- **What is the source of fever in atelectasis?**  
Alveolar macrophages.
- **When should sutures be removed from areas of good blood supply (i.e., face and neck)?**  
Within 4 or 5 days if the wound is not under tension.
- **T/F: Patients with biliary obstruction and an elevated INR should receive vitamin K prior to surgery.**  
True, if the INR is elevated.
- **What is the risk of perioperative MI in patients undergoing surgery within 3 to 6 months of an MI?**  
16%.
- **What drug class decreases the incidence of perioperative mortality in patients with idiopathic hypertrophic subaortic stenosis (IHSS)?**  
Beta-blockers.
- **After a patient undergoes general anesthesia, the temperature increases to 104 and the end tidal CO<sub>2</sub> increases. The patient develops diffuse muscle rigidity. What causes this condition and what are its treatments?**  
Malignant hyperthermia is caused by Ca release from the sarcoplasmic reticulum. It is best treated with supportive care, stopping offending agent, and dantrolene.
- **What parameter best correlates with the need for postoperative ventilatory support?**  
Arterial CO<sub>2</sub>.
- **What is the acceptable level of preoperative factor VIII in patients with hemophilia A?**  
100% of normal.
- **How is low Na/Cl corrected by the kidneys?**  
Renin produced in macula densa of kidney will convert angiotensinogen to angiotensin I. This is converted to angiotensin II, which induces Na<sup>+</sup> retention via aldosterone.
- **What is the appropriate tetanus prophylaxis for a patient with a tetanus-prone wound, who has not been previously immunized?**  
0.5 mL absorbed toxoid and 250 units of human tetanus immune globulin.
- **What is the difference between sensitivity and specificity?**  
Sensitivity = ability to detect a disease— $tp/tp + fn$ . A sensitive test has low fn. Positive in disease.  
Specificity = ability to say that no disease is present— $tn/tn + fp$ . A specific test has low fp. Negative in health.

○ **What type of suture causes the least amount of tension on wound edges?**

Interrupted perpendicular sutures.

○ **What is the most common site of perforation of the surgeon's glove during surgery?**

The nondominant index finger.

○ **What are type I and type II statistical error?**

Type I is when you reject the Null hypothesis and the hypothesis is true.

Type II is when you falsely accept the null hypothesis.

Type III is when conclusions are not supported by the data.

○ **What is the prophylactic antibiotic of choice prior to appendectomy?**

Cefotetan or cefoxitin.

○ **What are prevalence and incidence?**

Prevalence is the number of people having the disease in a population.

Incidence is the number of newly diagnosed cases in a population in a certain time.

○ **In what procedures should prophylactic antibiotics be given?**

Most alimentary tract operations, cesarean sections, hysterectomies, selected biliary tract operations and procedures associated with life-threatening consequences should infection occur (e.g., neurosurgery, cardiovascular procedures, and those involving implantable devices), and any procedure where prosthetic is inserted (hernia mesh, etc.).

○ **What is needed for conversion to angiotensin II?**

The lung produces ACE. This will convert angiotensin I to angiotensin II.

Angiotensin II increases aldosterone release and directly induces vasoconstriction.

Aldosterone enhances renal absorption of Na and secretion of  $K^+$  and  $H^+$  in the urine.

○ **T/F: Cold knife dissection is associated with an increased susceptibility to infection compared to cutting cautery dissection.**

False.

○ **What is the primary cause of renal osteodystrophy?**

Increase secretion of PTH. Secondary to renal loss of Ca and retention of  $PO_4$ . There is also a decrease in vitamin D 1-hydroxylation in the kidney, causing decreased GI absorption of calcium.

- **What are the changes in cardiac afterload associated with clamping the aorta at the infra-renal level?**

Minimal changes. There is a 2% increase in mean arterial pressure (MAP), no change in the left ventricular end-diastolic pressure (LVEDP) and a reduction in the ejection fraction (EF) of 3%. Supraceliac clamping, however, results in significant increased LVEDP, and subsequent left heart strain if blood pressure is not adequately controlled before clamping.
- **How is the stump pressure used in carotid endarterectomy (CEA)?**

After clamping the CCA and ECA, butterfly needle is inserted into distal CCA and back pressure is measured by connecting the needle to an A-line transducer. Pressure less than 30 necessitates a shunt during the CEA. It is dependent on extracranial collateral flow, systemic pressure, and cerebrovascular resistance. Pressures of 40–50 mm Hg are thought to indicate adequate flow.
- **What is the most common cause of late failure (24 months and beyond) of reversed saphenous vein grafts?**

Atherosclerosis.
- **What is the size at which elective repair of infrarenal abdominal aortic aneurysm (AAA) is recommended?**

5.5 cm. VA ADAM and British Small Aneurysm Trial found that the risk of death from AAA exceeds the operative risk for AAA greater than 5.5 cm.
- **What are the features of carotid body tumors?**

The carotid body is a chemoreceptor in the adventitia for the distal common carotid artery. The tumors are of neuroendocrine origin. Tumor blood supply originates from the external carotid artery. Duplex ultrasound reveals a “goblet” of the ICA and ECA as they are pushed apart by the tumor. Surgical excision is the treatment for these rarely malignant masses. Large tumors can benefit from presurgical embolization to reduce bleeding at surgery.
- **What is the appropriate treatment for superficial thrombophlebitis without evidence of clot extension into the deep venous system?**

Local heat, NSAIDs, and continued ambulation. Compression treatment, follow up duplex scan to rule out DVT.
- **What is the treatment of choice for superficial thrombophlebitis if the thrombus propagates toward the deep system or if evidence of venous infection develops?**

Short or long saphenous vein ligation. Excision of the involved vein is indicated in patients with persistence of symptoms despite medical therapy and recurrent episodes of thrombophlebitis.

- **Following an MVA where the patient was wearing a shoulder strap, the only notable physical findings are left neck tenderness with mild ecchymosis and a brief episode of aphasia reported by rescue workers at the scene. A duplex carotid Doppler study reveals a small intimal flap in the distal common carotid artery. What is the most appropriate management of this patient?**  
Surgical repair.
- **What are the characteristics of fibromuscular dysplasia (FMD) in the carotid artery?**  
Alternating short intervals of dilation and stenotic fibromuscular thickenings. Usually asymptomatic; however, turbulence with thromboembolic events, transient ischemic attacks, and stroke can occur and intervention is then indicated (percutaneous transluminal angioplasty [PTA] with embolic protection). This condition has an association with intracranial aneurysms. Treatment should be reserved for symptomatic patients.
- **What are the boundaries for classification and management of penetrating neck injuries?**  
Zone I extends from the clavicle to the cricoid cartilage, zone II extends from the cricoid cartilage to the angle of the mandible, and zone III extends from the angle of the mandible to the base of the skull.
- **What are the typical features of Takayasu's arteritis?**  
Early symptoms include fever, myalgias, arthralgias, weight loss, and pain over inflamed vessels. Late symptoms are referable to occlusive changes and include transient ischemic attacks, strokes, arm fatigue, leg claudication, and angina. Occurs in mostly female patients aged 30 to 45 years. Management of the acute/inflammatory stage consists of steroids/anti-inflammatories; chronic stage with PRN vascular reconstruction.
- **What are the arteriographic findings of Takayasu's disease?**  
Segmental dilatations, stenoses, and occlusions.
- **What is the treatment for patients with Takayasu's disease?**  
Surgery is required for the treatment of aneurysmal and stenotic lesions with failure of medical management.
- **What are the typical features of giant cell (temporal) arteritis?**  
A flu-like prodrome with fever, malaise, weight loss, scalp tenderness, headache, and myalgias. Pain over the temporal or occipital arteries, jaw claudication, and eye symptoms follow. Histologically identical to Takayasu's disease but occurs in older patients with a different anatomical disease pattern. Occlusive disease in the distal upper extremity arteries rather than central arteries.
- **What is the etiology of transient monocular blindness (amaurosis fugax) in patients with temporal arteritis?**  
Occlusion of the terminal retinal arterioles from atherosclerotic emboli arising from the carotid bifurcation.
- **What rheumatologic condition is frequently associated with temporal arteritis?**  
Polymyalgia rheumatica.
- **What is the appropriate management of Paget-Schroetter syndrome?**  
Heparinization, direct infusion thrombolysis, and percutaneous angioplasty if residual venous stenosis exists. This is followed by thoracic outlet decompression (first rib excision). Venoplasty is occasionally required.

- **What is the most appropriate exposure for a penetrating injury to the mid-subclavian artery?**  
Subperiosteal or complete removal of the medial portion of the clavicle combined with division of the anterior scalene muscle provides exposure to the middle and distal left subclavian artery and all three portions of the right subclavian artery. An alternative is a right anterior thoracotomy combined with a PRN supraclavicular incision to achieve proximal and distal control.
- **What are the signs and symptoms of the subclavian steal syndrome?**  
Dizziness, diplopia, ataxia, and bilateral sensory or motor deficits or syncope when exercising the ipsilateral arm. This is secondary to stenosis in the subclavian or innominate artery proximal to the vertebral artery origin. When the exercising arm vasodilates, a reversal of flow is seen in the vertebral arteries, resulting in a steal from the cerebral posterior circulation and causing neurologic symptoms.
- **What are the indications for patch closure of a CEA?**  
Patients with small arteries redo endarterectomies for recurrent stenosis. Most vascular surgeons currently patch all endarterectomies.
- **A 67-year-old male states that he had a 3-hour episode of left arm numbness and extreme weakness. The physical examination is significant for a right carotid bruit and a very subtle decrease in left grip strength. What is the appropriate management?**  
A head CT scan without contrast, ECG, echocardiography, and a carotid duplex study. Increasingly, experienced vascular surgeons proceed to endarterectomy without angiography (1% stroke risk) in appropriate clinical situations, particularly with the availability of MRA.
- **Which artery must frequently be divided to gain exposure to the hypoglossal nerve during CEA?**  
The artery to the sternocleidomastoid muscle.
- **What is a persistent sciatic artery?**  
An embryologic developmental anomaly in which the sciatic artery is the dominant inflow to the lower extremity and remains in direct communication with the popliteal artery. The proximal aspect of the artery tends to become aneurismal and may present as a pulsatile buttock mass.
- **What is the treatment for angiosarcoma?**  
Vessel resection and vascular reconstruction for these tumors that can be arterial or venous in origin. Clinical presentation is often with emboli. CT scan with contrast or angiography reveals villous masses growing into the lumen of the vessel.
- **What is the ankle-brachial index (ABI)?**  
Ratio of blood pressure at the ankles to the brachial artery. Normal is greater than 1. This index is not reliable in diabetic patients because of calcified arteries.
- **What are the noninvasive vascular studies that are still reliable in diabetics?**  
Doppler waveforms, toe pressures, and TCPO<sub>2</sub> measurements.

- **What is the treatment for penetrating injury to extremity arteries with >2 cm of devitalized tissue?**  
Replacement with interposition vein graft.
- **What are the most common major complications of thoracoabdominal aneurysm repair?**  
Spinal cord ischemia, myocardial infarction, pneumonia, and atelectasis.
- **What are the branches of the external carotid artery?**  
In order from proximal to distal, the superior thyroid, ascending pharyngeal, lingual, facial, occipital, posterior auricular, internal maxillary, and temporal arteries.
- **What are the clinical manifestations of diabetic neuropathy?**  
Neuropathic ulcers under the metatarsal head. Decreased reflexes (Achilles), sensory loss, and bone deformities with collapse of plantar arch (Charcot foot).
- **T/F: Low-molecular-weight heparin is safe to use in heparin-induced thrombocytopenia.**  
False. While incidence is reduced with LMWH, it may still induce antiplatelet antibodies.
- **What is the classic hemodynamic change with external compression of a high output arteriovenous fistula?**  
Decrease in heart rate. Diagnosis can be confirmed peripherally with duplex and with angiography for central fistulas. CHF symptoms warrant treatment via surgical ligation/repair or abolishing with covered stent.
- **What syndrome is associated with multiple congenital AV fistulas?**  
Osler–Weber–Rendu disease (AD inheritance). Pulmonary vasculature AV fistulas are common. Large peripheral AV malformations are best treated with embolization. The syndrome also features large capillary hemangiomas of the skin.
- **What conditions are associated with aortic dissection?**  
Connective tissue disorders such as Marfan's and Ehlers–Danlos syndromes, congenital heart lesions (e.g., bicuspid aortic valve and coarctation), and uncontrolled hypertension.
- **What is the DeBakey system of aortic dissection classification?**  
Type 1 involves the ascending aorta, aortic arch, and thoracoabdominal aorta. Type 2 dissections have a false channel limited to the ascending aorta. Type 3 dissections are divided into 3a (beginning distal to the left subclavian artery and terminating above the diaphragm) and 3b (beginning distal to the left subclavian artery and extending into the abdominal aorta).
- **What is the initial mainstay of medical therapy in all types of acute aortic dissection?**  
Intensive continuous monitoring. Cardiac output (CO) and blood pressure must be promptly reduced to as low a level as possible while still maintaining end-organ-perfusion. Nitroglycerin and IV beta blockade should be used to maintain systolic BP less than 120 mm Hg and to prevent tachycardia (maintain a heart rate less than 70).
- **T/F: Aortofemoral revascularization has a better long-term patency when the proximal anastomosis is placed as close to the renal arteries as possible?**  
True.

- **During CEA, what hemodynamic changes may occur with manipulation of the carotid bulb?**  
Bradycardia and hypotension.
- **What is the treatment for upper extremity arterial steal syndrome after brachial-cephalic AV graft that is well functioning?**  
DRIL (distal revascularization interval ligation) with vein bypass from the proximal to distal native circulation and ligation of the brachial artery between the graft and distal anastomosis.
- **What is the treatment for these hemodynamic changes?**  
Injection of 1 or 2 cc of 1% plain lidocaine into the carotid bulb periadventitial tissue. Systemic atropine may be considered for persistent intraoperative bradycardia. Postoperative bradycardia may be treated with judicious administration of atropine in the symptomatic patient. Occasionally, low-dose infusion of Neo-Synephrine is needed to maintain an appropriate MAP.
- **With respect to CEA, what intraoperative measures minimize the risk of perioperative stroke?**  
Smooth induction of anesthesia, avoidance of hemodynamic instability and resultant low cerebral blood flow, meticulous dissection of the carotid artery with minimal manipulation, selective shunting, appropriate flushing and back-bleeding of the arteries, anticoagulation, and meticulous closure.
- **T/F: Endarterectomy should always be performed for a completely occluded internal carotid artery.**  
False. An occluded ICA confirmed by duplex possesses no embolization potential. CEA provides no benefit in the setting of chronic ICA occlusion.
- **What medications are most useful in patients with carotid artery occlusive disease?**  
Statin medications have been found to stabilize plaques and sometimes induce regression. Antiplatelet agents (ASA/Clopidogrel) reduce the incidence of stroke.
- **What is the Stanford classification of aortic dissection?**  
Stanford type A dissection involves the ascending aorta. Type B dissection begins distal to the origin of the left subclavian artery.
- **What are the criteria for surgical management of aortic dissection?**  
All acute type A dissections should be treated with emergent operation including replacement or repair of the ascending aorta, aortic root, and aortic valve. Acute type B dissections are treated with early surgical intervention if visceral or extremity arterial origins are compromised. Other indications for intervention in type B dissections are aneurismal dilation of the aorta to 6 cm or intractable back pain.
- **What are the three types of recurrent carotid stenosis?**  
Myointimal hyperplasia, recurrent atherosclerotic lesions, and residual plaque left from the primary operation.
- **A patient has an asymptomatic 80% right ICA stenosis and a symptomatic left 65% ICA stenosis. What is the management?**  
Left CEA first. Subsequent right ICA can be performed in the future. The symptomatic disease poses a much higher stroke rate even in the face of lesser stenosis than an asymptomatic lesion.

- **Other than arch aortography, what diagnostic tests may be helpful in ruling out traumatic aortic disruption?**  
Transesophageal echocardiography and spiral CT scan of the chest (current standard).
- **Following left carotid–subclavian bypass, a patient developed a large amount of serous drainage from the wound. What is the most likely diagnosis?**  
Injury to the thoracic duct. Initial management is NPO/TPN/drainage. Refractory high-output fistulas should be treated with duct ligation after 2 weeks.
- **What is the mortality rate for ruptured AAA who arrive at the hospital alive?**  
50% and higher at some centers. Renal failure and pulmonary failure after successful ruptured AAA repair are the leading causes of mortality in this setting.
- **How should aortocaval fistula during AAA repair be managed?**  
Oversew the fistula from inside the aneurysm sac upon opening. Preoperative indicators may be leg swelling, high-output CHF, and rapid contrast enhancement of the inferior vena cava (IVC).
- **How should bilateral common iliac aneurysms be repaired?**  
Bifurcated transabdominal repair with preservation of at least one internal iliac artery.
- **What is the treatment for a persistent lymphatic leak overlying the femoral limb of an aortobifemoral graft?**  
If the graft is not exposed and the drainage is clearly lymphatic (not infected), opening the skin and placing a vac on the subcutaneous tissue are usually efficacious. If there is concern for indolent infection, opening the wound, irrigating the field, and providing graft coverage with a muscle flap (sartorius) can preserve the graft.
- **How does a *Staphylococcal epidermidis* aortofemoral graft infection present?**  
Typically a late (>1 month) presentation with cloudy, yellow drainage from a dermal sinus. Systemic signs may be absent. On US/CT fluid is seen around the graft, and on exploration the graft tissue is poorly incorporated into surrounding tissue. Tissue culture is needed to confirm the diagnosis. Treatment is excision of infected graft material.
- **T/F: An infected limb of an aortobifemoral graft does not always necessitate complete graft excision.**  
True. For mildly virulent *S. epidermidis* infections involving a groin limb only the more proximal graft can be preserved if it is well incorporated into tissues. Extra-anatomic or autogenous tissue bypass should then be used to revascularize the involved limb.
- **What is the appropriate management of chronic lymphedema?**  
Elevation of the legs, compression stockings when ambulating, periodic compression pumps for severe cases, and manual lymph drainage.
- **What is the treatment for an infrarenal AAA >5.5 cm and coexisting symptomatic renal artery occlusive disease with ischemic nephropathy?**  
Simultaneous surgical correction.

○ **What are the drawbacks of contrast venography in the diagnosis of deep vein thrombosis (DVT)?**

It is a costly, time-consuming, and painful study with a 10% interobserver diagnostic disagreement. In addition to complications related to the contrast medium, mild and major idiosyncratic reactions cause nephrotoxicity and provide little physiologic information. Finally, it is difficult to demonstrate the presence of thrombus in muscle sinusoids, the profunda femoris, or internal iliac veins. Duplex examination is the current standard for DVT evaluation. CT scan is helpful in detecting more proximal (iliac/IVC/proximal subclavian/superior vena cava [SVC]) DVT.

○ **What are the normal lower extremity venous Doppler flow patterns?**

A venous Doppler signal is low pitched, containing a wide spectrum of frequencies. (It sounds like a windstorm.) In supine subjects, the flow in the legs is phasic with respiration. With abdominal breathing, it increases with expiration and decreases with inspiration. Flow augments with distal leg compression.

○ **T/F: Compliance of synthetic arterial grafts is greater than that of the normal arterial system.**

False.

○ **What are the risk factors for portal vein thrombosis?**

Hypercoagulable state. Retroperitoneal inflammation (pancreatitis and duodenal ulcer disease) and cirrhosis.

○ **What is the treatment for portal vein thrombosis?**

Anticoagulation and evaluation and treatment of risk factors.

○ **What are the hallmarks of nonocclusive mesenteric ischemia (NOMI)?**

Vasospasm-induced occlusion of the distal mesenteric circulation occurring in the critically ill. Angiography confirms diagnosis, and distal occlusion of small vessels is seen. Intra-arterial (SMA) papaverine drip can benefit as does optimization of CO and treating the source of shock. Surgery should be performed for patients with peritoneal signs or features of bowel necrosis.

○ **What are the features of chronic mesenteric ischemia?**

Postprandial diffuse abdominal pain 30–90 minutes after meals, resulting in “food fear” with associated weight loss. Typically high-grade stenosis of the SMA and either the celiac or the IMA arteries is a minimal anatomic occlusive criteria. Treatment options include angioplasty and stenting of SMA/cealic for focal orifice disease, and surgical bypass to the SMA for more extensive or completely occlusive disease.

○ **What should be the test of choice in cases of suspected acute mesenteric ischemia in a hemodynamically stable patient?**

CT angiogram. If the diagnosis is confirmed the patient should be immediately heparinized, given ABX, and explored. Vascular reconstruction should precede bowel resection, and marginal bowel should be left in place with re-exploration 12–24 hours later. Grossly necrotic bowel should, of course, be resected at the time of initial operation.

○ **What inflammatory arteropathy is associated with multiple small visceral and renal artery aneurysms?**

Polyarteritis nodosa. This medium-sized artery vasculitis is associated with constitutional symptoms, cutaneous livido reticularis, and digital ischemia. Treatment is with steroids and anti-inflammatory medications. Diagnosis can be confirmed with biopsy of the dermis and subcutaneous fat.

- **T/F: Intravenous pyelography (IVP) is the diagnostic test of choice for renovascular hypertension.**  
False; angiography is the gold standard diagnostic tool. Other useful modalities are renal artery duplex (looking for increased peak systolic velocity) and MRA.
- **What is the most common site for atherosclerotic occlusion in the lower extremities?**  
The distal superficial femoral artery.
- **What complications are associated with percutaneous arterial closure devices after angiography?**  
Pseudoaneurysm with infection and arterial thrombosis.
- **What is the most common histological finding involved in ascending aortic aneurysms?**  
Cystic medial necrosis.
- **Name the features of complex regional pain syndrome (formerly called reflex sympathetic dystrophy).**  
Burning pain in the involved extremity with hyperalgesia and hyperhydrosis. With chronicity a dystrophic stage can occur with a cool, pale, cyanotic limb with osteoporosis. Response to pharmacologic sympathectomy confirms diagnosis and predicts success of surgical sympathectomy.
- **What is the expected ABI in patients with intermittent claudication?**  
Between 0.90 and 0.5.
- **What are the Doppler signs of acute DVT?**  
Noncompressibility of the typically enlarged vein. Absence of flow in a vein segment, continuous (nonphasic) flow distal to an obstruction, lack of augmentation proximal to an obstruction, and increased flow in the superficial veins.
- **How accurate is a ventilation/perfusion (V/Q) scan in diagnosis of acute pulmonary embolus (PE)?**  
Pulmonary angiography has shown that in a patient with a high probability V/Q scan, the incidence of PE is 87%. With an intermediate probability reading, the incidence is 30% and with a low probability reading, the incidence is 14%. CT scan is rapidly replacing V/Q scan as the diagnostic modality of choice for PE.
- **What are the indications for an emergency pulmonary embolectomy?**  
Persistent refractory hypotension despite maximal resuscitation in a patient with a documented acute, massive PE. A consideration of PA thrombolytic therapy in the absence of a contraindication should be considered before sternotomy.
- **What are the clinical features of lymphangiosarcoma?**  
Purplish patches or nodules on chronically (>5 years) lymphedematous limbs (post-mastectomy/axillary dissection most common). Treatment is wide excision with 2 cm margin. These tumors are very aggressive with poor associated survival.
- **What is the differential diagnosis for lower extremity claudication in a young, nonsmoking patient?**  
Popliteal artery entrapment syndrome, premature atherosclerosis, and adventitial cystic disease of the popliteal artery.

- **What are the etiology and treatment of popliteal entrapment syndrome?**  
Anatomical compression of the popliteal artery secondary to either an aberrant arterial course medial to the medial head of the gastrocnemius muscle or an abnormal insertion of the medial head of the gastrocnemius. Treatment is release of the gastrocnemius head. In cases of chronic popliteal occlusion, bypass is warranted.
- **What is the appropriate treatment for a 30-year-old male with an asymptomatic 3 cm splenic artery aneurysm?**  
Aneurysm repair with interposition graft if proximal, splenectomy if the aneurysm is in the splenic hilum.
- **What is the treatment of choice for acute arterial embolus to the lower extremity?**  
Immediate heparinization. Surgical embolectomy or intra-arterial thrombolytic therapy. Acute emboli to the more proximal circulation are best treated with embolectomy. More distal emboli with multi-tibial artery occlusions are where thrombolytic Tx should be considered, particularly in patients with significant underlying PVD. Must watch for reperfusion injury-associated compartment syndrome and rhabdomyolysis after revascularization.
- **What is the appropriate treatment for subclavian steal syndrome?**  
Carotid–subclavian bypass or carotid–subclavian transposition (highest patency) or angioplasty and stenting of the subclavian artery.
- **What is the treatment for axillary artery occlusion after anterior shoulder dislocation?**  
Direct surgical repair or bypass.
- **What are the presentation and diagnostic modalities for aortoenteric fistula?**  
Systemic inflammatory signs from graft infection and GI bleeding. Diagnosis is confirmed by endoscopy to the third portion of the duodenum. CT scanning can illustrate per-graft inflammation and retroperitoneal air.
- **What are the duodenal repair options in aortoenteric fistula?**  
Serosal patch, debridement, and primary closure; duodenal resection; and reanastomosis.
- **What are the vascular reconstructive options for aortoenteric fistula?**  
Extra-anatomic bypass and graft excision (Ax-fem-fem followed by graft excision and aortic stump oversewing).
- **What is the treatment of choice for patients with Leriche syndrome (high thigh/buttock claudication and impotence)?**  
Aortoiliac–bifemoral bypass or iliac angioplasty and stenting if short-segment amenable lesions.
- **What are the prerequisites for success of a cross-femoral venous bypass for relief of symptoms caused by a chronically occluded iliac vein?**  
Patency of the contralateral iliofemoral and caval runoff, presence of a supine resting pressure gradient in excess of 4–5 mm Hg between the femoral veins in the involved and contralateral limbs and a good-quality contralateral saphenous vein.

- **What is the appropriate management of reperfusion injury following vascular repair?**  
Serum electrolyte evaluation and intravenous administration of sodium bicarbonate and mannitol. PRN fasciotomy.
- **What is Milroy's disease?**  
Congenital familial lymphedema that is present at birth or is noticed soon thereafter.
- **What is lymphedema praecox?**  
Lymphedema that develops in adolescence.
- **What is lymphedema tarda?**  
Lymphedema with an onset after 30 years of age.
- **What is secondary lymphedema?**  
Lymphedema that occurs after traumatic/external lymphatic disruption from malignancy, trauma, surgery, or parasitic infection (filariasis is the most common cause of lymphedema worldwide).
- **What is the appropriate management of chronic lymphedema?**  
Elevation of the legs, compression stockings when ambulating, periodic compression pumps for severe cases, and manual lymph drainage.
- **What is the preferred replacement material for pediatric renal artery reconstruction?**  
Arterial autograft. Internal iliac artery is the most frequently used conduit.
- **What is the most common functional type of primary lymphedema?**  
Distal lymphatic obliteration.
- **What is the Charles' procedure for treatment of lymphedema?**  
Excision of the skin and subcutaneous tissues in the involved extremity and closure of the resulting defect with a skin graft.
- **What factors are predictive of healing following amputation?**  
A segmental arterial pressure of 50 mm Hg at the level of planned amputation and a TcPO<sub>2</sub> greater than 50 torr for the skin flap.
- **What is the treatment of choice for a patient with unilateral ilioaortic occlusion and an intra-abdominal infection?**  
Femorofemoral crossover graft.
- **What are the roles of the carotid body and sinus, respectively?**  
Body (@ carotid bifurcation) is a chemoreceptor that detects increased CO<sub>2</sub>/H<sup>+</sup> and triggers tachycardia and vasoconstriction. Sinus (along internal carotid) detects increased BP and triggers bradycardia and BP fall.

- **What is the appropriate treatment for a patient with symptomatic carotid stenosis on the right and asymptomatic 50% stenosis on the left?**  
CEA on the symptomatic side only.
- **What are the characteristic symptoms of vertebrobasilar ischemia?**  
Diplopia, dysarthria, vertigo, and ataxias.
- **Who is likely to benefit from the surgical treatment of chronic lymphedema of the lower extremity?**  
Patients with restricted movement and functional impairment because of gross enlargement of the extremity and those who experience frequent episodes of lymphangitis.
- **T/F: Long-term patency of above-knee femoropopliteal bypass with polytetrafluoroethylene (PTFE) has comparable patency rates with those of venous autografts.**  
False. Autogenous venous bypasses have superior patency in numerous randomized trials.
- **What are the indications for tibial level bypass grafts?**  
Gangrene of the forefoot, rest pain, and necrotizing infection or a nonhealing wound (below knee bypasses are reserved for limb-threatening ischemia—rest pain or tissue loss).
- **What are the alternatives to intra-arterial contrast angiography?**  
Duplex examination, intra-arterial ultrasound, CT angiography, MRA, and angiography.
- **How is carotid arterial stenosis measured from an arteriogram?**  
By comparing the diameter of the stenotic area with the diameter of the nondiseased distal internal carotid artery. This ratio is subtracted from one and expresses the percentage of diameter reduction.
- **What is the success rate of angioplasty for the following anatomic sites: iliac, femoral, popliteal, and tibial?**  
At 5 years, iliac angioplasty with stenting has more than 80% patency. Femoropopliteal success rates approximate 30% at 5 years, and tibial lesions are considerably lower.
- **What are the angiographic characteristics of FMD?**  
Eccentric stenoses with intervening areas of dilatation.
- **What is the major concern in a patient who develops bloody diarrhea following AAA repair?**  
Ischemic colitis secondary to loss of the IMA with inadequate collateral circulation.
- **What are the etiology and treatment for blue toes after AAA repair (trash foot)?**  
The source is cholesterol embolization from the proximal arterial tree during repair. Treatment is analgesia only with later digital amputation PRN. Heparinization is of no benefit and may increase the risk of intra-abdominal bleeding after AAA repair.

- **How is blunt carotid injury in the absence of a neurologic deficit best managed?**  
By anticoagulation.
- **What is the mechanism of action of clopidogrel (plavix)?**  
Inhibition of ADP receptors reducing platelet to platelet aggregation.
- **What is the anticoagulant effect of GP IIB/IIIa inhibitors?**  
Inhibition of platelet adherence to circulating fibrin. Most commonly used in acute coronary syndrome in the setting of PTA/stent.
- **What is SMA artery syndrome? What is the treatment?**  
Obstruction of the third portion of the duodenum in an unusually narrow space between the aorta and the SMA. Treatment is GI bypass (duodenojejunostomy).
- **What is the treatment of choice for patients with FMD of the renal arteries with hypertension?**  
PTA, if amenable, or renal artery bypass.
- **What type of aortic aneurysm is associated with Marfan's syndrome?**  
Ascending aortic aneurysm.
- **What causes the blood pressure fluctuation commonly seen after carotid surgery?**  
Manipulation of the carotid body.
- **What is the appropriate management for a 23-year-old male smoker who presents with symptoms of upper extremity ischemia?**  
Patients with Buerger's disease are encouraged to quit smoking and are managed with analgesics.
- **What is the treatment of choice for patients with SVC syndrome caused by malignancy?**  
Radiation therapy.
- **What are the causes of reduced urine output after aortic reconstructive procedures?**  
Inadequate circulating blood volume, low CO, and renal ischemia/acute tubular necrosis (ATN).
- **What are the benefits of CEA vs. antiplatelet agents in symptomatic carotid disease?**  
CEA produces a sevenfold reduction in the long-term risk of stroke.
- **There are two landmark studies in vascular surgery, which give strong indication for CEA vs. medical management of carotid disease. What are these studies and what are the important statistics for each?**  
ACAS—asymptomatic patients with >60% stenosis who underwent CEA; there is a 5-year reduction in CVA rate of 11% to 5%.  
NASCET—symptomatic patients with >70% stenosis CEA reduces 2-year CVA rate from 26% to 9%.

- **A popliteal aneurysm is palpated in your patient. What are the chances that the patient has another aneurysm?**  
50% have bilateral popliteal aneurysms and one-third have an AAA.
- **T/F: Conservative management is acceptable for nonsymptomatic popliteal aneurysm 2.1 cm in size?**  
False. These have a high risk of emboli and thrombus; therefore, operation by exclusion and bypass is standard of care. 2 cm is the threshold for repair.
- **What are some of the risk factors associated with AAA increase in size?**  
HTN, COPD, and smoking.
- **What are the 5-year risk of rupture of AAA based on size?**  
5 cm—20%.  
>7 cm—95%.  
**While 5-cm aneurysms rupture at only a 1% to 2% per year rate, most 5-cm AAAs continue to enlarge and rupture when at a larger size.**
- **What is dysphagia lusoria?**  
Dysphagia secondary to an aberrant right subclavian artery traveling between the esophagus and the trachea. Can be diagnosed by pulsations seen on EGD. Treatment is right subclavian to carotid transposition and ligation of the right subclavian stump.
- **What is the most common visceral aneurysm?**  
Splenic artery aneurysm (60%). Predisposing variables include portal hypertension, history of pancreatitis, and systemic arterial inflammatory diseases (polyarteritis nodosa, etc.).
- **What are the indications for surgery for splenic aneurysm?**  
>2 cm, female of child-bearing age or planning pregnancy, and any symptomatic patient.
- **What are the indications for repair of a renal artery aneurysm?**  
>2 cm size, evidence of embolization with secondary renal insufficiency, rupture, bilateral aneurysms, and FMD are the leading causes of RAA.
- **What is the recurrence rate of ipsilateral internal carotid stenosis following CEA?**  
10% to 15%.
- **What is the initial treatment of Takayasu's arteritis?**  
Steroid therapy.
- **What is the most common cause of renovascular hypertension?**  
Atherosclerosis. FMD is the second most common and is seen in younger patient populations.

○ **What is the earliest objective measurement reflecting compartment syndrome?**

Compartment pressure greater than 40 mm Hg. With respect to physical examination, pain with passive extension of the involved muscle groups is the most reliable finding.

○ **What is the characteristic gross appearance of an inflammatory AAA?**

An intense, thick, white fibroplastic reaction with adherence to the third and fourth portions of the duodenum and the IVC. A retroperitoneal approach is recommended for repair (if known preoperatively).

○ **What are the anatomic criteria for endovascular AAA repair?**

Infrarenal neck: length 15 mm or greater, diameter 30 mm or less, and anterior angulation less than 60 degrees

Landing zone: ability to fixate distally proximal to at least one internal iliac artery

Common femoral and external iliac artery diameters—at least 7 mm

Relative contraindications: severely calcified iliac arteries and severely tortuous iliac arteries

○ **What are the classifications of endoleak for endovascular AAA repair?**

Type I—leak around the proximal or distal fixation sites

Type II—filling of the aneurysm sac by backbleeding aortic side branches (IMA, internal iliacs, and lumbar)

Type III—leak between device components

Type IV—defects in graft material (porosity)

○ **Which endoleaks are treated aggressively and which are initially observed?**

Type I and III endoleaks are aggressively treated, ideally by endovascular means (additional stent graft components and fixation site angioplasty/stent). Type II endoleaks most often will thrombose and are not reintervened on unless AAA sac growth is observed.

○ **A type II endoleak is noted on a 1-month post-EVAR CT scan from the IMA. AAA size is unchanged vs. the preoperative scan. What is the treatment?**

Observation with repeat serial CT scans.

○ **What is the most common cause of cerebral ischemia?**

Arterioarterial emboli.

○ **What is the appropriate treatment for infected prosthetic grafts?**

Antibiotics, removal of the prosthesis, and re-establishment of vascular continuity through a field outside of the infection.

○ **Which trauma patients are at the highest risk of DVT?**

Spinal cord injured and blunt head trauma with neurological deficit.

○ **What are the indications for an IVC filter?**

PE despite therapeutic anticoagulation, DVT in a patient with firm contraindication to anticoagulation, free floating iliofemoral thrombus, periprocedural for iliofemoral thrombectomy or thrombolysis, and very-high-risk patients for DVT with a contraindication to anticoagulation (joint replacement, pelvic trauma/surgery, and trauma with neuro deficits).

- **What are the contraindications to thrombolytic therapy?**  
Major surgery within previous 10 days, CVA or TIA in previous 6 months, brain tumor/AV malformation, uncontrolled hypertension, and recent GI bleed.
- **What is the anticoagulant of choice in patients with suspicion for heparin-induced thrombocytopenia (falling platelets and possible thrombotic complications with recent heparin use)?**  
Direct thrombin inhibitors (argatroban, lepirudin, and hirudin) or factor Xa inhibitors (fondaparinux) both of which contain no heparin molecules.
- **What should be done for a patient who awakens with a new ipsilateral neurologic deficit following CEA?**  
Immediate bedside duplex; if duplex is not available immediately to rule out carotid thrombosis then emergent re-exploration.
- **Which is the most common CN injured in CEA?**  
Vagus.
- **A young woman presents to your office and has HTN and carries the diagnosis of FMD based on a “string of bead”-appearing right renal artery. Upon angiogram you see the lesion is in the right renal artery (most common location). What are the surgical treatment options?**  
Angioplasty is first line with bypass reserved for refractory lesions.
- **What noninvasive tests are used to assess the severity of claudication?**  
Resting segmental pressures and pulse-volume recordings may demonstrate occlusive disease. A graded-treadmill protocol will quantify the distance the patient can walk and demonstrate the typical pressure drop at the ankle following exercise.
- **Does TIPS procedure increase the rate of encephalopathy?**  
Yes, it approaches 25%.
- **What is Pagett–Schroetter syndrome?**  
Axillosubclavian venous thrombosis secondary to thoracic outlet syndrome.
- **What is the best method to evaluate whether a toe amputation in a diabetic patient will heal?**  
Measurement of toe pressures.
- **What is the appropriate treatment for patients with postphlebotic syndrome (chronic venous insufficiency after DVT from secondary valvular insufficiency)?**  
Compression of the lower extremity with stockings of a prescribed pressure, usually 20–40 mm Hg. For patients with ulcerations, medicated wraps, such as the Una boot, are used until healing occurs. For those who do not heal, ablation of the superficial saphenous vein can enhance deep venous circulation.

○ **What are the hallmarks of venous stasis ulceration?**

Superficial ulceration with associated surrounding skin bronzing from hemosiderin (destroyed RBC) deposition. Location is classically above the medial malleolus, and incompetence of the posterior arch vein is the leading inducer. Initial treatment is PRN debridement, compression therapy, keeping the wounds moist, and leg elevation.

○ **When should lower extremity valvuloplasty or valve replacement be considered?**

Persistent severe venous reflux after ablation of the superficial system refractory to compression and elevation.

○ **Name some features of Buerger's disease.**

Smokers, involvement of vessels distal to the elbow and knee joints, no coexisting connective tissue disease, 80% male, smoking cessation initial treatment in absence of gangrene, and corkscrew collaterals on angiography.

○ **What is the natural history of untreated popliteal artery aneurysms?**

It tends to thrombose acutely or be a source for distal emboli and cause limb-threatening ischemia.

○ **What is the relationship of a popliteal aneurysm to an AAA?**

30% to 40% of patients with a unilateral popliteal aneurysm may have an AAA; 50% have a contralateral popliteal aneurysm.

○ **3 days after an AAA repair your patient has bloody diarrhea. What test should you perform?**

Initial Hb; then follow with sigmoidoscopy to evaluate for ischemic colon. This occurs secondary to loss of IMA. Any evidence of transmural colon necrosis mandates colon resection.

○ **Your patient complains of claudication; what initial surgery is most beneficial?**

None. Lifestyle modification such as exercise, cessation of smoking, lipid profile optimization, and cilostazol are the initial treatments. Only 15% of patients with claudication will ever go on to develop limb-threatening ischemia if "left alone."

○ **What is the mechanism of renovascular hypertension?**

The renal juxtaglomerular apparatus (JGA), through the renin–angiotensin system, seeks to maintain a normal arterial pressure at the JGA. Stenotic arterial lesions proximal to the kidney cause the JGA to secrete renin, which, through the angiotensin cascade, raises the central pressure above normal and, therefore, the pressure at the JGA (beyond the stenosis) rises toward normal. Angiotensin also results in aldosterone release, which subsequently induces fluid retention via sodium resorption in the renal tubules.

○ **What is the thoracic outlet?**

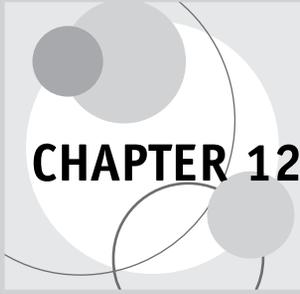
The thoracic outlet is an anatomic structure formed by the first rib, clavicle, and scalene muscles through which pass the brachial plexus, subclavian artery, and subclavian vein. The nerves and artery are posterior to the vein and separated by the anterior scalene muscle.

○ **What is thoracic outlet syndrome?**

Anything that narrows the outlet, such as muscular hypertrophy, fibrous tissue, cervical rib, scar tissue, or fracture callus, can impinge on one or more of the structures within the thoracic outlet and cause symptoms.

- **What is Virchow's triad?**  
Stasis, endothelial cell injury, and a hypercoagulable state. This predisposes to DVT.
- **Which patients are at the greatest risk of contrast-induced nephropathy?**  
Diabetes and baseline renal insufficiency.
- **T/F: Acetylcystine, sodium bicarb, fenoldopam (dopa agonists), steroids, and Lasix all have proven benefit in preventing contrast-induced nephropathy.**  
False. Preoperative hydration is the best preventative measure. In addition, sodium bicarbonate infusion perioperatively for patients with baseline renal insufficiency is protective. Data on acetylcystine are conflicting, yet there is no morbidity associated with the treatment. Lasix and dopamine agonists have no proven benefit.
- **How should new-onset neurologic deficit 90 minutes post CEA on the side opposite the operation be managed?**  
Re-exploration of the ICA because of a high probability of in situ thrombosis.
- **What patients are at increased risk of DVT?**  
Those with hypercoagulable body chemistries, previous DVT, lower extremity trauma, orthopedic surgery, major pelvic operations, immobility, acute MI, CHF, and malignancies and those taking oral contraceptives, especially if they smoke.
- **What are the effective prophylactic measures for DVT?**  
Coumadin, unfractionated heparin, low-molecular-weight heparins, dextran, antiplatelet drugs such as aspirin or ticlid, and sequential venous compression stockings (SCDS).
- **What is Charcot foot in the diabetic patient?**  
Inflammatory osteoarthropathy in the tarsal bones resulting in collapsed plantar arch.
- **T/F: Patients with an above-the-knee amputation (AKA) expend twice the energy to ambulate as those with a below-the-knee (BKA) amputation.**  
True.
- **What are the general classes of amputation?**  
The standard or conventional amputation, the osteomyoplastic or myodesis amputation, and the provisional or open (guillotine) amputation.
- **What is the operative mortality for amputations performed for trauma, isolated tumor, or infection?**  
Less than 3%.
- **What is involved in proper postoperative care following amputation?**  
Compression dressing followed by elastic dressings to avoid stump edema, splinting of the stump, exercise, proper positioning, and early rehabilitation.

- What is the treatment of choice when infection compromises the plantar skin flap of a potential transmetatarsal amputation?**  
A midtarsal (Chopart's) amputation.
- What are the major functional advantages of a BKA over an AKA?**  
A BKA provides the ability for a more functional prosthesis, easier ambulation, decreased energy expenditure, and decreased incidence of phantom pain.
- T/F: The talus is preserved in a Syme amputation.**  
False.
- T/F: Ischemic rigor of the calf muscles is a contraindication to BKA.**  
True.
- What are the disadvantages of knee disarticulation?**  
The end of the stump is bulky and has bony prominences that make prosthesis fitting more difficult.
- What is the most critical aspect of a lower extremity prosthesis?**  
A properly fitting and comfortable socket across which residual limb forces are transmitted.
- What is the most common indication for an upper extremity amputation?**  
Trauma.
- T/F: In digital phalanx amputations, the volar flap should be longer than the dorsal flap.**  
True.



## CHAPTER 12

# Thoracic and Cardiac Surgery Pearls

- **T/F: At the level of the carina, the pulmonary arteries lie anterior to the mainstem bronchi and posterior to the aortic arch.**  
True.
- **When performing a posterolateral thoracotomy, what chest wall muscles are usually transected?**  
The latissimus dorsi and serratus anterior.
- **What laboratory values suggest that a pleural effusion is an exudate?**  
Pleural fluid/serum protein ratio greater than 0.5 and pleural fluid/serum LDH ratio greater than 0.6.
- **What is the most common etiology of a spontaneous pneumothorax?**  
Rupture of a pulmonary bleb.
- **What is the treatment for traumatic hemothorax?**  
Chest tube drainage. If a persistent bloody effusion is present refractory to tube drainage then VATS/decortication is indicated to avoid lung encasement/atelectasis.
- **What is the treatment for empyema at the organized phase?**  
VATS decortication.
- **At what level do the vena cava, esophagus, thoracic duct, and aorta cross the diaphragm?**  
Vena cava—T8  
Esophagus—T10  
Aorta + thoracic duct—12
- **Which protozoa is responsible for a diffuse interstitial pneumonitis in immunocompromised patients?**  
*Pneumocystis carinii*.
- **What are the highest cardiac risk variables for surgical patients in the Eagle criteria?**  
Emergent major operation, congestive heart failure (CHF), recent MI, major vascular or aortic surgery, cardiac valvular disease, abnormal cardiac stress test, prolonged surgery with hemodynamic shifts.

○ **What is the standard therapy for a lung abscess?**

Systemic antibiotics and bronchoscopy to remove any foreign body and to exclude endobronchial tumor or obstruction. CT-guided drainage if failure to respond rapidly to ABX.

○ **What is the most common form of non-small-cell lung cancer in the United States?**

Adenocarcinoma.

○ **What is the diagnostic standard for a solitary speculated new lung mass in a smoker?**

Resection. Consider a preoperative PET scan to rule out metastasis. There is no role for CT-guided biopsy in an acceptable risk surgical patient.

○ **Name some features of small cell lung cancer.**

Associated with smoking in 90% of cases. Metastasis present at the time of presentation in 67%. Neuroendocrine cellular origin with ACTH- and ADH-secreting paraneoplastic syndrome association.

○ **What is the most common benign tumor of the lung?**

Hamartoma.

○ **What are the most common primary malignant tumors of the chest wall?**

Myeloma and chondrosarcoma.

○ **What is the most common benign tumor of the chest wall?**

Osteochondroma.

○ **Which lung neoplasm, in young to middle-aged patients, is often centrally located, is usually endobronchial, and may present with obstructive symptoms or hemoptysis?**

Bronchopulmonary carcinoid.

○ **Prior to thoracotomy PFTs are ordered on patients. The patients need certain FEV1's to ensure good outcome after procedure. What is the prethoracotomy PFT for pneumonectomy/lobectomy/wedge?**

Pneumonectomy—2L

Lobectomy—1L

○ **What is the feared complication when a patient develops chest pain, hemoptysis, and fever after right upper lobectomy and a right-sided pulmonary consolidation?**

Right middle lobe torsion. Bronchoscopy can confirm the diagnosis with a stenotic RML bronchus. Treatment is surgical detorsion and resection of any devitalized tissue.

○ **Which lung cell histology is associated with hypercalcemia?**

Squamous cell carcinoma when the paraneoplastic syndrome with elevated PTH occurs.

- **When is a lung cancer unresectable?**  
 N3—contralateral or subclavian or scalene involvement with respect to lymph nodes.  
 T4—mediastinal, heart, great vessel, esophagus, trachea, vertebral, or effusion (midline major structures).  
 Resectable—chest wall, pericardium, and diaphragm invasion.
- **What are the laboratory findings in a pleural exudate (empyema)?**  
 Low glucose, high WBC, low pH, and bacteria on Gram stain.
- **What preoperative arterial blood gas (ABG) values imply an increased risk of respiratory insufficiency following pulmonary resection?**  
 PCO<sub>2</sub> greater than 45 torr and PaO<sub>2</sub> less than 50 torr.
- **T/F: A 60-year-old male with a preoperative FEV<sub>1</sub> of 1.8 and a pulmonary ventilation–perfusion (V/Q) scan showing 60% function from the left lung is not at increased risk of postoperative respiratory insufficiency following left pneumonectomy.**  
 True.
- **What percentage of patients diagnosed with non-small-cell lung cancer have the potential to undergo surgical resection for cure?**  
 30%.
- **T/F: Mediastinal lymph nodes that appear larger than 1.0 cm in size on CT scan confer N2 (stage IIIA) disease, precluding curative resection of non-small-cell lung cancer.**  
 False.
- **What type of tumor should one think of when a patient presents with ptosis, miosis, and anhidrosis, and ulnar nerve injury findings?**  
 Pancoast, invasion of the sympathetic chain/stellate ganglion inducing Horner's syndrome.
- **What is the treatment of choice for an isolated brain metastasis that otherwise appears to have stage I non-small-cell lung cancer?**  
 Resection of the isolated brain metastasis followed by whole brain irradiation and resection of the primary lung tumor.
- **What stage disease does the above patient have?**  
 Stage IV.
- **What is the appropriate treatment for a superior sulcus (Pancoast) tumor?**  
 Radiation followed by surgical resection or a definitive dose (60–65 Gy) of radiation.
- **What is the 5-year survival of patients undergoing complete resection of a stage IA (T1N0M0) non-small-cell lung cancer?**  
 70%.

- **T/F: Postoperative radiation therapy for non-small-cell lung cancer improves patient survival.**  
False. However, it has been shown to decrease the rate of local recurrence in patients with completely resected stages II and III squamous cell carcinoma of the lung.
- **When is a pneumonectomy required for the resection of non-small-cell lung cancer?**  
When there is tumor invasion of the proximal mainstem bronchus or pulmonary arteries or veins in patients without other contraindications to resection.
- **Does resecting thymus in myasthenia improve symptoms?**  
Yes. 90% of patients improve. 10% of patients with myasthenia gravis (MG) have a thymoma; however, one does not need a thymoma for symptoms of MG to improve.
- **What is the preferred technique for resection of metastases to the lung?**  
Wedge resection.
- **T/F: There is a greater survival benefit to lobectomy over segmentectomy and wedge resection in the treatment of a peripheral T1N0M0 (stage IA) non-small-cell lung cancer.**  
True. Lobectomy improves 5-year survival and reduces the incidence of locoregional recurrence from 15% to 5%.
- **What is the appropriate treatment of a right upper lobe non-small-cell lung cancer involving the orifice of the right upper lobe but not extending into the bronchus intermedius or involving regional lymph nodes?**  
Right upper lobectomy with anastomosis of the bronchus intermedius to the mainstem bronchus.
- **T/F: Non-small-cell lung cancer that invades the parietal pleura or chest wall is not resectable for cure and should be treated with radiation.**  
False.
- **What is the preferred therapy for patients with superior vena cava syndrome caused by non-small-cell lung cancer?**  
Radiation therapy.
- **Which fungus has a propensity to colonize a pre-existing pulmonary cavity?**  
*Aspergillus*.
- **What are the current indications for surgical resection of pulmonary tuberculosis?**  
Persistent or recurrent infection despite adequate multidrug therapy, massive or recurrent hemoptysis, inability to exclude carcinoma, and bronchopleural fistula unresponsive to tube thoracostomy.
- **What is the best initial method for localizing hemoptysis in a patient who is actively bleeding?**  
Bronchoscopy.

- **What is the definitive treatment for a persistent bronchocutaneous fistula 6 weeks after penetrating trauma?**  
Control of associated pleural infection and muscle flap coverage of the involved bronchus.
- **Is there a survival advantage for pulmonary resection in isolated colorectal CA metastasis proven by PET scan?**  
Yes, 5-year survival rates up to 40% are observed.
- **What is the treatment for malignant effusion with shortness of breath?**  
VATS with pleurodesis. Other less efficacious palliations are repeated thoracentesis, chest tube drainage, and percutaneous chemical pleurodesis with talc or bleomycin.
- **What type of bronchopulmonary sequestration has a distinct pleural investment, no communication with the tracheobronchial tree, an arterial supply derived from small systemic arteries, and systemic venous drainage?**  
Extralobar sequestration. Intralobar sequestration has pulmonary venous return and a bronchial attachment to the pulmonary tree. Recurrent pneumonia is the most common presentation for intralobar sequestration and asymptomatic lung mass the most common for extralobar. Treatment is surgical resection with attention to anomalous pulmonary artery origins.
- **What is the initial bedside therapy for an acute bronchopleural fistula following pneumonectomy?**  
Turn the patient operated side down to prevent aspiration of pleural fluid into the contralateral lung and tube thoracostomy.
- **What fungus produces a granulomatous tissue reaction and can cause the triad of pneumonitis, erythema nodosum, and arthralgias known as valley fever?**  
Coccidioidomycosis.
- **Up to 50% of pulmonary arteriovenous malformations are associated with what inherited disorder?**  
Hereditary hemorrhagic telangiectasia (Osler–Weber–Rendu disease).
- **A chest X-ray of a smoker reveals a popcorn lesion. This slow growing tumor is needle biopsied (sensitive). What is the diagnosis?**  
Hamartoma.
- **At what rate will the intrapleural air of a pneumothorax be reabsorbed if left untreated?**  
1.25% per day.
- **What are the disadvantages associated with treating a pneumothorax with catheter aspiration alone?**  
It is difficult to evacuate the entire pneumothorax, and it is not applicable in patients with an active air leak.
- **Through what interspace should a chest tube be inserted for treatment of a pneumothorax?**  
The fourth or fifth intercostal space.

- **What complications are seen from chest tubes placed too low on the chest wall?**  
Injury to the diaphragm or abdominal viscera.
- **What is the most common type of pleural effusion in infants?**  
Chylothorax.
- **What are the indications for surgical treatment of a chylothorax?**  
Failure of nonoperative therapy after 7 to 14 days, continued drainage of more than 1500 mL/d in adults, persistent electrolyte abnormalities, and/or malnutrition.
- **T/F: Ligation of the thoracic duct at the diaphragmatic hiatus can be performed without significant lymphatic/edema side effects.**  
True.
- **If during the operative treatment of a chylothorax, the site of leakage cannot be identified, what definitive procedure should be performed?**  
Ligation of the thoracic duct at the diaphragm.
- **What is the most common location of the thoracic duct at the level of the diaphragm?**  
Between the aorta and the vertebral bodies.
- **What volume of pleural fluid is needed to obliterate the costophrenic angle on chest X-ray?**  
250 mL.
- **A man receives a stab to his lower neck/chest at the junction of L IJ and subclavian. A chest tube is placed, revealing milky white fluid. What is the treatment of this injury?**  
Chest tube drainage and NPO × 2 weeks. If this does not resolve then thoracotomy and thoracic duct ligation.
- **Where does the thoracic duct enter the chest?**  
Enters on right at T12 and traverses to the right of the aorta. It crosses the midline to join at IJ/subclavian junction.
- **What is the most common metastatic tumor to produce a malignant pleural effusion?**  
Breast cancer.
- **What is the treatment for recurrent spontaneous pneumothorax?**  
VATS with pleurodesis.
- **What are the clinical features of traumatic tracheobronchial disruption?**  
Persistent pneumothorax despite good functioning chest tubes. Diagnosis and extent of injury are confirmed with bronchoscopy. Selective intubation of the opposite bronchus can temporize the pneumothorax.

- **What is the initial management of refractory malignant pleural effusions not relieved by chemotherapy or radiation of the primary tumor?**  
Thoracostomy tube drainage followed by talc or chemical pleurodesis.
- **A tall thin male presents with SOB. A CXR reveals a pneumothorax. What are the chances it will recur? And what should be done on recurrence?**  
50% of spontaneous pneumothorax will recur. Surgery is indicated for persistent air leak or recurrence - thoracoscopy with pleurodesis and prn parenchymal stapling.
- **When should patients with MG undergo thymectomy?**  
As soon as possible after the development of generalized weakness.
- **What clinical syndromes are associated with thymoma?**  
MG, Eaton–Lambert syndrome, red cell hypoplasia, and Sjogren’s syndrome.
- **When is lung decortication indicated in the treatment of empyema?**  
When a residual undrained space prevents complete lung re-expansion, in spite of less invasive measures (i.e., tube thoracostomy with or without fibrinolytic enzymes or thoracoscopic debridement).
- **What options remain for a persistent empyema cavity that cannot be sterilized by open drainage or irrigation?**  
Decortication, obliteration of the pleural space using muscle flaps or omentum, thoracoplasty, or the Claggett procedure.
- **T/F: Pleural pneumonectomy for malignant mesothelioma has been shown to increase overall patient survival when compared to chemotherapy or radiation therapy.**  
False.
- **What is the diagnostic paradigm and treatment for a traumatic chylothorax?**  
Diagnosis is confirmed upon fluid analysis of thoracostomy drainage. Fluid has high chylomycron and TG levels with a milky, odorless fluid. Treat for 10 to 14 days with chest tube drainage, NPO, and TPN. If output is still high (>500 cc/d) exploration with duct ligation at the site of injury is indicated. Isosulfan blue can help identify leak site. If no leak site is found then ligation of the duct at the aortic hiatus is indicated. For large chylous effusions refractory to chest tube drainage, decortication is indicated. In cases of tension chylothorax after pneumonectomy, emergent drainage with surgical thoracic duct ligation is indicated.
- **What is the treatment for persistent chylothorax with stage IV malignancy?**  
Cases with advanced malignancy can be treated with pleuroperitoneal shunt. Radiation can be further palliative.
- **What conditions are consistently associated with pectus excavatum?**  
Marfan’s syndrome, mitral valve prolapse, and scoliosis.

- **What syndrome is associated with congenital pulmonary arteriovenous malformation?**  
Osler–Weber–Rendu disease with a pulmonary arterial to venous connection without a capillary interface.
- **What pulmonary function parameters are significantly improved following pectus excavatum repair?**  
Total lung capacity (TLC) and maximal voluntary ventilation (MVV).
- **What are the preferred materials for reconstructing skeletal defects following chest wall resection?**  
2-mm-thick polytetrafluoroethylene or a customized solid plate made of polypropylene mesh and methylmethacrylate.
- **What is the most common cause of SVC syndrome shortly after right pneumonectomy?**  
Cardiac herniation secondary to atrial torsion through a pericardial defect. Hypotension, tachycardia, distended neck veins, and a displaced heart on CXR are the hallmarks. Re-exploration and atrial detorsion with pericardial repair is required.
- **What is the differential diagnosis for anterior mediastinal masses?**  
Thyroid, lymphoma, teratoma, thymoma, and Morgagni (anterior) diaphragmatic hernia.
- **What is the differential diagnosis for middle mediastinal masses?**  
Bronchogenic cysts, atrial myxoma, esophageal leiomyoma/carcinoma, and adenopathy.
- **What is the differential diagnosis for posterior mediastinal masses?**  
Neurogenic tumor, thoracic aneurysm, and vertebral tumor.
- **What is the surgical approach for a symptomatic substernal goiter?**  
Cervical incision. The thyroid tissue is typically easily extracted from the substernal space.
- **After EGD, a patient displays neck crepitus. Gastrograffin swallow examination reveals a small (3 mm) cervical esophageal perforation. What is the initial management?**  
NPO, TPN, and observation with repeat swallow study in 5 days if no signs of localized sepsis develop.
- **After EGD with biopsy of a malignant-appearing mid-esophageal tumor, a patient develops chest pain with a new right pleural effusion. Swallow study confirms esophageal perforation. There are no clinical signs of sepsis. What is the recommended treatment?**  
Esophagectomy.
- **After EGD with mid-esophageal biopsy for benign disease, a patient develops chest pain with a new right pleural effusion. Swallow study displays a mid-esophageal tear with free passage of gastrograffin into the right hemithorax. What is the recommended treatment?**  
Right thoracotomy with esophageal repair complemented by intercostals muscle flap coverage of the defect.

- **After EGD with mid-esophageal biopsy for benign disease, a patient develops chest pain. Swallow study displays a small perforation of the esophagus with drainage of contrast back into the esophagus. There are no clinical signs of sepsis. What is the recommended treatment?**  
NPO, TPN, and observation with repeat swallow study in 5 days if no signs of localized sepsis develop.
- **When postoperative infection is excluded, what etiology is responsible for approximately 90% of cases of acute mediastinitis?**  
Esophageal perforation.
- **What is the treatment for descending necrotizing mediastinitis?**  
Broad-spectrum antibiotics and wide surgical drainage, usually requiring neck and transthoracic drainage, with frequent re-evaluation for possible undrained collections.
- **Why is it important to obtain a tissue diagnosis prior to treating superior vena cava syndrome in all patients?**  
High-dose radiation therapy may alter the tumor's histology and prevent a subsequent accurate diagnosis. It is also important to identify benign conditions and tumors that may respond to chemotherapy or radiation therapy.
- **A thin man with lung cancer presents with facial swelling and JVD and SOB. What is the treatment?**  
SVC syndrome—most commonly caused by lung cancer. It is treated initially by radiation therapy.
- **Through what type of incision are masses located in the middle or posterior mediastinum best resected?**  
Through a posterolateral thoracotomy.
- **What is the most commonly injured cardiac chamber in blunt cardiac trauma?**  
Right ventricle, with right bundle branch block being the most commonly encountered arrhythmia.
- **What surgical technique is useful for evaluation and biopsy of a mass of the middle mediastinum?**  
Mediastinoscopy.
- **Differentiate between benign and malignant germ cell tumors of the mediastinum.**  
Benign tumors are mature teratomas and dermoid cysts; they secrete no tumor markers and have well-differentiated tissues. Malignant tumors include seminomas and nonseminomatous germ cell tumors. Seminomas secrete beta HCG and are chemo/XRT sensitive. Nonseminomatous germ cell tumors secrete AFT, are the most aggressive, and have a less predictable response to chemo/XRT—resection, when anatomically feasible, is recommended.
- **What is the treatment of choice for patients with a thymoma?**  
Complete surgical excision of the thymus with postoperative radiation therapy for invasive tumors (stage II or III).

- **What is the outcome associated with empiric thymectomy for MG?**  
Significant improvement in symptoms in 50% to 90%. Complete remission in 35%. Improved complete remission rates if a thymoma also present. Reduced improved symptoms with increased patient age.
- **What factors is modern differentiation between benign and malignant thymic tumors based on?**  
Presence of gross invasion of adjacent structures at the time of surgery, presence of metastases, and microscopic evidence of capsular invasion.
- **Describe the clinical features of mediastinal lymphoma.**  
Multiple discrete masses are seen on CT scan in conjunction with systemic symptoms of malaise, fevers, and sweats. Additional lymphoma outside of the mediastinum is typically observed when sought.
- **T/F: Anterosuperior mediastinal masses in adults are most often malignant.**  
True.
- **T/F: Enteric mediastinal cysts are not routinely excised.**  
False.
- **What percentage of adults have a patent foramen ovale?**  
10%.
- **When do intracardiac shunts become physiologically important?**  
When the pulmonary blood flow exceeds 1.5–2 times the systemic flow.
- **Why is a paradoxical embolus able to cause septic end-organ disease?**  
An infected venous thrombus can enter the arterial circulation via a right-to-left intracardiac shunt and be sent distal to affect end organs.
- **What type of intracardiac shunt is most frequently associated with pulmonary hypertension?**  
A ventricular septal defect (VSD).
- **What is the diagnostic modality of choice to detect pericardial effusion/tamponade?**  
Ultrasound-based studies (fast scan in trauma/echocardiogram in other settings).
- **What radiographic finding is associated with transposition of the great vessels?**  
An egg-shaped heart.
- **A new cardiac murmur is detected after blunt trauma. What should be the initial diagnostic test?**  
Echocardiogram. If a traumatic VSD is discovered operative repair is the standard.
- **What are the pathophysiologic consequences of a left-to-right intracardiac shunt?**  
Diastolic overloading, cardiac dilatation, and ventricular enlargement.

- **T/F: CHF usually develops in children with a right-to-left intracardiac shunt.**  
False.
- **What are the management principles for chronic atrial fibrillation?**  
Rate control with B-blockers/digitalis. Anticoagulation. Electrical cardioversion is appropriate for acute atrial fibrillation, but chronic atrial fibrillation conversion requires cryoablation, radiofrequency ablation, or the cox-maze surgical conduction blockade procedure.
- **What are the two types of aortic dissection and their management?**  
Type A—proximal to L subclavian—surgical.  
Type B—distal to L subclavian—medical with aggressive HTN control. Surgery for aneurysmal enlargement, persistent back pain, and visceral/renal/lower extremity compromise.
- **What factors affect the degree of cyanosis in patients with a right-to-left intracardiac shunt?**  
The severity of anoxia and the concentration of blood hemoglobin.
- **Left atrial enlargement is associated with which congenital heart defects?**  
Mitral insufficiency, patent ductus arteriosus (PDA), and VSD.
- **What are the most common congenital aortic arch anomalies?**  
Double aortic arch.  
Coarctation of the aorta: rib notching is seen on CXR, upper extremity BP variation when preductal, patent PDA if preductal, lower B in legs vs. right arm, and systolic murmur, and intimal hyperplasia is the histology.  
PDA: machine-like murmur. Persistent canal between left pulmonary artery and descending aorta just distal to the left subclavian artery. Typically closes after birth. Persistence can induce CHF. Indomethacin can precipitate closure.
- **What auscultatory finding is associated with PDA?**  
A widely split and fixed S2.
- **Which congenital heart defects are associated with congenital aortic stenosis?**  
PDA, VSD, coarctation of the aorta, and mitral valve defects.
- **Splinter hemorrhages, Osler's nodes, Janeway lesions, petechiae, and Roth's spots can be indications of what process?**  
Infective endocarditis.
- **What percentage of patients with infective endocarditis display peripheral manifestations of the disease?**  
50%.
- **How is bacterial endocarditis diagnosed?**  
Evidence of valvular vegetations on echocardiogram combined with a positive blood culture.

- **If patients have not yet received antibiotics, what percentage of culture-negative endocarditis is expected?**  
Less than 5% (95% sensitive).
- **When does the intra-aortic balloon pump inflate?**  
Inflates during diastol before the T wave and deflates with p wave.
- **How does intra-arterial balloon pump (IABP) assist cardiac output?**  
It increases coronary blood flow and reduces afterload by inflating during diastole.
- **What is the sensitivity of a two-dimensional transesophageal echocardiogram for detecting vegetations?**  
95%.
- **Who is at high risk of developing endocarditis?**  
Patients with prosthetic heart valves, previous incidents of endocarditis, complex congenital heart disease, intravenous drug use, and surgically devised systemic pulmonary shunts.
- **What are the patency rates of IMA and GSV cardiac bypass grafts?**  
IMA—95% 20-year patency; GSV—80% 5-year patency.
- **What percentage of prosthetic valve-associated infective endocarditis do fungi cause?**  
15%.
- **What is the prognosis for patients with a complete atrioventricular canal?**  
Cardiac enlargement and severe cardiac failure in the first few years of life with a mortality rate of 5% to 15%.
- **What concomitant cardiac defect is required for survival for patients with total anomalous pulmonary venous drainage?**  
A patent atrial septal defect (ASD).
- **T/F: Partial anomalous pulmonary venous drainage usually arises from the right lung.**  
True.
- **Where do left anomalous pulmonary veins usually enter the systemic circulation?**  
Through a persistent left subclavian vein.
- **What is the palliative treatment for infants with total anomalous venous drainage until definitive surgical correction can be performed?**  
Balloon septoplasty.
- **What is the appropriate treatment for patients with infective endocarditis?**  
Intravenous antibiotics for 3 to 6 weeks and heparin/Coumadin. Close follow-up is necessary and the patient should have a series of two separate negative blood cultures to demonstrate resolution of the condition.

- **What ECG changes are associated with pericarditis?**  
ST elevation in all leads except V1 and VR. PR segment depression may also be present.
- **What is the treatment for acute pericarditis?**  
Treatment of the underlying problem and anti-inflammatory agents. Steroids and narcotic analgesics may be required.
- **Postpericardiotomy syndrome occurs in what percentage of patients who have undergone pericardiotomy?**  
10% to 30%.
- **What are the clinical manifestations of the postpericardiotomy syndrome?**  
Fever, pericarditis, pleuritis, and a pericardial friction rub.
- **What signs and symptoms are associated with myocardial abscesses?**  
Low-grade fevers, chills, leukocytosis, conduction system abnormalities, nonspecific ECG changes, and signs and symptoms of acute MI.
- **What is the definitive treatment for a patient with an infected myxoma?**  
Surgical excision.
- **What is the risk of infection of a transvenous pacemaker in the first 3 years after insertion?**  
1% to 6%.
- **What risk factors are associated with pacemaker infections?**  
Diabetes, malignancy, skin disorders, malnutrition, anticoagulants, steroids, and immunosuppressive medications.
- **What complications are associated with infected endovascular leads?**  
Valvular endocarditis, infected mural thrombi, localized abscesses, and electrode perforation.
- **What organism is most commonly associated with late infections following pacemaker insertion?**  
*Staphylococcus epidermidis*.
- **What is the treatment for prosthetic vascular graft infections?**  
Removal of the graft and debridement of the surrounding tissue. Extra-anatomic bypass or amputation may be required.
- **What are the most important risk factors for line sepsis?**  
In-line devices, intravenous drugs and solutions, number of lumens, number of times each lumen is handled, and catheter placement.
- **What electrolyte abnormalities can precipitate torsades de point?**  
Low potassium, magnesium, or calcium.

- **When should a patient quit smoking to receive the most beneficial effect prior to undergoing thoracic surgery?**  
2 to 3 months prior to surgery.
- **What is the most common type of VSD?**  
Membranous septum defects.
- **What is the preferred approach for repair of most VSDs?**  
Transatrial.
- **What should the postlung resection FEV1 be prior to extubation?**  
Greater than 800 mL.
- **What is the most common congenital aortic arch anomaly?**  
Double aortic arch.
- **What is the most common complication associated with mediastinoscopy?**  
Hemorrhage.
- **What other common complications are associated with mediastinoscopy?**  
Pneumothorax, recurrent nerve injury, and obstruction of the innominate artery.
- **What are methods for lung separation?**  
Bronchial blocker, endobronchial intubation, and double-lumen endobronchial tube (DLT).
- **Which methods of lung separation can be used in children?**  
Endobronchial intubation or an endobronchial blocker.
- **What are the disadvantages of a bronchial blocker?**  
It is difficult to place, is easy to obstruct the upper lobes, and moves easily.
- **How can you aid blind placement of DLTs?**  
By confirming the position with a fiberoptic bronchoscope, by direct visualization by the surgeon once the chest is open, or on chest X-ray.
- **Why is a left-sided DLT more commonly used than a right-sided DLT?**  
The distance of the right upper lobe bronchus and right mainstem bronchus is 2.1 cm in females and 2.3 cm in males. The distance of the left upper lobe bronchus and the left mainstem bronchus is 5 cm in females and 5.3 cm in males. Thus, it is easier to obstruct the right upper lobe.
- **What serious complications could occur with malposition of a DLT?**  
Complete obstruction of the trachea and air trapping with resulting barotrauma and cardiac arrest, tracheal or bronchial tears, compression or displacement of a mediastinal mass, and possible rupture of a thoracic aneurysm.

- **What tidal volume and respiratory rate should be used with a DLT?**  
The tidal volume should be between 10 and 12 mL/kg and the respiratory rate should be adjusted to keep the PaCO<sub>2</sub> near 40 mm Hg.
- **What should the peak inspiratory pressure be after lobectomy, pneumonectomy, or lung transplant?**  
Less than 30 mm Hg.
- **What are the possible complications of excessive peak inspiratory pressure?**  
Injury to the bronchial stump or suture line.
- **What is the most common cause of arrhythmias and hypotension during thoracic operations?**  
Pericardial manipulation.
- **What is hypoxic pulmonary vasoconstriction (HPV)?**  
It is the pulmonary response to hypoxemia (i.e., if there is an area in the lung that is adequately oxygenated, the pulmonary vasculature will vasoconstrict in that area to divert blood to a more oxygenated area).
- **What is the pathophysiology of Eisenmenger's syndrome?**  
Pulmonary vascular resistance (PVR) increasing to levels greater than systemic vascular resistance (SVR), resulting in reversal of the original left-to-right shunt and cyanosis.
- **What is the main contraindication to surgical closure of a PDA?**  
Cyanosis.
- **What is the most frequently used palliative procedure for patients with tetralogy of Fallot?**  
A subclavian artery-to-pulmonary artery (Blalock–Taussig) shunt.
- **What is the treatment of choice for patients with transposition of the great vessels?**  
The arterial switch procedure.
- **What are the predictors of postoperative ventilatory difficulties after trans-sternal thymectomy for patients with MG?**  
Duration of disease greater than 6 years, history of chronic respiratory disease not related to MG, pyridostigmine dosage greater than 750 mg/d, and preoperative vital capacity less than 2.9 L.
- **A 24-year-old male with a gunshot wound to the right chest is hemodynamically unstable. The entrance wound is in the second intercostal space, 1 cm lateral to the sternal border. Aortography reveals an injury of the distal innominate artery. What is the most appropriate surgical approach?**  
Median sternotomy with supraclavicular extension.
- **What patients have improved longevity with coronary artery bypass grafts (CABG)?**  
Those with unstable angina, left main coronary artery disease (CAD), and 2- or 3-vessel disease.

- **What is the main contraindication to CABG?**  
Refractory CHF with pulmonary hypertension.
- **What percentage of patients have fewer episodes of angina following CABG?**  
90%. Complete resolution is seen in approximately two-thirds of patients.
- **What is the appropriate therapy for patients with refractory angina?**  
Emergent percutaneous transluminal coronary angioplasty (PTCA) or CABG.
- **A 51-year-old male underwent CABG 5 hours ago and suddenly becomes hypotensive with a cardiac index (CI) of 1.5 L/min, central venous pressure (CVP) of 20 mm Hg, and left atrial pressure of 24 mm Hg, and has significantly increased drainage from his mediastinal thoracostomy tube. What is the treatment of choice?**  
Immediate mediastinal re-exploration.
- **T/F: Patients with refractory angina and left main CAD should be treated with PTCA.**  
False. CABG for left main disease.
- **What are the most common causes of aortic stenosis in adults?**  
Rheumatic fever or a long bicuspid valve.
- **What are the indications for valve replacement in patients with aortic stenosis?**  
Symptomatic patients, systolic pressure gradient greater than 50 mm Hg, valvular cross-sectional area less than 1 cm<sup>2</sup>, and serial X-ray evidence of rapid cardiac enlargement.
- **What are the typical symptoms of anterior circulation cerebrovascular ischemia?**  
Aphasia, contralateral weakness, or sensory change in the upper or lower extremities and contralateral facial droop.
- **What is the appropriate management for a neonate with hypoplastic left heart syndrome (HPHS)?**  
Prostaglandin infusion to maintain a patent PDA.
- **What clinical symptoms are most typical of vertebrobasilar ischemia?**  
Diplopia, dizziness, syncope, dysarthria, ataxia, and bilateral extremity sensory change or weakness.
- **What is the mortality rate for patients requiring permanent anticoagulation therapy?**  
1% to 2% per year.
- **Following a high-speed motor vehicle accident (MVA), evaluation reveals a widened mediastinum. What is the pathophysiology of the probable injury?**  
The ligamentum arteriosum tethers the undersurface of the aortic arch to the proximal left main pulmonary artery, at a point just distal to the left subclavian artery. Sudden deceleration causes shearing between the mobile aortic arch and the immobile descending aorta, resulting in aortic disruption.
- **What is the most common benign cardiac tumor?**  
Myxoma.

- **What is the most common cardiac tumor in infancy?**  
Rhabdomyoma.
- **What are the relative contraindications to the use of indomethacin for neonates with PDA?**  
Intracranial hemorrhage, nephritis, and enterocolitis.
- **What is the definition of a reversible ischemic neurologic deficit (RIND)?**  
Ischemic or embolic cerebral infarction resulting in neurologic deficits that last longer than 24 hours but resolve within 3 weeks.
- **What is the etiology of idiopathic hypertrophic subaortic stenosis (IHSS)?**  
A hypertrophic myopathy of the left ventricular outflow tract.
- **In performing repair of an ASD, there is poor decompression of the right heart despite achieving good bypass with bicaval cannulation. What is the most likely diagnosis?**  
A persistent left superior vena cava.
- **A 6-month-old presents with sweating and irritability while feeding. Chest X-ray demonstrates a markedly enlarged cardiac silhouette and echocardiogram reveals a dilated, poorly contractile left ventricle with moderate to severe mitral regurgitation. What is the most likely diagnosis?**  
Anomalous origin of the left coronary artery from the pulmonary artery.
- **T/F: Anomalous left coronary artery from the pulmonary artery is best treated by reimplantation of the coronary artery into the aorta.**  
True.
- **What congenital heart lesion is the most common cause of cyanosis presenting in the newborn period?**  
Transposition of the great vessels.
- **An 8-year-old child presents with cyanosis but is otherwise asymptomatic. Cardiac catheterization reveals the following:**

Site	Pressure (mm Hg)	Oxygen saturation (%)
Superior vena cava	5	61
Right atrium	5	62
Right ventricle	100/5	64
Pulmonary artery	100/60	67
Left atrium	8	98
Left ventricle	100/8	89
Aorta	100/70	82

**What is the most likely diagnosis?**

VSD with high PVR (Eisenmenger's syndrome).

**What are the indications for ventricular aneurysm resection?**

CHF, recurrent malignant ventricular arrhythmias, angina pectoris, and peripheral embolization.

**What is involved in the repair of an AV canal defect?**

Placing a patch to close the VSD, another patch to close the ASD, and division and resuspension of the common AV valve into a left-sided (corresponding to the mitral valve) and a right-sided (corresponding to the tricuspid valve) component.

**A 6-month-old with a VSD undergoes cardiac catheterization with the following findings:**

Site	Pressure (mm Hg)	Oxygen saturation (%)
Superior vena cava	5	65
Right atrium	5	66
Right ventricle	70/5	75
Pulmonary artery	65/20	90
Left atrium	7	98
Left ventricle	75/7	98
Aorta	75/40	98

**What is the degree of left to right shunt?**

4:1.  $(SaO_2 - SvO_2)/(SpvO_2 - SpaO_2)$ , where  $SaO_2$  is the systemic arterial oxygen saturation (aorta),  $SvO_2$  is the mixed venous oxygen saturation (superior vena cava),  $SpvO_2$  is the oxygen saturation in the pulmonary veins (left atrium), and  $SpaO_2$  is the oxygen saturation in the pulmonary artery.

**A 4-day-old infant presents with shock and severe acidosis. Echocardiogram demonstrates an interrupted aortic arch, type B. What is the next step in management?**

Continuous infusion of prostaglandin E1.

**What disorder is likely to accompany the patient in the question above?**

DiGeorge syndrome (thymic aplasia).

**A 9-month-old child has progressive cyanosis but is otherwise asymptomatic. Echocardiogram demonstrates tetralogy of Fallot. Complete repair is contemplated and cardiac catheterization is proposed. What is the most important information to be obtained from the catheterization?**

The coronary artery anatomy.

**What are the clinical characteristics of chronic constrictive pericarditis?**

Progressive edema, ascites, hepatomegaly, and exertional dyspnea.

- **What is the treatment of choice for patients with constrictive pericarditis?**  
Pericardiectomy.
- **At what age should the arterial switch procedure be performed for patients with transposition of the great vessels?**  
Usually at 1 to 2 weeks of age.
- **What are the indications for PTCA?**  
Acute evolving MI, critical coronary stenosis, stenotic vein bypass grafts, intraoperative dilatation of distal segmental lesions and distal bypass grafts, and patients with 1- or 2-vessel disease.
- **What is the embryological origin of an ostium secundum ASD?**  
A deficiency of the septum primum.
- **What is the appropriate treatment for critical aortic stenosis diagnosed in the neonate?**  
Balloon valvulotomy.
- **What auscultatory finding is associated with aortic insufficiency?**  
A decrescendo diastolic murmur. A systolic ejection murmur may also be heard.
- **What are the indication for use of an IABP?**  
Cardiac failure after cardiopulmonary bypass, refractory unstable angina, preoperative therapy for septal defects, arrhythmias, ventricular aneurysms, and cardiogenic shock.
- **An 8-year-old male is brought to the ER by his mother who states that he has been having chest pain. Physical examination reveals a systolic ejection murmur and a precordial thrill. Chest X-ray is normal. What is the treatment of choice?**  
Aortic valve replacement.
- **A 1-week-old female is brought to the ER by her parents because she is “turning blue.” The infant is clearly cyanotic and her stat chest X-ray reveals an egg-shaped heart. What test will confirm your diagnosis?**  
Echocardiography.
- **A 45-year-old female presents with angina and has a positive stress test. What is the next step in management?**  
Angiography.
- **What is the most common complication of ascending thoracic aorta aneurysms?**  
Aortic valve insufficiency.

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# Plastic and Reconstructive Surgery Pearls

- **What type of incision(s) should be used on skin overlying joints?**  
Oblique or transverse incisions.
- **What are the complications of excessive tension across a wound?**  
Delayed wound healing and a wide scar.
- **What is the definition of a free flap?**  
Transfer of an entire myocutaneous segment with a microvascular anastomosis from a native tissue bed artery to a large vein in the flap. This allows transfer of multiple tissues, and its viability is dependent on the anastomosis.
- **What is a Marjolin's ulcer?**  
Squamous cell carcinoma that develops in a chronic wound or ulceration. Erythematous discoloration and fungating appearance may be present. Treatment is wide excision. There is a high nodal metastasis rate (20%), so SLN Bx should be considered.
- **What is the difference between primary and secondary skin graft contraction?**  
Primary contraction refers to the immediate shrinkage that occurs after removal from the donor site. Secondary contraction is the phenomenon that occurs as the graft heals.
- **What is the most important factor in minimizing hyperpigmentation of skin grafts?**  
Protection from UV light for a full year postoperatively.
- **What are the indications for dermal overgrafting?**  
Unstable, depressed, or hypertrophied scars; unstable or hyperpigmented skin grafts; large pigmented nevi; radiation damage; and tattoos.
- **What is the appropriate ratio of the long and short axes for elliptical incisions?**  
4:1.
- **What complication will occur if the above ratio is not met?**  
A dog-ear deformity.

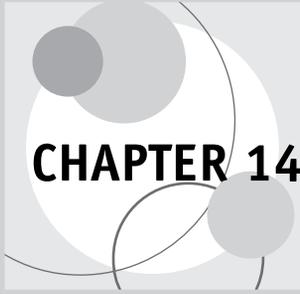
- **What is the single most reliable test of graft viability?**  
Examination by an experienced physician.
- **When is return of sensation after skin grafting considered maximal?**  
After 2 years.
- **How long can skin grafts be stored when banked in saline-soaked gauze sponges at 4°C?**  
Up to 21 days.
- **What is the single most important factor in the management of contaminated wounds?**  
Debridement of devitalized tissue.
- **What is the most important factor in the aesthetic outcome of lip reconstruction?**  
Alignment of the vermillion border.
- **What is a V-Y advancement?**  
Closure of a rectangular defect by incising an adjacent triangle of tissue and advancing it into the defect.
- **What is the appropriate treatment for a patient with a Stage III decubitus ulcer?**  
Sharp debridement of devitalized and infected tissue and conservative management.
- **What is the treatment for a congenital melanocytic nevus (giant hairy nevus)?**  
Early complete excision caused by a 5% malignant transformation to melanoma by age 24 months. Reconstructive procedures are frequently necessary adjuncts for soft-tissue coverage.
- **What vessels is the midline forehead flap based on?**  
The supratrochlear vessels.
- **T/F: Split-thickness skin grafts (STSG) contract more than full-thickness skin grafts (FTSG).**  
True.
- **What are the recommended margins for excision of basal cell skin cancers?**  
5 mm.
- **T/F: Tissue expanders increase the vascularity of skin.**  
True.
- **What is the appropriate ratio of crystalloid infusion to fat removal in suction lipectomy?**  
3:1.

- **What type of skin graft is most appropriate for resurfacing the upper eyelid?**  
FTSG.
- **What type of flap is most appropriate in the treatment of osteomyelitis?**  
A muscle-based flap.
- **Where are basal cell cancers most likely to recur after adequate treatment?**  
Around the orbits, nose, and ears.
- **What is the most frequently utilized flap for head and neck reconstruction?**  
The deltopectoral flap.
- **What is the estimated risk for developing a new basal or squamous cell cancer at 3 and 5 years?**  
35% and 50%, respectively.
- **The dermis primarily contains what type(s) of collagen?**  
Types I (80%) and III (15%).
- **What is the reported ratio of basal cell to squamous cell cancer in the United States?**  
4:1.
- **What are the predictors of tumor recurrence in squamous cell cancer of the skin?**  
Degree of cellular differentiation, depth of tumor invasion, and perineural invasion.
- **On what vessels is the greater omentum axial flap based?**  
Either the right or the left gastroepiploic artery.
- **In which areas of the body are squamous cell cancers prone to metastasis?**  
Scalp, ears, nostrils, and extremities.
- **What is the most appropriate donor site for grafting the skin of the face?**  
Postauricular.
- **What are the risk factors for melanoma?**  
Fair complexion, red hair, greater than 20 nevi on the body, previous diagnosis of melanoma in the individual or first-degree relative, and immunodeficiency.
- **Which tissues are included in the posterior thigh fasciocutaneous flap?**  
The fascia lata, subcutaneous skin and tissue, and the descending branch of the inferior gluteal artery.

- **What is the recommended excisional margin for a 3-mm depth melanoma?**  
2 cm.
- **What is the treatment of choice for a subungual melanoma?**  
Amputation at the interphalangeal joint of the thumb and the distal interphalangeal joint of the finger or at the metatarsal–phalangeal joint of the toe.
- **What is the most appropriate donor site for grafting the skin of the hand?**  
Inner aspect of the arm.
- **What is the incidence of skip metastasis in melanoma?**  
2%.
- **Which factor, other than tumor thickness, predicts regional metastasis in melanoma?**  
Ulceration.
- **Which process allows survival of skin grafts in the first 48 hours?**  
Plasmatic imbibition.
- **What are the indications for therapeutic intervention in a patient with a hemangioma?**  
Obstruction of the eye, airway, oropharynx or auditory canal, large ulcerated lesions with secondary hemorrhage or infection, Kasabach–Merritt syndrome, and hemangiomas of the head and neck that are sources of psychosocial trauma. Most infantile hemangiomas will involute with time.
- **What is meant by inosculation with regard to skin grafts?**  
The process by which vascular buds from the recipient bed make contact with capillaries within the graft.
- **What are the components of Sturge–Weber syndrome?**  
A facial port-wine stain over at least the first and second divisions of the trigeminal nerve, leptomeningeal venous malformations, and mental retardation.
- **How much is hospital mortality increased in patients who develop decubitus ulcers?**  
Up to 25%. The key to avoid this mortality is prevention with frequent turning of bed-bound patients, prophylactic beds, and close clinical observation of dependent areas.
- **What is the diagnostic test of choice for orbital fractures?**  
CT scan with axial and coronal views.
- **What type of cancer is red or purple cutaneous nodule, and neuroendocrine tumor staining for enolase and neurofilament?**  
Merkel cell carcinoma. Treatment is wide excision with 2-cm margin and SLN Bx.

- **What type of glands does hidradenitis involve?**  
Apocrine glands.
- **What is the most common skin cancer?**  
Basal cell Ca.
- **What is the difference between keloid and hypertrophic scar?**  
Keloid extends beyond wound margins and is associated with failure of collagen breakdown and increased collagen production. Hypertrophic scar does not extend beyond the margins.
- **What is the treatment of choice for patients with unstable mandibular fractures?**  
Open reduction and internal fixation (ORIF).
- **What lip defects may be closed primarily?**  
Defects of up to one-third of the lower lip and one-fourth of the upper lip.
- **What layers of the eyelid require reapproximation in through-and-through lacerations?**  
The conjunctiva and tarsal plate, the orbicularis oculi muscle, and the skin.
- **What is the most common cause of acquired ptosis?**  
Dysfunction of the oculomotor nerve or sympathetic chain, usually because of trauma.
- **What are the characteristics of an immature (infantile) hemangioma?**  
They have a raised bright red color, may not be present at birth, become evident in the neonatal period, grow rapidly, and usually involute spontaneously by 7 years of age.
- **What functional problems result from facial nerve paralysis?**  
Exposure keratitis, oral incompetence, abnormal speech, facial asymmetry, and profound diminution of facial expression.
- **What is the most common lymphatic malformation found in the head and neck?**  
A cystic hygroma. Most commonly located in the posterior triangle of the neck.
- **What are the possible benefits of breast reconstruction?**
  1. Improved body image
  2. Preservation of feminine identity
  3. Elimination of external prostheses
  4. Lessened psychosocial impact of mastectomy
- **What complications are associated with breast reconstruction with a tissue expander or implant?**  
Hematoma, infection, exposure of the implant, and capsular contraction.

- **What is the primary blood supply for a transverse rectus abdominus musculocutaneous (TRAM) flap?**  
The superior epigastric vessels.
- **What are the complications of macromastia?**  
Back pain, brassiere strap furrowing, skin irritation in the inframammary fold, and breast pain.
- **What are the possible complications of breast reduction procedures?**  
A long scar that is difficult to hide, hematoma, fat necrosis, nipple necrosis, and hypertrophic scar formation.
- **What is the most common complication of breast augmentation?**  
Capsular contraction.
- **T/F: Women with silicone breast implants have an increased incidence of collagen vascular disease.**  
False.
- **T/F: Closure of contaminated wounds with staples has a decreased infection rate relative to subcuticular closure.**  
True.
- **T/F: With timely removal, staple closure has an equivalent cosmetic appearance to subcuticular closure.**  
True. However, leaving the staples in beyond 7 days can increase scar formation.
- **What is the most common flap for a greater trochanter pressure sore?**  
The tensor fascia lata myocutaneous flap.
- **What are the preferred flaps for proximal one-third tibial wounds?**  
Gastrocnemius and soleus flaps.
- **What are the most important factors in choosing immediate vs. delayed breast reconstruction?**  
The vascular supply and degree of tension of the skin flap.
- **What is the most appropriate treatment for distal one-third tibial wounds?**  
Free-tissue transfer.
- **What is lymphedema tardum?**  
Congenital lymphedema that presents after the age of 35 years.



## CHAPTER 14

# Orthopedic and Hand Surgery Pearls

- **What severe complication is associated with cast treatment of unstable supracondylar humerus fractures in children?**  
Volkman's ischemic contracture of the forearm.
- **What orthopedic procedure is associated with the greatest improvement in quality of life?**  
Total hip arthroplasty.
- **What is the etiology of ganglion cysts?**  
Protrusion of a joint capsule or tendon sheath that fills with a jelly-like fluid.
- **What is the most common location of ganglion cysts?**  
At the scapholunate interosseous ligament at the wrist.
- **Injury to the ulnar nerve near the elbow has what effect on hand function?**  
Weakness of adduction and abduction of digits 2 through 5.
- **What is the appropriate treatment for a 2-year-old boy who walks awkwardly because his feet point inward?**  
Conservative therapy and counseling.
- **What is the etiology of trigger fingers?**  
Tenosynovitis in the region of the MCP joint.
- **Dislocations risk nerve injury. What nerves must be tested in hip and shoulder dislocations?**  
Hip—sciatic.  
Shoulder—axillary. Sensation on top of shoulder.
- **Humeral neck fracture is associated with what nerve injury?**  
Radial. May present with weak wrist extension.

- What nerve is most commonly injured with anterior glenohumeral (shoulder) dislocation?**  
The axillary nerve.
- What is the proper treatment for an athlete with isolated medial collateral ligament disruption?**  
Immobilization in 45 degrees of flexion for 2 to 3 weeks, followed by bracing and progressive increase in range of motion.
- What is a boutonniere deformity of the finger?**  
Proximal interphalangeal (PIP) flexion and distal interphalangeal (DIP) hyperextension.
- What is the most important finding in establishing the diagnosis of fat embolism syndrome?**  
A low PaO<sub>2</sub> after long bone fracture.
- What joint is involved in a Bennett's fracture?**  
The carpometacarpal (CMC) joint of the thumb.
- What are the indications for immediate surgical intervention in a patient with complete dislocation of the knee?**  
Popliteal artery injury, open dislocation, or irreducible dislocation.
- What is the most common cause of posterior dislocations of the shoulder?**  
Epileptiform seizures or electroshock therapy.
- What is the appropriate management of gonococcal arthritis?**  
A 2-week course of penicillin and joint immobilization.
- What type of collagen is found in cartilage?**  
Type II.
- What percentage of patients with fractures of the neck of the talus will develop avascular necrosis?**  
At least 50%.
- What are the characteristics of Paget's disease of bone?**  
Increased bone formation and resorption. The new bone becomes enlarged with thickened cortices and trabeculae yet is mechanically weak.
- What is the most common primary bone malignancy?**  
Osteosarcoma.
- What is the appropriate antibiotic prophylaxis for a farming-related open tibia fracture?**  
Triple-antibiotic therapy and tetanus prophylaxis.

- **What is the etiology of Dupuytren's contractures?**  
Proliferation of the palmar fascia.
- **What is the appropriate treatment if ischemia is suspected in a cast patient?**  
Cutting a window into the cast.
- **Which digits are most commonly affected by Dupuytren's contractures?**  
The ring and small fingers. This condition is the result of contracture of the palmar fascia. It occurs most often in men aged 40 to 60 years, diabetics. If the flexure is debilitating and refractory to physical therapy and greater than 30 degrees, palmar fasciotomy can be therapeutic.
- **Injury to which nerve is fracture of the distal radius associated with?**  
The median nerve.
- **What are the classic symptoms of carpal tunnel syndrome?**  
Pain, numbness, and tingling in the median nerve distribution; weakness of the thenar muscles; and worsening of symptoms at night.
- **What is the function of the osteoblast and the osteoclast?**  
Osteoblast—builds bone, inhibited by parathyroid hormone.  
Osteoclast—breaks down bone.
- **Which nerve root compression will L4–L5 disc give?**  
L5 (a level below).
- **What symptoms do the following root compressions give?**  
L4—weak knee jerk, L5—weak toes dorsiflexion, and S1—weak toe plantar flexion and weak ankle jerk.
- **What is the etiology of Volkmann's ischemic contracture?**  
Injury or constriction of the brachial artery or its anterior interosseous branch, usually from injuries about the elbow.
- **What are the late complications of Volkmann's ischemic contracture?**  
Obliteration of the radial pulse and anoxia of the median and ulnar nerves.
- **What are the characteristics of a Monteggia's fracture?**  
Fracture of the proximal ulna with subluxation of the radial head.
- **What is the current standard of care for patients with an osteosarcoma?**  
En bloc resection with neoadjuvant or adjuvant therapy.

- **What is the innervation of the flexor digitorum profundus to the ring and little fingers?**  
The ulnar nerve.
- **What is the most effective therapy for full-thickness burns of the hands?**  
Early excision and skin grafting.
- **Absence of the knee jerk is suggestive of what process?**  
Compression at the L3–L4 level.
- **What is the most common cause of pyogenic osteomyelitis of the vertebral column?**  
Hematogenous spread of *Staphylococcus aureus*.
- **What study do posterior knee dislocation and decreased distal pulses mandate be performed?**  
Arteriogram (CT angio acceptable with adequate facilities).
- **What fractures are likely to cause compartment syndrome?**  
Tibia Fx, supracondylar humerus Fx, and calcaneus Fx.
- **What is Volkmann's contracture?**  
Compartment syndrome of deep forearm flexor secondary to supracondylar humerus fracture.
- **Which artery and which nerve may be compromised in Volkmann's contracture?**  
Median nerve and anterior interosseous artery.
- **What are the most common locations of stress fractures?**  
The femoral neck, the distal second and third metatarsal shafts, the proximal tibia, the distal fibula, and the calcaneus.
- **What are the indications for surgical intervention in patients with gout?**  
Large, symptomatic, tophaceous deposits and severely involved joints.
- **What entity is suggestive of calf pain similar to claudication that does not resolve with rest?**  
Spinal stenosis.
- **What are the indications for prophylactic stabilization of a malignant lesion in the proximal femur?**  
Pain refractory to conservative management, lesion diameter greater than 2.5 cm, involvement of 50% of the cortical thickness, and avulsion of the lesser trochanter.
- **What are the nonoperative measures for treatment of Dupuytren's contractures?**  
Exercise, local injections of steroids, and radiotherapy.

- **What is a gamekeeper's thumb?**  
Rupture of the ulnar collateral ligament of the MP joint with resultant instability of the joint to radial-directed force.
- **What is the treatment of choice for Ewing's sarcoma?**  
Chemotherapy plus radiation therapy.
- **What complications may occur if nerve repair is delayed beyond 2 weeks?**  
Retraction of the nerve ends, resulting in the need for nerve grafting.
- **When is treatment of congenital club foot most successful?**  
When performed in infancy.
- **What are a Mallet finger and a swan neck hand deformity?**  
Injury to the extensor mechanism at the level of the DIP joint. Swan neck deformity occurs when the extensor tendon is ruptured. Initial treatment is splinting of the distal finger in extension.
- **Which carpal bone is most frequently fractured?**  
The scaphoid bone.
- **What are the typical characteristics of causalgia (reflex sympathetic dystrophy)?**  
Severe burning pain, hyperesthesia, and vasomotor instability.
- **What is the increase in energy expenditure required to walk with an above-knee amputation prosthesis?**  
100%.
- **What is the treatment of DeQuervain's stenosing tenosynovitis after failed medical management?**  
Surgical release of the first extensor compartment.
- **What complications are associated with displaced fractures of the scaphoid?**  
Avascular necrosis and nonunion.
- **What is the most sensitive clinical finding of compartment syndrome in an alert patient?**  
Pain with passive extension of the involved muscle groups.
- **How much blood can be stored in the thigh after a closed femur fracture?**  
Two to three units.
- **What is the etiology of isolated anterior cruciate ligament tears?**  
Hyperextension of the knee or forceful internal rotation of the tibia on the femur.

○ **What joints are most commonly affected by osteoarthritis?**

The large weight-bearing joints (e.g., hips and knees).

○ **What are the hip-stabilizing muscles?**

The piriformis, obturator internus, gemelli, and gluteus medius.

○ **What is the major cause of failure of total joint arthroplasty?**

Aseptic mechanical loosening at the interface between the bone, cement, and the implant.

○ **What is the typical presentation of osteoarthritis?**

Joint pain brought on by motion and weight bearing that is relieved with rest.

○ **What is a felon?**

Bacterial infection of the pulp space on the palmar surface of the hand. Treatment is drainage along the medial and lateral aspect of the finger.

○ **How does an omphalocele usually present?**

As a mass of bowel and solid viscera in the central abdomen, covered by a translucent peritoneal covering membrane. Omphalocele is more frequently associated with other congenital anomalies than gastroschisis.

○ **What are the characteristics of gastroschisis?**

Absence of peritoneal covering. Abdominal wall defect typically to the right of midline. Typically, only small bowel herniated (vs. omphalocele where other organ herniation is common).

○ **When should primary closure be attempted in a patient with gastroschisis?**

When the intragastric pressure is less than 20 cm H<sub>2</sub>O and the central venous pressure (CVP) does not increase by 4 mm Hg or more as the abdominal viscera are replaced into the abdominal cavity.

○ **If primary closure cannot be performed, how is the abdominal wall closed?**

Usually with a silastic sheet fashioned into a chimney or silo, the volume of which can be decreased day to day. Once the height of the silo is level with the rest of the abdominal wall, the infant is returned to the operating room for surgical abdominal wall closure.

○ **What classic triad is seen in patients with a congenital diaphragmatic hernia?**

Respiratory distress, cyanosis, and apparent dextrocardia. The degree of associated pulmonary hypoplasia is the primary prognostic variable.

○ **What are the major goals of perioperative management for neonates severely affected by a congenital diaphragmatic hernia?**

To prevent occurrence of hypoxemia and acidosis by maximizing ventilation and oxygenation and by minimizing metabolic stressors. Goals of ventilation are to minimize barotrauma even at the cost of a slightly higher PCO<sub>2</sub> and lower PaO<sub>2</sub>.

○ **What other congenital anomalies are often seen with congenital diaphragmatic hernia?**

Other midline defects, including congenital heart disease (i.e., patent ductus arteriosus).

○ **What bowel segments are typically involved in intestinal atresias?**

The duodenum, jejunum, terminal ileum, and anus.

○ **What is the etiology and presentation of jejunal–ileal atresias?**

Intrauterine mesenteric ischemia is the etiology and bilious emesis is the presentation. All infants with infantile bilious vomiting must be ruled out for midgut volvulus. There is an association of intestinal atresias with cystic fibrosis but not additional anatomic anomalies.

○ **What is the clinical picture of pyloric stenosis?**

Nonbilious projectile vomiting. The defect occurs in 1/300 births and is most common in first-born males. Olive may be palpable in epigastrium on PE.

○ **What noninvasive diagnostic test can reliably contribute to the decision-making process in pyloric stenosis?**

Ultrasound.

○ **What metabolic disturbances may infants with pyloric stenosis, whose diagnosis was delayed, present with?**

Dehydration, hypochloremic metabolic alkalosis, and hypokalemia.

○ **What is the leading cause of death in childhood?**

Trauma.

○ **What is the most common type of choledochal cyst?**

Type I; involves the CBD only; treatment is hepaticojejunostomy.

○ **In pulmonary sequestration, what type of circulation is associated with extralobar and intralobar?**

Extralobar—systemic artery and veins.

Intralobar—systemic inflow and pulmonary vein outflow.

○ **How does a patient most commonly present with pulmonary sequestration?**

Pulmonary infection.

○ **What is the most common complication of cystic hygroma and what is the treatment?**

Infection—Tx: resection.

○ **If a patient with a tracheoesophageal fistula, of the proximal esophageal pouch variety, also has congenital heart disease, how should the various surgeries be planned?**

Attention should first be turned to the fistula. Once the risk to the lungs has been minimized, consideration can be given to the congenital heart disease. Unless the patient has cyanotic heart disease, immediate reparative or palliative surgery of the heart and great vessels is usually not necessary.

○ **What problems do children with a history of tracheoesophageal fistula repair encounter as they grow?**

They typically have reactive airway disease or other lung disease suggestive of chronic aspiration. They may also experience esophageal stenosis at the anastomotic site and require repeated bougienage and dilatation.

- **What is the preferred maintenance fluid for children older than 6 months of age?**  
5% dextrose in 0.45% saline.
- **What is the preferred maintenance fluid for children for infants younger than 6 months?**  
5% dextrose in 0.2% saline. (The immature kidney is less able to handle a solute load.)
- **What is the preferred crystalloid for replacement of extracellular fluid or third space losses?**  
Lactated Ringer's, normal saline, or other similar fluid.
- **How is croup clinically differentiated from epiglottitis?**  
Croup is most prevalent in infants, whereas epiglottitis is more prevalent in toddlers and preschoolers. Epiglottitis is associated with high fevers, toxic appearance, and a brief course before the onset of respiratory distress. Croup, however, is usually more subacute in onset with a lower temperature and WBC count.
- **A cyst-like structure is found in neck of infant, which is midline and moves with swallowing. What is the treatment for this abnormality?**  
Excision of the thyroglossal duct cyst with the hyoid bone. This cyst is a derivative of the foramen cecum and can have aberrant thyroid tissue with malignant transformation potential (papillary CA develops in 1%).
- **What is the treatment of strawberry hemangioma?**  
Nothing. Most resolve by the age of 7 years.
- **Which tumor of childhood is the most common malignancy in child and is associated with increased VMA and N-myc?**  
Neuroblastoma.
- **What are the features of pediatric neuroblastoma?**  
Neuroblastoma is the most common solid malignancy of childhood. Hypertension is present in 25%. Tumor markers are catecholamines/metanephrines. Tumors occur anywhere along the sympathetic chain/nerve distribution.
- **What is the Rule of 2's for Meckel's diverticulum?**  
2 ft from IC valve  
2% population  
2% symptomatic  
Two types of tissue: pancreas and gastric  
Two presentations: GI bleed and diverticulitis
- **What is the immediate treatment for patients with epiglottitis?**  
Antibiotics directed against *H. flu* (most common pathogen). If airway is threatened, then direct laryngoscopy followed by tracheal intubation under general anesthesia in the operating room. With respect to diagnosis, stridor worse in the supine position and characteristic upper airway swelling on plain film are seen.

○ **What is the initial fluid resuscitation in a pediatric patient with hypotension?**

A 20 cc/kg normal saline bolus. This should be followed by a second bolus if an inadequate response is obtained. Consideration should be given to the use of blood if no response is noted after the second bolus.

○ **What are the most common organisms encountered in cervical lymphadenitis?**

Group A *Streptococcus* and *Staphylococcus aureus*.

○ **What is the clinical presentation of intussusception in the pediatric population?**

Intermittent crampy abdominal pain with severe bouts of colic. Mucous and bloody stool. Clinical bowel obstruction with bilious vomiting and poor PO tolerance. Dilated small bowel and air fluid levels on KUB. Involution of distal ileum into right colon is the most frequent site with characteristic target sign of US or CT. Confirmatory barium enema can be therapeutic. Refractory to BE necessitates laparotomy and reduction.

○ **What is the most common type of tracheoesophageal fistula?**

A blind-ending proximal esophageal pouch with a fistula from the lower esophagus to the trachea (85%). Diagnosis can be made with coiling and inability to pass an NGT. Coughing with feeds typical. Treatment is via right anterolateral thoracotomy.

○ **What percentage of children less than 5 years of age will have a perforated appendicitis at the time of initial presentation?**

More than 50%. CT scan identifies abscess well but is less sensitive for appendicitis than in adults because of reduced intra-abdominal fat. Mesenteric adenitis and gastroenteritis are the most common conditions leading to negative laparotomy.

○ **What is a normal urine output for a newborn baby?**

1–2 cc/kg/h.

○ **What are the clinical consequences of Crohn's disease in childhood?**

Growth retardation, SBO, and GI bleeding.

○ **What is the incidence of a contralateral inguinal hernia in an infant who presents with a unilateral hernia?**

50% or more.

○ **What is the differential diagnosis for pediatric lung mass?**

Metastatic disease most common with osteogenic sarcoma and Wilm's tumor are most frequent sources. Fine needle aspiration (FNA) via CT guidance is a diagnostic measure to determine histology/source.

○ **What are the fundamental steps required in a Ladd procedure for malrotation?**

Detorsion of a volvulus, if present; division of Ladd's bands overlying the duodenum; mobilization and straightening of the duodenum; and appendectomy.

○ **What is the differential diagnosis for a midline neck mass in a child?**

Thyroglossal duct cyst, dermoid cyst, or adenopathy.

- **What is the most common branchial cleft anomaly?**  
A second branchial cleft sinus.
- **What is the anatomic location of most congenitally acquired diaphragmatic hernias?**  
More than 80% occur in the left posterolateral chest through the foramen of Bochdalek.
- **What are the anatomic features characteristic of pulmonary sequestration?**  
A systemic blood supply (frequently subdiaphragmatic) and an absence of communication with the tracheobronchial tree.
- **What associated anomalies must be excluded in the evaluation of the neonate with esophageal atresia?**  
Those of the VATER or VACTERRL syndrome (vertebral, anorectal, cardiac, tracheoesophageal, radial, renal, and limb).
- **What genetic abnormality may be present in up to 30% of newborns with duodenal atresia?**  
Trisomy 21 (Down's syndrome). Duodenal is also associated with cardiac abnormalities in particular. Polyhydramnios is seen on neonatal ultrasound. Plain films reveal "double bubble" sign. Meconium passage does not rule out duodenal or small bowel atresia. The most common etiology is a mucosal web secondary to failure of bowel recanalization.
- **What is the preferred treatment for duodenal atresia?**  
Duodenoduodenostomy.
- **What is the etiology of a cystic hygroma (congenital lymphangiomatous malformation)?**  
Sequestration or obstruction of developing lymph vessels.
- **What are the most common locations for a cystic hygroma?**  
The posterior triangle of the neck, axilla, groin, and mediastinum (anywhere lymphatics are prominent). Cystic hygroma = lymphangioma.
- **What is the most common cause of colonic obstruction in infants?**  
Hirschsprung's disease. The disease occurs in 1:5000 births, and 80% of affected are male. Clinical presentation is most commonly failure to pass meconium, although delayed presentation well reported.
- **What is the gold standard for the diagnosis of Hirschsprung's in the newborn period?**  
The absence of ganglion cells in the submucosal and myenteric plexuses on rectal biopsy (both Meissner and Auerbach plexuses). Biopsy reveals aganglionic, hypertrophic nerves, and increased cholinesterase staining. The noninnervated segment of distal bowel has a failure of relaxation. Most commonly the rectum is innervated to 5–6 cm of the dentate line (rectosigmoid area also a common transition zone), although skip areas are a well-reported feature.
- **What is the treatment for Hirschsprung's (aganglionic megacolon) disease?**  
Resection of deinnervated segment and coloanal anastomosis.

- **In the child with recurrent urinary tract infections and persistent clear drainage from the umbilicus, what diagnosis should be considered and what study is most likely to demonstrate the problem?**  
A patent urachus should be suspected and is best investigated with a contrast cystogram.
- **What is the inheritance pattern of familial adenomatous polyposis? At what age are polyps generally present?**  
Familial adenomatous polyposis is transmitted as an autosomal-dominant syndrome with high penetrance. Polyps are present in 15% of children by the age of 10 years and more than 98% by the age of 30 years.
- **A contrast enema is used in the evaluation of possible intussusception. How often is this method effective at reduction and what is the risk of recurrence following enema reduction?**  
A contrast (air, barium, or water-soluble) enema will successfully reduce an intussusception in 80% of cases. Recurrence is seen in 10% to 15% of patients, most commonly in the first 24 hours following reduction.
- **What are the clinical features and initial treatment of necrotizing enterocolitis?**  
Intestinal ischemia, which occurs almost exclusively in premature infants. The terminal ileum and right colon are most frequently involved. Pneumatosis can be seen on XR or CT. Initial treatment is bowel rest and TPN with empiric antibiotics. Surgery for frank GI perforation or sepsis with resection as needed.
- **What are other common causes of infantile GI perforation?**  
Midgut volvulus with intestinal ischemia, vasopressor medications and indomethacin.
- **What are the relative indications for operative intervention in necrotizing enterocolitis?**  
Abdominal wall erythema, fixed abdominal mass, portal venous air, or a persistently dilated bowel loop on abdominal radiograph. Evidence of GI perforation and sepsis.
- **What are the prognostic variables of short-gut syndrome?**  
Survival and growth are improved in patients with preservation of the ileocecal valve; greater than 50 cm of colon preserved, at least 130 cm of jejunum and ileum if the colon cannot be salvaged. Mucosal hyperadaptation and hypertrophy occur for 2 to 3 years after onset of short gut.
- **What is the most common malignant childhood malignancy?**  
Leukemia.
- **What is the most common hepatic malignancy in a child less than 4 years old?**  
Hepatoblastoma.
- **What is the most common hepatic malignancy in a child greater than 4 years old?**  
Hepatocellular carcinoma.
- **What is the differential diagnosis of an anterior mediastinal mass in a child?**  
Thymoma, teratoma, lymphoma, ectopic thyroid tissue, cystic hygroma, or lipoma.

- **What is the most common soft-tissue tumor of childhood?**  
Rhabdomyosarcoma. Treatment is surgical excision. Negative prognostic variables are advanced grade, stage, retroperitoneal/pelvic/thoracic location relative to extremities, and perineum.
- **What is the embryologic remnant that causes a Meckel's diverticulum? What is the most common symptom associated with the diverticulum?**  
Omphalomesenteric duct. This is the leading cause of GI bleeding in children. Ectopic gastric or pancreatic mucosa is present in 95% of symptomatic patients and 60% of asymptomatic patients. Bleeding occurs from irritation of adjacent normal mucosa from gastric/pancreatic enzymes.
- **What is the treatment for imperforate anus?**  
Anoplasty if below the levators. Temporary colostomy, vaginal/bladder repair PRN, and delayed coloanal repair for high imperforate anus.
- **What is the diagnostic and therapeutic treatment of meconium ileus?**  
Gastrograffin enema.
- **What is the differential diagnosis of right lower quadrant pain in childhood?**  
Appendicitis, UTI, Crohn's disease, omental infarction, Meckel's diverticulitis, and ovarian teratoma.
- **What are the histologic characteristics of pediatric ovarian teratoma?**  
Tissue from all three primordial germ cell layers. Mature teratomas (dermoid cysts) are benign and can be treated with cystectomy alone.
- **What is the initial treatment for the constipation associated with cystic fibrosis?**  
Pancreatic enzyme PO supplementation. Enemas are the secondary measure.
- **What is the MACE procedure and what is its indication?**  
An appendiceal conduit to the colon for colonic irrigation in chronic constipation after Hirschsprung or imperforate anus surgery refractory to enemas, diet modifications, and laxatives.
- **In intussusception what test should be done before the barium enema?**  
An abdominal X-ray looking for free air. Do not give contrast if free air, go directly to the OR.
- **What are intestinal atresias secondary to?**  
Intrauterine vascular occlusion.
- **Inadvertent violation of the mucosa occurs in approximately 1% of pyloromyotomies. What are the treatment options for such an occurrence?**  
Repair of the mucosal defect and omental patch or roll the pylorus 45 degrees and perform a second myotomy after repair of the initial site.

○ **What is the incidence of incarceration of inguinal hernias in the pediatric patient?**

6% to 18% of uncorrected inguinal hernias. In infants less than 2 months of age, the risk of incarceration may be as high as 30%.

○ **What is the differential diagnosis for a posterior mediastinal mass in a child?**

Bronchogenic cyst, esophageal duplication cyst, neuroblastoma, ganglioneuroma, or pulmonary sequestration.

○ **What is the preferred method of airway control in the injured child?**

Placement of an oral airway and bag mask ventilation should be the initial approach. If more secure airway control is necessary, orotracheal intubation should be obtained. Uncuffed ET tubes should be used for children less than 12 years old. If these measures fail or are not appropriate, needle cricothyroidotomy is the method of choice, followed by PRN or tracheostomy.

○ **What is the role of surgery in a pediatric rhabdomyosarcomas?**

Surgical resection prior to chemotherapy is the ideal management if an acceptable cosmetic and functional result can be obtained. Re-excision of the tumor bed in the setting of positive margins prior to chemotherapy has also been shown to be of benefit.

○ **What is the most common cause of rectal bleeding in the child more than 1 year of age?**

Juvenile polyps.

○ **What is the major perioperative concern in a child undergoing biopsy of an anterior mediastinal mass?**

Tracheal compression.

○ **What are the operative indications for patients with typhlitis, a necrotizing colitis localized to the cecum?**

Persistent gastrointestinal bleeding despite resolution of thrombocytopenia and neutropenia, free intraperitoneal air, clinical deterioration requiring vasopressor support, and evidence of an intra-abdominal process, such as an abscess.

○ **What clinical variables determine prognosis for patients with a neuroblastoma?**

The age of the patient and the stage of the disease at time of diagnosis and the site of the primary tumor.

○ **An 8-year-old male presents with profound hypothermia from a near drowning in icy waters. What are the treatment options to achieve active rewarming?**

Heated intravenous fluids, heated inspired respiratory gases, warmed gastric or colonic lavage, warmed peritoneal or pleural lavage, hemodialysis, or ECMO.

○ **What is the appropriate management for a deep puncture wound from a dog or cat bite?**

Postexposure rabies prophylaxis should be considered for all bites. If the animal is healthy, it should be quarantined for 10 days to exclude rabies. If the animal is unavailable or suspected rabid, immediate vaccination and immunoglobulin therapy should be administered. In addition, antibiotic coverage to include *Pasteurella multocida* should be initiated.

- **What is the most common location of a gonadal germ cell tumor in childhood?**  
The ovary.
- **What is the most common location of an extragonadal germ cell tumor in childhood?**  
The sacrococcygeal region.
- **What is the presumed diagnosis in a patient with bilious emesis until proven otherwise?**  
Malrotation of the midgut.
- **What is the operative management for a patient with malrotation of the midgut?**  
Counterclockwise reduction of the volvulus, if present, and resection of nonviable bowel.
- **What is the diagnostic algorithm for the patient above if he/she is unstable and is suspected of having a bowel obstruction?**  
Exploratory laparotomy.
- **A patient is referred for management of an incidentally discovered abdominal mass thought to be a duplication cyst. What is the most likely location of this cyst?**  
Cystic duplications can be found in any segment of the gastrointestinal tract; however, they are most common in the small intestine, in particular near the terminal ileum.
- **What is the role of surgery in the above patient?**  
Surgical resection is indicated for all duplication cysts as the origin and natural history of these lesions is poorly understood.
- **What is the initial surgical approach to the child with a large renal-based mass?**  
The diagnosis of exclusion is a Wilm's tumor. After preoperative evaluation (abdominal and chest CT) exploration of the abdomen is undertaken to rule out metastatic disease.
- **What is the incidence of bilateral disease in a patient with a Wilm's tumor?**  
5%.
- **What are the clinical features of Wilm's tumor (nephroblastoma)?**  
A large painless abdominal mass is the most common presentation; hematuria is seen in less than 10%. The most common site of metastasis is the lung (as opposed to liver for nephroblastoma of the retroperitoneum). Predictors of recurrence are high-grade tumors (anaplastic), capsular penetration and tumor spillage at surgery, and absence of lymph node excision in the renal and central retroperitoneum.
- **What is the most common diagnosis leading to liver transplantation in the pediatric population?**  
Biliary atresia.

- What is the most common indication for splenectomy during childhood?**  
Hereditary spherocytosis.
- What is the most common intra-abdominal tumor diagnosed during childhood?**  
Wilm's tumor.
- What is the most common indication for cholecystectomy in the pediatric age group?**  
Cholelithiasis secondary to sickle cell disease.
- What is the goal of surgery in children with a choledochal cyst?**  
Removal of the cyst to prevent the late development of malignancy and to establish adequate biliary drainage to prevent cholangitis (hepaticojejunostomy for type 1).
- What is the treatment of choice for patients with biliary atresia?**  
Hepatoportoenterostomy (Kasai procedure).
- A 3-year-old male presents with a firm neck mass. Examination reveals Horner's syndrome. What is the most likely diagnosis?**  
Neuroblastoma.
- What is the most common cause of cervical adenopathy in children?**  
Inflammation.
- A 4-month-old female has had a progressive barking cough and inspiratory stridor for 2 months. Examination reveals a raised, bright red lesion on her back that has been gradually enlarging. High kilovoltage X-rays of her neck demonstrate asymmetric narrowing of the subglottic region. What is the most likely diagnosis?**  
A subglottic hemangioma.
- A 9-year-old male presents with headaches and a rock hard left posterior triangle mass. Examination is significant for mouth breathing and bilateral serous otitis media. FNA of the neck mass reveals poorly differentiated malignant cells. What is the most likely source of the tumor?**  
The nasopharynx.
- A 7-year-old female presents for the evaluation of florid warty lesions growing from both tonsils. Biopsy demonstrates a well-differentiated, nonkeratinizing squamous epithelium growing over a fibrovascular stalk. What is the most likely diagnosis?**  
Papillomatosis.
- What etiology must be considered in the above patient?**  
Sexual abuse.

- **An infant is born with a large port wine stain involving the forehead and maxilla. What other organ system should be evaluated?**  
The central nervous system. Capillary malformations (port wine stains) involving the V1 and V2 distribution may be indicative of Sturge–Weber syndrome, with vascular malformations involving the brain, resulting in seizures and cognitive impairment.
  
- **What percentage of thyroid nodules in children are malignant? What is the treatment algorithm?**  
25% to 55%. Well-differentiated thyroid CA in patients less than 18 years old has a 50% incidence of nodal metastasis at presentation. I-131 scanning can identify extrathyroid disease. Treatment is total thyroidectomy, modified neck dissection if node + disease, and postoperative ablative I-131 therapy.
  
- **A 3-year-old sustains bilateral subcondylar fractures of the mandible. Occlusion is normal, and radiological studies demonstrate minimal displacement. What is the recommended management?**  
A soft diet and physical therapy aimed at maintaining range of motion.
  
- **An 11-year-old boy struck his neck on a wire while riding an all-terrain vehicle. He is hoarse, has an abrasion directly over his thyroid cartilage and has neck and chest crepitus but is not in respiratory distress. After a complete history and physical examination, how is the airway assessed?**  
Flexible laryngoscopy.
  
- **What is the most common cause of acute facial paralysis in children?**  
Bell's palsy. However, in some series, it appears that Lyme disease may be the most common.
  
- **What is the immediate treatment of acute facial paralysis associated with otitis media?**  
Myringotomy or myringotomy with tube insertion and appropriate antibiotics.
  
- **An 8-year-old boy has a draining ear filled with friable tissue. CT demonstrates a punched-out lytic lesion of the temporal bone. Biopsies show only lipid-laden histiocytes. What is the most likely diagnosis?**  
Histiocytosis X.
  
- **What is the immediate treatment for a tympanic membrane perforation caused by a cotton-tipped applicator, in the absence of dizziness or hearing loss?**  
Observation. Spontaneous healing occurs in approximately 90%.
  
- **What is the treatment for laryngomalacia in a 4-month-old with adequate weight gain and no respiratory distress?**  
Observation.
  
- **Posterior compression of the esophagus demonstrated on barium esophagogram is most likely caused by what vascular anomaly?**  
An aberrant subclavian artery.

- **A 4-month-old male has a history of tracheoesophageal fistula repaired successfully, as well as an imperforate anus. He has frequent choking and cyanosis with feeding. Barium swallow demonstrates free aspiration at the larynx. What is the best way to secure a diagnosis?**

Direct laryngoscopy. Laryngotracheoesophageal clefts may be associated with tracheoesophageal fistula and are likely to result in aspiration.

- **What is the pathophysiological difference between acid burns and alkaline burns in corrosive injuries of the esophagus?**

Acid causes a coagulative necrosis, which tends to protect the deeper tissues, as opposed to alkaline burns, which create a liquefactive necrosis and are associated with more extensive burns.

- **What is the treatment for caustic injury to the entire esophagus with full-thickness necrosis?**

Esophagectomy with colon interposition replacement.

- **What medical therapy may be beneficial for patients with corrosive burns of the esophagus?**

Antibiotics hasten epithelialization, and corticosteroids may decrease stricture formation.

- **A 3-year-old with constant purulent nasal drainage and recurrent pneumonia has dextrocardia on chest X-ray. What is the most likely diagnosis?**

Kartagener's syndrome.

- **A 5-year-old presents to the emergency department 5 days after having sustained a blow directly to the nasal tip. Although no nasal fracture is suspected, intranasal examination reveals a markedly widened, erythematous, and boggy nasal septum. What is the appropriate treatment?**

Immediate drainage is necessary to prevent cartilage necrosis and loss of nasal support that would lead to a saddle nose deformity.

- **A 4-year-old has constant nasal congestion. Examination reveals that both nasal cavities are obstructed by shiny, translucent tissue. What diagnostic test would be most helpful?**

Nasal polyps in a prepubescent child are highly suggestive of cystic fibrosis. A sweat chloride level should be obtained.

# Genitourinary and Gynecology Pearls

- **What type of renal calculi are associated with a history of distal ileum resection and why?**

Calcium oxalate stones. Increased oxalate absorption occurs in the colon because calcium binds fatty acids in the small bowel instead of oxalate in the more proximal GI tract secondary to fat malabsorption from bile salt deficiency resulting from the lack of bile salt reabsorption in the now resected terminal ileum. The result is increased free oxalate to be absorbed in the colon creating high serum oxalate levels.
- **At what anatomical sites do ureteral injuries most often occur?**

Near the pelvic brim, at the infundibulopelvic ligament, at the base of the broad ligament where the ureter crosses the uterine artery, and at the ureterovesical junction where the ureter moves medially to insert into the bladder.
- **How do patients with ureteral obstruction present postoperatively?**

With flank pain, fever, and leukocytosis.
- **What effect does ureteral obstruction have on serum creatinine levels?**

It may be normal or slightly elevated.
- **If urinary leakage is suspected, what tests on the recovered fluid are diagnostic?**

Measurement of creatinine or BUN will reveal levels many times greater than serum levels if urine is present.
- **How are suspected urethral injuries identified?**

By urethroscopy or retrograde urethrogram. For trauma with clinical suspicion (blood at meatus or high-riding prostate) obtain retrograde cystourethrogram.
- **T/F: Urinary sepsis is a contraindication to percutaneous stenting.**

False.
- **What are the advantages of percutaneous or cystoscopic management of ureteral injuries?**

Correction can be done without general anesthesia, it has minimal morbidity, and it decreases recovery time from laparotomy.

- **What surgical techniques are available for treating ureteral injuries?**  
Ureteroureterostomy, ureteroneocystostomy, and transureteroureterostomy.
- **During hysterectomy, when do most ureteral injuries occur?**  
During clamping the uterine vessels or ligation of the infundibulopelvic ligaments.
- **T/F: Patients with cryptorchidism are at 3–14× risk of testicular Ca. Orchiopexy returns this risk to normal.**  
False. Operation does not decrease cancer risk, only increases fertility.
- **Patient presents with a varicocele of the left testicle. What should you be concerned about?**  
Retroperitoneal or renal mass because the left gonadal vein drains into the L renal vein.
- **Which laparoscopic bladder injuries can be managed conservatively?**  
Punctures involving 5–7 mm trocars will self-seal with prolonged transurethral drainage. Similarly, small-caliber bladder injury caused by cautery or lasers may be treated with prolonged drainage.
- **Which surgical procedures most commonly result in vesicovaginal fistulas?**  
Total abdominal or vaginal hysterectomy.
- **How should a partially transected ureter be managed?**  
With several interrupted sutures, stenting, and retroperitoneal drainage.
- **What is the treatment for renal arteriovenous fistula producing CHF symptoms after trauma?**  
Embolization or coverage of the arterial defect with a covered stent.
- **A trauma patient has blood at urethral meatus and a high-riding prostate, what test do you order?**  
Retrograde urethrogram, before you place a Foley; if urethral disruption has occurred, suprapubic cystostomy should be placed.
- **What are the multidisciplinary approaches to prostate cancer?**  
In general, younger patients with higher-grade tumors are recommended for prostatectomy and older patients with low-grade carcinoma are treated with radiation. Metastatic disease is treated with medical or surgical orchiectomy.
- **What are the treatments for extra- and intra-peritoneal bladder rupture?**  
Extraperitoneal—Foley.  
Intraperitoneal—Foley and multilayer bladder closure in OR.
- **Which factors determine the type of procedure appropriate for repair of a totally transected ureter?**  
Level of the ureteral transection, length of the damaged segment, mobility of the ureter/bladder, quality of the pelvic tissue, the underlying indication for the procedure, and the general health and expected lifetime of the patient.

- **What is the surgical approach to metastatic nonseminomatous testicular CA?**  
Chemotherapy is the primary modality with surgical resection for residual disease.
- **How are injuries to the pelvic ureter best treated?**  
By ureteroneocystotomy.
- **How do the left and right ureters differ in their pelvic course?**  
The left ureter enters the pelvis and crosses the common iliac artery more medially than the right.
- **T/F: Preoperative stenting decreases the risk of ureteral injury.**  
False.
- **What problems are associated with preoperative ureteral stenting?**  
Colicky pain, hematuria, and ureteral fibrosis.
- **If ureteral injury is recognized during a hysterectomy, when should it be repaired?**  
After the uterus is removed.
- **How does pelvic irradiation affect the ureter?**  
The blood supply is compromised, the ureter appears more pale and is harder to palpate, connective tissue of the broad ligament is more difficult to dissect from the ureter, and, rarely, obstruction may result.
- **If ureteral obstruction is detected in a patient after radiation for cancer of the cervix, what is the most likely cause?**  
Recurrent tumor.
- **What type of suture is best for bladder or ureteral repairs?**  
Fine-caliber absorbable suture.
- **T/F: We operate on cryptorchidism so that the young man can look normal in the locker room.**  
False. The testicle has faulty sperm production when the testicle has elevated temp, as occurs when undescended. Thus, fertility is increased s/p operation. Operate after 1 year if not descended on own.
- **What is the initial clinical effect of acute tubular necrosis (ATN) on renal function?**  
Loss of urinary concentrating ability.
- **What is the effect of PEEP on renal function?**  
It can decrease cardiac output and, thus, renal blood flow, glomerular filtration rate, and urine output.
- **What factors predispose to renal failure in myoglobinemia secondary to rhabdomyolysis?**  
Low urine pH (less than 5.6) and hypovolemia.

- **Why is a normal serum creatinine still consistent with impaired renal function, especially in the elderly?**  
Serum creatinine concentrations are dependent on dietary protein intake and muscle tissue turnover. Elderly people have less muscle mass and, thus, lower serum creatinines.
- **Why should pancuronium be used cautiously in patients with renal failure?**  
Pancuronium is 40% to 50% excreted in the urine, and one of the hepatic metabolites (3-hydroxypancuronium) is active and excreted in the urine.
- **What are the problems with the use of sodium nitroprusside in patients with renal impairment?**  
The half-life of thiocyanate, one of the metabolites, is prolonged. This may result in hypoxia, nausea, tinnitus, muscle spasm, and/or psychosis if levels exceed 10 mg/100 mL. With prolonged elevation, hypothyroidism may result.
- **What are the absolute contraindications to extracorporeal shock wave lithotripsy (ESWL)?**  
Pregnancy and bleeding disorders.
- **What degree of nephron loss and fall in creatinine clearance is associated with uremia?**  
Loss of 95% of functioning nephrons and a fall in GFR to less than 12 mL/min.
- **What is the fractional excretion of sodium (FeNa)?**  
(Urinary sodium/plasma sodium) divided by (urinary creatinine/plasma creatinine) × 100.
- **What is the importance of ECG monitoring during ESWL?**  
There is a risk of cardiac dysrhythmias caused by the discharge of shock waves independent of the cardiac cycle.
- **T/F: Succinylcholine is a safe choice in the renal failure patient.**  
True. If the patient has been recently dialyzed and the potassium is normal, succinylcholine is an appropriate choice, if indicated.
- **What are the etiologies of renal ischemia?**  
Chronic atherosclerotic occlusive disease, renal artery emboli, trauma, aortic dissection with renal artery compromise, and fibromuscular dysplasia of the renal artery.
- **What are the clinical presentation and treatment for renal artery embolization?**  
Acute onset of flank pain with microhematuria. CT scan can display renal infarct with IV contrast. Emboli to distal renal artery branches (wedge infarcts) are treated with anticoagulation alone. Embolic occlusion of a main renal artery can be managed by catheter-directed thrombolytic therapy.
- **What hemodynamic variables must be considered in a patient recently dialyzed who is about to undergo anesthesia?**  
Following dialysis, patients are usually hypovolemic. They also often take antihypertensive medication as well as the possible hypotensive interaction with various anesthetic agents.

- **What is the most common cause of painless hematuria in children?**  
A glomerular lesion.
- **What is the function of atrial natriuretic peptide (ANP)?**  
It relaxes vascular smooth muscle, decreases sympathetic stimulation, and inhibits renin and aldosterone secretion.
- **Why may the use of NSAIDs be a concern in patients with hypovolemia or renal impairment?**  
Blockade of prostaglandin-mediated effects on renal blood flow by NSAIDs predisposes these patients to developing renal failure.
- **What is the most common cause of acute left varicocele?**  
Renal vein occlusion (commonly related to renal tumors).
- **When a patient presents to the emergency department with sudden onset of severe testicular pain, what is the most likely diagnosis and why is it important to make the diagnosis quickly?**  
Testicular torsion. If the torsion is not corrected within 4 hours, there may be irreversible damage to the testis.
- **What types of kidney stones are associated with perinephric abscesses?**  
Struvite or staghorn calculi.
- **What is the most common manifestation of metastatic gonococcal infection?**  
Gonococcal arthritis (80%).
- **What is the etiology of urinary tuberculosis?**  
Hematogenous spread from primary pulmonary or intestinal lesions.
- **What type of kidney stone is associated with primary hyperparathyroidism?**  
Hydroxyapatite crystal predominance.
- **What percentage of urinary tract stones are radiopaque?**  
90%.
- **What are the best tests for detecting prostate cancer?**  
Digital rectal examination and measurement of serum prostatic-specific antigen (PSA).
- **What is the mechanism of action of alpha-blockers (flomax) in the treatment of BPH?**  
It relaxes the smooth muscle and partially relieves the dynamic component of obstruction.
- **What is the most common cancer affecting the kidney?**  
Renal cell carcinoma (85%).

- **What is the most common cancer affecting the kidney in childhood?**  
Wilm's tumor (adenomyosarcoma).
- **What is the classical triad of clinical manifestations seen in patients with renal tumors?**  
Pain, palpable mass, and hematuria. However, they occur late and all three in the minority of patients.
- **What is the standard surgical procedure for unilateral renal neoplasms?**  
Radical nephrectomy with removal of the ipsilateral adrenal and hilar nodes. If tumor extends into the IVC removal is recommended (typically can be carefully pulled out of vessel without disruption).
- **What is the most common tumor affecting the renal pelvocalyceal system?**  
Transitional cell carcinoma.
- **What is the management of inadvertent pediatric vas deferens ligation in hernia repair?**  
Direct repair over a stent with monofilament suture. Stent should exit a more proximal vasotomy and be exteriorized. It can then be removed in 3 weeks.
- **What is the appropriate treatment for bladder stones?**  
Cystoscopic removal and correction of predisposing factors.
- **A 55-year-old male presents with gross hematuria and renal colic. IVP shows a filling defect in the left mid-ureter. What is the most likely diagnosis?**  
Transitional cell carcinoma.
- **A 70-year-old white male smoker with a history of prolonged exposure to beta-naphthalene presents with microhematuria and dysuria. What is the most likely diagnosis?**  
Transitional cell carcinoma of the bladder.
- **What percentage of prostatic nodules palpated by digital rectal examination are positive for cancer on biopsy?**  
50%.
- **What therapeutic options are available for the patient with prostate cancer who cannot tolerate surgery or radiation?**  
Androgen blockade or orchiectomy.
- **What is the relative incidence of testicular tumors in patients with an abdominal undescended testicle?**  
20 times greater than the normal population. (The risk does not change even if the testicle is brought down to its normal location.)
- **Which testicular tumor is most common in older men?**  
Seminoma.

- **What must be done prior to exteriorization of the testis to prevent spread of tumor?**  
Occlusion of the spermatic vessels.
- **What are the indications for retroperitoneal nodal dissection in a patient with a testicular tumor?**  
CT-defined nodal involvement, invasion of lymphatics or blood vessels within the parenchyma by nonseminomatous tumors, persistence of a large volume of teratocarcinoma within the testis and failure of markers to return to normal after removal of a testicle containing nonseminomatous germ cell elements.
- **Which testicular tumor has the worst prognosis?**  
Choriocarcinoma (it is almost always fatal).
- **Which testicular tumor is the most radiosensitive?**  
Seminoma.
- **What are the tumor markers to check before orchiectomy?**  
HCG (seminomatous) and AFP (nonseminomatous). Also obtain an abdominal CT for staging before surgery.
- **What is the sperm count in a normal healthy male?**  
Between 30 and 100 million sperm/mL with at least 70% showing purposeful motility.
- **What are the indications for surgery in a patient who has sustained traumatic renal injury?**  
Urinary extravasation, IV contrast blush on CT scan outside the renal capsule, persistent retroperitoneal bleeding, and nonviable tissue.
- **What is the best surgical approach for renal exploration after trauma?**  
Midline abdominal.
- **What is the most common cause of ureteral injury?**  
Iatrogenic injury during abdominal procedures.
- **A patient returns for follow-up after sustaining a rapid deceleration motor vehicle accident 2 weeks prior. The patient complains of flank pain, has a palpable mass, and shows ileus on abdominal films. What is the most likely GU-associated diagnosis?**  
A missed ureteral injury with development of a urinoma.
- **What is the treatment of choice for injuries to the middle or upper third of the ureter?**  
Primary ureteroureterostomy over a J stent.
- **What percentage of bladder injuries are extraperitoneal?**  
75%.

- **What is the most common cause of traumatic bladder injury?**  
Pelvic fracture with penetration of the bladder by bone spicules.
- **What percentage of pelvic fractures have an associated bladder or urethral injury?**  
5% to 15%.
- **What is the treatment for most extraperitoneal bladder injuries?**  
Conservative management with catheter drainage.
- **What is the treatment of choice for an intraperitoneal bladder injury?**  
A two-layer closure with suprapubic drainage for several weeks.
- **What is the most common cause of urethral injury?**  
Pelvic fracture or perineal penetration (saddle injury).
- **What is the initial procedure for patients with documented urethral injury?**  
Cystostomy.
- **What is the typical presentation of a urethral valve anomaly?**  
A young boy with a weak or dribbling stream.
- **What are the possible complications of an unrepaired urethral valve anomaly?**  
Uremia and hypertension from obstructive uropathy.
- **What is the treatment for urethral valve anomalies?**  
Destruction of the valves.
- **How is the diagnosis of neurogenic bladder confirmed?**  
Excretory urography, voiding cystourethrogram, and cystometry. A positive finding includes large residual urine with low-pressure, high-volume tracings and lack of sensation of filling until large volumes have been instilled.
- **What is the characteristic complaint of women with an ectopic ureteral orifice?**  
Urinary incontinence despite normal voiding habits.
- **What congenital anomaly is associated with infantile or ectopic ureterocele?**  
Duplication of the drainage system.
- **What conditions are associated with vesicoureteral reflux (VUR)?**  
Posterior urethral valves, prune-belly syndrome, complete duplication of the collecting system, Ask-Upmark kidney (segmental renal hypoplasia), neurogenic bladder, bladder neck obstruction, tuberculosis, bladder infections, suprapubic and indwelling urethral catheters, and bladder–urethral dysynergia.

- **What is the usual outcome for patients with adult polycystic kidney disease?**  
Renal failure.
- **What percentage of premature males have undescended testicle? Full-term males?**  
30% and 4%, respectively.
- **What is the critical finding that must be ruled out when a varicocele is detected?**  
A retroperitoneal tumor.
- **What are the indications for repair of a varicocele?**  
Size, scrotal pain, rapid growth, and subfertility with abnormal sperm in the ejaculate.
- **A 2-year-old male is brought to the emergency department by his mother who states that his scrotum is enlarged during the day but decreases in size at night. What is the most likely diagnosis?**  
A hydrocele.
- **What is the most common fusion defect of the urethra?**  
Hypospadias (1:300 male births).
- **What is the most common location of the urethral meatus in a patient with hypospadias?**  
At the distal end of the penile shaft, anteriorly.
- **What is the standard oncological surgical procedure for ovarian cancer?**  
TAH/BSO, omentectomy, and peritoneal fluid cytology. In addition, there is a role for peritoneal surface serosal debulking. Ovarian cancer is the leading fatal GYN malignancy caused by the typical advanced stage at presentation.
- **What is the most common neoplasm in reproductive-aged women?**  
Benign leiomyomata.
- **What is the best predictor of recurrence-free interval for early-stage leiomyosarcomas?**  
The mitotic index.
- **What effect on GYN malignancy does the anti-breast CA drug tamoxifen have?**  
Increased risk of endometrial CA and uterine sarcoma. Other side effects are increased DVT rate and cataract formation rate.
- **What are the side effects and benefits of postmenopausal hormone supplementation (estrogen/progesterone)?**  
Increased rate of CAD, breast cancer, and endometrial cancer. Decreased rates of osteoporosis and colorectal cancer.
- **What is a Krukenberg tumor?**  
Adenocarcinoma metastatic to the ovaries. Typically pancreatic, gastric, or colorectal primary tumors are the etiology.

- **What is the effect of adjuvant radiation therapy on early-stage leiomyosarcomas?**  
Pelvic recurrences have been shown to be reduced by almost 50%.
- **What is the effect of estrogen on the endometrium?**  
It causes the endometrial glands to lengthen and the glandular epithelium to become pseudostratified.
- **In a woman of reproductive age, what is the first step in the evaluation of dysfunctional uterine bleeding following the history and physical examination?**  
A pregnancy test.
- **What are the treatment options for ectopic pregnancy?**  
Methotrexate if early in course. Salpingotomy and extraction, salpingectomy, and laparoscopic transfibrial extraction.
- **What is most common cause of dysfunctional uterine bleeding in adolescence?**  
Anovulation.
- **What percentage of adolescents who require hospitalization for abnormal bleeding have an underlying coagulation disorder?**  
25%. The majority of these patients will have Von Willebrand's disease, problems with platelet number, or problems with platelet function.
- **What is the most common presenting complaint for a woman with cervical cancer?**  
Menorrhagia.
- **What is the treatment for tubo-ovarian abscess from PID?**  
Initial hospitalization and IV antibiotics. Failure to respond to ABX necessitates surgical drainage. Immediate drainage for cases of intraperitoneal rupture. CT scan has become the standard diagnostic modality. Cervical cultures typically reveal the causative organism.
- **What is the concern if a TOA occurs in a postmenopausal woman who is not sexually active?**  
Endometrial or fallopian-tube malignancy.
- **What is the most common cause of postmenopausal bleeding?**  
Atrophic endometrium and/or atrophic vaginitis.
- **Decline in which hormone heralds the onset of menses?**  
Progesterone.
- **How much of a reduction in the risk of ovarian cancer is oral contraceptive use associated with?**  
40% after 4 years and 60% after 12 years. There is a persistent protective effect after discontinuation of use.

- **What is the site of most ectopic pregnancies?**  
The fallopian ampulla.
- **Is CA-125 specific for ovarian cancer when elevated in serum?**  
No. Other sources are endometriosis, hepatic dysfunction, pancreatitis, and pelvic inflammatory disease.
- **A 10-year-old girl presents with an adnexal mass. What is the most common etiology?**  
A mature cystic teratoma (dermoid cysts).
- **A 6-year-old girl presents for evaluation of premature thelarche. Her workup reveals Tanner stage IV breast development, numerous café' au lait spots, and ovarian cysts. What is the most likely diagnosis?**  
McCune–Albright syndrome.
- **What percentage of teratomas are bilateral?**  
10% to 15%.
- **What is the risk of malignant transformation in a mature teratoma?**  
Less than 2%.
- **What is the most common type of malignant transformation in a mature teratoma?**  
Squamous cell carcinoma.
- **What is leiomyomatosis peritonealis disseminata?**  
A rare condition in which benign leiomyomatous nodules are spread out over the pelvic and abdominal peritoneum. This usually occurs in young women and is associated with a recent pregnancy or estrinizing granulosa tumor.
- **What are the risk factors for endometrial CA?**  
Obesity, family history and the Lynch syndrome (II), and exogenous estrogen or tamoxifen use. Protective variables are history of oral contraceptive use and multiparity.
- **What are the risk factors for ovarian CA?**  
BRCA1 mutation, early menarche and late menopause, nulliparity, and family history. Again, history of OCP use reduces risk as in breast and endometrial CA.
- **When should PAP smears be initiated?**  
When a woman becomes sexually active or reaches the age of 18 years.
- **How effective have PAP smears been in reducing the incidence of cervical cancer?**  
It has decreased by almost 80%.
- **What is the most common presenting symptom for patients with cervical cancer?**  
Abnormal vaginal bleeding.

○ **What is the relative frequency of the two major histologic subtypes of cervical cancer?**

Squamous cell carcinoma occurs in 85% to 90% and adenocarcinoma accounts for the majority of the remaining cases.

○ **Which lymph node group is most frequently involved with metastatic cervical cancer?**

The external iliac group.

○ **Ureterovaginal fistulas occur in what percentage of patients undergoing radical hysterectomy?**

1% to 2%.

○ **What are the advantages of radical hysterectomy over radiation therapy for stage I cervical cancer?**

Ovarian preservation, unimpaired vaginal function, and establishment of extent of disease.

○ **How does a modified radical hysterectomy differ from a radical hysterectomy?**

The uterine artery is divided medial to the ureter rather than at its origin, the cardinal ligament is divided medial to the ureter rather than at the pelvic wall, and only the medial portion of the uterosacral ligament is resected and the vaginal margin is smaller.

○ **Clinical staging of a 56-year-old female with cervical cancer involving the left parametrium detects a 6-cm complex right adnexal mass. How is treatment affected by the mass?**

Surgical exploration is necessary to exclude a simultaneous ovarian cancer with staging or debulking as indicated. Given the parametrial extension, a hysterectomy should not be performed.

○ **What is the therapy of choice for an isolated vaginal cuff recurrence following radical hysterectomy for cervical cancer?**

External beam radiation therapy followed by brachytherapy.

○ **What is the most common clinical condition associated with the development of endometrial hyperplasia?**

Polycystic ovary syndrome.

○ **What differentiates complex atypical hyperplasia from well-differentiated adenocarcinoma?**

The presence of stromal invasion.

○ **What surgical options are currently available for the treatment of endometrial hyperplasia?**

Curettage for acute bleeding, hysteroscopy to exclude polyps and carcinoma, and hysterectomy, particularly if cytologic atypia is present.

○ **What risk factors are associated with endometrial carcinoma?**

Obesity, nulliparity, early menarche, and late menopause. Women 21–50 pounds more than ideal body weight increase their risk of developing endometrial carcinomas threefold. Women in excess of 50 pounds more than ideal body weight increase their chance of developing endometrial carcinoma 10-fold.

- **What is type II Lynch syndrome?**  
A hereditary predisposition to the development of colon, breast, ovarian, and endometrial cancer.
- **Who might benefit from endometrial cancer screening?**  
Postmenopausal women on exogenous unopposed estrogen, obese postmenopausal women, women whose menopause occurred after the age of 52 years and premenopausal women with chronic anovulation.
- **What effect does the prior use of oral contraceptive agents have on the development of endometrial cancer?**  
It decreases the risk.
- **What is the most common presenting complaint of a woman with endometrial cancer?**  
Dysfunctional uterine bleeding.
- **What is the initial workup for a woman whose history is suspicious for endometrial cancer?**  
Pelvic examination, PAP smear, biopsy of any abnormal cervical or vaginal lesions, and endometrial biopsy.
- **In what clinical circumstances are pelvic and abdominal CT helpful in evaluating patients with endometrial cancer on biopsy?**  
Abnormal liver function tests, hepatomegaly, palpable upper abdominal mass, palpable extrauterine pelvic disease, and ascites.
- **Why do younger women have a better prognosis for endometrial carcinoma compared to older women?**  
Young women tend to have lower-grade tumors with less myometrial invasion.
- **What is the significance of estrogen and progesterone receptor status in the prognosis of women with a diagnosis of endometrial carcinoma?**  
ER status does not correlate well with prognosis, but the absence of progesterone receptors is associated with a poor prognosis.
- **What is the estrogen and progesterone receptor status in obese women with endometrial cancer?**  
The majority are ER+ and PR+.
- **What is a Walthard nest?**  
A benign inclusion cyst created in the fallopian tube by invagination of the tubal serosa.
- **What tumor marker is useful in the follow-up of tubal serous carcinomas?**  
CA-125.
- **What is the most common primary malignant neoplasm of the fallopian tubes?**  
Papillary serous adenocarcinoma.

- **What is the standard treatment for tubal carcinoma?**  
Total abdominal hysterectomy and bilateral salpingo-oophorectomy (TAH/BSO), aggressive cytoreductive surgery, and chemotherapy.
- **What is the lymphatic drainage of the fallopian tubes?**  
The para-aortic lymph nodes.
- **What link does the human papilloma virus (HPV) have with vulvar cancer?**  
HPV DNA can be identified in approximately 70% to 80% of intraepithelial lesions but is seen in only 10% to 50% of invasive lesions. HPV type 16 seems to be most common but types 6 and 33 have also been identified.
- **What is the treatment of Paget's disease without an underlying adenocarcinoma?**  
This is a true intraepithelial neoplasia and can be treated as such with wide local excision.
- **What are the most frequent histologic subtypes seen in Bartholin gland cancer?**  
Adenocarcinoma and squamous cell carcinoma.
- **What is the most frequent primary vulvar sarcoma?**  
Leiomyosarcoma.
- **What is the most common location on the vulva to find an adenoid cystic carcinoma?**  
Bartholin's gland.
- **What is the single most important prognostic factor in women with vulvar cancer?**  
Lymph node metastases.
- **Prior to treatment of Paget's disease of the vulva, which screening tests should be performed?**  
Breast examination, mammography, and cytologic and colposcopic evaluation of the cervix, vagina, and vulva.
- **Which vaginal tumor presents as a mass of grape-like nodules most commonly in the first 2 years of life?**  
Embryonal rhabdomyosarcoma (sarcoma botryoides).
- **What is the most common vaginal tumor?**  
Secondary carcinoma from extension of a cervical cancer.
- **What is the most common type of primary vaginal cancer?**  
Squamous cell.
- **What is the most common location of a primary vaginal carcinoma lesion?**  
The upper third and posterior wall of the vagina.

- **What is the treatment of clear cell adenocarcinoma confined to the upper vagina and/or cervix?**  
Radical hysterectomy with upper vaginectomy and pelvic lymphadenectomy with retention of the ovaries.
- **What is the treatment of malignant melanoma of the vagina?**  
Radical excision with nodal dissection.
- **What are the risk factors for PID?**  
Age less than 20 years, multiple sexual partners, nulliparity, and previous history of PID.
- **What is the most likely diagnosis in a patient whose uterus is larger than expected from the history of gestation, has vaginal bleeding, and passes grape-like tissue from the vagina?**  
Hydatidiform mole.
- **What are chocolate cysts?**  
Endometriomas (cystic forms of endometriosis on the ovary).
- **What is Meig's syndrome?**  
Ascites with hydrothorax associated with benign ovarian tumors with fibrous elements, usually fibromas.
- **What are the risk factors for vulvar carcinoma?**  
Older age, smoking, previous squamous cell carcinoma of the cervix or vagina, chronic vulvar dystrophy, and immunocompromise.
- **What is the method of spread of vulvar carcinoma?**  
Lymphatic (to the inguinal nodes).
- **What is the treatment of choice for vulvar carcinoma?**  
Radical vulvectomy with inguinal lymphadenectomy.
- **What are the most common organisms that cause pelvic inflammatory disease?**  
*N. gonorrhoea* and *Chlamydia*.
- **What is the treatment for patients with stage IB and IIA cervical cancer?**  
Radical hysterectomy with pelvic lymphadenectomy or definitive radiotherapy.
- **In the treatment of cervical cancer, when is it required to use combination radiotherapy and surgery?**  
With stage IB and cancers that exceed 5 cm in diameter.
- **When is extended-field radiotherapy required?**  
When metastases are found in the common iliac or para-aortic lymph nodes.

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## CHAPTER 17

# Head, Neck, and ENT Pearls

- **What is the lymphatic drainage from the middle and posterior third of the tongue?**  
To the submandibular and internal jugular nodes.
- **Where should sutures be placed in repairing full-thickness lacerations of the pinna?**  
Through the cartilage.
- **What is the most common cause of laryngeal stenosis?**  
Trauma.
- **Old women with a dry mouth and foul-smelling breath and pain on lateral face 1 cm anterior to ear. She has been diagnosed with parotiditis; what is her treatment?**  
Antibiotics, which cover *Staph*. However drainage required if abscess develops or not improving.
- **What effect can CO<sub>2</sub> lasers have on the eyes?**  
Exposure to a 10,600 nm wavelength produced by the CO<sub>2</sub> laser can cause corneal opacification because energy is largely absorbed on the surface of the eye.
- **T/F: Most carcinomas of the ear are related to excessive sun exposure.**  
True.
- **Where are most esophageal foreign bodies found?**  
Just below the cricopharyngeus muscle.
- **What is the mechanism of postobstructive pulmonary edema or negative pressure pulmonary edema?**  
Forced inspiration against a closed glottis, inducing large negative intrapleural and transpulmonary pressure gradients. This promotes transudation of edema fluid from the pulmonary capillaries into the interstitium.
- **What is the treatment for edema induced by partial glottic or subglottic airway obstruction?**  
Humidified oxygen, adequate hydration, and, if necessary, corticosteroids alone or in combination with nebulized racemic epinephrine.

**Which organism most commonly causes otitis media in the newborn?**

*E. coli.*

**Which topical anesthetics have been shown to induce methemoglobinemia?**

Prilocaine, benzocaine, lidocaine, and procaine.

**What are the current indications for surgical exploration after penetrating injury to zone II of the neck?**

Expanding hematoma and external hemorrhage. Strong consideration for neurological deficit, hematemesis, and bruit. Hemodynamically stable patients can be evaluated with CT angiogram, swallow evaluation, and bronchoscopy.

**T/F: Erythroplakia is a premalignant condition.**

True.

**T/F: Retinoids can reverse leukoplakia and reduce chance of neck malignancy?**

True.

**What is the most common cause of stridor in a newborn?**

Laryngomalacia.

**What is the recommended treatment for large carcinomas of the paranasal sinuses?**

Combination surgery, radiation therapy, and chemotherapy.

**What are the generally accepted indications for tonsillectomy and adenoidectomy (T&A)?**

Airway obstruction, sleep apnea, recurrent tonsil infections, recurrent ear infections, peritonsillar abscess, and unilateral tonsillar enlargement.

**What are the treatment options for Zenker's (cricopharyngeal space) esophageal diverticulum?**

A myotomy of the cricopharyngeus muscle should always be performed in conjunction with diverticular excision, exclusion via stapling off, or suspension.

**What genetic syndrome is commonly associated with lymphoid hyperplasia resulting in severe upper airway obstruction?**

Down's syndrome (trisomy 21).

**What are the signs of ongoing bleeding after T&A?**

Frequent swallowing, tachycardia, and hypotension.

**What is the main determinant of cosmetic outcome in repair of full-thickness lip lacerations?**

Proper apposition of the vermilion border.

- **What is the most common malignant salivary tumor?**  
Mucoepidermoid carcinoma.
- **What is the most common malignant salivary tumor of the submandibular glands?**  
Adenoid cystic carcinoma.
- **What is the treatment of pleomorphic adenoma?**  
Superficial parotidectomy with facial nerve preservation.
- **What are the #1 and #2 most common benign salivary tumor?**
  1. Pleomorphic adenoma
  2. Warthin's tumor—10% are bilateral
- **What is the disadvantage of using PVC, red rubber, or silicone endotracheal tubes during laser surgery?**  
Each of these tubes can be ignited by the carbon dioxide laser in an environment of 100% oxygen.
- **Which part of the airway shows the greatest degree of inflammation in a child with laryngotracheobronchitis (croup)?**  
The subglottic region.
- **A patient presents with gingival pain and a foul mouth odor. Physical examination reveals fever, lymphadenopathy, bright red gingiva, and ulcerated papillae with a gray membrane. What is the most likely diagnosis?**  
Acute necrotizing ulcerative gingivitis.
- **What is the treatment of choice for the above patient?**  
Antibiotics (tetracycline or penicillin) and topical anesthetics.
- **What is the most common oral manifestation of AIDS?**  
Oropharyngeal thrush.
- **What is the most common cause of vertigo in a child?**  
Otitis media.
- **What complications must be considered in patients with nasal fractures?**  
Septal hematoma and cribriform plate fractures.
- **What is the treatment for thyroid lymphoma?**  
Chemo and radiation therapy.

- **What physical examination findings would make posterior epistaxis more likely than anterior epistaxis?**  
Inability to see the site of bleeding, blood from both sides of the nose, blood trickling down the oropharynx, and inability to control bleeding by direct pressure.
- **A child with a sinus infection presents with proptosis, a red swollen eyelid, and an inferolaterally displaced globe. What is the most likely diagnosis?**  
Orbital cellulitis and abscess associated with ethmoid sinusitis.
- **An ill-appearing patient presents with a fever of 103°F, bilateral chemosis, third nerve palsy, and sinusitis. What is the most likely diagnosis?**  
Cavernous sinus thrombosis.
- **In what age group is retropharyngeal abscess most common?**  
6 months to 3 years (retropharyngeal lymph nodes regress in size after the age of 3 years).
- **What are the most common types of malignant neoplasms of the nasopharynx in adults?**  
Squamous cell carcinoma (SCC) and its variant and lymphoepithelioma.
- **A teenage male presents with obstructed nares and epistaxis. What should be suspected? And what is your treatment?**  
Juvenile nasopharyngeal angiofibroma. Treated with embolizing the internal maxillary artery for control of bleeding and then removal of the tumor.
- **What syndrome may inadvertent disruption of the auriculotemporal nerve during parotid surgery and subsequent cross-reinnervation with branches of the sympathetic supply to the skin result in?**  
Frey's syndrome (postoperative gustatory sweating), seen after up to 50% of parotidectomies. Temporal muscle flaps to obliterate the space between the facial nerve branches and the skin can reduce the incidence.
- **What key anatomical structures are preserved in the modified radical neck dissection?**  
The sternocleidomastoid muscle, internal jugular vein, and/or the spinal accessory nerve.
- **To what nerve does submandibular gland excision warrant careful dissection to prevent injury?**  
Marginal mandibular nerve.
- **How should patients be followed after iodine-131 ablation post thyroidectomy for malignancy?**  
Serum thyroglobulin levels. Synthroid is held for 2 weeks and then T4 levels are checked. PET scan is emerging as another screening/follow-up modality. When follow-up screening is positive, subsequent I-131 scanning can be performed to localize potential recurrences, as can PET scanning.
- **A 48-year-old male presents with a high fever, trismus, dysphagia, and swelling inferior to the mandible in the lateral neck. What is the most likely diagnosis?**  
Parapharyngeal abscess.

- **T/F: A patient can lose more of the upper lip than the lower lip without cosmetic problems.**  
False. Up to one-third of the lower lip can be avulsed or debrided and the patient may still have an acceptable cosmetic appearance. The upper lip is less forgiving because of the relationship with the columella, alar bases, and philtrum.
- **What is an insular component to thyroid cancer, and what is the prognostic significance?**  
An insular component consists of tumor cells resembling pancreatic islet cells of neuroendocrine origin. This can be seen in conjunction with either papillary or follicular carcinoma and carries a worse overall survival prognosis. The insular components do concentrate I-131, so ablative therapy for metastasis is still appropriate.
- **What acute complication may bilateral mental fractures cause?**  
Airway obstruction.
- **What is the appropriate management of TMJ syndrome?**  
Physiotherapy, analgesia, soft diet, muscle relaxants, and warm moist compresses four to five times daily.
- **What structures are removed in the classic radical neck dissection?**  
The sternocleidomastoid muscle, internal jugular vein, spinal accessory nerve, and submandibular salivary gland with the associated lymph node-bearing fibrofatty tissue.
- **What are the etiology and treatment for paranasal sinusitis in the ICU patient?**  
Diagnosis requires quantitative cx of purulent material. Gram-negative bacteria (*Pseudomonas*) are the most common pathogens. Removal of NG tubes and changing of nasotracheal tubes to nasopharyngeal tubes is beneficial. Other treatments include antihistamines, ABX, and sinus decongestants. Conversion to tracheostomy is not necessary.
- **Where are most calculi within the parotid duct found?**  
Near the orifice.
- **What is the initial diagnostic modality for an isolated solitary neck mass?**  
Fine needle aspiration (FNA)/biopsy. Social history for smoking/tobacco use makes SCC the most common diagnosis. History should also focus on history of recent upper airway or head and neck infection, prior neck interventions, and TB. Other diagnostic measures if malignant cells found include CT head/neck/chest, endoscopy, laryngoscopy, and pharyngoscopy.
- **A patient is 1 month out from tracheostomy and has a small bleed from trach site. Then 24 hours later the patient has massive bleeding from the trach site. What is the problem?**  
Tracheo/innominate fistula. Emergent surgical repair via sternotomy with vascular control, debridement repair of the artery and trachea, and soft-tissue flap interposition over trachea. When first diagnosed the trach cuff should be hyperinflated after being slightly pulled back to temporize bleeding. If this is unsuccessful, direct finger pressure may be necessary.
- **How is the facial nerve best protected when performing operations on the parotid gland?**  
By identifying its trunk as it exits the stylomastoid foramen at the posterior aspect of the gland.

- What symptom are patients with acoustic neuromas more likely to complain of?**  
Tinnitus and hearing loss.
- Have long-term outcomes been proved to be improved with respect to survival and incidence of laryngeal stenosis with percutaneous tracheostomy vs. traditional open surgical tracheostomy?**  
No.
- T/F: Parapharyngeal abscesses should be drained through a transverse neck incision.**  
True.
- In which Le Fort fracture is CSF rhinorrhea most common?**  
III.
- A 16-year-old boxer presents with right ear pain and swelling after receiving a blow to the ear. What is the appropriate treatment?**  
The ear should be aseptically drained by incision or aspiration and a mastoid conforming dressing applied. ENT follow-up is mandatory.
- What is the ideal reconstruction of a skin defect greater than 1 × 1 cm on the nose or medial face after squamous cell CA excision?**  
Rotational skin flap.
- What physical findings are associated with a unilateral sensory hearing loss?**  
The patient will have air conduction greater than bone conduction (normal Rinne test), and the Weber test will lateralize to the normal ear.
- What is the most common cause of unilateral sensory hearing loss?**  
Viral neuronitis.
- What are the most common causes of bilateral sensory hearing loss?**  
Noise or ototoxins such as certain antibiotics, loop diuretics, and antineoplastics.
- A young male was involved in a bar room brawl and now complains of ear pain, significantly decreased hearing, and vertigo. A tympanic membrane rupture is seen on examination. What is the major concern?**  
Injury to the ossicles, temporal bone, or labyrinth. Emergent ENT consult is necessary.
- What are the most common organisms causing acute otitis media in children?**  
*S. pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*.
- What are the most common clinical complications of substernal goiter?**  
Horner syndrome from sympathetic chain involvement, dysphagia, and respiratory difficulty are the most common. Phrenic nerve irritation (hiccups/atelectasis) can occur as can central vein occlusion via external pressure.

- **In which salivary gland are stones most likely to occur?**  
The submandibular gland.
- **What percentage of patients with carcinoma of the tongue present with lymph node metastases?**  
50%.
- **What is the treatment of choice for a pleomorphic adenoma of the parotid gland?**  
Superficial parotidectomy with preservation of the facial nerve.
- **What is the most common cause of laryngeal trauma?**  
Blunt trauma secondary to motor vehicle accidents.
- **What X-ray findings are associated with lower airway foreign bodies?**  
Air trapping on the affected side and a mediastinal shift to the contralateral side.
- **What are the clinical features of basal cell carcinoma?**  
A raised, waxy nodule with occasional erythema.
- **What prophylaxis should be given to household contacts of patients with acute epiglottitis?**  
Rifampin 20 mg/kg (maximum 600 mg) for 4 days.
- **What is the treatment of choice for a radicular cyst of the mandible?**  
Local excision or curettage.
- **What means of airway maintenance are recommended for patients with Ludwig's angina?**  
Tracheostomy or cricothyroidotomy.
- **What is the most common indication for surgical drainage in patients with Ludwig's angina?**  
Failure of antibiotic therapy.
- **What are the most common presenting signs of anterior lateral pharyngeal space infections?**  
Trismus, swelling at the angle of the mandible, and medial bulging of the pharyngeal wall.
- **What are the most common findings on lateral neck X-rays in patients with a retropharyngeal abscess?**  
Prevertebral soft-tissue widening, air-fluid levels, loss of cervical lordosis, and cervical osteomyelitis.
- **What is the imaging modality of choice for the diagnosis of septic thrombophlebitis of the jugular vein?**  
CT with contrast.

○ **What are the clinical features of cystic hygroma?**

A lateral neck mass, most commonly in the posterior neck triangle. The mass is soft and transilluminates. Excision is recommended because of frequent infections. This clinical appearance is different than a branchial cleft cyst, which typically occurs along the anterior border of the SCM muscle, is more firm, and causes a skin buckling or indent.

○ **What are the most common bacterial causes of acute sinusitis?**

*Pneumococcus* and *H. influenza*.

○ **What is the most common bacterial cause of malignant external otitis?**

*Pseudomonas aeruginosa*.

○ **What is the most frequent neurological complication of malignant external otitis?**

Facial nerve palsy.

○ **What antibiotic regimen is most appropriate in the treatment of malignant external otitis?**

Broad-spectrum combination therapy with activity against *P. aeruginosa*.

○ **What is the most important risk factor for the development of acute bacterial parotitis?**

Dehydration.

○ **What is the most common organism associated with acute suppurative parotitis?**

*Staphylococcus aureus*.

○ **What is the treatment of choice for a patient with a peritonsillar abscess?**

Incision and drainage.

○ **Through what anatomical space must a peritonsillar abscess extend to involve the carotid sheath?**

The lateral pharyngeal space.

○ **What is the etiology of ventricular ectopy during right radical neck dissection?**

Trauma to the right stellate ganglion and cervical autonomic nervous system during dissection.

○ **How long should a patient with epiglottitis and airway compromise remain intubated?**

36–48 hours (when inflammation has subsided).

○ **What is the treatment for croup?**

Humidified oxygen. If tachypnea and cyanosis are present, racemic epinephrine may be helpful.

○ **How is the diagnosis of sleep apnea syndrome confirmed?**

Complete cessation of airflow, oxygen desaturation to 90%, obstruction for 10 seconds or more with no air movement, and paradoxical movement of the chest and abdomen or nasopharyngoscopic or cinofluoroscopic documentation of upper airway obstruction.

- **What sequelae result from superior laryngeal nerve injury?**  
Loss of sensation above the vocal cords, impairment of laryngeal protective reflexes, hoarseness, and limited vocalization of high-pitched tones (external branch).
- **T/F: Atlantoaxial instability is more common in the pediatric population.**  
True. The ligaments of the cervical spine are immature and loose, and the odontoid process is not fully developed. (As many as 30% of children with Down's syndrome and achondroplastic dwarfism have atlantoaxial instability.)
- **What complications are associated with surgery for head and neck cancer?**  
Open neck veins can entrain air into the venous system; tumors involving the major vessels in the neck may require sacrifice of one or both internal jugular veins, resulting in decreased cerebral perfusion pressure, cerebral edema, and cardiac arrhythmias.
- **What is the risk of general anesthesia in a patient with a peritonsillar abscess?**  
Spontaneous rupture of the abscess with spillage of pus into an unprotected airway.
- **T/F: In patients with cancer of the oral gingiva, extraction of a tooth in the area of the tumor provides access for rapid deep invasion of the bone.**  
True.
- **What are the indications for postoperative radiation therapy for the above patient?**  
Massive tumor involvement, close or involved surgical margins, perivascular or perineural invasion, and/or extensive nodal metastasis.
- **T/F: The majority of minor salivary gland tumors in the upper aerodigestive tract are malignant.**  
True, as opposed to the parotid gland in which the majority of tumors are benign.
- **A patient presents with a small mass in the left parotid gland. FNA cytology shows SCC. What is the likelihood that this is a primary SCC of the parotid?**  
It is unlikely. Metastasis from the surrounding oropharyngeal/laryngeal area is more common.
- **T/F: Leukoplakia has a higher incidence of malignant transformation than erythroplakia.**  
False.
- **T/F: Nonepithelial cancers are the most prevalent malignancies in carcinoma of the larynx.**  
False. SCC is the most common cancer (95%–98%).
- **On initial presentation of a patient with SCC arising in the tongue, floor of the mouth, gingival, or cheek mucosa, how many will have evidence of regional nodal metastasis?**  
One-third.
- **A patient presents with a complaint of a recurrent, painful swelling of the side of the face at mealtimes that usually resolves within 2–3 hours. What is the most likely diagnosis?**  
Sialolithiasis.

- **When does a mandible fracture become an airway embarrassment?**  
If there are bilateral parasymphyseal fractures of the mandible.
- **What signs and symptoms indicate malignancy of a parotid gland tumor?**  
Weakness or paralysis of the facial nerve, presence of nodal enlargement, and fixation of the tumor to skin or deep tissues.
- **Which salivary gland tumor has a well-known propensity for extension along perineural spaces and invasion of bone?**  
Adenoid cystic carcinoma.
- **What are the common causes of stomal recurrence after laryngectomy?**  
Submucosal extension of tumor, lymphatic spread, paratracheal lymph node metastasis, and tumor implants at the site of surgery.
- **A patient has undergone a total thyroidectomy for cancer. Postoperatively, the patient is unable to breathe after extubation. What surgical complication may have occurred?**  
Bilateral recurrent laryngeal nerve injury.
- **A toddler sustains an electrical injury to the commissure of the mouth after biting through an electrical cord from a floor lamp. What postinjury warning should be given to the parents?**  
The labial artery may hemorrhage if the overlying soft tissue of the commissure breaks down. The parents should be instructed to hold digital pressure on the lip with their thumb and index finger to control the bleeding and seek help immediately.
- **What is the most common intracranial complication of suppurative otitis media?**  
Meningitis.
- **An acutely ill child presents with profuse, purulent, foul-smelling otorrhea, and a large tympanic membrane perforation. What is the most likely diagnosis?**  
Acute necrotizing otitis media caused by beta-hemolytic *Streptococcus*.
- **What are indications for myringotomy in acute otitis media?**  
Failure of initial antibiotic therapy, severe pain, complicated acute otitis media, and an immunocompromised patient.
- **During a Valsalva maneuver, a weight lifter experiences sudden decrease in hearing with vertigo and unsteadiness. Over the next few weeks, the weight lifter has fluctuations in symptoms but with worsening hearing. What is the most likely diagnosis?**  
A perilymphatic fistula.
- **What distinguishes central from peripheral facial nerve paralysis?**  
Central has intact frontalis and orbicularis oculi function, intact mimetic function, and absent Bell's phenomena.

- **Which cranial nerve innervates derivatives of the second branchial arch?**  
VII (geniculate ganglion).
- **Fourth and sixth arch derivatives are innervated by which nerves?**  
Superior laryngeal nerve and recurrent laryngeal nerve, respectively.
- **In neonates, against which organisms should initial antibiotic therapy for acute otitis media be effective?**  
Enteric organisms (Gram negative).
- **Which component defines nystagmus?**  
Fast component. Slow phase is vestibular in origin, direction of endolymph flow; the fast phase is compensatory, from reticular formation.
- **What is the most common result of delayed treatment of a septal hematoma?**  
Cartilagenous necrosis with resultant saddle nose deformity.
- **A 24-year-old male presents with unilateral vigorous epistaxis following blunt trauma during a basketball game. His nasal dorsum is displaced laterally, and intranasal examination reveals bleeding from the superior aspect of the nasal cavity. What is the most likely diagnosis?**  
Traumatic injury to the anterior and posterior ethmoid arteries.
- **What is the most important information to be gained from plain X-rays of the paranasal sinuses?**  
Presence or absence of bony destruction.
- **A 15-year-old male presents to your office with persistent, severe, and recurrent epistaxis associated with unilateral nasal obstruction. Examination reveals a large left-sided bluish intranasal mass. What is the most likely diagnosis?**  
Juvenile angiofibroma.
- **What signs and symptoms are associated with orbital blowout fractures?**  
Diplopia with upward gaze, shallow supratarsal sulcus, enophthalmos, and vertical shortening of the lower eyelid.
- **What is the most common location of salivary gland tumors?**  
The parotid gland (80%).
- **What percentage of parotid gland tumors are malignant?**  
20%.
- **What is the most common malignant tumor of the parotid gland?**  
Mucoepidermoid carcinoma.

- **What is the most common malignant tumor of the submandibular gland?**  
Adenoid cystic carcinoma.
- **An 88-year-old white male presents with a painless mass just below his ear that has been slowly enlarging for 2 to 3 years. Pathology shows round, plump, granular eosinophilic cells with small indented nuclei. What is the most likely diagnosis?**  
Warthin's tumor (adenolymphoma); these tumors are bilateral 10% of the time. This is the second most common parotid malignancy overall.
- **What is the most common bacterial pathogen causing cervical lymphadenitis in young children?**  
*Staphylococcus*.
- **The sensory distribution of which cranial nerves is responsible for the sensory distribution referred otalgia?**  
CN V, IX, and X.
- **Which muscle is the sole abductor of the vocal cords?**  
Posterior cricoarytenoid.
- **A paralyzed vocal cord in the paramedian position is the result of what kind of injury?**  
Isolated unilateral recurrent laryngeal nerve injury.
- **Which intrinsic laryngeal muscles are responsible for tension of the vocal cords?**  
Cricothyroid (chief tensor) and thyroarytenoid (internal tensor).
- **What is the significance of vocal cord paralysis in a patient with thyroid cancer?**  
Poor prognosis, neurapraxia caused by compression, paralysis that is not reversible, and/or inoperability.
- **In which space will a deep neck abscess secondary to pansinusitis will occur?**  
Retropharyngeal.
- **A 6-year-old male presents with dysphagia, fever, and noisy breathing. His voice is muffled when he speaks, his neck is stiff, and he has rigid posturing of his head. What is the most likely diagnosis?**  
Retropharyngeal abscess.
- **What is the most common source of an airway obstructing oropharyngeal deep space abscess?**  
Poor dental hygiene. Airway obstruction and respiratory distress mandate tracheostomy.
- **A 55-year-old nonsmoking male presents with a sensation of a lump in his throat and constant throat clearing. He denies weight loss. The cough is most troublesome at night. Examination results are normal except for a moderately erythematous larynx, particularly in the posterior glottis. What would be the most effective initial management of this problem?**  
Antireflux precautions.

- **In which triangle of the neck are most branchial cleft cysts found?**  
Anterior triangle, lateral to the midline.
- **Where on the neck are most thyroglossal duct cysts found?**  
Midline, beneath the hyoid, and superior to the thyroid gland.
- **Where would you expect to find the parathyroid glands in a 10-year-old patient with a lingual thyroid gland?**  
In the tracheoesophageal groove.
- **T/F: Laryngeal malignancy posterior to the cricoid and thyroid cartilage is more than five times more common in women than in men.**  
True. In addition, the Plummer–Vinson syndrome has an association with low-lying laryngeal SCC.
- **A 3-year-old boy presents with a midline anterior neck mass just below the hyoid bone that moves with deglutition and tongue protrusion. What is believed to be the cause of this congenital mass?**  
Failure of complete obliteration of the thyroglossal duct.
- **An infant presents with coughing, choking, and cyanosis during feeding. What process does this clinical triad suggest?**  
A tracheoesophageal fistula.
- **What are the most common sources of anterior epistaxis?**  
Septal branches of the sphenopalatine artery and branches of the anterior ethmoidal and facial arteries.
- **What cranial nerves are most commonly affected by skull base lesions?**  
CN VII and VIII.
- **What is the most common lesion of the cerebellopontine angle or skull base?**  
Acoustic neuroma.
- **What is the most common initial finding in a patient with an acoustic neuroma?**  
Unilateral sensorineural hearing loss.
- **Which lip is most commonly affected by sun exposure-induced carcinoma?**  
The lower lip.
- **What are the primary lymphatics for central lower lip cancer?**  
The submental lymph nodes.
- **What is the most common histopathology for lip cancer?**  
SCC.

- **What is the treatment of choice for lip cancer?**  
Surgical excision.
- **What is the most common cause of death in patients with advanced oral cancer?**  
Locoregional failure.
- **What are the primary lymphatic zones at risk with oropharyngeal cancer?**  
Zones II–IV (upper, middle, and lower jugular lymph nodes).
- **What is the cure rate with radiation alone for T1 and T2 cancers of the larynx?**  
80% to 95% for T1 cancers and 65% to 80% for T2 cancers.
- **Which lymphatic groups do cancers of the supraglottis spread to?**  
Zones II–IV (upper, middle, and lower jugular nodes) bilaterally.
- **What syndrome is associated with post-cricoid carcinoma in nonsmoking young women?**  
Plummer–Vinson syndrome.
- **What anatomically divides zones III and IV?**  
The omohyoid muscle.
- **What percentage of patients with parotid cancer will present with facial nerve paralysis?**  
12%.
- **What is the incidence of cancer arising in a preexisting benign pleomorphic adenoma?**  
1.5% at 5 years and 10% at 15 years.

- **What are the scoring criteria for the Glasgow coma score?**  
 Motor—6, follows commands; 5, withdraws from painful stimuli; 4, localizes pain; 3, flexion posturing; 2, extension posturing; 1, flaccid.  
 Verbal—5, appropriate; 4, confused; 3, inappropriate; 2, incomprehensible sounds; 1, no vocalizing.  
 Eyes—4, spontaneous; 3, open to voice; 2, open to painful stimuli; 1, do not open.  
 Total score 10 or less—intubation.  
 Total score 8 or less with head trauma—ICP monitor.
- **What is the most common cause of cerebrospinal fluid (CSF) leaks?**  
 Basilar skull fractures.
- **What therapy should be used for a patient with hemophilia A who has suffered a traumatic brain injury?**  
 Cryoprecipitate.
- **What is the minimum systemic arterial pressure required to maintain cerebral perfusion?**  
 At least 50 mm Hg.
- **What is the appropriate empiric antibiotic therapy for a spinal epidural abscess?**  
 A penicillinase-resistant penicillin (e.g., nafcillin and oxacillin).
- **What are the clinical characteristics of DIC associated with severe brain injury?**  
 Prolongation of the prothrombin time (PT), decreased fibrinogen level, and elevation of fibrin split products.
- **Head injury can produce both diabetes insipidus and syndrome of inappropriate diuretic hormone. Compare and contrast the two.**  
 DI = high Na, high serum osm, high urine output, and low urine specific gravity.  
 Syndrome of inappropriate antidiuretic hormone (SIADH) = low Na, low serum osm, low urine output, and high urine specific gravity.
- **Which is more deadly, an epidural or a subdural hematoma?**  
 Subdural has 50% mortality as it tends to occur in more elderly, comorbid patients.

- **What are the most common causes of persistent sequelae after minor head trauma?**  
Residua of organic brain damage, quest for secondary gain, and psychological reaction to the injury.
- **What is the incidence of epilepsy in patients with traumatic intracranial hematomas?**  
As high as 30% to 36%.
- **What are the most common causes of delayed increase in neurological deficit after traumatic spinal cord injury?**  
Post-traumatic syrinx formation or enlargement and persistent spinal cord compression.
- **What diagnosis must be investigated in a patient presenting with pulsating exophthalmos?**  
Carotid-cavernous fistula.
- **T/F: Patients with severe traumatic brain injury should be routinely hyperventilated.**  
False.
- **What is the most common primary malignant brain tumor?**  
Glioblastoma multiforme (GBM).
- **What clinical features are strongly associated with increased survival after spinal cord compression by tumor?**  
The ability to walk and urinary continence.
- **What is the median postoperative survival for patients with GBM who do not receive radiation therapy following surgery?**  
4 months.
- **What is the risk of cerebral infarction in the first 5 years following posterior circulation transient ischemic attacks (TIAs)?**  
35%.
- **What segment of the vertebral artery most frequently involved in traumatic dissection?**  
The segment between the second cervical vertebra and the occiput (third portion of the vertebral artery).
- **What are the most common initial symptoms in patients with acoustic neuromas?**  
Tinnitus, hearing loss, and unsteadiness.
- **Which symptoms, related to lumbar disc herniation, are indications for emergency surgery?**  
Urinary retention, perineal numbness, and motor weakness of more than a single nerve root.
- **What are the most common clinical problems seen at the initial presentation of a patient with an intracranial arteriovenous malformation?**  
Seizures and hemorrhage.

- **What is a clay shoveler's fracture?**  
Avulsion of a spinous process (usually C7).
- **What is the most common type of odontoid fracture?**  
Type II (fracture through the base of the dens).
- **What is the most likely diagnosis in a patient presenting with symptoms of neurogenic claudication?**  
Lumbar spinal stenosis.
- **What spinal abnormality is commonly seen in patients with rheumatoid arthritis?**  
Atlantoaxial subluxation.
- **What are the symptoms of anterior spinal artery syndrome?**  
Loss of bilateral motor, pain, and temperature loss.  
Position and light touch intact.
- **What is Brown–Sequard syndrome?**  
Penetrating trauma with 1/2 cord transaction.  
Loss of ipsilateral motor and contralateral pain and temp.
- **What is central cord syndrome?**  
Usually an MVA of elderly patients with hyperextension injury. Bilateral loss of upper extremity motor pain and temp. The legs retain function.
- **When is surgery required for skull fx?**  
Open or depressed skull fracture.
- **What are the major sources of brain abscesses?**  
Direct extension from middle ear, mastoid and sinus infections, hematogenous spread, and trauma.
- **What clinical entity is bilateral facial paralysis associated with progressive ascending motor neuropathy of the lower extremities and elevated CSF protein characteristic of?**  
Guillain–Barré syndrome.
- **What organism is associated with necrotizing otitis externa?**  
*Pseudomonas aeruginosa*.
- **In which clinical entity are bilateral acoustic neuromas found?**  
Neurofibromatosis II.
- **What nonglial neoplasm arises from the meningotheelial cells of the arachnoid villi?**  
Meningiomas.

- **What radiologic findings are characteristic of histiocytosis X?**  
Single or multiple sharply circumscribed osteolytic lesions, most frequently found on the skull.
- **Which intracranial tumors are radiosensitive?**  
Pituitary adenomas, craniopharyngiomas, and certain tumors of the pineal region.
- **How long can a CSF leak, without signs of infection, be observed?**  
Up to 14 days.
- **A patient with known HIV infection presents with seizures and two ring-enhancing brain lesions. What is the most likely diagnosis?**  
Toxoplasmosis or a CNS lymphoma.
- **A transplant recipient presents with a ring-enhancing lesion and seizures. What is the most likely diagnosis?**  
An infectious abscess.
- **A patient with a history of lung cancer presents with a seizure and a ring-enhancing lesion on CT of the brain. Examination reveals a new heart murmur in an otherwise normal patient with normal vital signs and no history of fever. What is the most likely diagnosis?**  
Bacterial endocarditis.
- **A child presents with headache, lethargy, erythema, and forehead tenderness. After a CT of the brain, what treatment should be undertaken?**  
Drainage of the infected paranasal sinuses.
- **A 22-year-old female presents 2 weeks postpartum with a severe headache and lethargy. CT scan shows the empty delta sign with some enhancement of the tentorium and cortical surface. What is the most likely diagnosis?**  
Sagittal sinus thrombosis.
- **What criteria must be met to establish the diagnosis of the SIADH?**  
A low serum sodium and euvolemia.
- **What is the treatment of choice for patients with SIADH?**  
DDAVP.
- **What finding is present in all types of subdural hematomas?**  
A decreased level of consciousness out of proportion to the observed focal neurological deficit.
- **What are the significant differences between Lambert–Eaton (LE) syndrome and myasthenia gravis (MG)?**  
LE is associated with lung carcinoma, and synaptic blockade occurs at the presynaptic calcium channels, impeding the release of muscle acetylcholine. In addition, LE is manifested by muscle strengthening with repetition, as opposed to fatigue with repetition in MG.

- **When should a child born with an open myelomeningocele undergo repair?**  
Emergently, to prevent infection and resultant meningitis.
- **What is the goal of a myelomeningocele repair?**  
To reconstitute the normal anatomic barriers and repair the dural cutaneous fistula.
- **Which tumors most commonly metastasize to the spine?**  
Lymphoma, breast, prostate, and kidney.
- **A patient presents with a third nerve palsy and recent episode of excruciating headache. What is the most likely diagnosis?**  
Posterior communicating artery aneurysm.
- **A 54-year-old male presents with a sudden severe headache. CT scan of the brain is normal. What is the next step in management?**  
Lumbar puncture.
- **Your patient develops new-onset headache 1 week after presenting with subarachnoid hemorrhage and having had a cerebral aneurysm clipped. You are concerned about the development of cerebral vasospasm. What is the appropriate management?**  
Maintain a mean blood pressure greater than 90 mm Hg, systolic blood pressure between 150 and 200 mm Hg, CVP less than 8 mm Hg, PAWP greater than 12 mm Hg, and a hematocrit of 33%.
- **A 35-year-old trauma patient presents with quadriplegia. After resuscitation and full evaluation revealing no other injuries, the systolic blood pressure falls to 80 mm Hg. What is the appropriate intervention at this time?**  
IV fluid followed by pressor support and invasive monitoring of the volume status.
- **Why is there a higher incidence of complete neurologic loss with thoracic fractures than with cervical or lumbar fractures?**  
The thoracic spinal canal has the least cross-sectional area for the spinal cord, thus allowing less room for movement of the cord. Furthermore, since the thoracic spine is so strong, a thoracic spine injury is the result of a tremendous force. In addition, the blood supply to the thoracic cord has a more of a watershed distribution than the other regions.
- **Why are spinal injuries of the lumbar region more likely to have neurologic recovery than injuries to other regions of the spine?**  
The neurologic compromise in the lumbar region is a result of cauda equina or lumbosacral nerve root injury, not spinal cord injury.
- **What is the physiologic difference between epidural and subdural hematomas as seen on an axial CT scan?**  
Epidural hematomas are lens-shaped because spread of the hemorrhage is contained by the tight adherence of the dura to the skull, while subdural hematomas are more concave.

○ **What is the significance of a fracture through the posterior table of the frontal sinus?**

There is potential communication between a contaminated space (the sinus) and the intracranial contents that can lead to a CSF leak or meningitis. Furthermore, significant disturbance of the sinus contours with entrapment of the sinus mucosa can lead to mucoceles.

○ **T/F: Excessive hyperventilation in a patient with a head injury may cause brain ischemia and edema.**

True.

○ **What is cerebral perfusion pressure (CPP) and what does it signify?**

CPP = MAP – ICP, where MAP equals mean arterial pressure. CPP represents the pressure required to push blood from the arterial tree to the venous tree in the intracranial space. If CPP is inadequate, the brain tissue will be underperfused.

○ **You stabilize a multiple trauma victim whose injuries include mild head injury, scalp lacerations, and a femur fracture. The next morning you note a new right hemiparesis, confusion, and petechiae on the chest and in conjunctivae. The victim's oxygen saturation has dropped to the low 90s and the urine output is declining. What is the most likely diagnosis?**

Fat embolism.

○ **A multiple trauma patient presents with a deteriorating level of consciousness, a dilated right pupil, and left hemiparesis. The patient is hypotensive and has a grossly positive DPL. The patient is rushed to the operating room for exploratory laparotomy. When and how should the head injury be addressed?**

A separate team should place a right temporal fossa burr hole as the laparotomy proceeds.

○ **What is Kernohan's notch syndrome?**

A phenomenon in the setting of uncal herniation where temporal lobe herniation displaces the brainstem against the opposite tentorial edge (Kernohan's notch) and causes symptoms of contralateral brainstem injury and ipsilateral hemiparesis.

○ **What muscles does the trigeminal nerve supply innervation to?**

The muscles of mastication (temporalis, masseter, and medial and lateral pterygoid muscles).

○ **Deviation of the tongue to the side indicates injury to which nerve?**

The ipsilateral hypoglossal nerve.

○ **What is the mortality rate for a patient with a Glasgow Coma Scale of 5?**

Greater than 50%.

○ **What is the difference between a communicating and a noncommunicating hydrocephalus?**

A communicating hydrocephalus communicates with all of the ventricles. In a noncommunicating hydrocephalus, the fourth ventricle is isolated from the dilated third and lateral ventricles.

- **What is the physiologic basis for the difference in communication vs. noncommunicating hydrocephalus?**  
The noncommunicating form causes an obstruction to CSF flow. The obstruction in the communicating hydrocephalus is in the extraventricular subarachnoid space.
- **T/F: Most spinal cord tumors are extradural.**  
True.
- **You are called to consult on a child in the emergency department with abdominal discomfort, a 2-day history of nausea and vomiting, and a palpable abdominal mass. There is no history of fever, and bowel sounds are within normal limits. The only significant history is that of a congenital hydrocephalus previously treated with placement of a ventriculoperitoneal shunt. The patient is cooperative but uncomfortable and has no peritoneal signs. Physical examination reveals a palpable mass in the right lower quadrant. What is the most likely diagnosis?**  
An intra-abdominal pseudocyst associated with an indolent VP shunt infection.
- **What is the most appropriate diagnostic test for the above patient?**  
An abdominal ultrasound or CT scan of the abdomen.
- **A multiple trauma patient is sleepy and confused after a transient loss of consciousness at the time of injury. The only external sign of injury is a seatbelt/shoulder strap bruise on the chest and neck. Initial head CT and neck X-rays are normal. The patient deteriorates over the next 12 hours from purposeful movement of all extremities to left hemiplegia. Repeat CT still reveals no obvious focal abnormalities. What is the most likely diagnosis?**  
A missed injury of the right carotid artery.
- **A child presents after falling from the bicycle. The parents, who were first on the scene, report that the child appeared to be having a seizure. On examination the child is now awake but drowsy. CT of the head is normal. The parents are obviously concerned after witnessing the seizure. What can you guardedly tell them about the child's prognosis for recovery and future seizures?**  
Impact or immediate seizures can occur with traumatic incidents. However, they do not predispose the patient to future epilepsy.
- **What is the role of lumbar puncture in the treatment of increased ICP?**  
It is contraindicated. (It may lead to cerebellar or temporal herniation!)
- **A trauma patient is found to have a significant acute subdural hematoma by CT scan. What is the appropriate treatment?**  
Emergency craniotomy.
- **What are the CT signs of diffuse, severe brain edema that are often associated with a dismal prognosis?**  
Intracranial hypertension, cerebral herniation, loss of basal cisterns, compression of the ventricles, and obliteration of the third ventricle.

- **A 24-year-old female presents with lethargy, dizziness, headache, nausea, and vomiting. She has no medical problems other than chronic neck and back pain, for which she receives chiropractic manipulations. Her current symptoms started not long after a session with the chiropractor earlier that day. A CT of the head demonstrates hypodensity of the left cerebellum with associated edema. The radiologist wonders why such a healthy young patient would suffer from a posterior fossa region infarct. What is the possible physiology of the infarction?**

Atherosclerosis and hypertension are the main causes for posterior fossa infarcts. However, any trauma to the vertebral arteries can manifest in a similar way. The vertebral arteries are vulnerable to blunt injury and significant cervical movements (i.e., MVAs and falls and manipulative therapies).

- **What is the appropriate treatment for the above patient?**

Emergent posterior fossa decompression.

- **A 35-year-old female presents with a right hemisphere TIA. Evaluation reveals angiographic narrowing of the right internal carotid artery. The radiologist describes the appearance as a string of beads. What is the treatment of choice?**

Endovascular treatments, such as balloon angiography and intra-arterial stenting, may prove to be beneficial for fibromuscular dysplasia.

- **A 70-year-old male presents with acute right-sided hemiparesis and mild aphasia that has improved since arrival to the emergency department. Angiography reveals complete occlusion of the left internal carotid artery. What is the appropriate management?**

Surgical intervention should be delayed for days to weeks since the symptoms are resolving. Furthermore, complete occlusion is not usually amenable to surgical intervention unless it is a hyperacute event.

- **What is the origin of the artery of Adamkiewicz?**

It usually arises as a radicular artery from the descending aorta between T8 and L4.

- **A patient presents with foot drop and back pain. What is the diagnostic test of choice?**

MRI. However, CT myelography can be used as an alternative or adjunctive study.

- **What disc level is most likely herniated in the above patient?**

L4-5.

- **A 39-year-old male presents to the emergency department after shoveling snow and complains of acute onset of severe low back pain. Evaluation reveals bilateral weakness of the feet on dorsiflexion, loss of sensation on the inner thighs and perineal regions, and a distended bladder. What is the most likely diagnosis?**

Cauda equina syndrome.

- **What is the appropriate treatment for the above patient?**

Emergent surgical decompression with removal of the disc fragment(s).

- **What type of tumor does a patient who has coarse facial features and continues to increase shoe and glove size in adulthood have?**  
A growth hormone-secreting pituitary adenoma.
- **What diagnosis does an obese woman with hypertension, diabetes, and a large deposit of fat over the lower cervical and upper thoracic spine most likely have?**  
Cushing's syndrome.
- **A 53-year-old female presents with spontaneous breast secretions and bitemporal field cuts. What is the most likely diagnosis?**  
A prolactin-secreting macroadenoma.
- **What is the etiology of vasospasm following subarachnoid hemorrhage?**  
Contraction of the smooth muscle cells in the cerebral vasculature secondary to breakdown of red blood cells and release of hemoglobin into the CSF.
- **What is the most likely cause of sudden painful exophthalmos with an ocular bruit?**  
A carotid-cavernous fistula.
- **T/F: A patient with transient monocular blindness and a carotid bruit is best managed by carotid end arterectomy (CEA).**  
True.
- **What is the mechanism of diffuse axonal injury?**  
Rotation of the brain within the skull secondary to sudden deceleration.
- **What syndrome are subdural hematomas and retinal hemorrhages in infants pathognomonic of?**  
Shaken baby syndrome.
- **What is the goal CPP in patients with brain injury?**  
Greater than 70 mm Hg.
- **What physical findings are indicative of a basilar skull fracture?**  
Periorbital ecchymosis, anterior fossa fractures (Battle's sign), and retromastoid ecchymosis with petrous fractures. Patients may also suffer hearing loss, anosmia, and CSF leaks.
- **What is the most common source of bleeding from an epidural hematoma?**  
Laceration of the middle meningeal artery.
- **What is the source of bleeding from a subdural hematoma?**  
Shearing of bridging veins between the dura and brain.

- **What reflex is affected by an L5–S1 herniated disc?**

The ankle jerk.

- **At what level can a patient with normal reflexes, diminished grip strength, and numbness over the fourth and fifth digits be expected to have a herniated disc?**

C7–T1.

- **What is the most common cause of a chance fracture?**

A high lap belt worn during an MVA.



## CHAPTER 19

# Anesthesia Pearls

*Mr. Anesthetist, if the patient can keep awake, surely you can. —Wilfred Trotter*

- **What is the primary toxicity risk of halothane anesthesia?**  
Hepatitis with fever, eosinophilia, and jaundice.
- **What percentage of anesthetics induce atelectasis at 1 hour post surgery? At 24 hours post surgery?**  
90% at 1 hour, 50% at 24 hours.
- **What antiemetic agent increases gastric motility?**  
Reglan (metoclopramide).
- **How often is phrenic nerve paralysis found after cardiac surgery?**  
In fewer than 10% of patients.
- **What conscious sedation agent is often used with children that increases cardiac work, secretions, and BP and is not associated with respiratory depression?**  
Ketamine.
- **Name the metabolic features of morphine**  
Hepatic metabolism and renal excretion. Loading dose of 0.1 mg/kg and a half life of 90 minutes.
- **What muscle is typically the first to recover from paralytic therapy?**  
The diaphragm.
- **What variables are associated with severe atelectasis following cardiac surgery?**  
The number of saphenous vein grafts, the use of internal mammary artery grafts, the length of cardiac by-pass time, and whether or not the pleural space was entered.
- **What is the classic mechanism of phrenic nerve injury during cardiac surgery?**  
Phrenic nerve frostbite from the cardioplegia solution. The phrenic nerve can also be mechanically injured in the dissection of the internal mammary artery because of its anatomic proximity.

- **What is the death rate from anesthesia in patients with an ASA class I or II?**  
One in 200,000.
- **What are the signs of lidocaine toxicity?**  
Neurologic signs are first with paresthesia, headache, and tinnitus possible. For patients sedated with general or MAC anesthesia cardiac arrhythmia may be the first sign.
- **What are the toxic doses of lidocaine with and without epinephrine?**  
5 mg/kg without epinephrine; 7 mg/kg with epinephrine.
- **T/F: Clindamycin prolongs the effect of nondepolarizing muscle relaxants.**  
True.
- **What has occurred when a patient with a high thoracic epidural develops a drooping eyelid and a pinpoint pupil and has a dry face?**  
Horner's syndrome caused by local anesthetic block of the first thoracic sympathetic ganglia (stellate ganglion).
- **What is the inheritance pattern and incidence of pseudocholinesterase deficiency?**  
Autosomal recessive with an incidence of approximately one in 3000.
- **How is the allowable blood loss (ABL) for a patient calculated?**  
In adults, estimated blood volume (EBV) is 60–70 cc/kg.  $ABL = EBV \times (Hg [initial] - Hg [final]) / Hg [initial]$ .
- **In patients planned for a coronary artery bypass graft (CABG), what is the incidence of carotid disease?**  
Up to 38%.
- **How does renal failure affect the cardiac status of a patient?**  
These patients are often plagued by hypertension, volume overload, anemia, accelerated atherosclerosis, and electrolyte abnormalities.
- **What medicine is associated with decrease splanchnic blood flow?**  
Vasopressin—therefore used in GI bleeds.
- **T/F: Beta-blocker eye drops can cause bronchoconstriction in patients under anesthesia.**  
True.
- **What medication class in the anesthetist's arsenal most commonly causes anaphylaxis?**  
Paralytic agents.
- **Name some complications of epidural anesthesia.**  
Epidural hematoma (cannot place with coagulopathy); bradycardia and hypotension from sympathetic blockade.

- **What patients may have detrimental side effects from succinylcholine?**  
Those with closed-angle glaucoma, space-occupying intracranial lesions, and severe crush injuries of the lower extremity.
- **What is the treatment for malignant hyperthermia?**  
Cessation of anesthesia, administration of dantrolene, and general supportive measures.
- **Which local anesthetics are amide compounds?**  
Lidocaine and bupivocaine (amides all have an “I” before the “caine” in their name).
- **Why is sodium nitroprusside bottle in aluminum foil?**  
To avoid the breakdown products of SN. Most notably cyanide; light enhances the formation of CN.
- **What makes midazolam particularly useful in the outpatient setting?**  
It has a relatively short onset of action and an elimination half-life of 2–4 hours.
- **What role might oral clonidine play in the preoperative period?**  
As an alpha-2 adrenergic agonist, it can reduce anesthetic requirements and has been used to provide sedation and anxiolysis while maintaining hemodynamic stability.
- **What is the primary toxicity of meperidine (Demerol)?**  
Neurotoxic metabolites, which accumulate in patients with renal insufficiency. Clinical presentation consists of papillary dilation and seizures.
- **What is the best time to administer oral ranitidine for prophylaxis against acid aspiration?**  
60 minutes before induction of anesthesia.
- **What is the single most important factor predicting postoperative cardiac morbidity?**  
History of congestive heart failure (CHF).
- **What PaO<sub>2</sub> level causes a significant change in oxygen saturation begin to occur?**  
Less than 80 mm Hg.
- **What factors increase the risk of perioperative cardiac complications?**  
Greater than five premature ventricular contractions (PVCs) per minute, withdrawal of beta-blockers and topical nitrates, and presence of CHF and known 3-vessel coronary artery disease (CAD).
- **What does end-tidal CO<sub>2</sub> measurement reflect?**  
Metabolism, circulation, and ventilation.

○ **What are the potential adverse side effects of propofol?**

Hypertriglyceridemia with chronic use, vasodilation and hypotension, and respiratory depression.

○ **What is the mechanism of action of metoclopramide?**

It inhibits dopamine and enhances the release of acetylcholine, resulting in an increased rate of gastric emptying and increased lower esophageal sphincter (LES) tone. It also inhibits the chemoreceptor zone.

○ **What are the ventilator exchanges gas abnormalities when CO<sub>2</sub> embolus occurs during laparoscopic surgery?**

Increased end-tidal CO<sub>2</sub>.

○ **What are the extrapyramidal effects of droperidol?**

Acute dystonia, parkinsonism, and akathisia.

○ **What is the single most important factor that determines the length of stay after general anesthesia in ambulatory patients?**

Postanesthesia nausea.

○ **What are the advantages of propofol over volatile agents in pediatric ambulatory patients?**

Decreased postoperative nausea and vomiting and a decreased incidence of airway obstruction.

○ **How does neostigmine decrease postoperative nausea and vomiting?**

It increases LES pressure and counteracts the increased risk of regurgitation of gastric contents after atropine administration (which lowers LES)

○ **What are the advantages oral midazolam over oral ketamine as a premedicant?**

Oral midazolam has a shorter recovery time and a lower cost and is less hallucinogenic.

○ **What is the most common peripheral nerve injury associated with prolonged general anesthesia?**

Ulnar neuropathy from prolonged compression at the elbow.

○ **What is a reliable alternative induction technique in a 5-year-old struggling child who refuses the mask and cannot be managed by intravenous induction because of lack of accessible veins?**

A sedating intramuscular injection of ketamine (3 mg/kg).

○ **T/F: All local anesthetics are weak bases and produce vasodilation.**

False. Cocaine is the exception.

○ **T/F: Basal rates on morphine PCA giving a continuous low-dose drip of narcotic decreases overall pain medication use and improves pain control.**

False.

- **After an oral dose of midazolam, when is it appropriate to separate children from their parents?**  
Between 10 and 30 minutes.
- **What may result from an intra-arterial injection of thiopental?**  
Crystal formation and local norepinephrine release that may culminate in thrombosis and severe ischemia of the extremity.
- **What is the ideal anesthetic approach to patients with rib fractures and pulmonary contusions?**  
Epidural anesthesia. Morphine has a longer therapeutic duration via the epidural than fentanyl because morphine is lipid insoluble.
- **What is the treatment for an intra-arterial injection of thiopental?**  
Intravascular dilution and perivascular infiltration with local anesthetic, sympathetic block of the extremity, and anticoagulation with heparin.
- **What effects of ketamine discourage its use in patients with increased intracranial pressure (ICP)?**  
It causes sympathetic nervous system stimulation, with a rise in blood pressure, heart rate, and ICP.
- **What factors determine cerebral blood flow?**  
Arterial CO<sub>2</sub> and O<sub>2</sub> tension, systemic arterial blood pressure, head position, jugular venous obstruction, and positive end-expiratory pressure (PEEP).
- **What are the cardiovascular effects of propofol?**  
Cardiovascular depression, by a combination of direct myocardial effects and vasodilatation.
- **What is the second gas effect of nitrous oxide?**  
The ability of nitrous oxide to increase the uptake of other, more potent, inhaled agents.
- **What is the most sensitive indicator of a falling cardiac output (CO) during surgery?**  
Mixed venous oxygen tension will decrease.
- **What anesthetic considerations must be taken into account in a patient with sickle cell disease?**  
Adequate hydration and oxygenation. Spinal or local anesthesia should be used whenever possible.
- **What are the advantages of nitrous oxide?**  
It has a low solubility and is nonflammable, easy to administer, and inexpensive.
- **What is the mechanism of ondansetron (zofran)?**  
Serotonin antagonist.

- **Among the currently available potent inhaled anesthetic agents, which ones have a pleasant odor and are not irritating to the airway?**  
Halothane and sevoflurane.
- **What is the mechanism of clonidine?**  
Centrally acting alpha-2 agonist, which has a vasodilatory effect from sympathetic inhibition. Clonidine can decrease postoperative analgesia requirements and may cause bradycardia.
- **What makes methadone appealing for treatment of narcotic addiction and weaning?**  
Long half-life and oral route of administration.
- **What anesthetic considerations must be taken into account in a patient with ascites?**  
Ascites decreases the ventilation–perfusion (V/Q) ratio in the basilar sections of the lung, decreases diaphragmatic excursion, compresses the vena cava, and increases the volume of distribution of anesthetic drugs.
- **What are the primary side effects of the dopa and alpha blocking antiemetic agent droperidol?**  
Anxiety in awake patients and potential cardiac arrhythmia.
- **What effect does halothane have on the liver?**  
Halothane undergoes significant metabolic degradation, generating compounds that may cause halothane-associated hepatic toxicity.
- **What are some clinically observed advantages of epidural anesthesia after abdominal surgery?**  
Decreased rate of ileus, decreased DVT rates, decreased ventilator dependence, and decreased atelectasis; urinary retention is a common side effect of epidural anesthesia.
- **What are the cardiovascular effects of isoflurane?**  
Myocardial depression, decreased systemic vascular resistance (SVR), and myocardial steal in patients with CAD.
- **Which patient population might have a decreased amount of pseudocholinesterase?**  
Patients taking anticholinesterase medications for glaucoma or myasthenia gravis and chemotherapeutic drugs and patients with a genetically atypical enzyme.
- **What are the risk factors for malignant hyperthermia?**  
Neuroleptic malignant syndrome, family history, and muscular dystrophy. Dantrolene and cessation of anesthetic are the treatments along with patient cooling. Excessive release of calcium from the sarcoplasmic reticulum is the etiology.
- **What are the adverse side effects of succinylcholine?**  
Cardiac dysrhythmias, fasciculations, hyperkalemia, myalgia, myoglobinuria, increased pressures (ocular, gastric, and cranial), trismus, and allergic reactions, and it is a trigger for malignant hyperthermia.

- **At what core body temperature does cardiac arrhythmia begin to occur?**  
23°C.
- **What is the mechanism of action of nondepolarizing neuromuscular blocking agents?**  
They combine with nicotinic cholinergic postjunctional receptors. However, they do not activate the receptor or directly block the channel.
- **Which neuromuscular blocking agent might be best in an ambulatory patient with significant renal or liver disease?**  
Atracurium. It undergoes spontaneous degradation.
- **Which inhalational agent is the worst offender in terms of sensitizing the myocardium to catecholamines?**  
Halothane.
- **What is bronchus suis and what is the potential anesthesia-related complication?**  
A right upper lobe bronchus arising from the trachea above the carina. This can be obstructed by the endotracheal tube and induce RUL atelectasis.
- **What are the limits of epinephrine injection when given for hemostasis?**  
Clinically, epinephrine is limited to 2  $\mu\text{g}/\text{kg}$  with isoflurane. Epinephrine concentrations greater than 1:100,000 increase the risk of ectopy without improving hemostasis.
- **Which nondepolarizing neuromuscular blocking agent might be best in an ambulatory patient who is particularly sensitive to blood pressure changes?**  
Vecuronium. It is the only neuromuscular blocking agent essentially devoid of cardiovascular side effects.
- **What effect does local infiltration of bupivacaine have on postoperative pain after laparoscopic tubal ligation?**  
Mesosalpinx infiltration of 0.5% bupivacaine significantly lowers pain intensity and need for postoperative narcotic analgesics.
- **What regional nerve blocks can be performed to provide postoperative analgesia after inguinal hernia repair in children?**  
Ilioinguinal and iliohypogastric nerve blocks.
- **In terms of duration of action, how does a single dose of fentanyl (1  $\mu\text{g}/\text{kg}$  IV) compare with a single dose of ibuprofen (800 mg PO)?**  
The therapeutic effects of a single dose of ibuprofen may last more than 4 hours, whereas fentanyl lasts no longer than 2 hours.
- **Which local anesthetic has the longest half-life?**  
Bupivacaine (marcaine) with a 4–6 hours total duration.

- **What are the advantages of using propofol instead of thiopental for induction and/or maintenance in pediatric patients undergoing ambulatory surgery?**

Continuous infusion of propofol is a well-tolerated anesthetic technique in children. The speed and quality of recovery after propofol are superior to that observed after thiopental and/or halothane administration, and it is associated with an extremely low incidence of vomiting.
- **What are the benefits of using sevoflurane over isoflurane in adult ambulatory surgical patients?**

Sevoflurane results in faster recovery and decreased side effects.
- **What are the possible mechanisms for opioid-induced nausea and vomiting?**

Delayed gastric emptying, sensitization of the vestibular center, and direct action at the chemoreceptor trigger zone.
- **T/F: A child with congenital heart disease is not a candidate for ambulatory surgery.**

False. A child who has stable congenital heart disease and is being followed by a pediatrician or cardiologist may be an appropriate candidate for ambulatory surgery.
- **What is the maximum dose of bupivacaine with epinephrine?**

3 mg/kg.
- **What are the proper technical aspects of a digital nerve block?**

Injection of epinephrine-free local anesthetic along the dorsal web space on each side of the finger with 5–7 cc per digit of 1% lidocaine.
- **Which local anesthetic offers the least likelihood of systemic toxicity when performing intravenous regional anesthesia?**

Prilocaine; caused by its short plasma half-life. This local anesthetic has the potential toxic effect of methemoglobinemia as well.
- **After performing an axillary block, why might the medial aspect of the upper arm occasionally be spared?**

If it is innervated by the intercostobrachial nerve (T2), which is not part of the brachial plexus. In many individuals, however, this area is primarily innervated by the medial cutaneous nerve of the arm, which is part of the brachial plexus and can be anesthetized with an axillary block.
- **What are the landmarks in performing a midline lumbar spinal block?**

The iliac crest and the L4 and L5 spinal processes (and/or L3 spinous process).
- **What is the most feared toxicity of ketorlac (toradol)?**

Renal toxicity via inhibition of prostaglandin synthesis, which results in renal vasoconstriction.
- **What are the grades of the Ramsay sedation score for ICU patients?**

Ranges from 1 (awake and restless) to 6 (comatose); 2 = cooperative; 4 = asleep yet responds to verbal stimulation.

- **At what level does the subarachnoid space terminate in children?**  
The S2–S3 or S3–S4 space.
- **What effects does stimulation of the mu1 and mu2, and opioid receptors have?**  
Mu1—analgesia  
Mu2—respiratory depression and vasodilation
- **What is the mechanism of action for naloxone (narcan)?**  
Opioid receptor blockade.
- **What is transient radicular irritation (TRI)?**  
Back pain with radiation down one or both buttocks or legs, occurring within 24 hours after surgery.
- **What is the best parameter in predicting successful weaning from mechanical ventilation?**  
Rapid Shallow Breathing Index (RR/TV).
- **What signs and symptoms are associated with ionic contrast media administration?**  
Flushing, tachycardia, nausea, volume contraction, high urine osmolality, and nephropathy. True allergic reactions to the iodine may precipitate anaphylaxis, requiring urgent treatment.
- **What effects do magnetic fields have on pacemakers?**  
The effects are variable. The magnetic fields may generate an internal electrical circuit that affects the pacemaker microcircuitry, resulting in failure of normal output. There is also a possibility that the mode of the pacemaker may be switched (i.e., demand to asynchrony).
- **What is the physiologic action and potential toxicity of nitroglycerin?**  
Smooth muscle relaxation causing venodilation. Potential toxicity of methemoglobinemia, which can be treated with IV methylene blue.
- **What is the physiologic mechanism and potential toxicity of nitroprusside?**  
Arterial and venous dilation. Cyanide toxicity with associated left shift of the O<sub>2</sub> saturation curve can occur—this is treated with thiosulfate.

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# Medical Oncology, Hematology, and Coagulation Pearls

- **To which platelet glycoprotein does Von Willebrand factor bind to enhance platelet aggregation?**  
Glycoprotein Ib.
- **Fibrinogen forms bridges between activated platelets by binding to which platelet glycoprotein?**  
Glycoprotein IIb/IIIa.
- **What is the characteristic chromosomal abnormality seen in patient with Burkitt's lymphoma?**  
A chromosomal translocation (8:14).
- **Beta-naphthylamine is associated with what neoplasm?**  
Bladder cancer.
- **Activated factor X (Xa), in combination with which two cofactors, activates prothrombin on the surface of platelets?**  
Ionized calcium and factor Va.
- **Which complex activates protein C on the surface of endothelial cells?**  
Thrombin–thrombomodulin complex.
- **What is the most central natural anticoagulant protein?**  
Antithrombin III.
- **What are the major endogenous activators of plasminogen?**  
Tissue plasminogen activator (tPA) and urokinase.
- **When should heparin-induced thrombocytopenia be suspected?**  
When thrombosis occurs while receiving heparin or when there is a fall in the platelet count by greater than 50% or to below 100,000/ $\mu$ l.

○ **What are the molecular events in heparin-induced thrombocytopenia?**

It is believed to be caused by a heparin-dependent IgG platelet antibody (“platelet 4 antigen”) that causes aggregation of platelets when exposed to heparin.

○ **What is the nature of the thromboses in heparin-induced thrombocytopenia?**

It can be arterial or venous and is a characteristic white clot. Venous complications are more frequent than arterial.

○ **What is the typical presentation of a patient with antithrombin III deficiency?**

Homozygotes usually die in infancy, and 85% of heterozygotes have suffered a thrombotic event by 50 years of age. The diagnosis should be suspected in a patient with a thrombotic event while on heparin or an inability to be anticoagulated with heparin.

○ **What are the common causes of acquired antithrombin III deficiency?**

Liver disease, malignancy, nephrotic syndrome, DIC, malnutrition, or increased protein catabolism.

○ **What is the appropriate therapy for a patient with antithrombin III deficiency, requiring anticoagulation?**

Fresh frozen plasma (FFP) can be used as a source of antithrombin III when heparin is necessary, followed by anticoagulation with sodium warfarin. Additionally, antithrombin III concentrates are available.

○ **How does sodium warfarin (Coumadin) work as an anticoagulant?**

It prevents the reduction of vitamin K once it has functioned as a cofactor for the carboxylation of factors II, VII, IX, and X.

○ **What is the danger of initiating anticoagulation with Coumadin alone?**

Coumadin may decrease protein C levels prior to a reduction in clotting factors, thereby inducing a procoagulant state in the early phases of therapy.

○ **When is this situation particularly devastating?**

In patients with protein C deficiency, Coumadin can cause an excessive reduction in protein C levels. The resulting procoagulant state can cause skin necrosis, usually in fatty regions such as the breasts, buttocks, or thighs, from clotting in the microcirculation.

○ **What is the molecular abnormality in resistance to activated protein C?**

It is most likely because of a decrease in the anticoagulant function of factor V (autosomal dominant, factor V Leiden mutation).

○ **What is the most common laboratory abnormality associated with the antiphospholipid syndrome?**

An elevated aPTT not corrected by normal plasma, in the face of other standard coagulation tests that are normal.

○ **T/F: A patient with thrombosis associated with the antiphospholipid syndrome may receive heparin therapy.**

True. Proper treatment includes heparinization followed by long-term sodium warfarin therapy.

- **What laboratory abnormalities are associated with hemophilia A?**  
Prolongation of aPTT, with other tests being normal.
- **What is the molecular abnormality in hemophilia B?**  
An X-linked recessive deficiency of factor IX (Christmas factor).
- **T/F: Hemophilia A is clinically distinguishable from hemophilia B.**  
False.
- **Which clotting factors, labile factors, are most likely to be decreased as a result of massive transfusion?**  
Factors V and VIII (low half-lives).
- **What is the mechanism of action of methotrexate?**  
It binds dihydrofolate reductase, preventing reduction of folate to tetrahydrofolate, which is necessary for production of thymidine and purines.
- **What is the maximum total cumulative dose of adriamycin suggested to minimize the risk of cardiomyopathy?**  
450–550 mg/m<sup>2</sup>.
- **What tumor marker is associated with choriocarcinomas?**  
Beta-HCG.
- **What is the mechanism of action of paclitaxel?**  
Enhancement of tubulin polymerization.
- **What antibiotics should be used initially in a febrile neutropenic patient?**  
Drug combinations including Gram-negative coverage (aminoglycosides or aztreonam) and an extended spectrum penicillin or cephalosporin.
- **What is the treatment for chemotherapy-induced mucositis?**  
Topical solutions containing viscous xylocaine, antacids, and antifungals may be used along with adequate pain relief.
- **What is vincristine belly?**  
Constipation caused by autonomic neuropathy secondary to vincristine.
- **What drug is usually associated with the hemolytic–uremic syndrome?**  
Mitomycin C.
- **What is the dose-limiting toxicity of paclitaxel?**  
Myelosuppression.

- **What factors shift the oxygen curve to the right?**  
High CO<sub>2</sub>, acidosis, high DPG, and increased temp.
- **What is the only clotting factor not made in liver?**  
Factor 8.
- **How long will ASA affect the platelet?**  
7 days, the entire life of the platelet, because it irreversibly binds cyclo-oxygenase.
- **What clotting abnormalities are found with VW disease?**  
Long PTT and long bleeding time or functional platelet assay.
- **VW disease is treated with what?**  
Recombinant factor VIII or cryoprecipitate. However, types I and III have low VWF and type I can respond to DDAVP to increase endogenous release. Type II—the platelets are of poor quality and must be replaced with transfusion.
- **What is the treatment for Hodgkin's disease?**  
Combination chemotherapy, such as nitrogen mustard, vincristine (Oncovin), procarbazine and prednisone (MOPP), or MOPP/ABV (adriamycin, bleomycin, and vinblastine).
- **Can LMWH cause HIT?**  
Yes.
- **What is involved in Phase III of clinical testing of new drugs?**  
Agents that have demonstrated a benefit (in Phase II) are compared in a randomized fashion with standard treatment programs.
- **What is the dose-limiting toxicity associated with vincristine?**  
Neurotoxicity.
- **T/F: Patients with ovarian cancer can be followed by serial evaluation of CA-125 levels.**  
False; it is not specific enough.
- **What is the mechanism of action of vinca alkaloid-type drugs?**  
Binding of tubulin to produce mitotic arrest.
- **What is the dose-limiting toxicity of 5-FU?**  
Stomatitis, often with nausea and vomiting.
- **For what gynecologic malignancy is actinomycin D frequently used as a single agent for therapy?**  
Gestational trophoblastic neoplasms.

- **What is the most significant side effect associated with bleomycin?**  
Interstitial pneumonitis.
- **By what parameter of pulmonary function testing can interstitial pneumonitis resulting from bleomycin be measured?**  
Decreased diffusion capacity.
- **What is the dose-limiting toxicity associated with hydroxyurea?**  
Myelosuppression.
- **What is the mechanism of action of actinomycin D?**  
It blocks RNA synthesis by intercalating DNA nucleotide pairs.
- **What is irradiation recall?**  
Skin erythema and irritation in a previously irradiated field following administration of chemotherapy. Adriamycin and actinomycin D are commonly reported.
- **What is the dose-limiting toxicity of carboplatin?**  
Myelosuppression.
- **Why does tumor heterogeneity often result in drug resistance?**  
Spontaneous mutations give rise to small numbers of resistant cells that may rapidly reproduce when sensitive cells are killed.
- **What is the multiple drug resistance (MDR) gene?**  
The MDR gene is normally present in some human tissues and may be activated in tumors by exposure to certain chemotherapeutic agents, resulting in resistance to many drugs.
- **What is the most important factor in predicting the efficacy of progestin therapy in endometrial cancer?**  
Progesterone receptor status of the tumor.
- **What systemic chemotherapeutic agents are used for Stage IV colon cancer?**  
5-FU and leucovorin.
- **Patients undergoing surgery after bleomycin treatment should avoid high inhaled oxygen concentrations. Why?**  
Acute pulmonary decompensation can occur.
- **What finding on a peripheral blood smear is characteristic of surgical or functional splenectomy?**  
Howell–Jolly bodies.

- **What is the storage form of iron?**  
Ferritin.
  
- **What are the common complications of hereditary spherocytosis?**  
Sphenic rupture, cholelithiasis, and aplastic anemia.
  
- **What type of hemolytic anemia is associated with ulcerative colitis?**  
Autoimmune hemolytic anemia.
  
- **What is the expected increase in the platelet count following transfusion with six platelet packs?**  
40,000–50,000/mm<sup>3</sup>.

# Immunology and Transplantation Pearls

- **What is an orthotopic graft?**  
A graft placed in the anatomic position normally occupied by such tissue.
- **What chromosome contains the major histocompatibility complex (MHC)?**  
Chromosome 6.
- **Which MHC antigens best trigger the proliferation of allogenic lymphocytes?**  
Human leukocyte antigen (HLA) class II antigens (HLA-D, DR, DQ, and DW/DR).
- **What cells have HLA Class I molecules?**  
All nucleated cells.
- **What cells have HLA Class II molecules?**  
Macrophages, dendritic cells, B cells, and activated T cells.
- **T/F: Interferons (IFN-alpha, IFN-beta, and IFN-gamma) induce increased expression of Class I molecules.**  
True.
- **What cells produce IFN-alpha?**  
Fibroblasts.
- **What is the mechanism for hyperacute rejection?**  
Preformed antibodies to ABO antigens. Neutrophil infiltration on organ biopsy is seen and an acutely septic picture presents. Graft removal is necessary.
- **What is the clinical picture and treatment for acute graft rejection?**  
Recipient organ failure. Lymphocytic infiltrate is seen on organ biopsy. Treatment is steroids and OKT3 (antibody to CD3 receptor).
- **What are the methods of determining the degree of histocompatibility between donor and recipient?**  
MHC matching and mixed lymphocyte culture (MLC).

- **What is the most common use of the MLC?**  
Related bone-marrow transplantation.
- **What triggers the rejection reaction after transplantation?**  
The immune response to the HLA antigens on the cells of the transplanted organ/tissue.
- **What are the critical cytokines that influence lineage maturation?**  
Granulocyte-macrophage colony-stimulating factor (GM-CSF), interleukin-1 (IL-1), and erythropoietin.
- **What is the clinical use of GM-CSF?**  
It decreases infection in neutropenic patients.
- **What organs are considered secondary lymphoid organs?**  
The spleen, peripheral lymph nodes, skin, and Peyer's patches.
- **What constitutes the T-cell receptor (TCR) complex (CD3)?**  
The T cell's membrane-bound TCR and associated transmembrane proteins.
- **What T-cell cluster of differentiation (CD) antigen lyses target cells and kills cells infected with virus?**  
CD8.
- **T/F: Mature T cells can reenter the thymus.**  
False.
- **What is required for a lymphocyte to become sensitized?**  
An accessory antigen-presenting cell (APC) of the monocyte–macrophage line.
- **What is the function of IL-2 with regard to the immune cellular response?**  
It amplifies the immune response by exerting an autocrine feedback on the same cell and a paracrine effect to activate other T cells in the local microenvironment.
- **ABO incompatibility is an example of what type of hypersensitivity reaction?**  
Type II.
- **What cells do Class II alloantigens preferentially stimulate?**  
CD4 and T-helper cells.
- **What is the function of perforin (released by sensitized T cells)?**  
It forms tubular transmembrane pores (once the cytotoxic T cell binds to the antigen on the target cell) to allow unidirectional granule exocytosis with destruction of the target cell.

- **T/F: IL-1 is cytotoxic for tumor cells.**  
True.
- **What are the effects of tumor necrosis factor (TNF)?**  
It acts synergistically with IL-1 to mediate acute-phase changes, including tumor necrosis, hypotension, and inflammatory reactions.
- **What are the macrophage-derived cytokines?**  
IL-1, IL-6, and TNF-alpha.
- **T/F: Circulating antibody is an obligatory participant in the rejection of solid tissue allografts.**  
False.
- **How do antibodies activate the complement pathway?**  
When an antibody binds to antigen, the antibody undergoes a conformational change that activates the constant (Fc) end of the antibody, which then triggers complement activation.
- **T/F: Complement mediates lytic destruction of antibody-bound cells.**  
True.
- **What are the biologic actions of C3a?**  
It causes release of histamine from mast cells, is chemotactic for PMNs, has a kinin activity, and causes immune adherence.
- **What initiates release of cellular tissue thromboplastin?**  
Damage to the endothelial cell membrane by antibody and complement or through the direct cytotoxic effects of lymphocytes.
- **What factor initiates the intrinsic pathway of the clotting system?**  
Hageman factor (factor XII).
- **What is thought to be the etiology of the progressive, obliterative vascular reaction seen in a chronically rejecting allograft?**  
A by-product of fibrin laid down along the endothelium that has been damaged by immune mechanisms.
- **What characteristics of rejection are modified by immunosuppression agents?**  
Endothelial cell damage in the allograft, hypertrophy, and hyperplasia.
- **What are the characteristics of accelerated atherosclerosis?**  
A thickened intimal layer with loss of the smooth endothelial lining, presence of vacuolated cells, and a narrowed lumen.

○ **What is the role of platelets in allograft rejection?**

Platelet aggregation leads to release of histamine and serotonin, which increases capillary permeability. This results in exposure of the basement membrane and enhancement of platelet aggregation. Platelets also release factors that increase destruction.

○ **What is the mechanism of action of FK 506 (tacrolimus)?**

It inhibits T-cell activation and maturation by calcineurin inhibition and IL2 synthesis blockade. It is 100× more potent vs. T cells than cyclosporine. FK 506 has potential nephrotoxicity.

○ **What is the mechanism of action of mycophenolate mofetil (MMF)?**

Blockade of purine synthesis in proliferating T cells with minimal effect on bone marrow.

○ **What is the mechanism of immunosuppression for steroids?**

Inhibition of transcription of genes coding for cytokines and inhibition of nuclear factor of T cells.

○ **How does irradiation suppress the immune response?**

By preventing the differentiation and division of immunocompetent lymphocytes.

○ **How do alkylating agents suppress the immune response?**

They combine with DNA and other cellular components to prevent proliferation of immunocompetent cells.

○ **When are antimetabolites given to a transplant patient?**

At the time of transplantation and then for the life of the graft.

○ **What is the mechanism of action of azathioprine?**

It is structurally similar to inosine monophosphate; thus, it inhibits the enzymes that convert inosine nucleotide to adenosine and guanosine monophosphate (antimetabolite). AZ also slows down the entire purine biosynthetic pathway by fraudulent feedback inhibition of cellular synthesis of RNA, DNA, cofactors, and other active nucleotides. Side effects include pancytopenia, pancreatitis, hepatitis, and hair loss.

○ **What is the role of methotrexate in chronic immunosuppression?**

It is used clinically only for bone marrow transplantation if there is a contraindication to cyclosporine or FK 506 as graft-vs.-host (GVH) prophylaxis because of its severe toxicity.

○ **What is the mechanism of action of alkylating agents?**

They contain unstable rings with electron-seeking points that combine with electron-rich nucleophile groups (i.e.,  $-\text{NH}_2$ ,  $-\text{COOH}$ ,  $-\text{SH}$ , and  $-\text{PO}_3\text{H}_2$ ) and result in alkylation of DNA and RNA.

○ **What are the clinical uses of cyclophosphamide?**

It is used in renal transplant patients when liver toxicity prohibits the use of AZ and for bone-marrow recipients.

○ **What side effects are specific to cyclophosphamide?**

Prompt fluid retention, severe hemorrhagic cystitis, and cardiac toxicity.

- **What are the adverse effects of cyclosporine?**  
Hirsutism, neurotoxicity, hyperkalemia, nephrotoxicity, hypertension, and tremors.
- **T/F: Cyclosporine is effective against activated T cells.**  
False.
- **How does FK 506 affect the immune response?**  
It inhibits production of IL-2 and IFN-gamma.
- **What is the mechanism and side effects of rapamycin (sirolimus)?**  
Inhibition of T-cell activation by IL-2 transduction blockage. Side effects include pancytopenia and hyperlipidemia.
- **What is the effect of adrenal corticosteroids on lymphocytes?**  
Inhibition of DNA, RNA, and protein synthesis as well as inhibition of glucose and amino acid transport.
- **What are the characteristics of chronic steroid administration?**  
A cushingoid appearance, hypertension, weight gain, peptic ulcers, gastrointestinal bleeding, euphoric personality changes, cataract formation, hyperglycemia, diabetes, osteoporosis, and avascular necrosis of bone.
- **What is the prototypic monoclonal antibody in clinical immunosuppression?**  
OKT3.
- **What is the most important mode of cellular damage from radiation?**  
Production of scattered breaks in the deoxyribose-phosphate backbone of DNA.
- **In what stage(s) of the cell cycle is radiation most effective?**  
The M and G2 phase. (Lymphocytes are also sensitive in the G0 phase.)
- **What is the most common cause of death in transplant recipients?**  
Infection.
- **The majority of deaths in transplant recipients are because of what organisms?**  
*Candida albicans*, followed by *Aspergillus*.
- **What are the most common viral organisms causing rejection in renal transplant patients?**  
The herpes group DNA viruses (particularly CMV).
- **What percentage of renal transplant patients are infected with cytomegalovirus (CMV)?**  
50% to 90%.

- **Name some contraindications to organ donation.**  
History of malignancy and current bacterial or viral sepsis.
- **What are the typical manifestations of CMV infection in transplant patients?**  
A mild febrile illness followed by an antibody response and regression of viral symptoms.
- **What are the most effective precautions for decreasing the number of severe infections?**
  1. Elimination of all sources of infection prior to transplantation.
  2. Proper technical procedures and gentle handling of tissues.
  3. Well-matched organs.
  4. Prevention of leukopenia (e.g., careful monitoring of AZ).
- **What are the most frequent malignancies seen in transplant patients?**  
Those that are common to immunosuppressed patients. Most are epithelial or lymphoid in origin (i.e., carcinoma in situ of the cervix, carcinoma of the lip, squamous or basal cell carcinoma of the skin, and B-cell lymphoma).
- **What is the incidence of lymphoma in transplant recipients?**  
350 times the average population. Central nervous system lymphoma in particular occurs almost exclusively in the immunosuppressed patient.
- **What percentage of transplant patients with lymphoma have brain involvement?**  
50%.
- **Besides lymphoma, what other malignancies occur at increased rates in transplant patients?**  
Skin cancer (squamous and basal cell) including penile, vulvar, and anal squamous cell. Kaposi sarcoma in immunosuppressed as well.
- **What is the post-transplant lymphoproliferative disorder?**  
Lymphoid neoplasm, typically in the transplanted organ, that is specific to the immunosuppressed. Symptoms are fever, abdominal pain, and potential mass in the abdomen. It is more common in pediatric recipients and can regress with cessation of immunosuppression.
- **What is thought to be the etiology of lymphoma in transplant patients?**  
Infection with Epstein–Barr virus (EBV) (lymphoproliferative disease, LPD).
- **What is the significance of the BK (polyoma) virus in renal transplantation?**  
Interstitial fibrosis of the donated kidney can occur when BK-negative patient receives a seropositive organ. The virus becomes activated in the immunosuppressed and, when renal graft infection occurs, organ loss follows in more than 50%.
- **What is the treatment for acute adrenal insufficiency?**  
Solumedrol (methylprednisone) IV.

- **What dose of solumedrol should be given as a stress dose in patients on steroids per procedure for a major surgery?**  
100 mg IV for 2 days with a subsequent wean.
- **What vaccines should be given before elective splenectomy?**  
*H. flu*, *Meningococcus*, and *S. pneumonia* 1 week before surgery. Reimmunization should be performed 5 years after surgery because the immunization is an antibody-based response.
- **What is the clinical progression of overwhelming postsplenectomy sepsis?**  
Initial fever and malaise progress to septic shock within hours. Overall mortality exceeds 50%. Coexisting meningitis and pneumonia are common.
- **What is the etiology of hypertension in transplant patients?**  
Prednisone, failure to regulate normal salt and water balance, and secretion of renin.
- **Removal of T cells from bone marrow grafts would theoretically eliminate the GVH reaction. Why is this not tolerated?**  
T cells must be present to help the pluripotent bone-marrow stem cells to engraft.
- **What are the clinical manifestations of the GVH reaction?**  
Skin rash, hepatic dysfunction, diarrhea, wasting, and myelosuppression.
- **How is the diagnosis of GVH reaction confirmed?**  
Skin biopsy.
- **What is the treatment for GVH reaction?**  
FK 506 or cyclosporin plus steroids.
- **T/F: Transplantation of insulin-producing islet cells (beta cells) is sufficient to achieve glucose hemostasis.**  
True. Although rejection of these cellular grafts is a significant limitation.
- **What are the surgical approaches to pancreatic duct drainage?**  
Bladder drainage, ductal injection with a synthetic polymer, and enteric drainage. Enteric drainage has emerged as the standard. Bladder drainage has the associated complications of metabolic acidosis, bladder irritation and bleeding, and pancreatitis.
- **What is the most common type of patient population receiving small bowel transplants?**  
Pediatric patients who have lost their small bowel secondary to malrotation with midgut volvulus or necrotizing enterocolitis (NEC).
- **What patients require a liver transplant along with small bowel transplantation?**  
Those who have been on long-term hyperalimentation with subsequent development of cirrhosis and liver failure.

- **What are the variables in the King's criteria for hepatic failure?**  
INR, bilirubin, and creatinine.
- **What are the indications for hepatic transplant?**  
Profound hepatic failure with grade 4 encephalopathy, profound coagulopathy, or hepatorenal syndrome.
- **What is the most common cause of early hepatic graft loss?**  
Acute rejection. Hepatic artery thrombosis is the second most common.
- **What is the most common pathology leading to infantile liver transplantation?**  
Congenital biliary atresia accounts for more than 50%.
- **T/F: Hepatitis C-positive liver recipients have a worse graft survival when the donor is also hepatitis C positive.**  
False.
- **What is the clinical picture of the hepatorenal syndrome?**  
Urinary electrolytes are analogous to pre-renal azotemia with low urine sodium and FeNa. Survival with this syndrome is dismal without hepatic transplantation. A relative loss of sympathetic tone contributes to the etiology, and vasopressin can be temporizing.
- **T/F: Given a lack of extrahepatic disease, transplantation offers improved survival at 2 years relative to resection for hepatocellular carcinoma?**  
True. Marker for HCC is alpha fetoprotein.
- **How is patency of the portal system evaluated prior to liver transplantation?**  
CT, ultrasound, and/or celiac angiography.
- **What is the best sequence of anastomosis to remove the cold perfusate and prevent systemic hyperthermia and heparinization in liver transplantation?**  
The suprahepatic caval, followed by the portal vein, inferior hepatic caval, and, finally, the hepatic artery and inferior vena cava.
- **What is the next step after vascular anastomosis?**  
Biliary drainage; direct bile duct-to-bile duct anastomosis in adults and choledochojejunostomy in children.
- **How is rejection differentiated from ischemia, viral infection, and cholangitis?**  
Percutaneous liver biopsy.
- **What findings suggest cholangitis?**  
PMNs within the portal tracts.

- **What is the first indication of primary nonfunction of a liver graft?**  
Factor V levels fail to return to normal.
- **What are the most common causes of encephalopathy following liver transplantation?**  
Gastrointestinal bleeding or other protein loads and hepatic coma secondary to cerebral edema and increased intracranial pressure.
- **A 50-year-old male, status—post-liver transplant, has a rapidly rising serum bilirubin, elevated transaminases, hyperkalemia, hypoglycemia, and coagulopathy. What is the most likely diagnosis?**  
Thrombotic occlusion of the hepatic artery or portal vein.
- **T/F: Patients with idiopathic cardiomyopathy are usually young, otherwise healthy patients.**  
True.
- **What are the requirements for designating a patient as Status I for cardiac transplant by the United Network for Organ Sharing (UNOS)?**  
The patient must require intravenous pressors or inotropic agents, an intra-aortic balloon pump, respiratory support or a ventricular support device, and ICU care.
- **T/F: All patients requiring a cardiac transplant who are less than 6 months of age are automatically UNOS Status I.**  
True.
- **T/F: The sinus node of the donor heart becomes the dominant pacemaker.**  
True.
- **What is the most common regimen of immunosuppression following cardiac transplantation?**  
Triple therapy with oral cyclosporine, AZ, and prednisone.
- **What drugs are used in rescue therapy for cardiac rejection?**  
Cytolytic agents (OKT3, ATG, and ALG).
- **What biopsy findings suggest Grade 2 cardiac rejection?**  
Focal infiltrates with myocyte necrosis.
- **What signs and symptoms are associated with cardiac rejection?**  
Malaise, fatigue, dyspnea/orthopnea, tachycardia, a ventricular gallop, rales, and edema.
- **What are the indications for double-lung transplantation?**  
Cystic fibrosis, bronchiectasis, pulmonary hypertension, correctable congenital defects, and emphysema.

○ **What are the leading causes of early and late lung transplant failure?**

Rejection is the leading early cause occurring in up to 20%. Treatment is steroids and positive pressure ventilation with avoidance of pulmonary edema. Bronchiolitis obliterans and associated pneumonia are the leading late cause.

○ **What are the most common indications for lung transplant?**

COPD, alpha-1 antitrypsin deficiency, and idiopathic pulmonary fibrosis.

○ **How is CMV lung disease in a transplanted lung established?**

By finding inclusion bodies in lung tissue obtained by transbronchial biopsy.

○ **What is the initial treatment for Grade 2 or greater lung rejection?**

An oral or intravenous steroid boost. Refractory rejection is treated with a cytolytic agent.

○ **What are the most common causes of chronic renal failure?**

Malignant hypertension, polycystic kidney disease, glomerulonephritis, pyelonephritis, and other systemic diseases such as diabetes, systemic lupus erythematosus, and Wegner's granulomatosis.

○ **What are the indications for renal dialysis?**

Hyperkalemia, acidosis, fluid overload, symptomatic uremia, and drug overdose treatable via dialysis.

○ **What is the leading cause of long-term renal transplant graft failure?**

Chronic rejection.

○ **What is tertiary hyperparathyroidism?**

Persistent secondary hyperparathyroidism (four-gland hyperplasia) after renal transplantation maintaining high calcium levels. It typically resolves within a year of transplant, and parathyroidectomy should initially be reserved for the symptomatic patient.

○ **What is calciphylaxis?**

Calcification of arteries in the subcutaneous fat and skin seen in patients with secondary and tertiary hyperparathyroidism and hypercalcemia. Firm nodules are found on the skin. Parathyroidectomy is recommended.

○ **What are the absolute contraindications to renal transplantation?**

Active infection or malignancy that cannot be brought under control.

○ **What is the success rate for matched renal transplants between siblings?**

95%.

○ **Why is the left kidney preferred for donor nephrectomy?**

The longer left renal vein.

- **True/False: Life expectancy with successful renal transplant is twice that for patients on chronic dialysis.**  
True.
  
- **A patient is anuric post renal transplant. What are the ultrasound and nuclear medicine uptake study findings for patients with hyperacute renal rejection, renal artery thrombosis, ATN, and ureteral obstruction?**  
Hyperacute rejection—enlarged kidney on US and no radionuclide uptake.  
Renal artery thrombosis—no flow in renal artery on US, normal-sized kidney on US, and no radionuclide uptake.  
ATN—normal kidney on US and normal radionuclide uptake without excretion.  
Ureteral obstruction—hydronephrotic kidney on US and good radionuclide uptake without excretion.
  
- **How long can donor kidneys be stored?**  
48–72 hours.
  
- **What is the differential diagnosis for early anuria following renal transplantation?**  
Hypovolemia, thrombosis of the renal artery or vein, hyperacute rejection, compression of the kidney or obstruction to urine flow, and ATN.
  
- **What is the treatment of choice for urinary extravasation following renal transplantation?**  
Re-exploration with reimplantation of the ureter.
  
- **T/F: Spinal cord reflexes may still be present in the brain-dead patient.**  
False.

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