Manickam Ramalingam
Vipul R. Patel

Operative Atlas of Laparoscopic Reconstructive Urology

DVD Included

Springer

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Edited by

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Springer

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This book is fondly dedicated
to our teachers and trainees,
who inspired us,
and
our patients,
for their immense faith.

Foreword

Arthur D. Smith

This new *Operative Atlas of Laparoscopic Reconstructive Urology* is the ideal reference book for residents and fellows as it has step-by-step pictures and only the essential prose.

It is conveniently divided into eight clinical sections, with a ninth section outlining training exercises. The major part of the book is illustrated with magnificent photographs and diagrams depicting every step of a particular procedure.

Section I is devoted to instrumentation, access, and exit from the abdomen. The instruments are clearly shown and have been photographed from both outside and inside the abdomen.

Sections II to IV demonstrate accepted laparoscopic techniques that are becoming the new gold standard in urology. Outcome analyses show that with laparoscopy one can achieve the same oncologic success as with open surgery but will less morbidity.

Although there are 21 contributors to this textbook, Dr. Ramalingam has ensured that there is minimal repetition and a uniformity of style.

Every laparoscopist should aim to emulate the pictures in this atlas, as they reflect clear visualization of the anatomy of the operative site, which is the basic requirement for all surgery. I believe that no new techniques should be performed without prior practice in the laboratory. The final section of this atlas is devoted to a series of exercises or training sessions for the would-be laparoscopist. It will undoubtedly prepare them for the "real thing."

I highly recommend this atlas as it gives the reader a clear picture of exactly what should be done, and the rest is up to them!

Arthur D. Smith
Editor, *Journal of Endourology*
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Foreword

Ganesh Gopalakrishnan

Dr. Ramalingam has done it again. After producing comprehensive CDs of high standard on the basics of laparoscopic urologic surgery, he has now launched this wonderfully illustrated book, *Operative Atlas of Laparoscopic Reconstructive Urology,* devoted purely to reconstructive laparoscopic urologic procedures.

I personally know the amount of time and hard work that has been put into producing this book. He has managed to get a large number of reputed national and international authors to help him in this venture.

The accompanying DVD is an informative addition. It comprises videos of commonly done procedures such as laparoscopic pyeloplasty, laparoscopic partial nephrectomy, laparoscopic radical prostatectomy, and robot-assisted laparoscopic radical prostatectomy in a step-by-step manner. I feel very happy and at the same time a bit embarrassed that he has asked me to write a foreword to this book, as I myself have very average laparoscopic skills. I wish Dr. Ramalingam all the very best in the future and I would recommend that this book be kept as a primer in all urologic departments.

Ganesh Gopalakrishnan
Professor and Head
Department of Urology
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Preface

Laparoscopic urology has become routine in many centers for ablative procedures such as radical nephrectomy. Uro-oncologic procedures such as adrenalectomy, partial nephrectomy, nephroureterectomy, retroperitoneal lymph node dissection, radical cystectomy, and radical prostatectomy are done by skilled laparoscopic urologists in a few centers.

With experience in precise suturing, indications for laparoscopic reconstructive urology are increasing. It looks as though most of the reconstructive procedures in the kidney, ureteropelvic junction (UPJ), ureter, bladder, and prostate are technically possible laparoscopically in skilled hands. Technical advances such as bioadhesives, absorbable longitudinal and circumferential staplers, refined suturing devices, steerable multifunctional laparoscopic instruments, laser welding, three-dimensional visualization, and robotics, which will facilitate laparoscopic reconstruction, remain a dream in developing countries. Hence there is a need for training in intracorporeal suturing, as without good training in suturing techniques these skills cannot be practiced on patients. An intensive animal laboratory training program in suturing will help practitioners gain confidence. We believe that a good laparoscopic training aiming at improving skills especially in suturing and knotting will definitely go a long way to achieving the goal of learning to perform laparoscopic procedures.

This book contains sequential pictures for most of the reconstructive urology procedures. Illustrations for each chapter come from a single case, except in one or two situations where an illustration comes from a similar case or a diagrammatic representation has been added. Illustrations of laparoscopic-assisted procedures such as ileal conduit, ileal ureter, orthotopic neobladder, and ileocystoplasty have been included. These are major and complex reconstructive procedures if done entirely by laparoscopy. Laparoscopic-assisted procedures reduce the operative time, and average-skilled laparoscopic urologists may attempt these procedures comfortably.

A DVD with comments showing the video of laparoscopic pyeloplasty, laparoscopic partial nephrectomy, laparoscopic radical prostatectomy, robot-assisted radical prostatectomy, laparoscopic-assisted orthotopic neobladder, and laparoscopic sacrocolpopexy has been included.

Some unusual situations or complications have been highlighted under the headings "Special Situations" or "Problem and solutions," with illustrations and pictures where appropriate.

This comprehensive book in an atlas format, with as many pictures as possible from renowned authors with a wealth of experience across the globe, will give some insight to laparoscopic reconstructive urology. This book is written with the fond hope that many more urologists will undertake such procedures.

Manickam Ramalingam
Vipul R. Patel

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We are truly grateful to our colleagues M.G. Pai, K. Selvarajan, and K. Senthil for their unstinting support and invaluable contribution.

We wish to thank the following authors for sharing their knowledge so generously and for making this atlas possible with their appropriate illustrations. Their sincere efforts are commendable:

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We sincerely thank the support rendered by the administrators, anesthesia and surgery colleagues, and operating room staffs of K.G. Hospital, G.K.N.M. Hospital, V.G. Hospital, and Kongunadu Hospital Coimbatore. My special thanks go to my friends V. Venkatesh, P. Raju, G. Ramanathan, P. Viswanathan, D.N. Purushothaman, and S.N. Bala Shanmugam.

We also wholeheartedly thank Dr. Clarence Lei Chang Moh (consultant urologist, Malaysia) and Mrs. Hema Pai for their patient proofreading.

Finally, this book would not have been possible without the continued encouragement of our family members.

Manickam Ramalingam
Vipul R. Patel

Contents

Section VII Laparoscopically Assisted Procedures

Section VIII Miscellaneous

Section IX Training

DVD Contents

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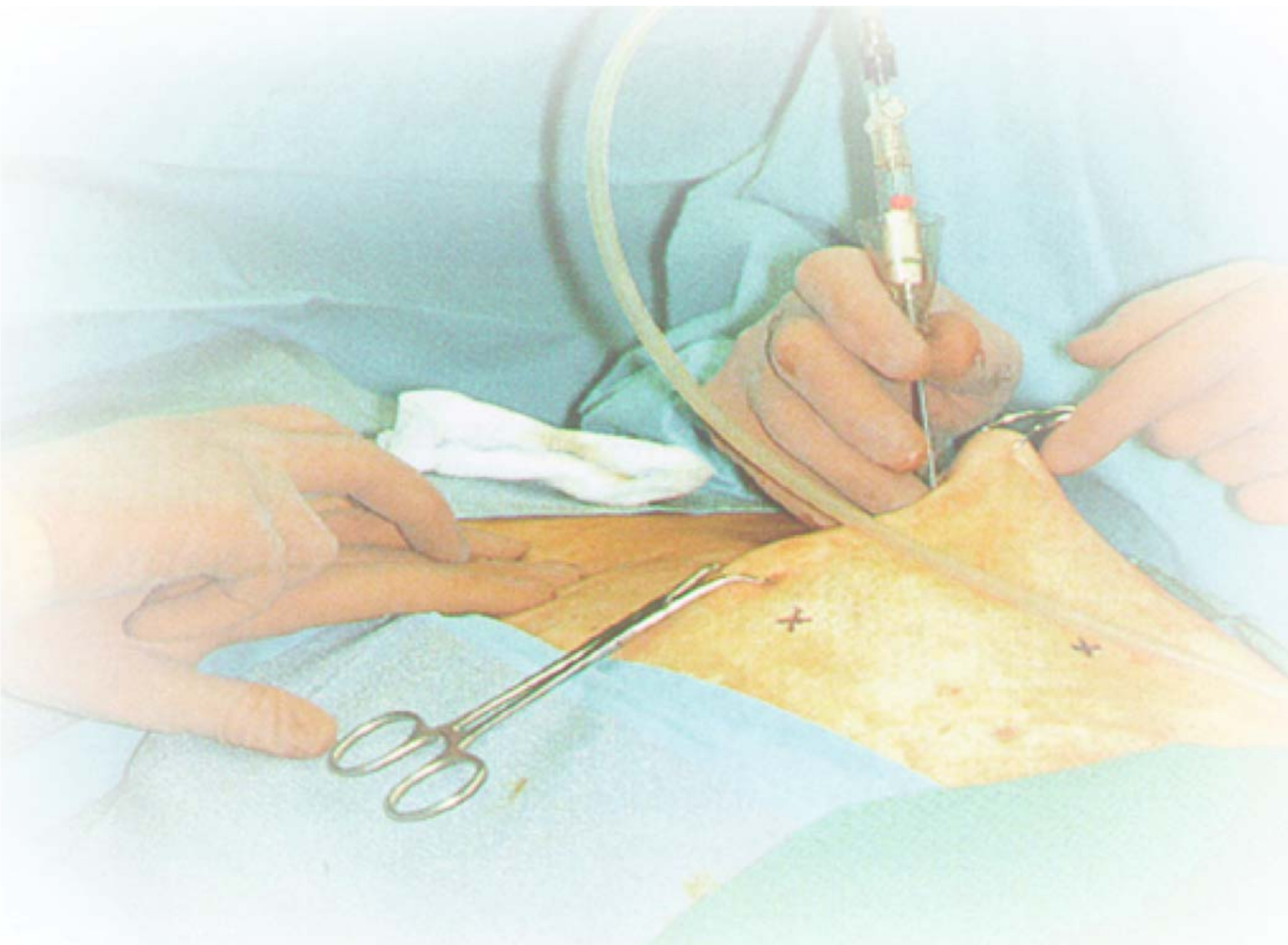
Section I
Introduction



1
Reconstructive Laparoscopic Urology: Past, Present, and Future

Brian A. VanderBrink, Michael C. Ost, Gopal H. Badlani, and Benjamin R. Lee

Laparoscopy represents an invaluable diagnostic and therapeutic technique in the treatment of patients with genitourinary disease. It is indisputable that patients frequently benefit from decreased pain, shortened hospital stay, and more rapid return to full activity with a laparoscopic approach, compared to an open technique. Within the field of urology, laparoscopy has evolved from its early use purely for diagnostic purposes, to providing the means necessary to perform extirpative surgery for solid organ tumors. Currently, complex reconstructive urologic procedures are being performed completely intracorporeally using laparoscopy. As technology continues to advance, future directions will need to focus on merging these innovative technologies with existing and novel laparoscopic instruments.

Historical Perspective

In 1976, Cortesi et al [5] pioneered the use of laparoscopy as a diagnostic tool for localizing nonpalpable undescended testicles in the pediatric population. Schuessler et al [25] first applied laparoscopy to the field of adult urology in 1991 for minimally invasively sampling pelvic lymph nodes in patients with prostate cancer. These initial successful experiences were shortly followed by the use of laparoscopy to perform extirpative surgeries such as nephrectomy, nephroureterectomy, radical prostatectomy, bladder diverticulectomy, cyst decortication, laparoscopic cystectomy, varicocelectomy, retroperitoneal lymphadenectomy, ureterolithotomy, orchiectomy, and laparoscopic-assisted renal autotransplantation [2–4,13,14,16,18,20,21,25,28].

As the feasibility was being established for laparoscopic ablative surgeries, focus turned toward utilizing the technique for reconstructive urologic procedures. Laparoscopic suturing and tying constitute advanced minimally invasive surgery skills, and Schuessler et al [24] performed the first laparoscopic pyeloplasty for ureteropelvic obstruction in 1993 utilizing these skills. The high success rate of pyeloplasty in combination with the less morbid laparoscopic approach has made laparoscopic pyeloplasty an attractive therapeutic option in treating ureteropelvic junction obstruction. Direct comparison of percutaneous antegrade endopyelotomy and laparoscopic pyeloplasty in patients with ureteropelvic obstruction has demonstrated superior efficacy rates for the latter, especially in cases of severe hydronephrosis or the presence of a crossing vessel [19].

It was only a matter of time following the early success and feasibility of laparoscopic radical nephrectomy that laparoscopic partial nephrectomy was performed. Winfield et al [31] are credited with the first laparoscopic partial nephrectomy in the human for benign disease. The widespread use of cross-sectional imaging modalities has resulted in a substantial increase of incidentally detected renal masses. Commensurate with the increased detection of these incidental renal masses, there has been great interest in an effort to determine whether these masses can be treated safely with nephron-sparing surgery in patients with a normal contralateral kidney. Studies have shown that the survival of patients undergoing nephron-sparing surgery for low-stage renal cell carcinoma is comparable to survival of patients undergoing radical nephrectomy [30]. Duplicating open surgical technique while performing laparoscopic partial nephrectomy is critical in achieving an excellent oncologic outcome. Intentional entry into the collecting system may be necessary to obtain appropriate surgical margins. Substantive renal parenchymal resections that incorporate laparoscopic suture repair of the collecting system resulting in a watertight closure can be achieved [6]. The critical factors of hemostasis and limiting warm ischemia time during laparoscopic partial nephrectomies are currently under investigators to further improve outcomes.

The skill and expertise involved with free-hand intracorporeal suturing has been applied to more extensive reconstructive procedures such as laparoscopic enterocystoplasty, gastrocystoplasty, sacrocolpopexy, ileal ureter interposition, ureteral reimplant, and the creation of urinary diversion, both noncontinent and continent following radical cystectomy [1,7–12,15,17,26]. It is still early to assess the long-term efficacy of these new techniques, specifically the oncologic outcomes following laparoscopic radical cystoprostatectomy; however, the decreased morbidity and convalescence associated with the laparoscopic approach may be more evident in these major operations. Currently these surgeries are relegated to centers with advanced laparoscopic surgeons; however, the future may mandate wider dissemination if long-term results show similar if not improved results.

Future Trends

The transfer of a familiar three-dimensional operation to a two-dimensional video format has created a steep learning curve for performing complex laparoscopic reconstructive procedures. In an effort to mitigate this, the introduction of robotics to the operating room has dramatically increased the ease with which such procedures are conducted. The difference between standard laparoscopic instruments and the robotic instruments are that robotic instruments have six degrees of freedom of movement, whereas standard instruments have four degrees of movement. This translates into instruments that can be moved in a manner similar to the human wrist. This advantage, combined with re-creation of a magnified, high-resolution, three-dimensional image of the operative site at the console, affords one the ability to manipulate tissue as the surgeon's hand would in open surgery. Unfortunately, the enormous cost of the system (more than $1 million per system) and the absence of tactile feedback have remained large obstacles to widespread use.

There is clinical experience with robotics in urologic surgery, primarily for laparoscopic radical prostatectomy and pyeloplasty [22,29]. Specific advantages of robotics can be seen during robotic radical prostatectomy where the robotic arm allows the angle of placement of instruments under the pubic symphysis in tight spaces to be optimized. Long-term data evaluating the efficacy of robotic prostatectomy will be necessary before embracing its general use; however, comparison between robotic prostatectomy and open prostatectomy has demonstrated lesser blood loss, postoperative pain, and length of stay [27]. However, these benefits were outweighed by increased operating room costs.

It appears that the potential uses of laparoscopy are limited only by our imagination. The evolution of laparoscopic urology to establish the reconstructive era has arrived. A remarkable change in the face of medicine and surgery has occurred in the past 15 years. The next step will be in improved instrumentation to increase the efficiency of education and the dissemination of these techniques to teach these advanced and complex skills.

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2
Entry and Exit: Transperitoneal Laparoscopic Approach

Khurram M. Siddiqui and David M. Albala

It is mandatory for a laparoscopic surgeon to follow the basic principles of entry and exit to ensure a safe outcome during any procedure; any shortcuts have a strong potential to convert a relatively straightforward procedure into a formidable venture.

Most of the organs of the genitourinary system lie within the retroperitoneum or in the extraperitoneal space. The retroperitoneum can be entered either directly or transperitoneally. The choice of the appropriate approach depends on the operation to be performed, the patient's body habitus, and the skills of the surgeon. Most urologic laparoscopic procedures can be safely accomplished via a transperitoneal approach. The transperitoneal approach has the advantage of familiar anatomy with ample landmarks to orient a laparoscopist; however, it does expose the abdominal viscera to a potential risk of injury and adhesion formation.

Indications

Urologic laparoscopic procedures can be divided into three categories: ablative, diagnostic, and reconstructive. Ablative procedures are, by far, most commonly performed in adults, while limited diagnostic studies are more often performed in children. Reconstructive procedures are the most technically challenging and require advanced laparoscopic skills. With the advancements in techniques and instrumentation, many reconstructive urologic procedures are becoming more common. The indications for these procedures are the same as for open surgery, and at the present time almost all open urologic procedures have been performed laparoscopically.

Contraindications

The list of contraindications is fast shrinking and is dependent on the surgeon's skills. However, for a majority of urologists, the major contraindications can be categorized as follows:

1. Infectious states
    a. Peritonitis
    b. Abdominal wall infection
    c. Sepsis
2. Anatomic
    a. Bowel obstruction
    b. Multiple adhesions
    c. Large abdominal aortic aneurysm
    d. Abdominal wall/umbilical hernia
    e. Near-term pregnancy
    f. Morbid obesity
3. Systemic factors
    a. Severe cardiopulmonary disease
    b. Uncorrected coagulopathy

Preparation

The preparation for surgery begins with obtaining informed consent. This discussion with the patient should include the alternative treatment options available as well as the risks and benefits of each treatment. The possibility of conversion to an open procedure should always be discussed.

We routinely give a mechanical and antibiotic bowel preparation to all patients undergoing laparoscopic kidney and bladder procedures. This maneuver helps with the bowel dissection and mobilization by minimizing visual interference. Antibiotic bowel preparation reduces the morbidity, should a bowel perforation occur during the procedure.

Blood should be typed and screened for all ablative and reconstructive procedures.

Techniques for Safe Trocar Insertion

Primary Trocar

The first trocar is usually used to introduce the pneumoperitoneum and can be inserted by either a closed or open technique. The technique used is usually based on the experience of the surgeon.

Closed Technique

The pneumoperitoneum is established by the closed technique using a Veress needle. This is a 14-gauge needle that is 12 to 15 cm in length as shown in Figure 2.1. It has an outer sharp beveled tip that cuts through the tissue. The blunt-tip stylet of the inner cannula is retractable and serves as safety mechanism. In Figure 2.2, the mechanism of entry of the Veress needle is demonstrated. As the needle traverses the fascia and enters the peritoneum, the blunt tip springs forward upon entering an open space. This blunt stylet protects the abdominal contents from the sharp outer cannula. Before introduction of the Veress needle into the abdomen, it can be confirmed that the mechanism is intact as shown in Figure 2.3.

The most favored site for introduction of the Veress needle is at the level of the umbilicus. It is at this level that the fascial layers are most tethered, making penetration into the abdomen easier. However, if this site is not available because of a previous scar or hernia, other sites may be used. To introduce the Veress needle into the abdomen, a periumbilical vertical incision is made. The incision is lengthened to ensure that it can accommodate the outer diameter of the trocar; this helps to prevent excess force being placed on the trocar during insertion.

Problem: A too large or too small skin incision.

Solution: To ensure that the incision is the correct length, take the outer cannula of the trocar and make an impression on the skin. This serves as a guide for the length of the incision.

The Veress needle is then advanced at a right angle to the fascia, simultaneously lifting the abdominal wall away from the underlying viscera by using towel clips, as shown in Figures 2.4 and 2.5. As the needle advances through the fascia and the peritoneum, two distinct pops may be felt. The first pop occurs when the abdominal wall fascia is traversed and a second pop is associated with an audible click as the inner cannula springs forward upon entering the peritoneum.

Problem: Insufflation within omentum giving a bubbly appearance, as shown in Figure 2.6.

Solution: After inserting the secondary trocar, a nick can be made to deflate the bubbly appearing omentum.

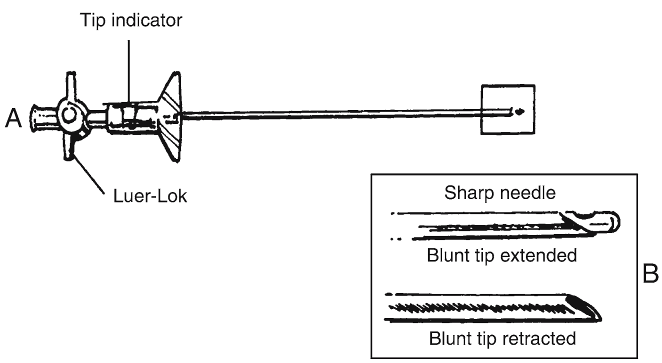


FIG. 2.1.

FIG. 2.2.

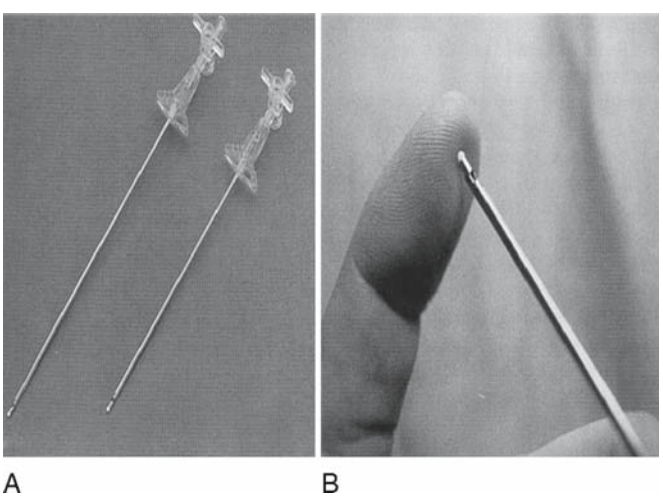


FIG. 2.3.

FIG. 2.4.

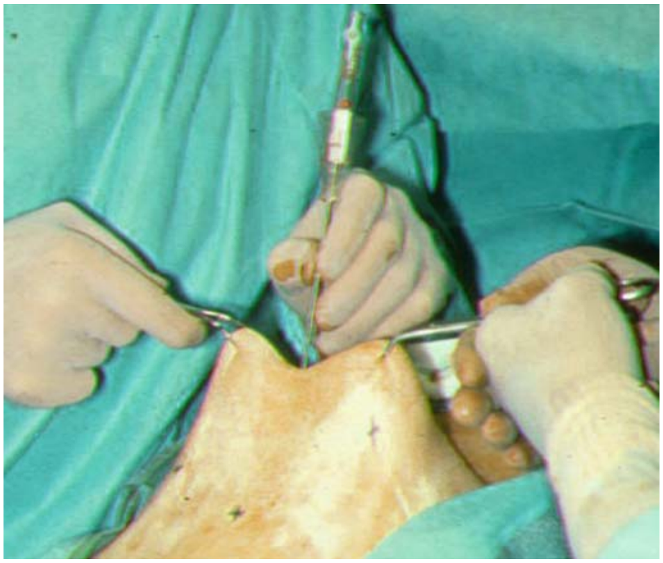


FIG. 2.5.

FIG. 2.7.

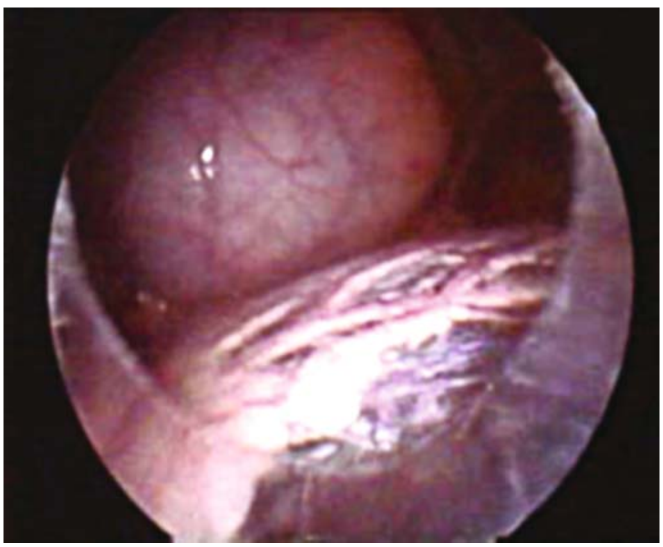


FIG. 2.6.

Problem: Injury to deep structures including great vessels.

Solution: Deep penetration of the Veress needle into the abdominal cavity should be avoided to minimize the risk of great vessel injury.

To check for correct placement of the needle, a 10-cc syringe with saline is attached to the Veress needle. Initially, it is aspirated to look for blood, enteric contents, or excessive air. After this, saline is irrigated to see if free flow into the abdomen is possible. The syringe barrel is then removed and the saline in the Veress needle should flow freely into the abdomen because of the negative pressure as shown in Figure 2.7. If this does not occur, the needle is in the wrong position and should be removed.

Problem: Blood is present in the aspirate. If blood is aspirated from the Veress needle, a vascular injury is suspected.

Solution: The needle should be removed and replaced. Once access is obtained, the puncture site as well as the retroperitoneum should be inspected for evidence of vascular injury or expanding hematoma. During this time if the patient becomes hemodynamically unstable and vascular control is not feasible laparoscopically, emergency laparotomy should be performed.

Problem: Excessive air or enteric contents is present in the aspirate. In this situation, an enteric injury is suspected.

Solution: The needle is left in place, as it might be difficult to isolate the site of injury if the needle is removed and also result in further spillage of enteric contents. A new access site should be chosen for laparoscopic access and the initial needle placement can be confirmed and any perforation repaired. The decision to repair the injury laparoscopically or via an open approach is based on the experience of the surgeon and the extent of the injury. In most cases, the Veress needle is a forgiving instrument and does not require repair. Patients should be placed on antibiotics for a few days.

Although these complications are rare (occurring in 0.05% to 0.2% of cases), they do require vigilance [1].

Open Technique

In an attempt to increase the safety for insertion of the initial trocar, Hasson introduced a method to obtain laparoscopic access through an open technique. This technique is especially useful when a patient has undergone previous abdominal surgeries.

A semicircular incision is created around the umbilicus. An alternate position may be chosen in certain situations, usually lateral to the rectus muscle, and in a way to avoid major vascular structures of the abdominal wall as shown in the Figure 2.8.

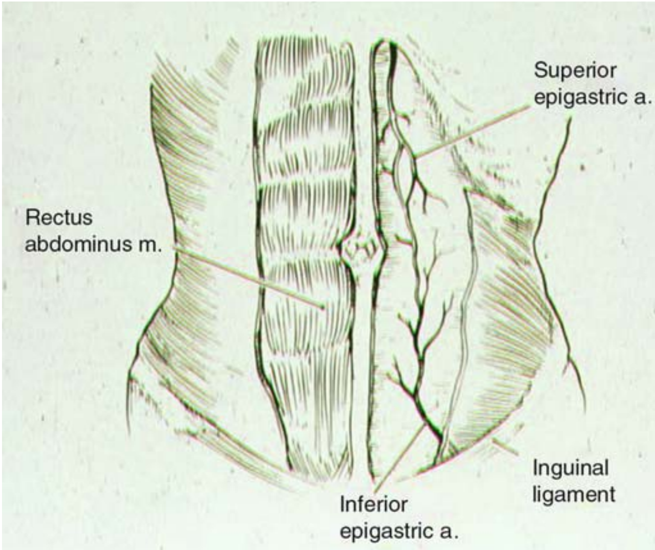


FIG. 2.8.

Using a combination of two army-navy retractors, the subcutaneous fat is cleared from the fascia. A small 1- to 2-cm incision is created within the fascia after placing stay sutures. These sutures are used as a purse string to prevent the gas leakage during the case and to help with the closure of defect at the end of the case. Following this, the peritoneum is identified, grasped between two clamps, and incised sharply. Entry to the abdominal cavity is confirmed visually and by placing a finger into the cavity. The Hasson cannula is then inserted into the abdominal cavity.

The Hasson cannula has three parts: the outer sheath, a blunt obturator, and a cone that is movable along the sheath that may be locked into position. The cannula also has wings at the base of the trocar's outer sheath where the fascial sutures can be wrapped and locked as shown in Figure 2.9.

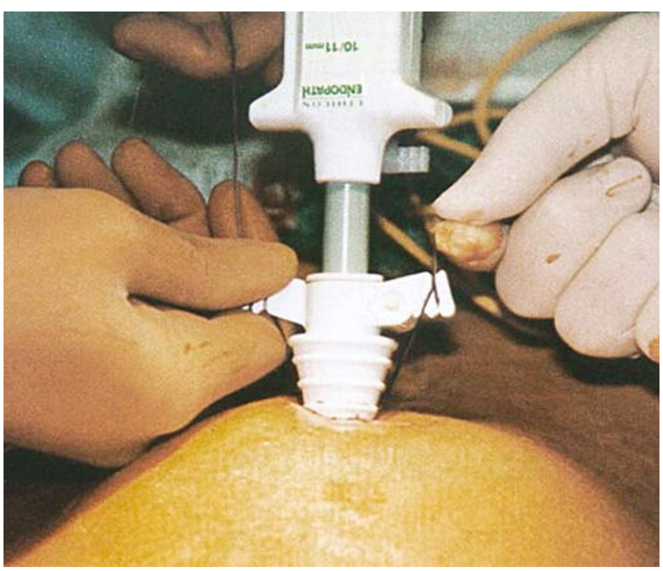


FIG. 2.9.

Technique for Creation of the Pneumoperitoneum Using a Veress Needle

Once it has been established that no injury has occurred during the insertion of Veress needle, one can then progress to insufflating the abdomen. The flow of carbon dioxide gas through the tubing is then confirmed by placing the end of the tube in a water-filled container. The tubing is then attached to the Veress needle. The initial intraabdominal pressure should be <8 mm Hg and the flow of gas between 1 and 2 L/min. Satisfactory establishment of the pneumoperitoneum can be checked by watching a gradual rise in the intraabdominal pressure to 15 mm Hg. Percussion over all four quadrants will also confirm establishment of the pneumoperitoneum, as shown in Figure 2.10. Once the pneumoperitoneum has been established and the patient's hemodynamic status is confirmed

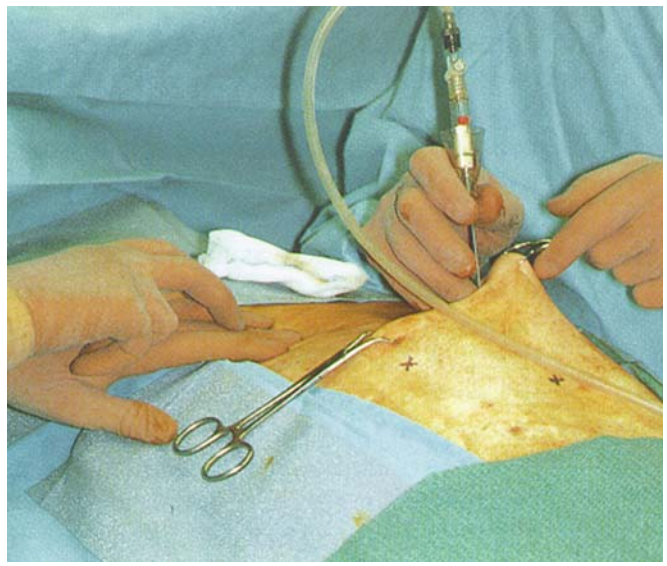


FIG. 2.10.

to be stable by the anesthesiologist, the flow of gas can be increased.

A 10/12 mm trocar is then inserted after withdrawing the Veress needle. The trocar should be held in the palm with the index finger extended down the shaft to gain maximum control (Figure 2.11).

Trocars should be inserted by rotating the trocar between the 10 and 2 o'clock positions and applying a steady downward force; it is helpful to simultaneously lift the abdominal wall with the nondominant hand or towel clips, as shown in Figure 2.12. Once in position, the inner cannula of the trocar is removed immediately, the gas tubing is reattached to the new cannula, and the laparoscope is positioned to ensure proper placement and to inspect the abdomen to visually confirm the safe entry.

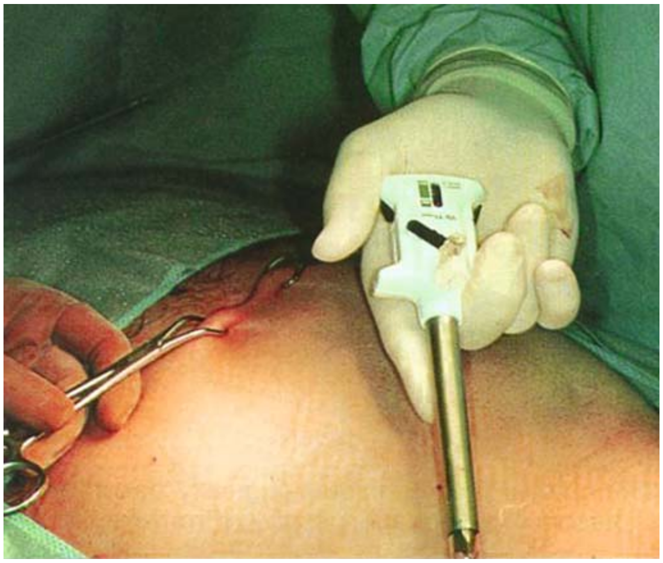


FIGURE 2.11

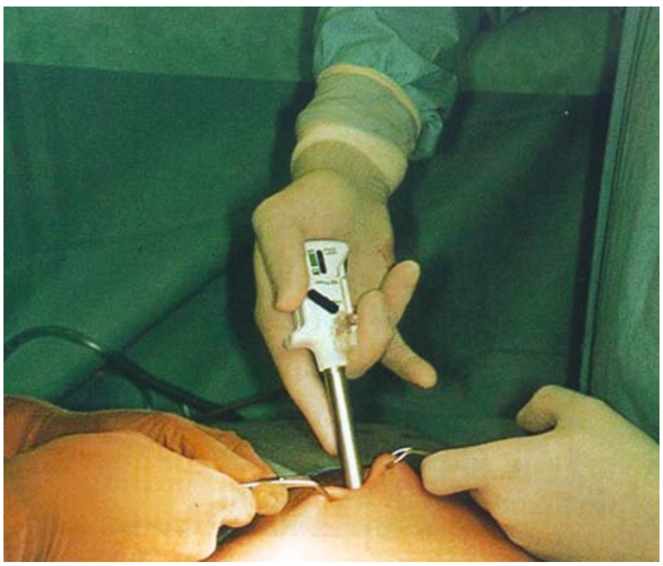


FIG. 2.12.

FIG. 2.13.

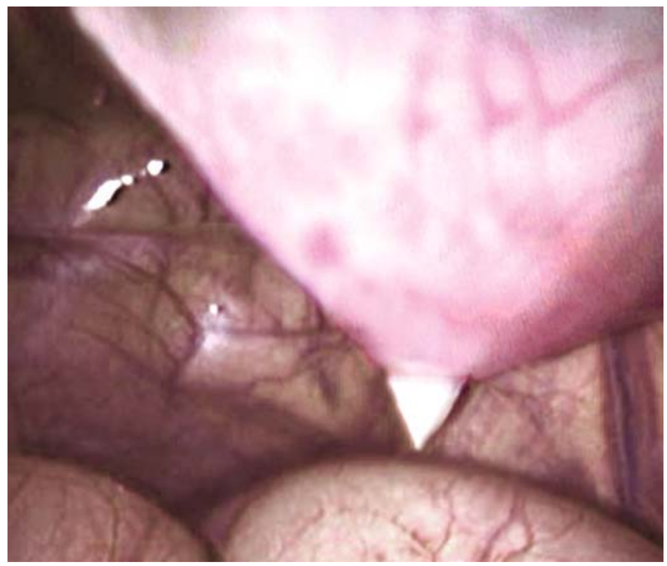


FIG. 2.14.

Technique for Creation of the Pneumoperitoneum Using the Hasson Technique

A skin incision is made at the level of the umbilicus. Using two retractors, the incision is deepened down to the level of the fascia. A Vicryl suture is placed on both edges of the fascia and the fascia is then cut. Using great care, the peritoneal cavity is entered. After placing the trocar in the peritoneal cavity as shown in Figure 2.13, it is attached to the gas and similar steps are subsequently followed as described for the closed technique.

Insertion of Secondary Trocars

The secondary trocars may be placed either under direct vision or by palpation, with the nondominant hand in the abdomen protecting the intraabdominal organs in the case of hand-assisted laparoscopy. The safe entry of the secondary trocar should be monitored under vision, as shown in Figure 2.14.

Problem: Vascular injury of abdominal wall resulting in blood trickle, as shown in Figure 2.15A.

Solution: After inserting the trocar, percutaneous transfixation can be done as shown in Figure 2.15B.

Technologic Advancements

To further ensure safe entry into the abdomen, many new trocar designs have been introduced. These include trocars with blades that retract upon entering the abdominal cavity, as shown in Figure 2.16.

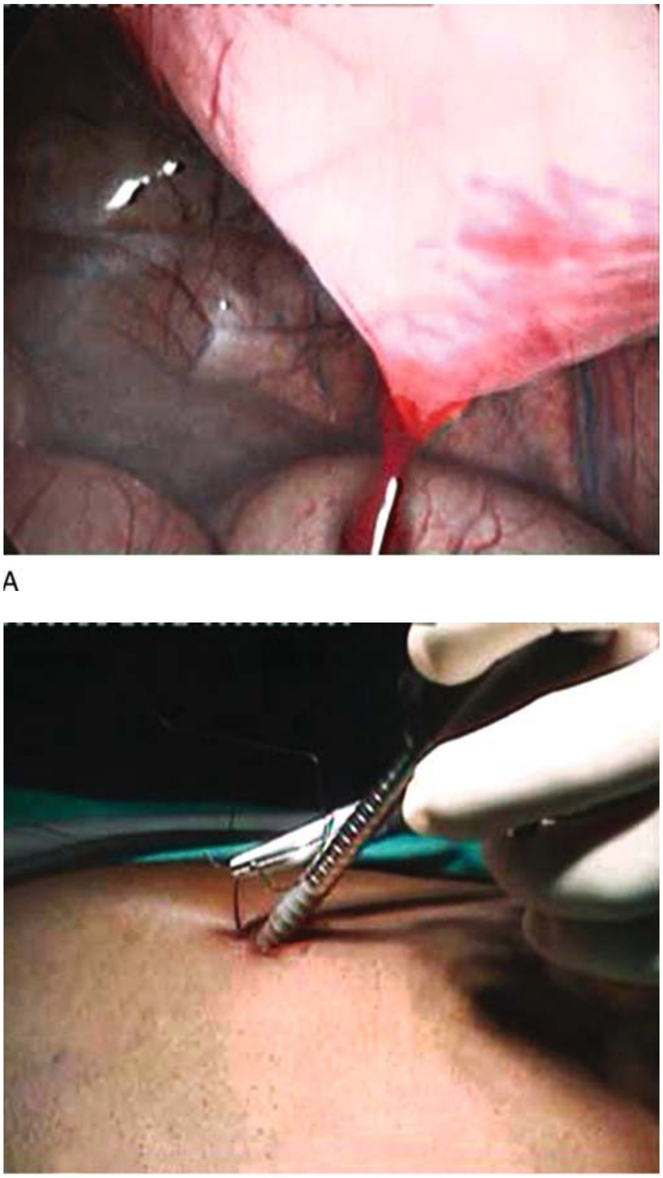


Fig. 2.15.

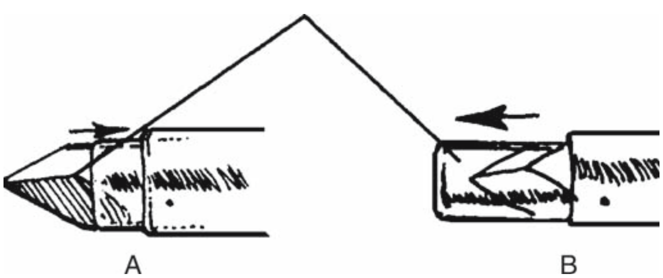


Fig. 2.16.

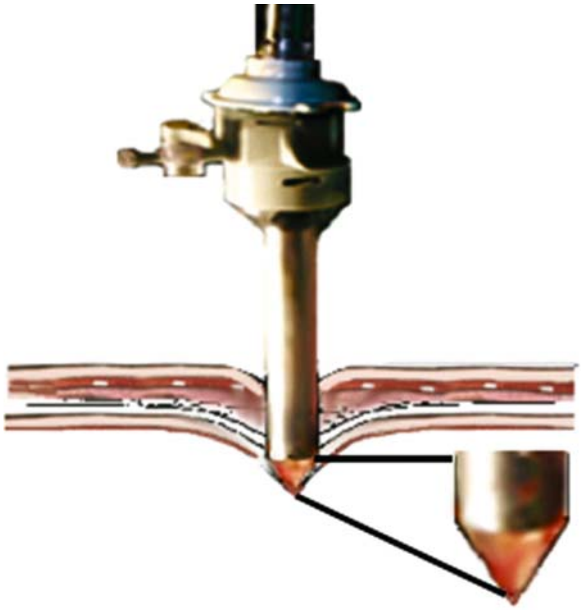
Blunt-tip trocars that radially dilate are also available, as shown in Figure 2.17. These trocars separate the abdominal layers by dilating the tissues instead of cutting them. This will prevent the formation of hernias and allow for a quicker closure at the end of the procedure. We also found them to cause less postoperative pain.

We routinely use the “one-step” trocars that utilize a mesh-like sleeve. These are introduced with the Veress needle and serve as a tract through which a blunt-tip radially dilating trocar can be inserted. This sleeve is shown in Figure 2.18.

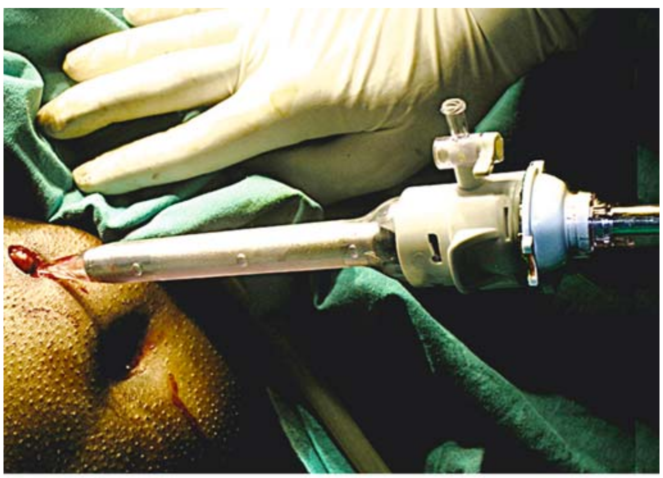
Most recently, clear trocars, which allow a 0-degree laparoscope to be placed within the tip of the trocar, have been introduced. They enable the surgeon to visualize the different layers of the abdominal wall as the trocar is placed into the peritoneum as shown in Figures 2.19 and 2.20.

Fig. 2.17.

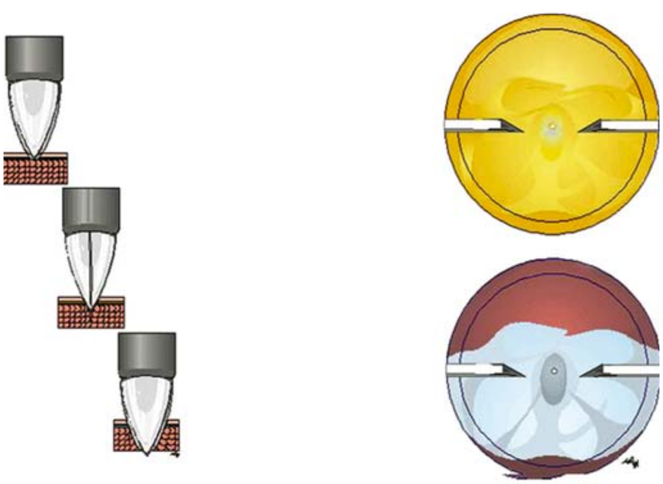
Fig. 2.18.



A

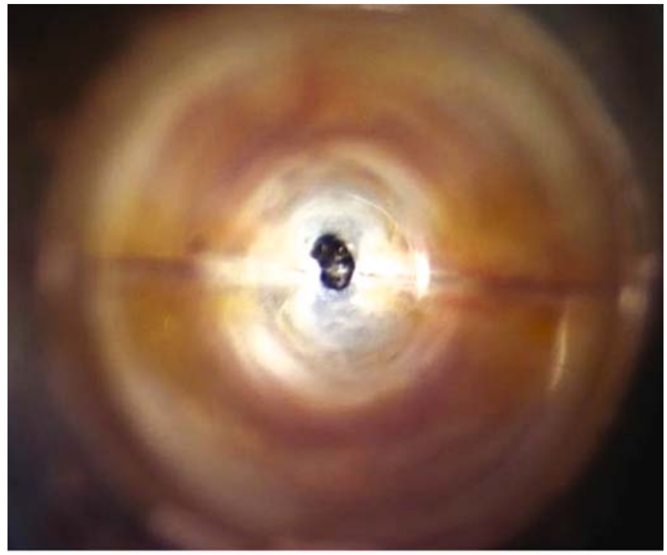


B



C

FIG. 2.19.



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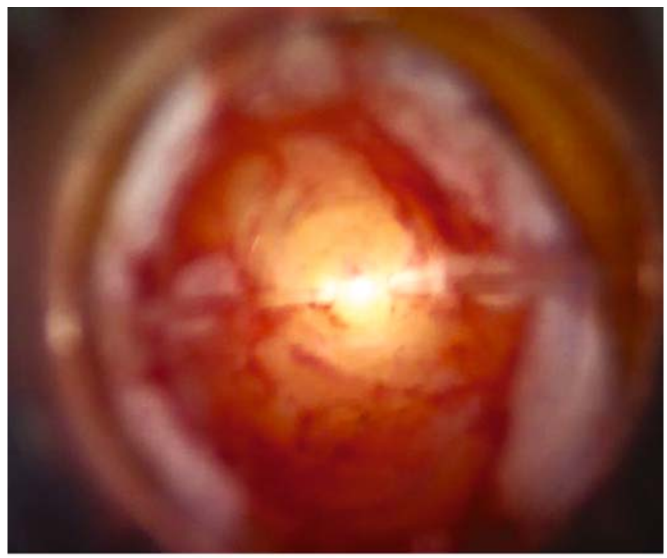


B

FIG. 2.20.

Recently, a new type of trocar has been introduced with an inflatable balloon at the tip. This may be used instead of a traditional cone-shaped Hasson trocar and does not need fascial sutures. Once inserted, the balloon is inflated and the base of the trocar is pressed against the skin, creating an airtight seal. A tight, secure fit allows for movement of the trocar while maintaining an airtight seal. This trocar is shown in Figure 2.21.

Exiting the Abdomen

Despite the utmost care during placement of trocars, some injuries may be detected only during the exit. Before starting to remove the trocars, all instruments and sponges should be

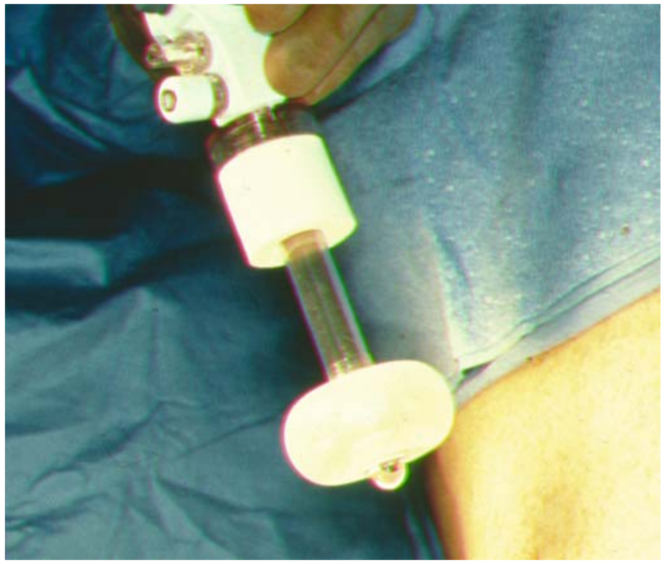
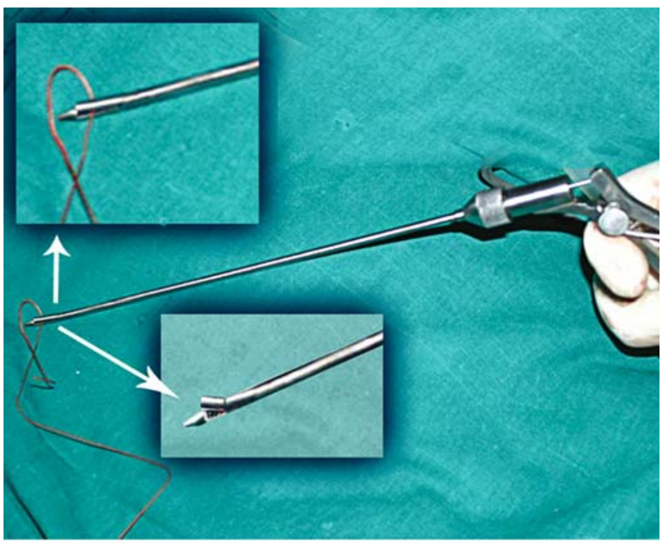
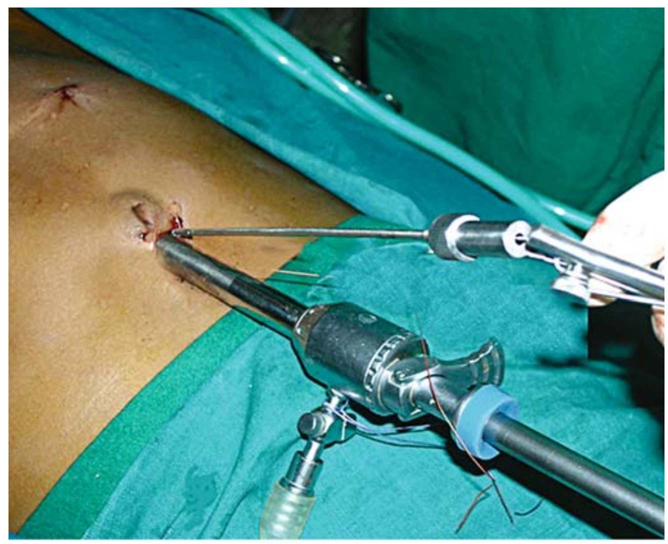


FIG. 2.21.



A



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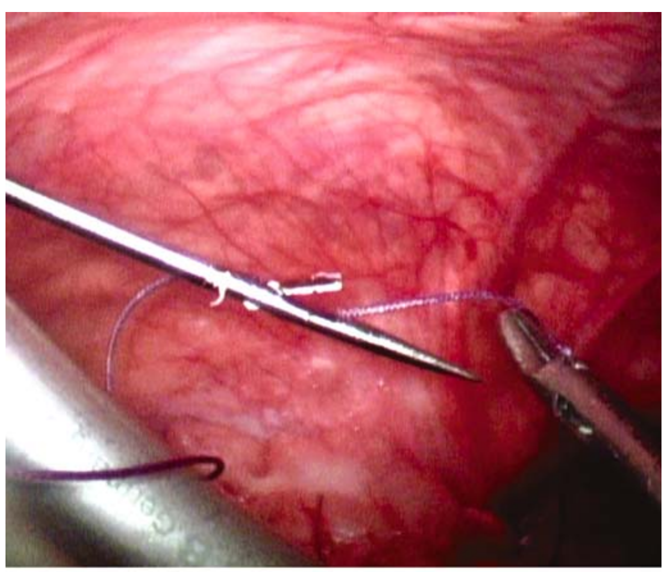

C

FIG. 2.22. **(A)** Port closure needle with the suture **(B)** Insertion of port closure needle along side the trocar **(C)** Endoview shows port closure needle picking up the suture

removed. The pressure of the pneumoperitoneum should be reduced to 5 mm Hg to confirm adequate surgical hemostasis. All working trocars should be removed under vision and the exit sites inspected for any bleeding. Then the primary trocar is finally removed. All trocars that are greater than 9 mm in size should have a fascial closure stitch placed to prevent a hernia.

The port closure needle is shown in Figure 2.22.

Useful Tips

- Know your instruments.
- Be familiar with your clip-applier and stapler.
- Be careful when using monopolar electrocautery to prevent thermal burns.
- Work with a surgeon familiar with laparoscopic techniques.
- Always have an open surgical setup in the room.

Reference

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3
Basic Techniques in Retroperitoneoscopy

M. Ramalingam, K. Selvarajan, and K. Senthil

Retroperitoneum is a familiar space for all urologists. John Wickham in 1979 was the first to perform retroperitoneoscopy to remove a ureteric stone. After a long period of 10 to 12 years it became a viable alternative to the transperitoneal approach, after being popularized by Ralph Clayman [2]. D.D. Gaur [3–6] developed the new concept of using a balloon to distend the retroperitoneal space (RPS) before pneumoinsufflation, which is widely practiced now. A variety of retroperitoneal balloons were later designed.

Techniques

We approach retroperitoneal organs posteriorly or anterolaterally/laterally. The basic difference from transperitoneal laparoscopy is that the space is smaller and the field is a little darker.

Indications

The following procedures of the kidney and ureters and a few lower tract procedures can be attempted retroperitoneoscopically:

- Simple nephrectomy for a nonfunctioning kidney, and donor nephrectomy [1,8–10]
- Radical nephrectomy for tumors <7 cm
- Partial nephrectomy for tumors <4 cm
- Renal cyst—marsupialization [11]
- Pyeloplasty
- Pyelolithotomy for large-burden stones
- Ureterolithotomy [7]
- Ureteroureterostomy in retrocaval ureter/ureteric stricture
- Nephroureterectomy

Contraindications

Retroperitoneoscopy is difficult in patients who have undergone retroperitoneal surgeries such as percutaneous nephrolithotomy (PCNL), because adequate pneumoinsufflation cannot be achieved.

Position of Patient

Patients are usually positioned in the lateral kidney position (90 degrees) and the flank space is widened by breaking the table.

Different types of balloon trocars are used for opening up the retroperitoneal space. Balloon-tip trocars and Malecot-tip trocars help to retain the tip of the trocar within the retroperitoneal space.

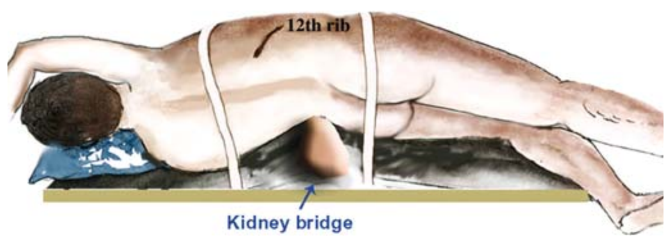


Fig. 3.1. Position for retroperitoneoscopy

Step-by-Step Description

Port Placement

Entry

The primary port can be in the renal angle. Some surgeons prefer the anterolateral approach, in which case the primary port can be a little anterior to the renal angle and the working ports can be on either side. Hasson's trocar is preferably used to prevent pneumoleak.

Secondary ports are about 4 cm away from the primary port, complying with the triangulation concept. A fourth port may be inserted anterosuperiorly for retraction, or suction and irrigation in such a way that it does not interfere with the other instruments.

Dissection and suturing techniques are the same as in the transperitoneal approach, but the restricted space makes the steps a little difficult.

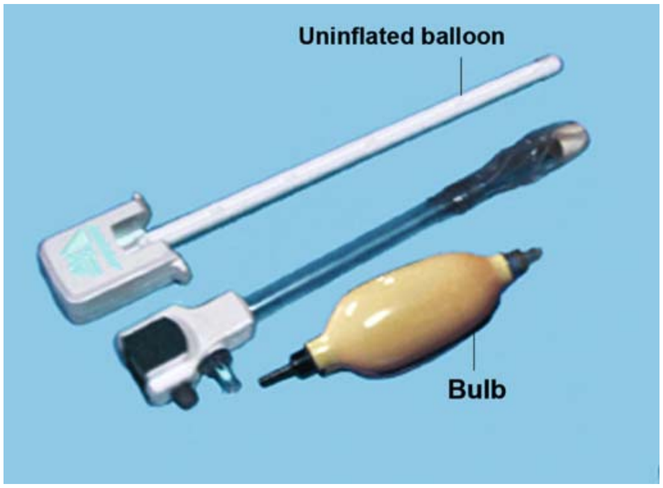


Fig. 3.2. Balloon trocar

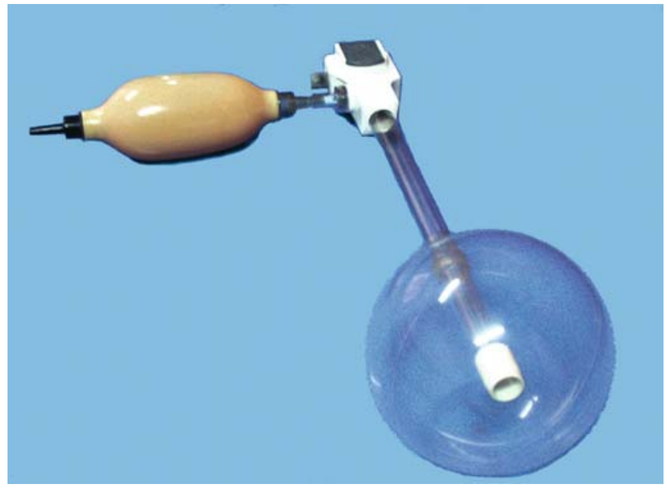


Fig. 3.3. Inflated spherical balloon

Fig. 3.4. Cylindrical balloon

Fig. 3.5. Gaur balloon

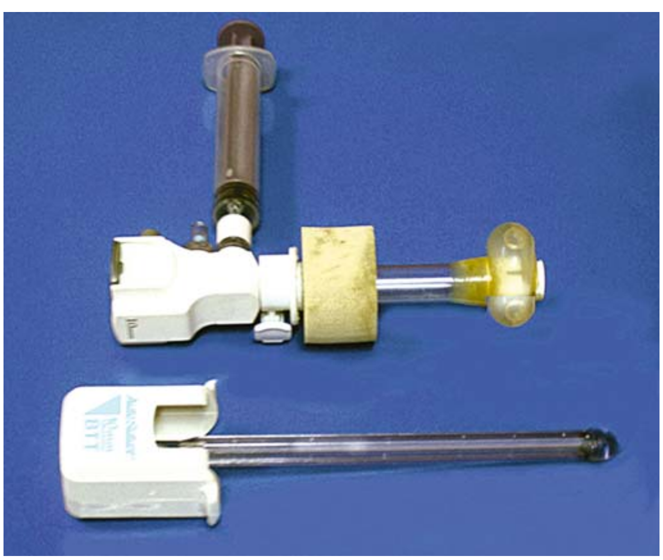


Fig. 3.6. Balloon-tip trocar

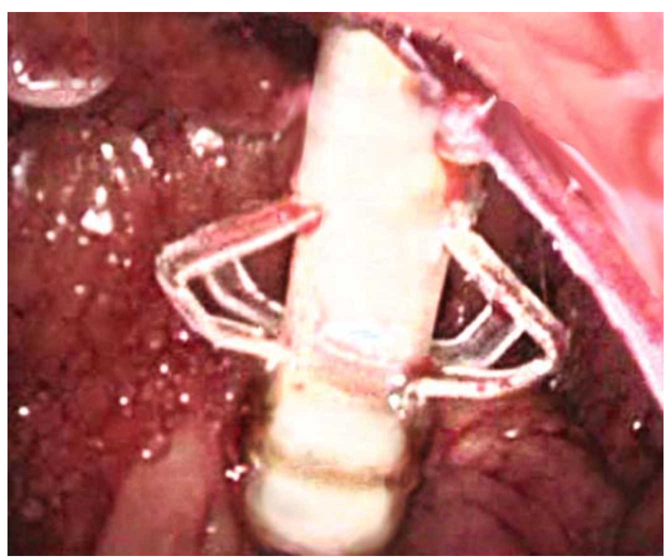


Fig. 3.7. Malecot-tip trocar

FIG. 3.8. Hasson's trocar

FIG. 3.9. Proposed direction of finger to create retroperitoneal space

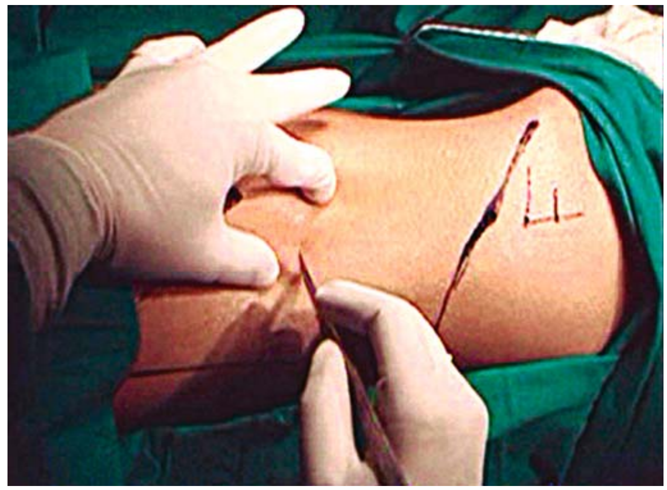
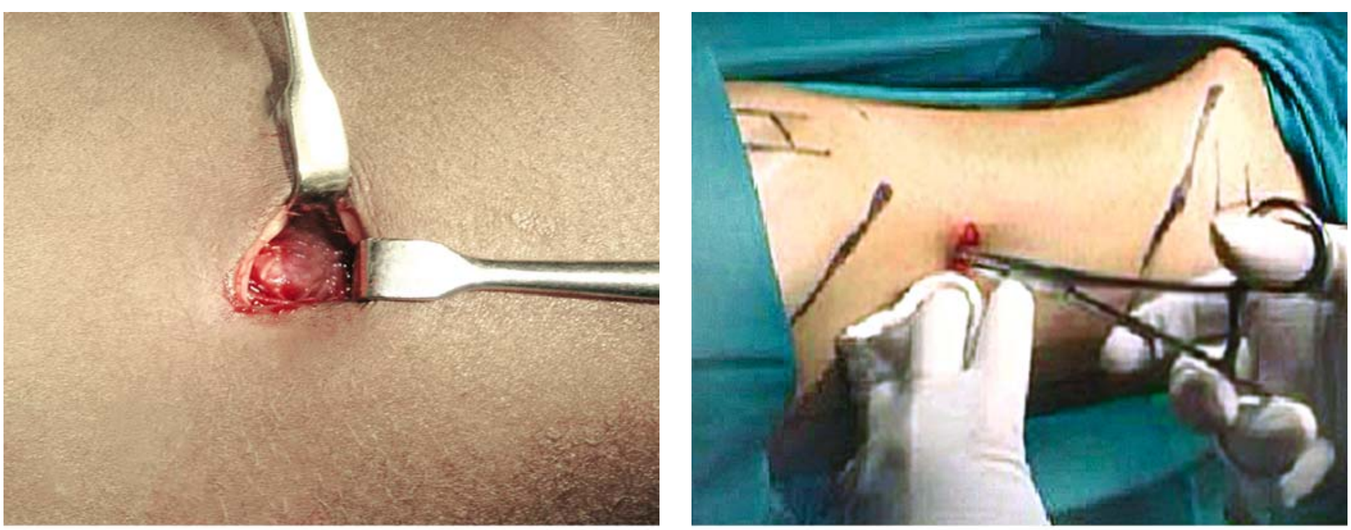


FIG. 3.10. The primary port is made at the renal angle, a finger's breadth below the tip of 12th rib (the primary port can also be placed a little anteriorly if one wants to place a hand instrument in the renal angle)



A B

FIG. 3.11. Thrusting and opening a hemostat through the muscle layer and lumbodorsal fascia so that a finger can be introduced subsequently

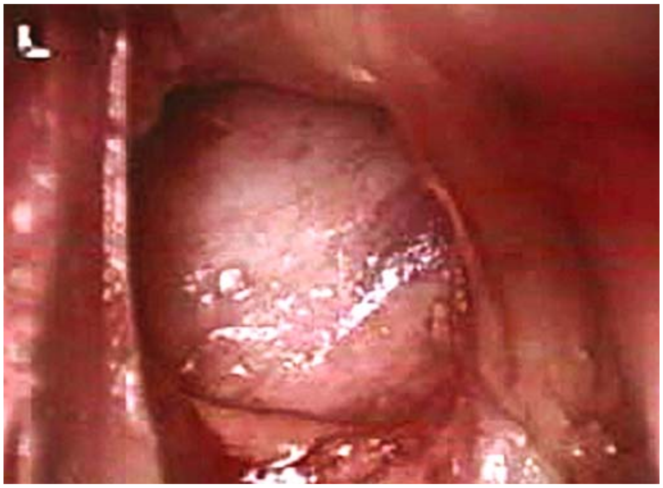


FIG. 3.12. Opening the muscle layers reveals glistening lumbodorsal fascia, which has to be opened to enter the retroperitoneal space

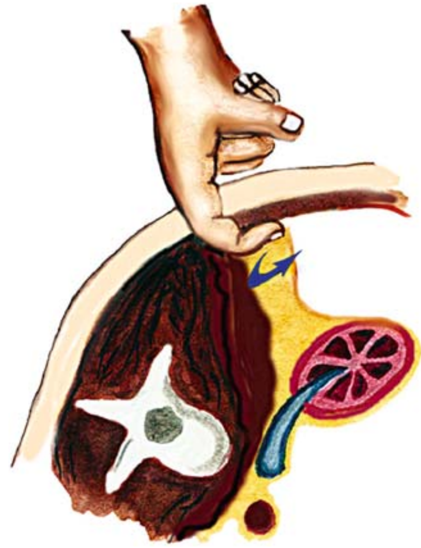


FIG. 3.13. Diagrammatic representation of finger dissection of the retroperitoneal space, pushing the peritoneum anteriorly

FIG. 3.14. Pushing the peritoneum forward so that the secondary ports can be inserted extraperitoneally

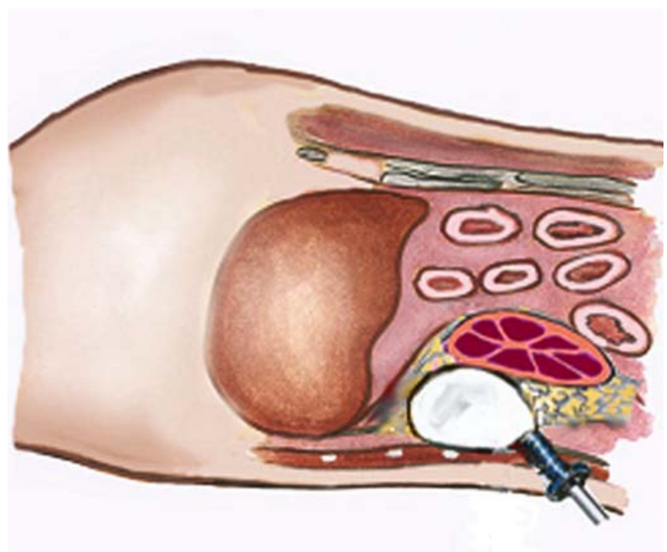


FIG. 3.15. Diagrammatic representation of introduction of the balloon that is used to widen the space

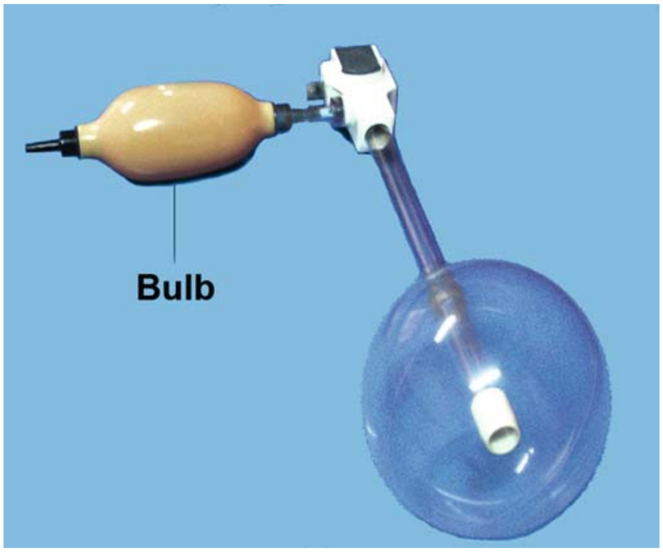


FIG. 3.16. An inflated balloon is used to open the retroperitoneal space concentrically

FIG. 3.17. On inflating the balloon a bulge appears in the flank (H, head end; F, foot end)

FIG. 3.18. View through balloon trocar may help in anatomic orientation

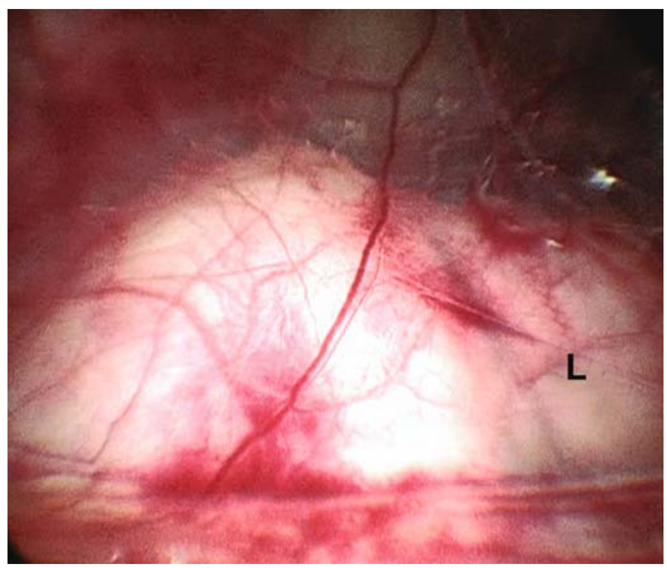


FIG. 3.19. Quite often the initial view may show the lower pole (L) of the kidney

FIG. 3.20. Another type of balloon trocar that can be used

FIG. 3.21. A rolled-up balloon that opens at right angles when inflated

FIG. 3.22. A simpler Gaur's balloon can also help in creating a retroperitoneal space

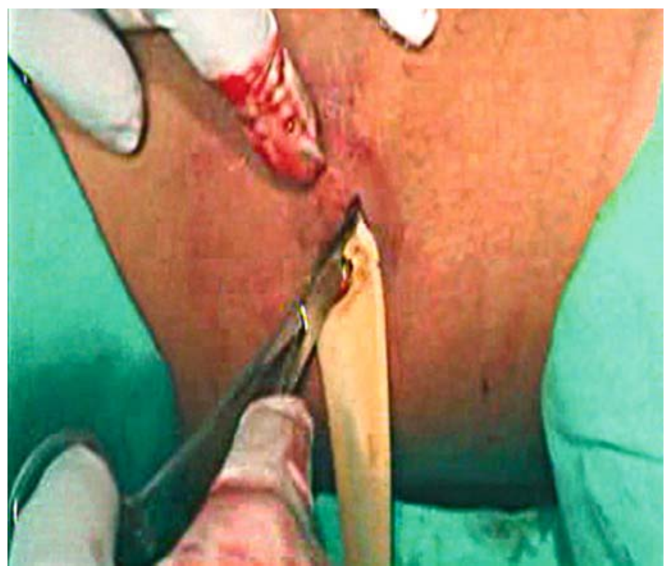


FIG. 3.23. The inflatable segment of balloon should be completely pushed deeper to the lumbodorsal fascia, otherwise the muscle layers may split and get splayed and carbon dioxide emphysema may result

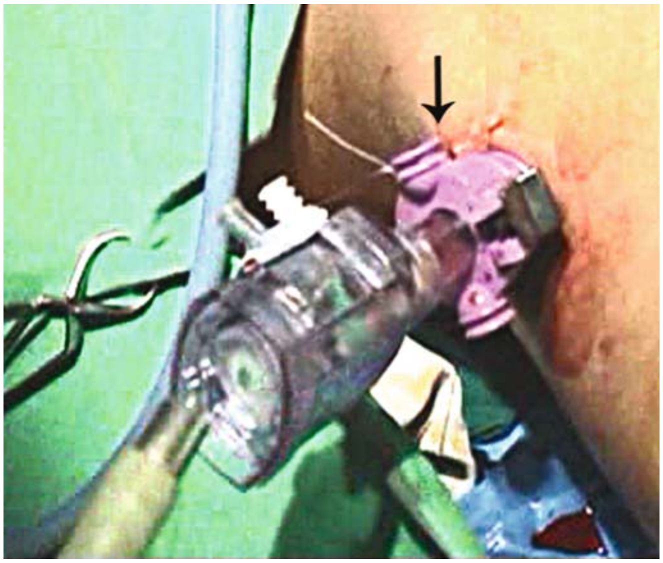


Fig. 3.24. Hasson's trocar helps to prevent pneumo leak. This trocar has a conical stopper with provision (arrow) for fixation

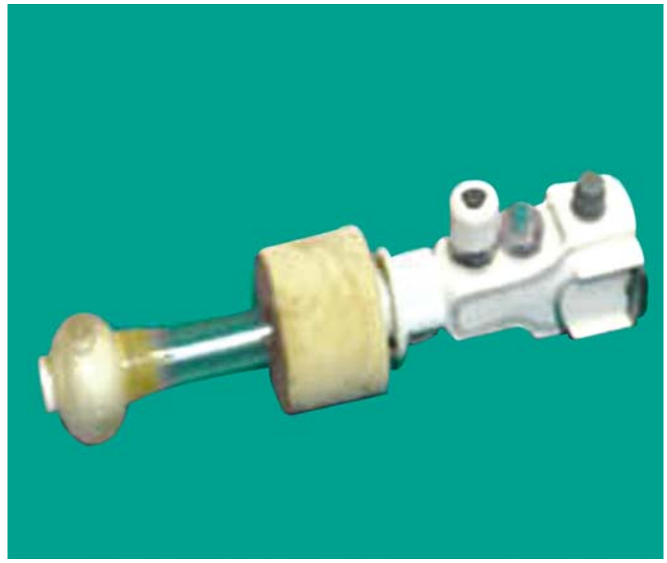


Fig. 3.25. Balloon-tip trocar may be preferred to reduce pneumoleak and prevent trocar slippage

Fig. 3.26. Inserting a conventional trocar at the primary site can result in pneumoleak, which can be reduced by packing with a piece of gauze

Fig. 3.27. The primary port is fixed to prevent slippage of the trocar (as the initially created tract is wider)

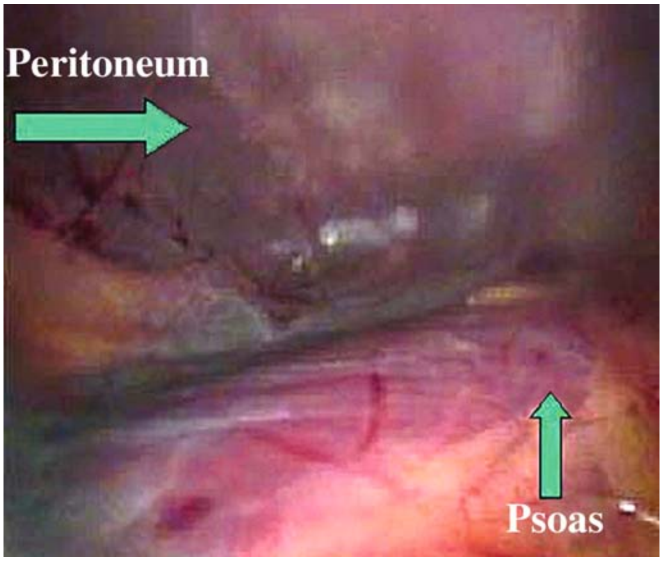


FIG. 3.28. Initial view to orient the landmarks: psoas below, peritoneum in front, and sometimes the lower pole of the kidney

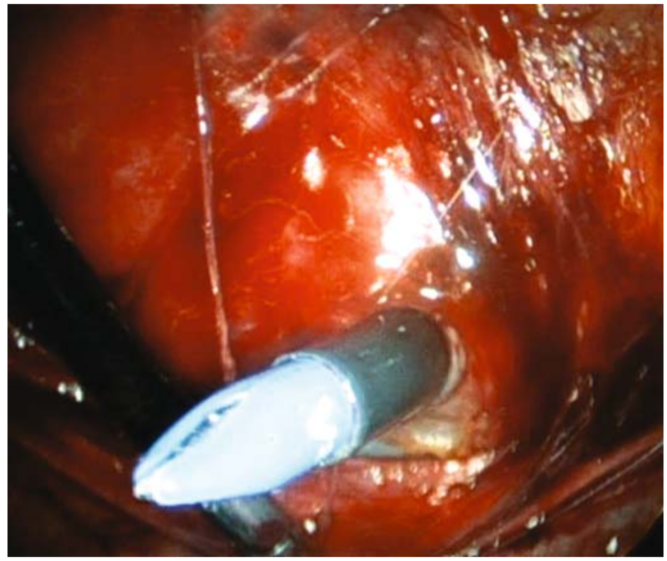


FIG. 3.29. The secondary trocar is introduced under vision

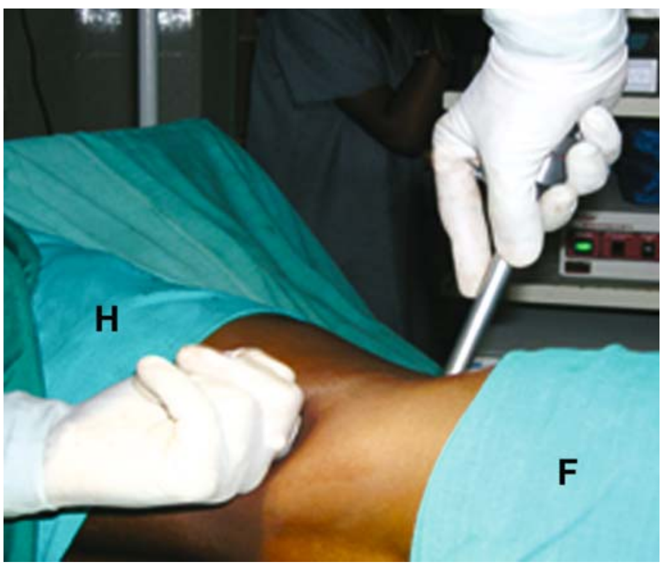


FIG. 3.30. Alternatively, the secondary trocar can be inserted with finger guidance as seen from behind (H, head end; F, foot end)

FIG. 3.31. Another secondary subcostal port is inserted with finger guidance (as seen from front)

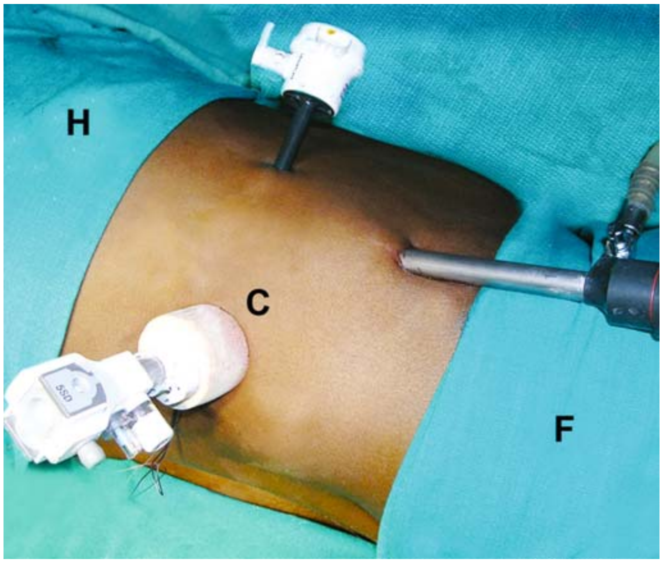


FIG. 3.32. Trocar positions: bird's-eye view (C, camera port at renal angle)

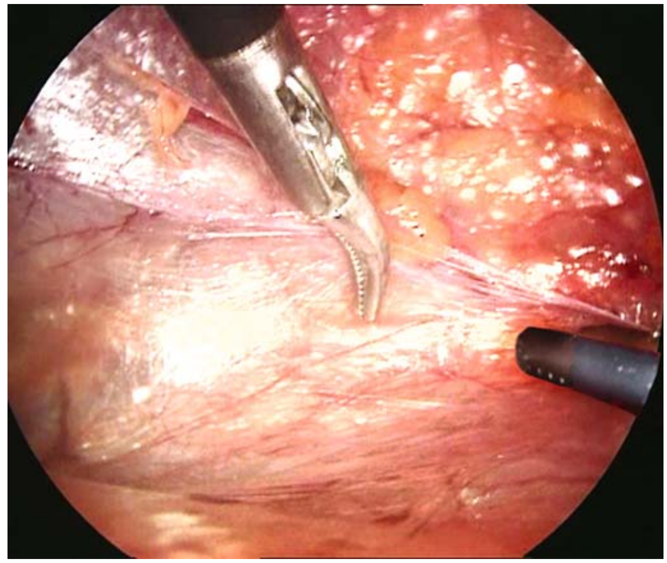


FIG. 3.33. Initial dissection may be done with blunt instruments until a few landmarks are evident

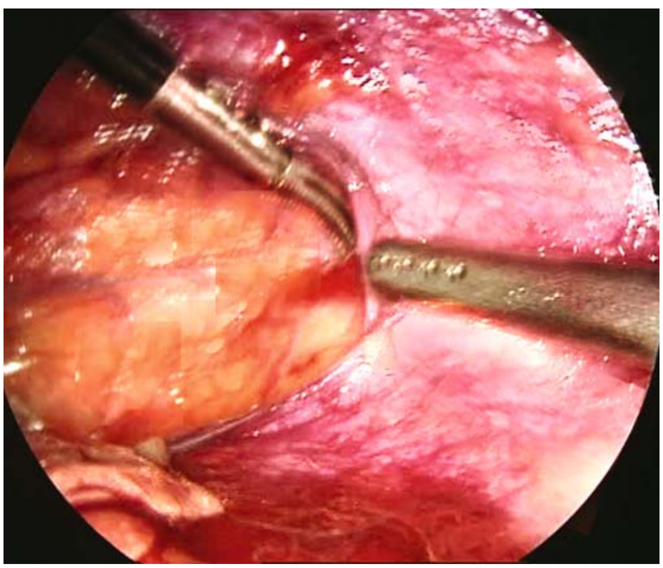


FIG. 3.34. Initial dissection should start in the flimsy areolar tissue between the psoas posteriorly and the peritoneum in front to locate the ureter

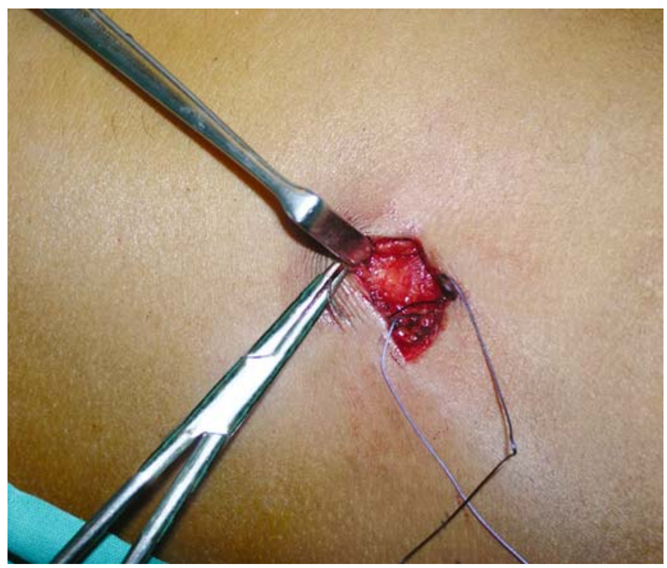


FIG. 3.35. The muscle layers of the primary port are closed with absorbable sutures

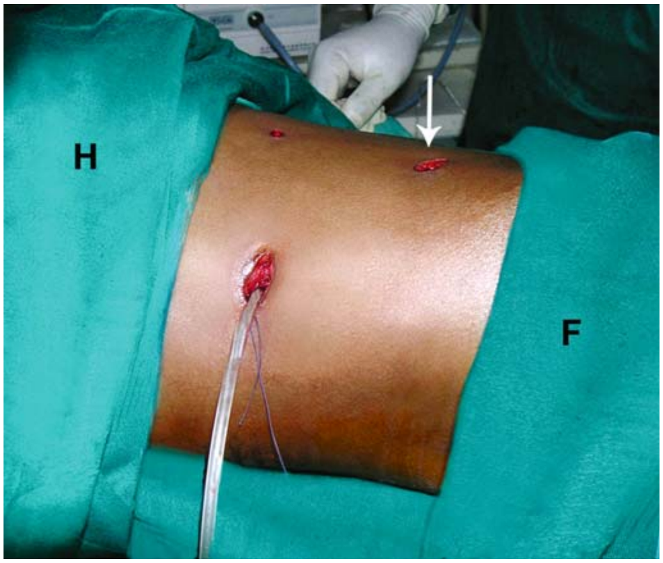


Fig. 3.36. A drain is placed through the primary port (can also be introduced under vision through lower anterior port)

Specimen Retrieval

A simple custom-made bag can be used for retrieving stones and other benign masses. However, the commercially available Endocatch is preferable if the mass is a tumor.

Drain

A drain can be left through the primary or accessory port site.

Exit

Muscle layers in the primary port (10 mm) should be closed with interrupted Vicryl sutures.

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4 Instruments Used in Laparoscopic Reconstructive Urology

Chandra Shekhar Biyani and Michael Murphy

Each surgical specialty has different requirements for instruments, and the explosion in laparoscopic urology has created a market for a wide range of equipment tailored to its needs. Laparoscopic instruments vary from 1.8 to 12 mm in diameter and are usually 34 to 37 cm long (although length can vary from 18 to 45 cm). They may be disposable or reusable. Most laparoscopic instruments have a basic opening and closing function and can also rotate 360 degrees, while some also offer angulation at the tip.

A basic set should include the following: fenestrated grasper, blunt grasper, hook, needle-holder, scissors, bipolar diathermy forceps, trocars, and a suction/irrigation system.

Laparoscopic instruments can be divided into four broad categories based on their use:

1. Access
2. Manipulative instruments
    a. Retraction
    b. Dissection
    c. Suturing
3. Hemostasis
4. Retrieval bags

Access

The trocar is a tubular device through which operative access is achieved. Common components of trocars are the sleeve, the tip, the sealing system, the shield, and the insufflation port (Figures 4.1 to 4.3). Most instruments pass through 5- or 10-mm trocars. Gas leakage is prevented by sealing the trocar using a soft membrane diaphragm acting as a valve (which may be flap, ball, or trumpet) and the trocar tip may vary as shown (Figure 4.2). There are subtle differences between access ports, for example the screw-in port (Ethicon) tends to smear the camera less as it is re-introduced because of differences in the sealing valve compared with Hassan. Some surgeons anchor trocars with stitches or use balloon devices to prevent displacement.

Manipulative Instruments

The variety of manipulative instruments for laparoscopic surgery is increasing all the time. Retraction can be achieved using a wide variety of tissue-holding forceps, dissectors, probes, and dedicated retractors. These instruments are available in various sizes, shapes, and forms to suit different purposes. The grasping forceps tip can be single action or a double action, atraumatic or traumatic, straight, curved, Allis, Babcock, or angled. Retraction during laparoscopy is done by application of grasping forceps but in special circumstances laparoscopic retractors are required. Scissor-dissection may be performed with or without diathermy. Scissors tip can be fine, curved, and straight or hooked.

Hemostasis

Monopolar coagulation or cutting currents using a dissecting scissors or a grasping forceps are common. However, bipolar coagulation is a safer option; mainly because the current flows between the instrument tip and therefore there is less risk of diathermy. The Harmonic® scalpel (Ethicon; Cincinnati, USA) is an ultrasonic cutting and coagulating surgical device, offering surgeons important benefits, including, minimal lateral thermal tissue damage, minimal charring and desiccation, and simultaneous cutting and coagulation. The LigaSure™ vessel sealing generator (Valleylab, Colorado, USA) produces a high-current, low-voltage output that corresponds to at least four times the current of a standard electrosurgery generator, with one-fifth to one-twentieth the amount of voltage. It permanently fuses vessels up to and including 7 mm in diameter and tissue bundles without dissection or isolation. Ligasure safely seals 7 mm vessels, however most surgeons are reluctant to use it as the sole modality on a 5 mm renal pedicle and use a mechanical occlusive device such as Hem-o-Lok or staple. Table 4.1 lists important features of various devices currently available for coagulation and cutting.

Fibrin-Based Hemostatic Agents

Fibrin sealant has been used in a wide variety of clinical applications. The first commercial product Tisseel (Baxter Healthcare Corp., Deerfield, Illinois, USA) was approved in 1998. It contains pooled fibrinogen and thrombin as well as bovine aprotinin, and the cost is approximately $100/mL. A second-generation fibrin sealant Crosseal became available in 2003. It contains pooled fibrinogen and thrombin as well as synthetic tranexamic acid. The cost is approximately $100 to $150/mL. A third agent CoStasis (Cohesion Technologies, U.S. Surgical) combines bovine collagen and bovine thrombin with autologous plasma.

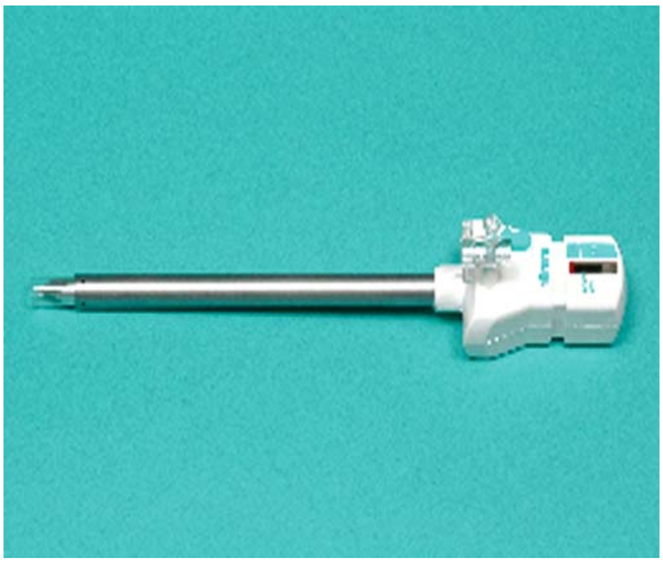

FIG. 4.1. A 10-mm trocar

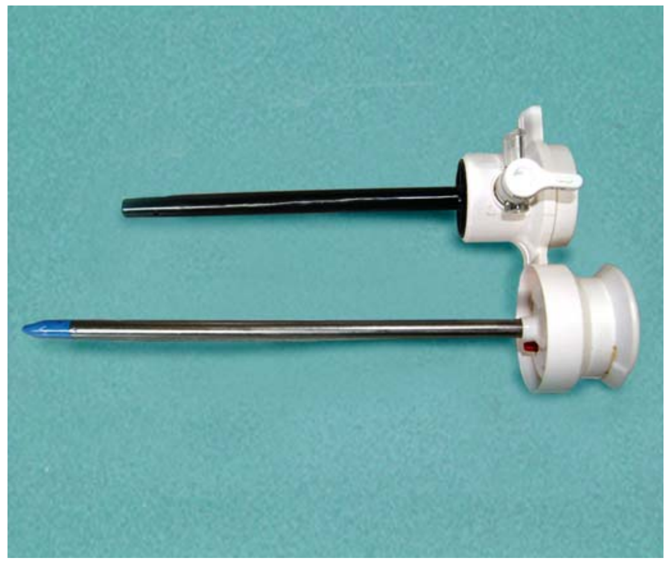

FIG. 4.2. A 5-mm trocar with canula

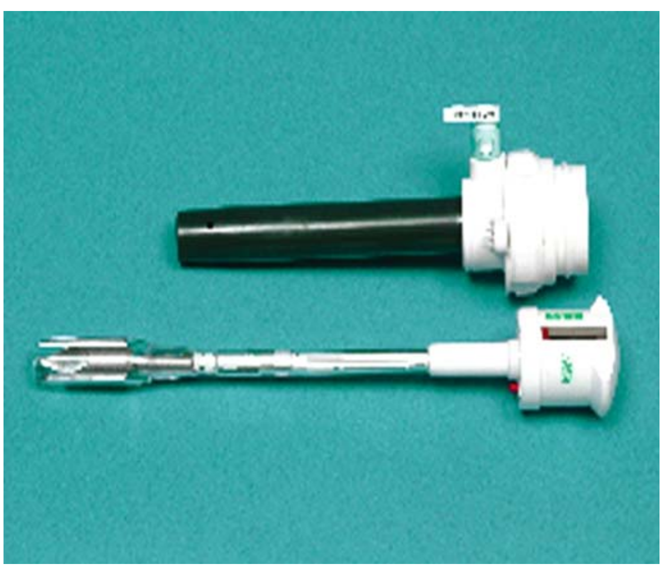

FIG. 4.3. A 5- to 12-mm trocar with canula

FIG. 4.4. Grasping forceps (long tip)

Table 4.1. Characteristics of commonly used coagulation and cutting devices

Name	Manufacturer	Control	Mechanism	Vessel size (mm)	Length (mm)
Harmonic scalpel	Ethicon	Foot	Ultrasonic	3	350/360
Harmonic scalpel	Ethicon	Hand	Ultrasonic	3	450
LigaSure™ V	Valleylab	Hand	Bipolar cautery	7	370
LigaSure atlas™	Valleylab	Hand	Bipolar cautery	7	370
EnSeal™	SurgRX	Hand	Bipolar cautery	7	350
AutoSonix™ Ultrashears	U.S. Surgical	Foot	Ultrasonic	3	300/380
PK System cutting forceps	Gyrus Medical	Hand	Bipolar cautery		330/450

V, model.
Note: All devices will pass through the 5-mm port with the exception of the LigaSure, which requires 10-mm access. The vessel size listed is the maximum the device can safely control.

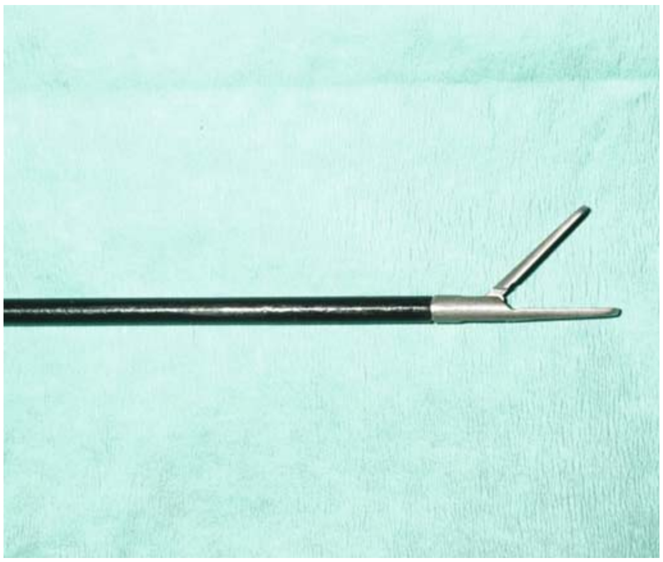

Fig. 4.5. Grasping forceps (short tip)

Fig. 4.6. Maryland-style grasper

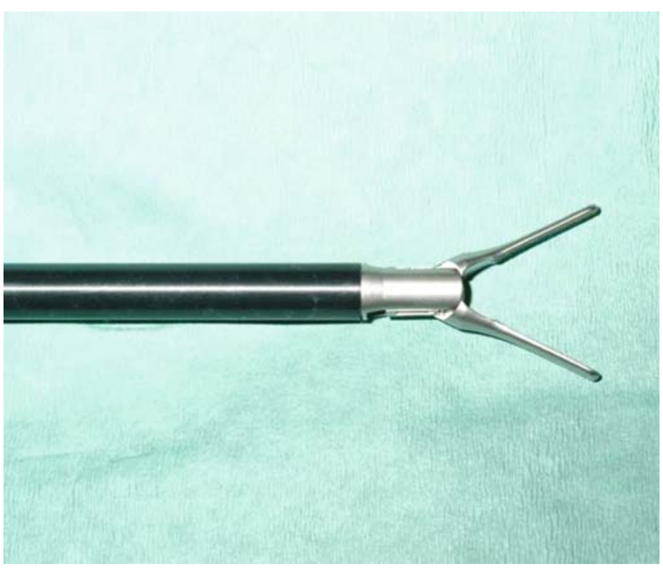

Fig. 4.7. DeBakey grasper

Fig. 4.8. DeBakey grasper

FIG. 4.9. Maryland dissector (10 mm)

FIG. 4.10. Alligator grasper

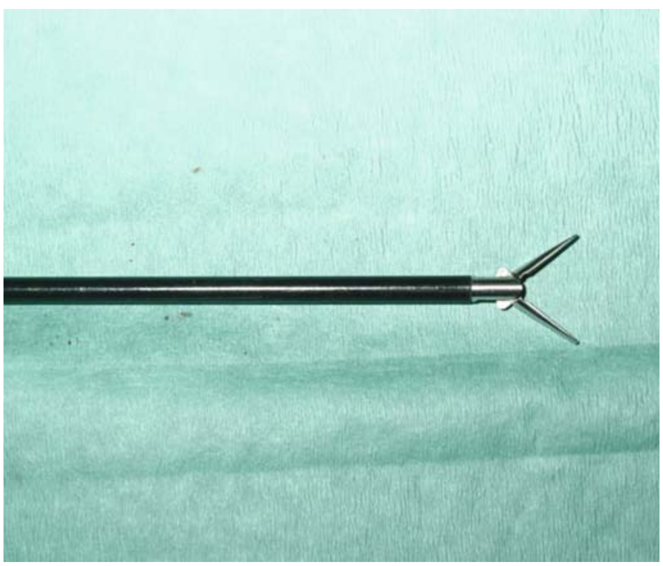

FIG. 4.11. Straight grasper

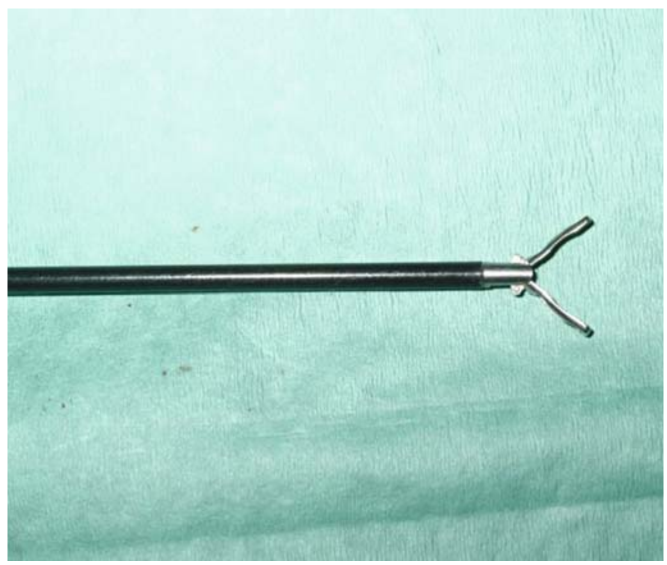

FIG. 4.12. Atraumatic grasper

FIG. 4.13. Metzenbaum scissors

FIG. 4.14. Hook scissors—single action

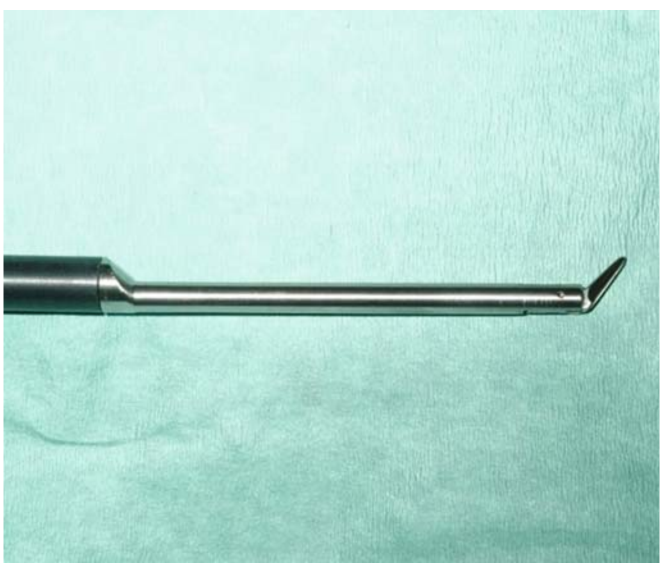

FIG. 4.15. Pott's scissors (10 mm)

FIG. 4.16. Laparoscopic retractor

FIG. 4.17. Laparoscopic retractor (angled)

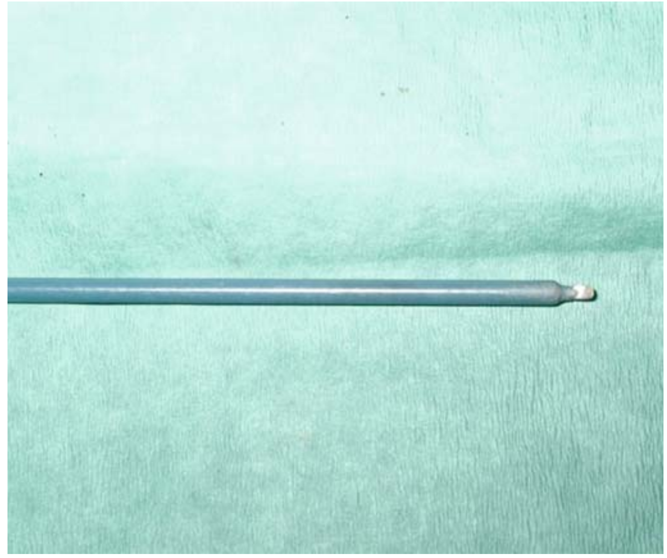

FIG. 4.18. Laparoscopic spatula

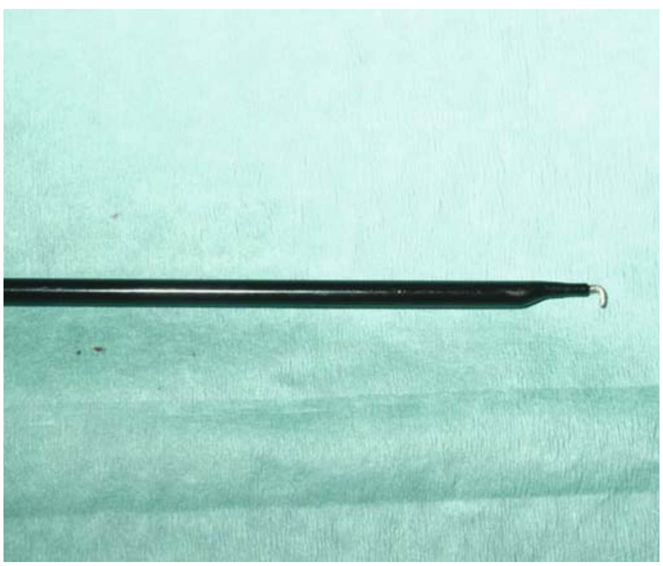

FIG. 4.19. Laparoscopic hook

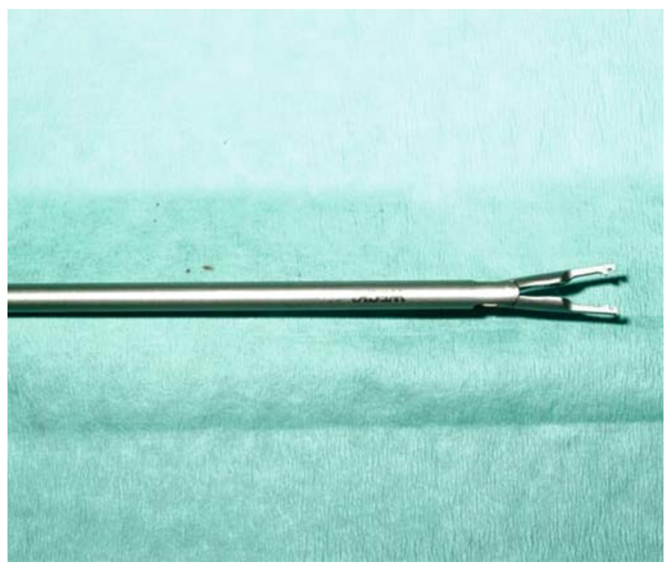

FIG. 4.20. Laparoscopic 5-mm Hem-o-Lok applicator

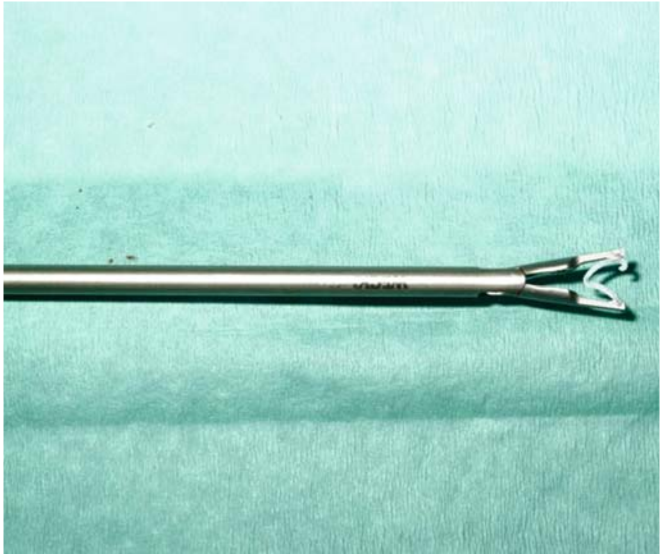

FIG. 4.21. Laparoscopic 5-mm Hem-o-Lok applicator with a clip

FIG. 4.22. Laparoscopic 10-mm Hem-o-Lok applicator

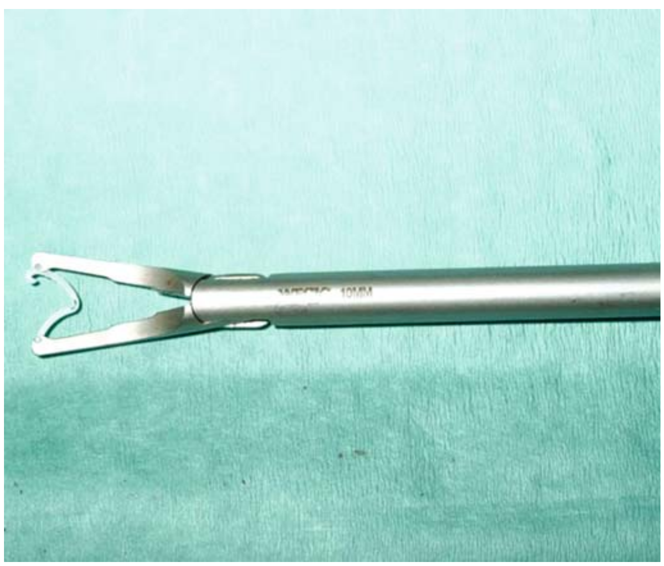

FIG. 4.23. Laparoscopic 10-mm Hem-o-Lok applicator with a clip

A B

Fig. 4.24. Laparoscopic Satinsky clamp

Fig. 4.25. Laparoscopic bulldog clamp applicator

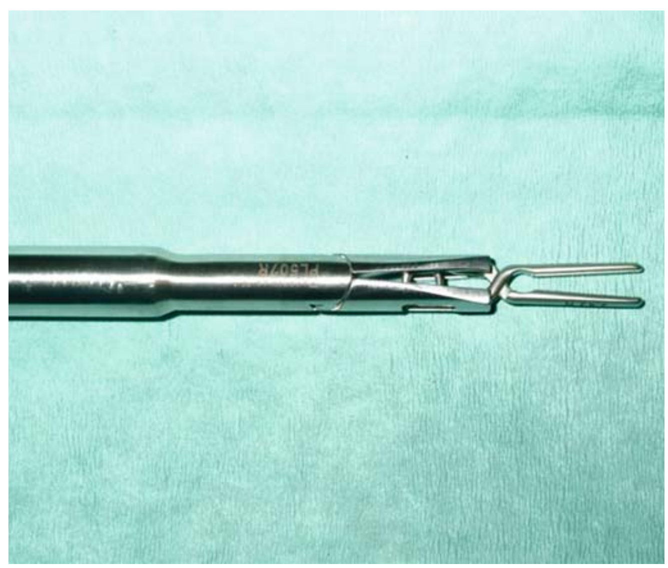

Fig. 4.26. Laparoscopic bulldog applicator with a bulldog clamp

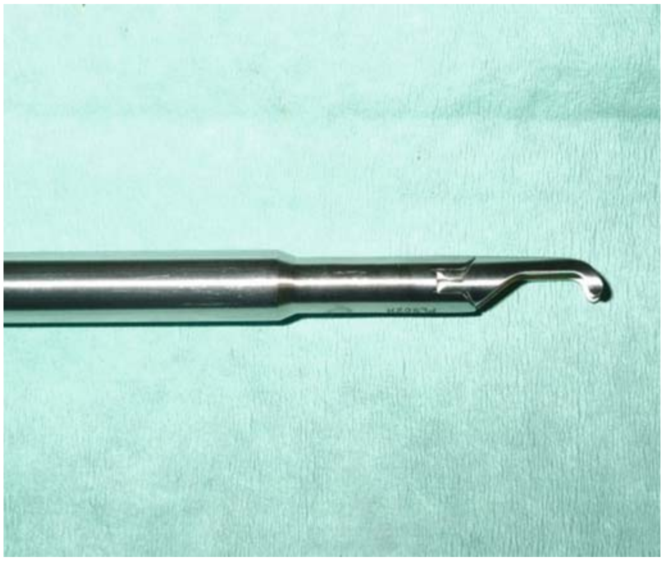

FIG. 4.27. Laparoscopic bulldog clamp remover

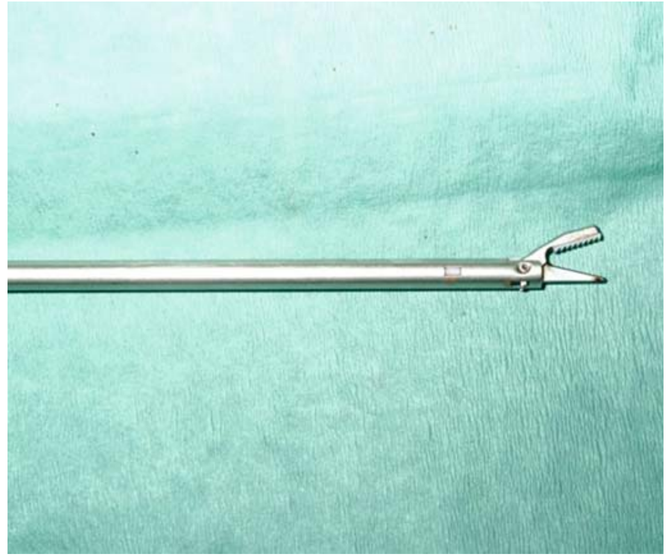

FIG. 4.28. AutoSonix™ Ultra Shears™ (U.S. Surgical)

FIG. 4.29. AutoSonix™ Ultra Shears™ (5 mm)

FIG. 4.30. AutoSonix™ ultrasonic coagulation device: control panel

Fig. 4.31. Harmonic scalpel

Fig. 4.32. FloSeal

Fig. 4.33. LigaSure

Suggested Readings

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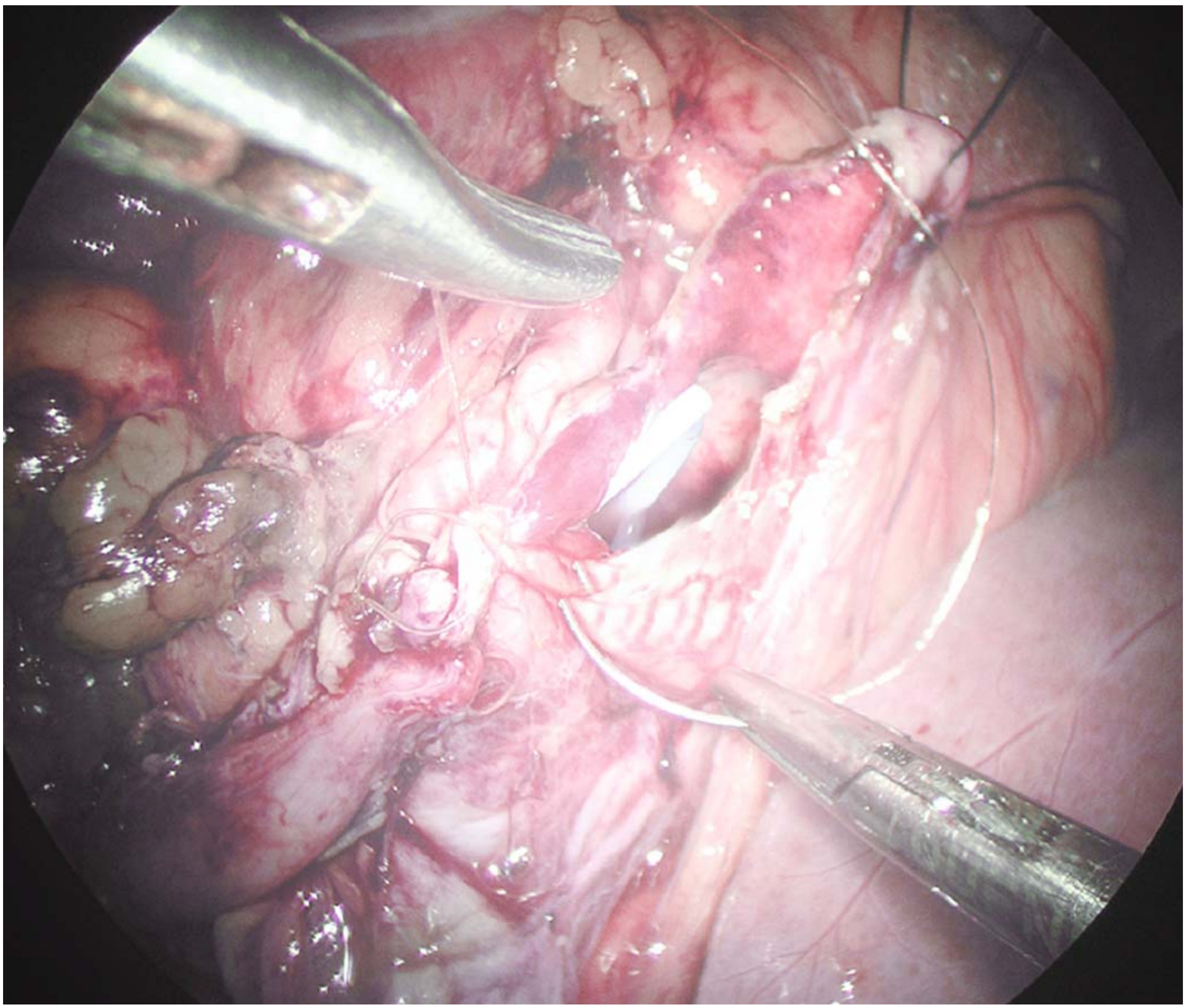
Section II
Reconstructive Procedures for Kidney and Ureteropelvic Junction Obstruction



5
Laparoscopic Pyeloplasty

M. Ramalingam, K. Selvarajan, and K. Senthil

Basic Principles

Schuessler et al [14] were the first one to do laparoscopic pyeloplasty in 1993. Since then, several centers have published their experience. Today laparoscopic pyeloplasty is an established alternative procedure to the standard open technique in ureteropelvic junction (UPJ) obstruction [6–9].

Though morbidity in antegrade or retrograde endopyelotomies is low, the success rates are around 75% only and not suitable if there is a vessel crossing the UPJ [16].

Indications

Indications are similar to those for open pyeloplasty [1]:

1. Intrinsic UPJ obstruction (congenital, acquired)
2. Extrinsic: vessel crossing

Contraindications

A secondary calculus is not a contraindication to laparoscopic pyeloplasty. The contraindications are as follows:

1. Intrarenal pelvis
2. Failed pyeloplasty may be a relative contraindication if there is dense periureteric scarring. Nevertheless, in skilled hands an attempt can be made in this situation.

Patient Preparation

1. Enema to clear bowel
2. Antibiotics

Technique

Retrograde pyelogram (RGP) is done just before surgery to study the ureteropelvic junction location and to rule out distal ureteric pathology. Laparoscopic pyeloplasty can be performed retroperitoneally or transperitoneally. It can be dismembered [13] or nondismembered. The retroperitoneal approach is preferable, as it is similar to the open approach. However, the suturing is more difficult due to over crowding of instruments.

Complications

General complications are bleeding, bowel injury, and transient ileus. Early specific complications are prolonged urinary leak resulting in ileus, persisting drainage, or urinoma [13, 14]. This may settle spontaneously or with ultrasound-guided percutaneous nephrostomy, which is retained for about 2 weeks.

Delayed complications are UPJ stenosis, which will need intervention.

Transperitoneal Approach

Entry

With the patient in the 70-degree lateral position and the kidney bridge elevated, pneumoperitoneum can be created using a Veress needle placed in the supraumbilical or subcostal area. The primary 10-mm port has to be placed in the midclavicular line about 5 cm above and lateral to the umbilicus for a good view. Secondary ports are placed four fingerbreadths apart in a triangulated manner.

Incision with a hook dissector in the paracolic gutter (i.e., the white line) is carried up and down, and the colon is reflected medially until the ureteropelvic junction and part of the pelvis is well seen. A 30-degree telescope may be preferable for a better view from different angles. Retraction of the colon can be done through another port (5 to 10 mm convertible) at the epigastric level.

Once the pelvis and UPJ are adequately mobilized, a stay suture is placed through the pelvis using a straight needle, which is brought out through the flank. This stabilizes the pelvis and avoids frequent unwanted movements of the instrument.

Dismembered Pyeloplasty

This approach is preferable in a large pelvis with a very narrow UPJ or crossing vessel. Excision of the pelvis starts from lateral to superomedial. Subsequently the narrowed UPJ is excised and the ureter is spatulated on the lateral aspect for about 1 cm using a curved scissors that is brought in through subcostal port. Suturing starts at the distal spatulated area of ureter, then carried onto the posterior wall using 4-0 or 5-0 absorbable suture (preferably interrupted). A ureteric stent can be passed down at this stage (through the subcostal port or using a short ureteroscope through the subcostal port to prevent gas leak). Subsequently the anterior layer is sutured, and the pyelotomy can be closed with 4-0 continuous locking sutures.

Nondismembered Pyeloplasty

If the pelvis is not large and the UPJ is short without a crossing vessel, Fengerplasty or Y–V plasty can be done because it is technically easier and can give equally good results. The suturing technique described earlier in retroperitoneal pyeloplasty can be followed.

Transmesocolic Pyeloplasty [11,12]

In a UPJ obstruction in children and in thin adults on the left side, the dilated pelvis bulges through the mesocolon on the left side. Once the mesocolon is incised, the pelvis can be dissected off and pulled inside the peritoneal cavity. Thus the UPJ can be approached without the need for colonic mobilization. The advantages are as follows:

1. Very good illumination, as there is not much of raw area with blood clots, which can absorb light.
2. The UPJ can be quickly accessed.

An occasional problem in this approach is injury to the left colic vessel. A stay suture on the pelvis will stabilize it and prevent retraction. The rest of the procedure, excision of the UPJ, and the suturing techniques are the same as described for the transperitoneal approach. The mean operative time is reduced by about 30 minutes.

Retroperitoneoscopic Approach

With the patient in the 90-degree lateral position and the kidney bridge elevated, the primary (camera) port is made by an open technique in the renal angle (i.e., lateral to erector spinae just below the tip of the twelfth rib). The incision is 1.5 cm long. A hemostat is introduced to split the muscles and the lumbodorsal fascia. The index finger is introduced through the wound to push away the peritoneum anteriorly, thus enlarging the potential space.

A custom-made balloon is then placed in the potential retroperitoneal space and inflated to the required volume (150 to 600 mL according to the build and age of the patient). Alternatively, commercially available balloon trocars can be used. This camera port has to be fixed in an airtight manner with a mattress suture to prevent gas leak. Subsequent instrument ports are introduced under vision in the axis of anterior axillary line, one at the subcostal area and another above the iliac crest. An additional 5-mm port can be used for the retractor if needed from the subcostal area. The first landmark to be identified is the psoas muscle. Dissection in the same plane will easily lead to the ureter. If the Gerota's fascia gets in the way of the UPJ, it has to be cut, clearing the way for free movement of the hand instruments.

A preplaced stent or guidewire in the ureter makes identification of the ureter easier (as the gonadal vessel may look like the ureter). The UPJ and the part of the pelvis that need to be excised are mobilized.

Nondismembered Pyeloplasty

If the pelvis is not very large and the UPJ is short, a nondismembered Y-V plasty or Fengerplasty [3] (Heineke Mikulicz) technique can be performed. One can use a sharp scissors or endoknife for the pyelotomy and spatulation of ureter. Suturing of the anterior wall starts distally with a 4-0 or 5-0 Vicryl or PDS suture in an interrupted or continuous fashion. Once the anterior wall is completed, the stent can be placed across the suture line; if there is no preplaced stent, antegrade stenting can be done through an additional 3-mm port. Subsequently the posterior layer is sutured in a similar manner.

Dismembered Pyeloplasty

Dismembered pyeloplasty is preferable if the pelvis is (1) very large and reduction of pelvis may be beneficial, the UPJ is very narrow and long and spatulation may be difficult, and (5) when there is a crossing vessel [16]. After the surgeon excises the UPJ and the required segment of the pelvis, the ureter is spatulated laterally with scissors for about 1 cm. Interrupted or continuous absorbable 5-0 suture starts at the level of the spatulated apex on the anterior layer and continues cephalad. The stent is passed down and the posterior layer is sutured. The pyelotomy can be closed with 4-0 or 3-0 Vicryl continuous locking suture. A peripelvic tube drain is advanced through one of the 5-mm ports. After irrigating and sucking all the collected fluids, ports are closed with 2-0 Vicryl.

Special Situations

Special situations include a UPJ obstruction with secondary calculi, redo pyeloplasty (failed open pyeloplasty), a vessel crossing the UPJ, a UPJ with infected hydronephrosis, difficulties in stenting, a horseshoe kidney with UPJ obstruction, and a Culp flap pyeloplasty.

Table 5.1. Comparison of laparoscopic pyeloplasty [3]

References	No. of pts	Approach	Type/correction (No.)	Mean hours of operative time	Mean days hospitalized (follow-up)	Mean months (range)	% success	No. of conversions (%)	No. of complications (%)
Jarrett et al	100	TP	DM (71) Y-V plasty (20, other 9)	4.4 (2–8)	3.3 (2–8)	26.4 (1–72)	96	0 (0)	13 (13)
Janetschek et al	65	RP, RP	Fengerplasty	2.1	–	25 (4–60)	98	0 (0)	7 (12)
Chen et al	57	–	DM (44), Y-V plasty (13)	4.3 (2.3–8.0)	3.3 (2–6)	17.2 (1–37)	96	0 (0)	7 (12.7)
Soulfe et al	55	TP	DM (48), Fengerplasty (7)	3.1 (1.7–4.3)	4.5 (1–14)	14.4 (6–43.6)	87	3 (5.5)	2 (4)
Eden et al	50	RP	DM (50)	2.7 (2–4)	2.6 (2–7)	18.8 (3–72)	98	2 (4)	1 (2)
Turk et al	49	RP	DM (49)	2.7 (1.5–4)	3.7 (3–6)	23.2 (1–53)	98	0 (0)	–
Ramalingam et al	73	TP (64)	Pure TP (38) DM (30) NDM (8) Culp Plasty (1) Y V Plasty (1) Fengerplasty (6)	3.1 (2.3.5)	6-7 (5-7)	42 (3-96)	94	3 (46)	4 (6)
			TM (26) DM (22) NDM (4) Fengerplasty	2.6 (1.8.-3)	4-5 (3-5)	32 (3-96)	96	0	1 (3.8)
		RP (9)	DM (4) NDM (5) Fengerplasty (4) Y V Plasty (1)	2.6 (2.5.-3)	4 (3-5)	40 (3-94)	89	0	1 (11.1)

DM, dismembered; NDM, nondismembered; RP, retroperitoneal; TM, transmesocolic; TP, transperitoneal.

Transperitoneal Dismembered Pyeloplasty

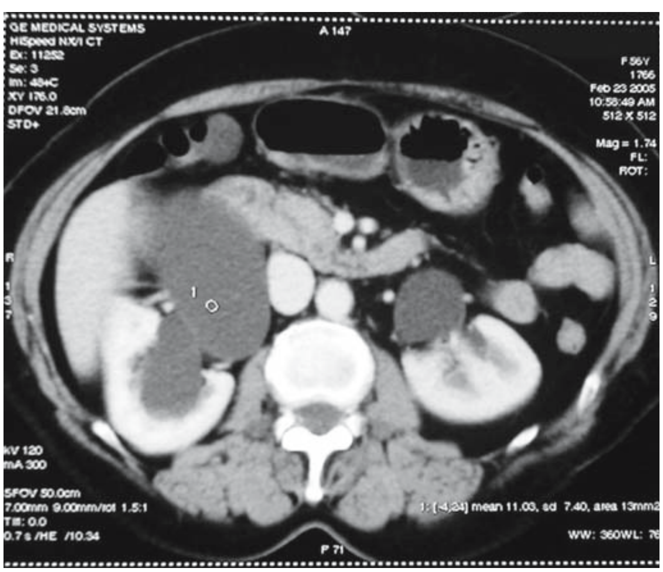


Fig. 5.1. Computed tomography (CT) scan shows gross right hydronephrosis

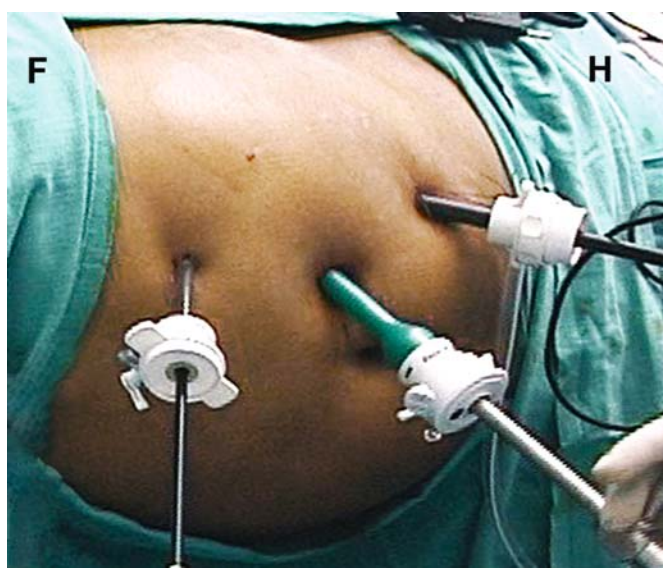


Fig. 5.2. Patient placed in the 70-degree flank-up position, with the port positions shown (H, head end; F, foot end)

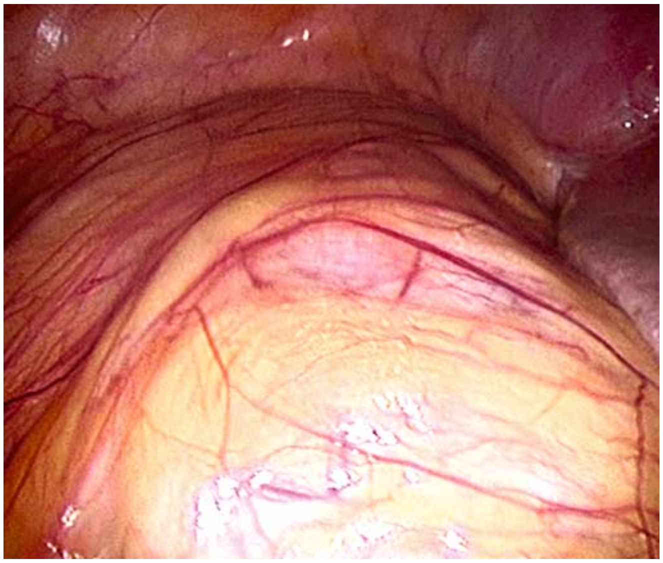


FIG. 5.3. Initial laparoscopic view of renal bulge

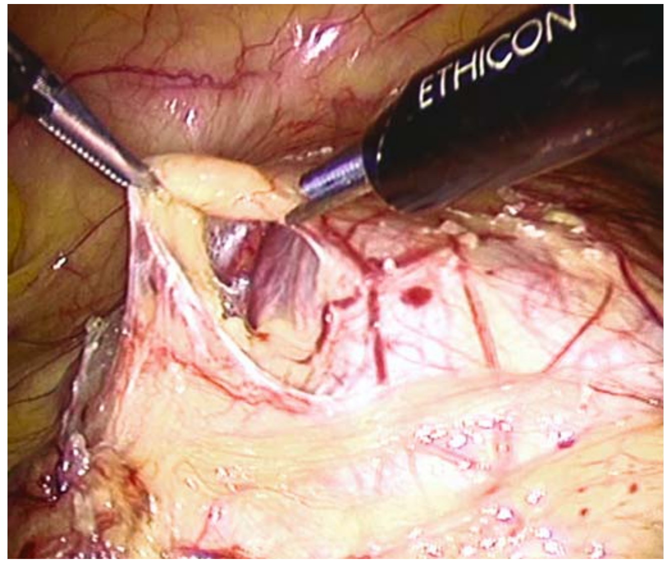


FIG. 5.4. Right colonic mobilization

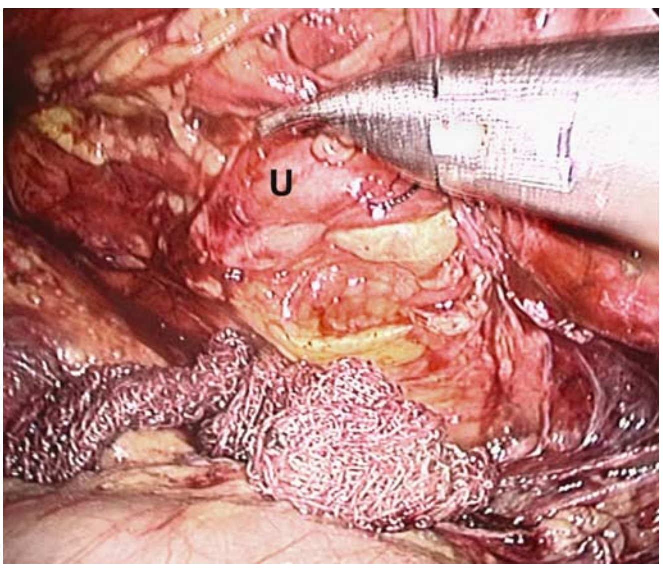


FIG. 5.5. Ureteric mobilization (U, ureter)

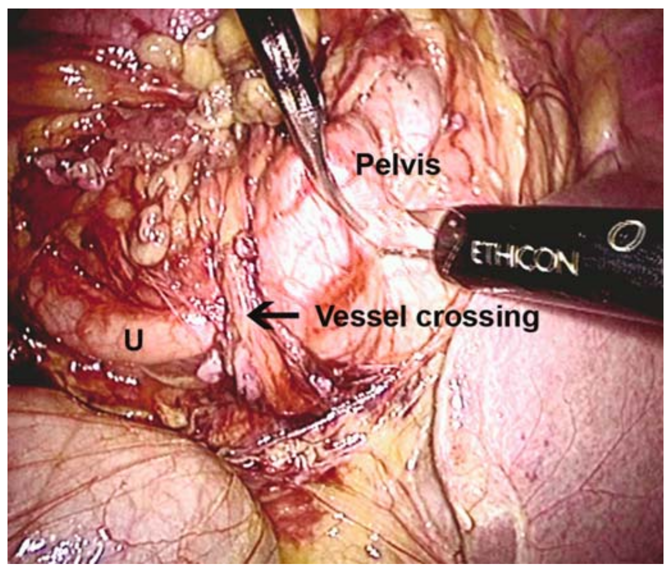


FIG. 5.6. Pelvis and ureter are dissected and the ureteropelvic junction (UPJ) is probably obstructed by the crossing vessel (U, ureter)

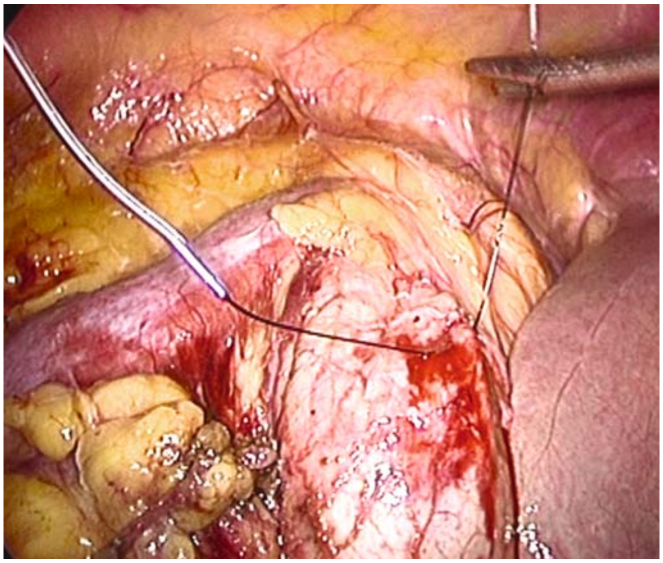


FIG. 5.7. A stay suture in the pelvis

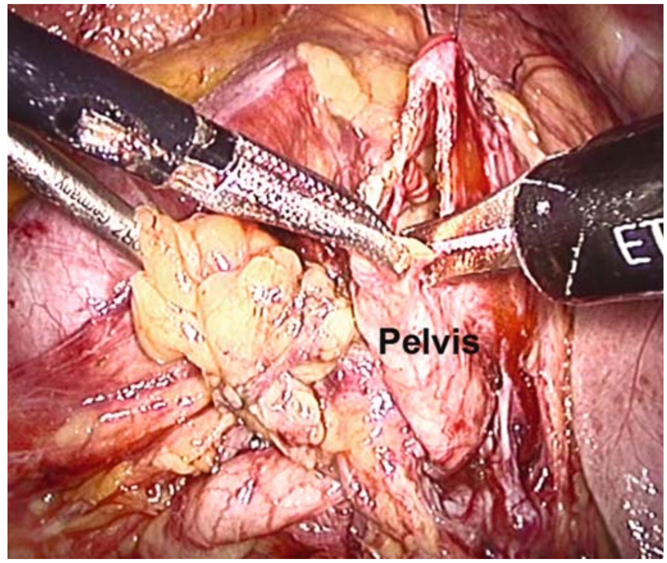


FIG. 5.8. Pyelotomy in progress

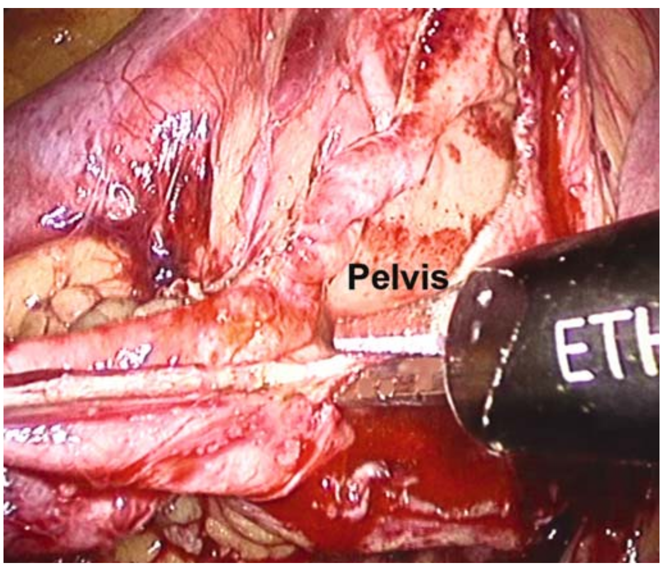


FIG. 5.9. Redundant pelvis being excised

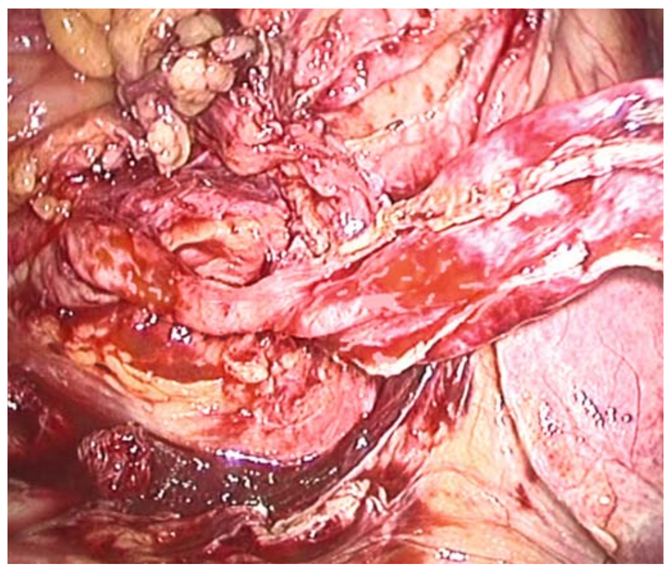


FIG. 5.10. Pyelum flap along with the UPJ brought underneath the crossing vessel

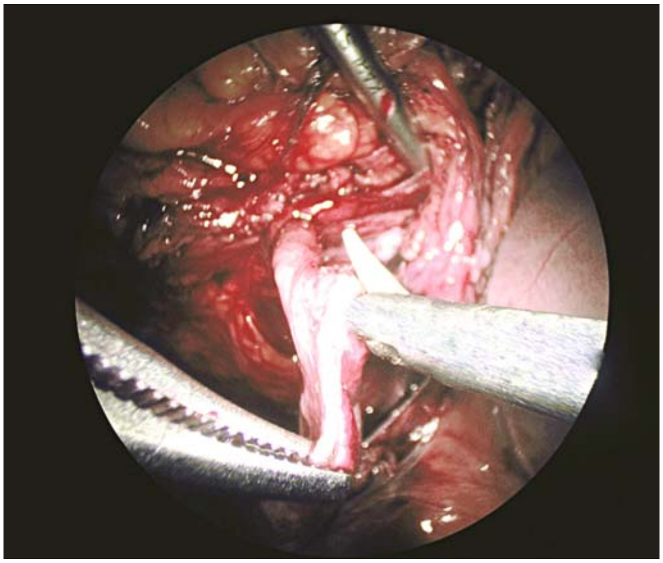


FIG. 5.11. Spatulation of ureter on the lateral aspect (pyelum flap is useful to stabilize the UPJ and ureter)

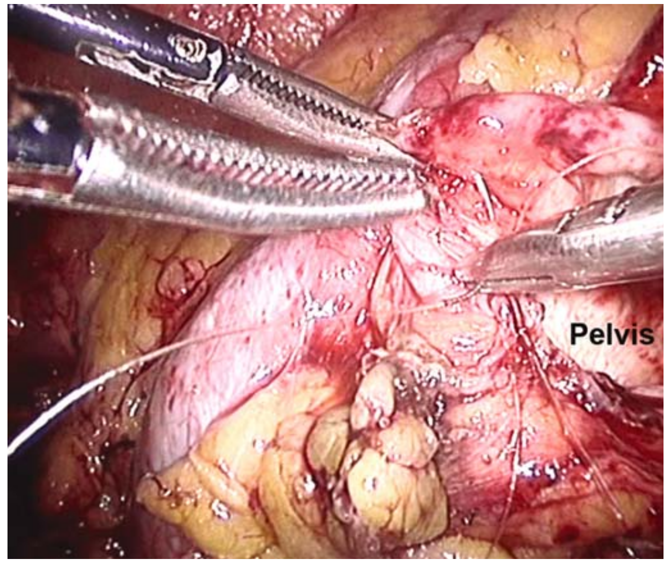


FIG. 5.12. Initial suture with 4-0 Vicryl taken outside-in through the pelvis

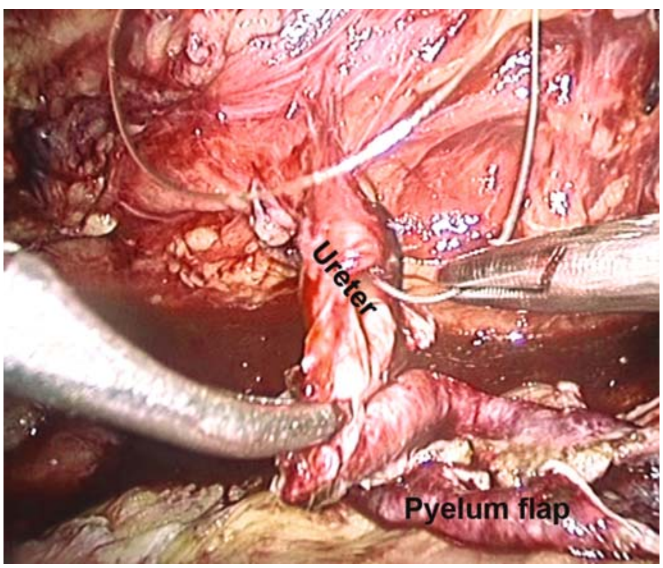


FIG. 5.13. Corresponding suture taken inside-out of the spatulated ureter

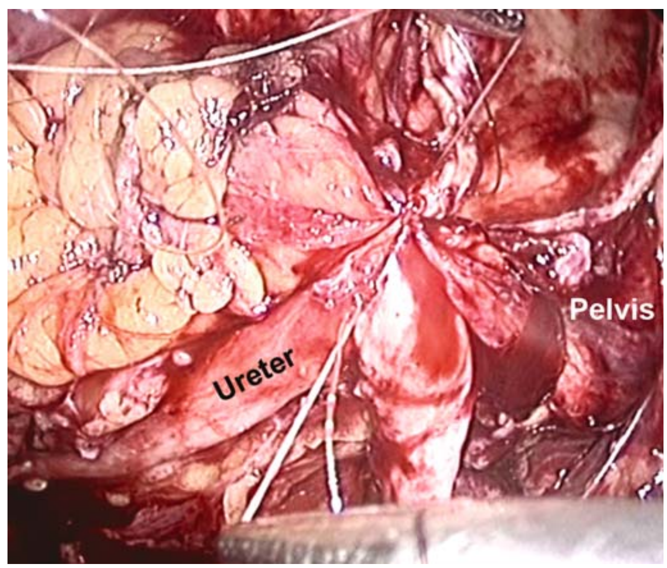


FIG. 5.14. View after initial suture

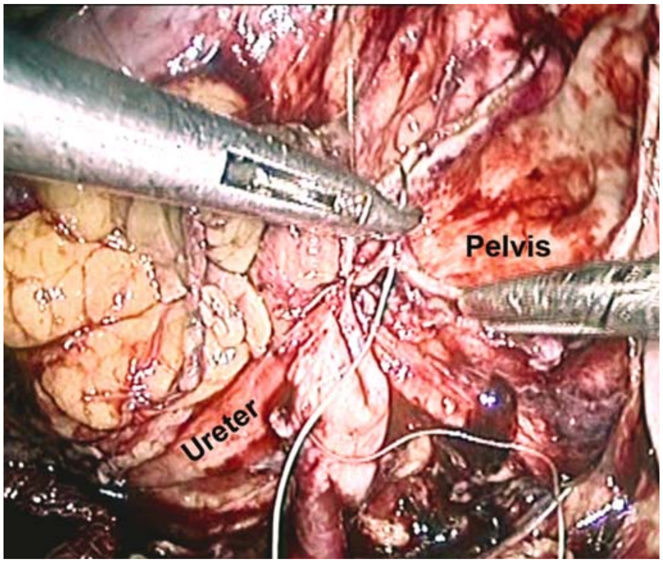


FIG. 5.15. Continuous suture on the posterior lip of pelvis and ureter

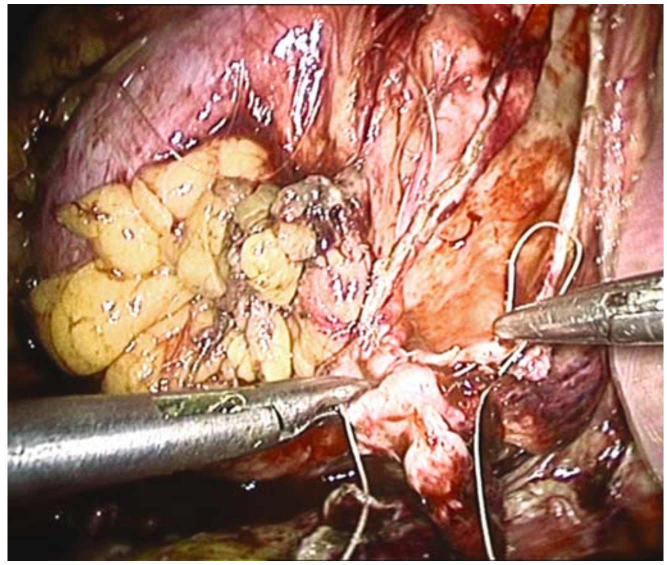


FIG. 5.16. Continuous suture on the posterior lip of pelvis and ureter in progress

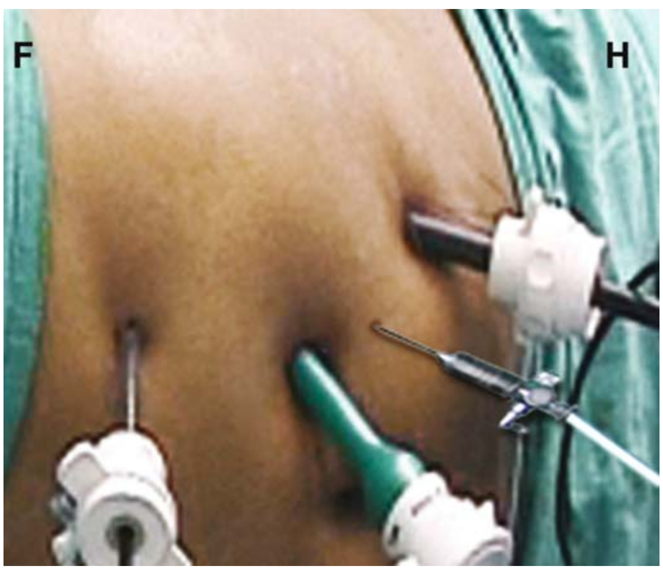


FIG. 5.17. External view of antegrade stent advancement through a Veress needle

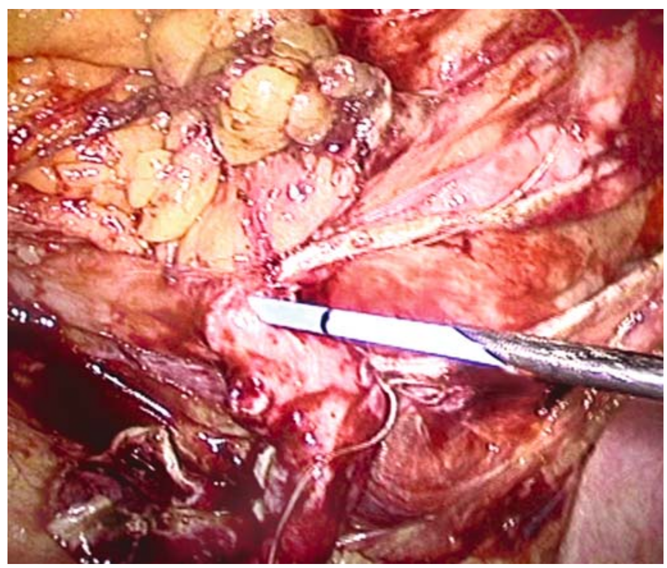


FIG. 5.18. Endoview of stent advancement

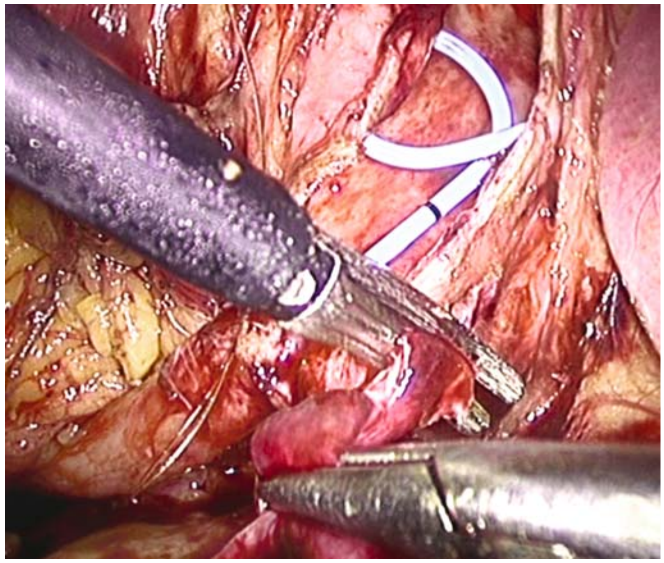
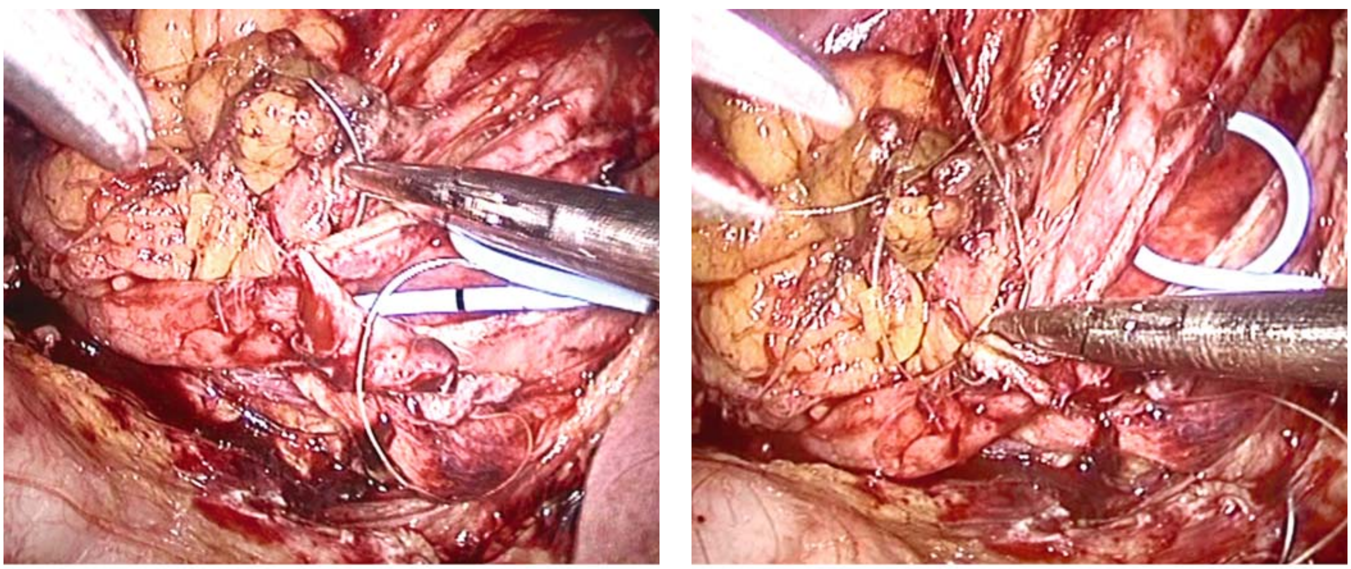


Fig. 5.19. Excision of the UPJ along with the pyelum flap



A B

Fig. 5.20. Suturing of anterior layer

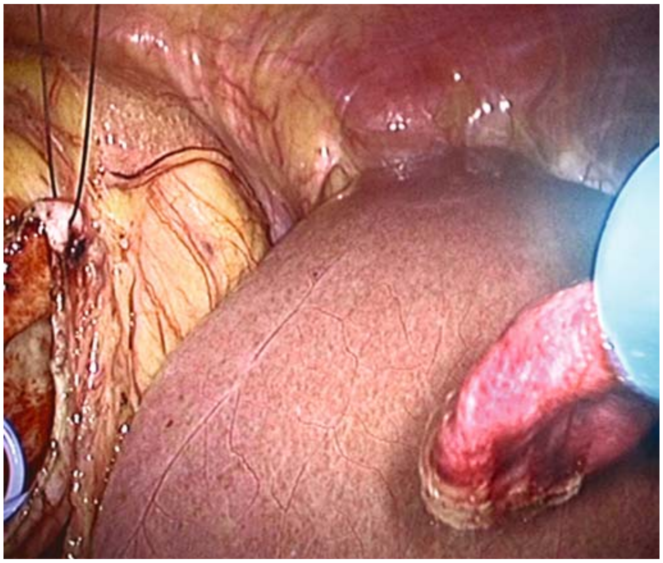


FIG. 5.21. Specimen retrieval

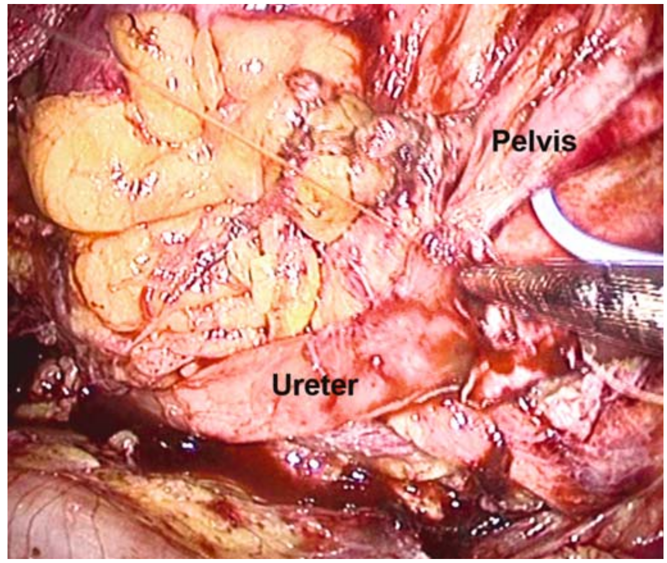
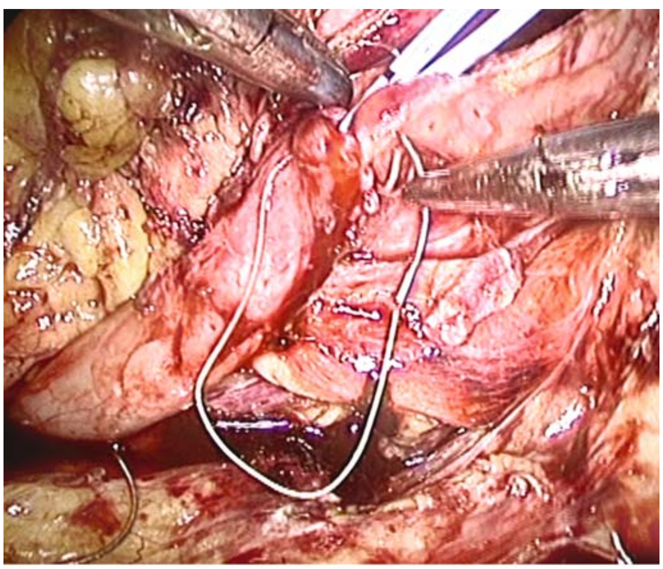
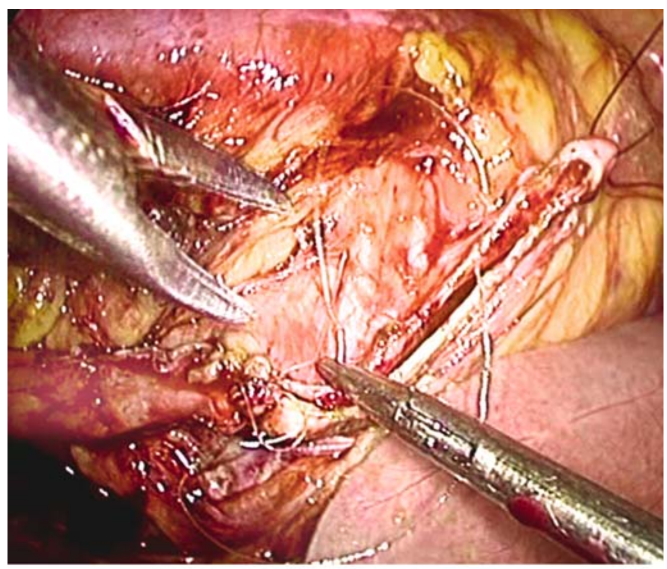


FIG. 5.22. View after completion of anterior-layer suture



A



B

FIG. 5.23. Closure of the pyelotomy

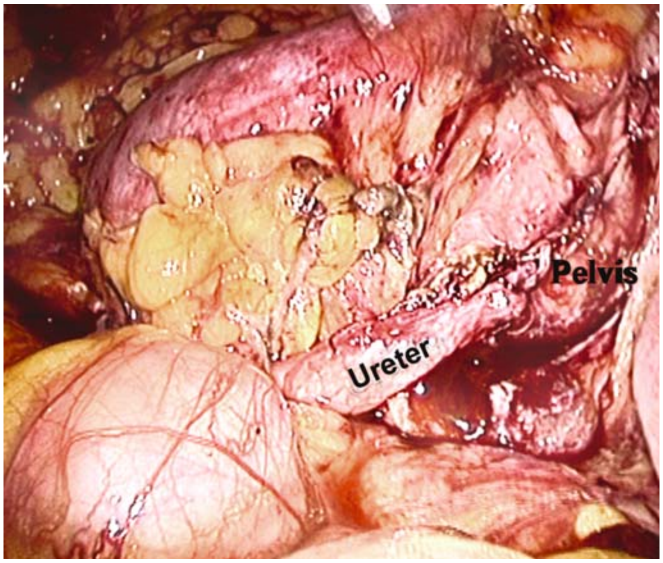


FIG. 5.24. View after dismembered pyeloplasty

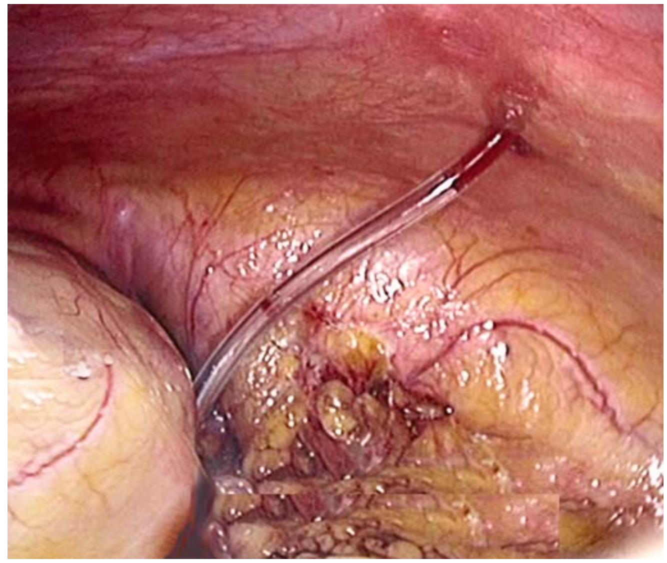


FIG. 5.25. Tube drain inserted through the flank port

Transperitoneal Nondismembered Pyeloplasty

FIG. 5.26. Intravenous urogram (IVU) shows right UPJ narrowing

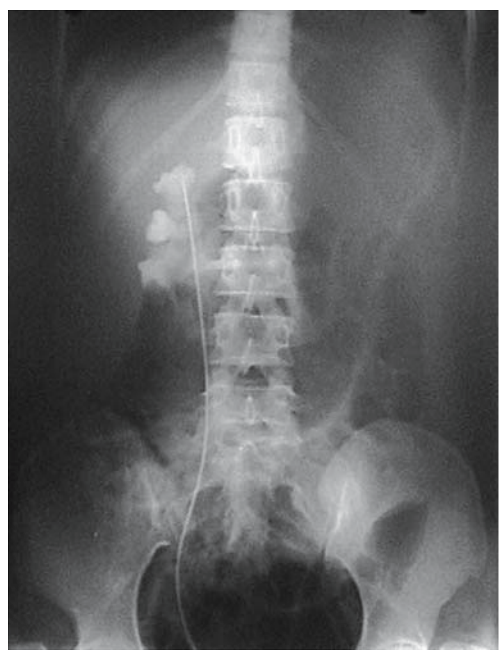


FIG. 5.27. Preplacement of a ureteric catheter after retrograde pyelogram

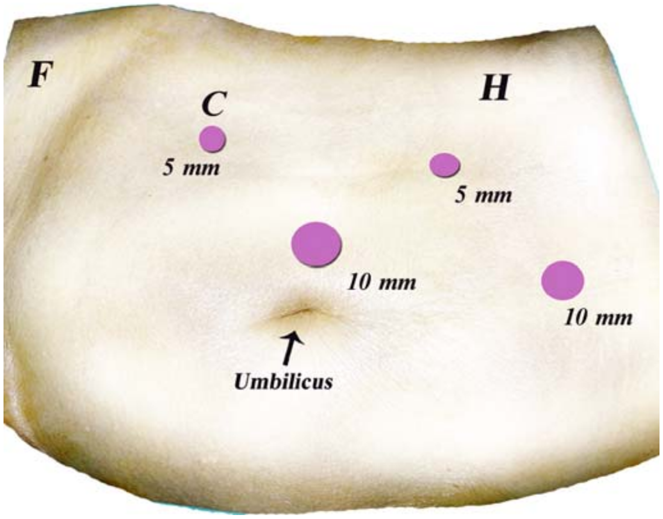


FIG. 5.28. Port position, external view (c, camera port)

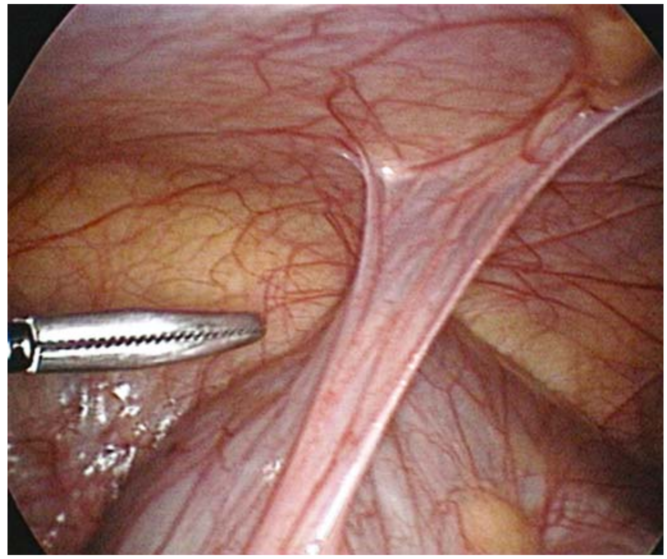


FIG. 5.29. Initial laparoscopic view shows renal bulge

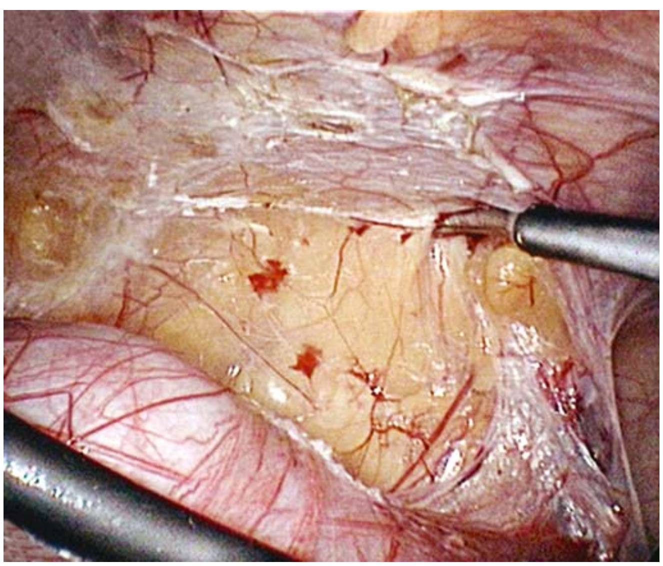


FIG. 5.30. Colonic mobilization

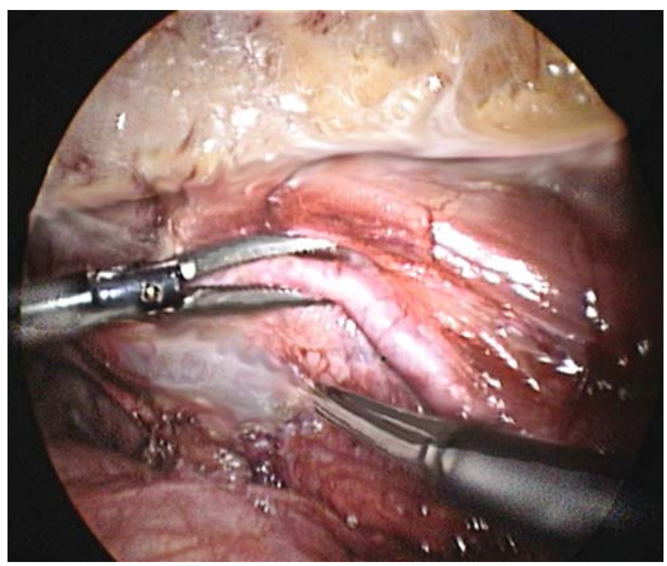


FIG. 5.31. Right upper ureter coming into view on colonic mobilization

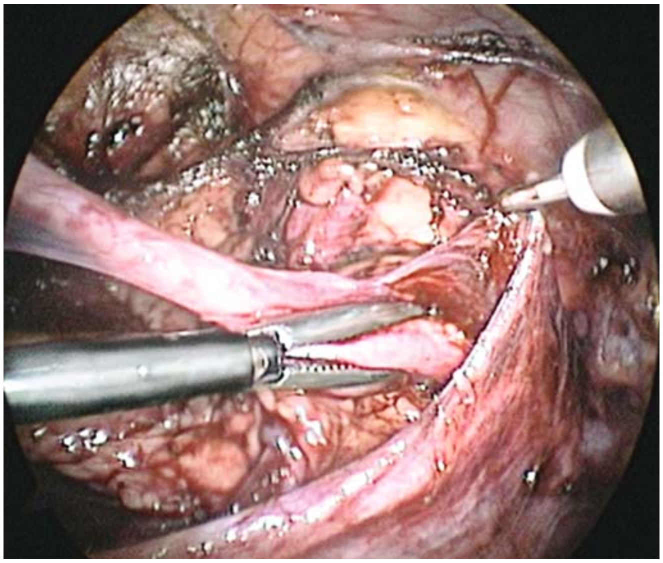


FIG. 5.32. Dissection continues cephalad until the UPJ and pelvis are adequately exposed

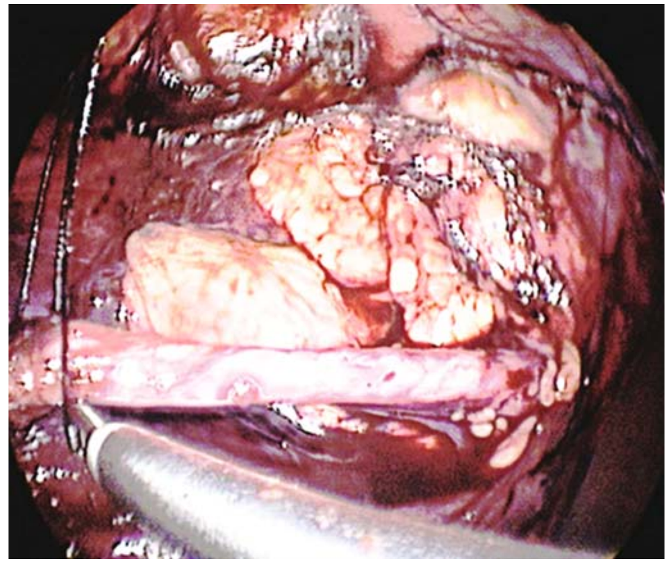


FIG. 5.33. Sling over the upper ureter with monofilament suture (preferable to a stay in the ureter)

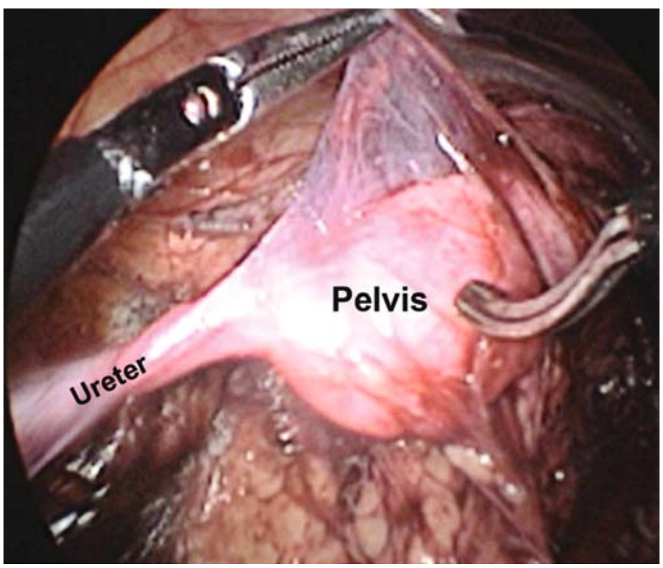


FIG. 5.34. Adequately mobilized UPJ; if the pelvis is not very much dilated, a Fengerplasty may be adequate

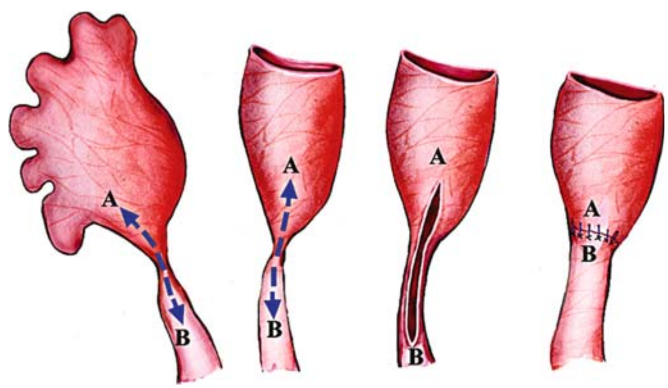


FIG. 5.35. Diagrammatic representation of a Fengerplasty procedure

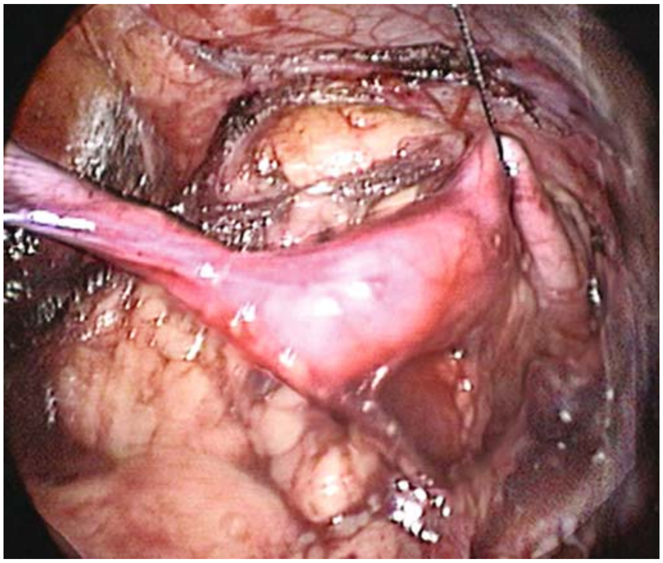


Fig. 5.36. A stay in the pelvis stabilizes it

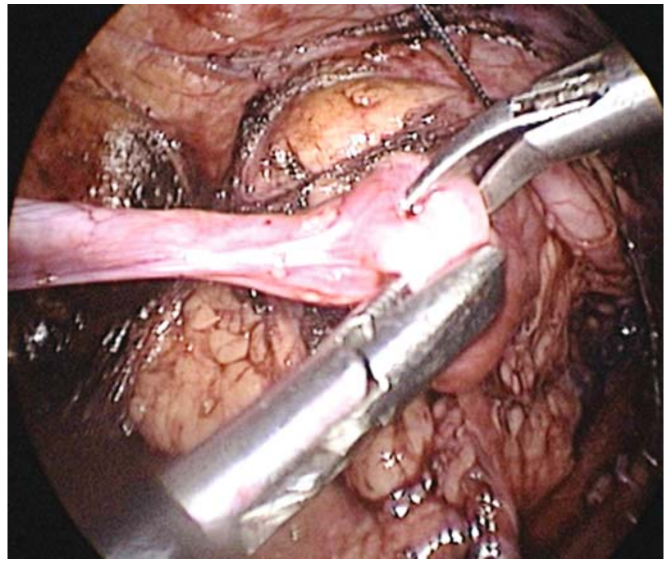


Fig. 5.37. Lateral pyelotomy is made

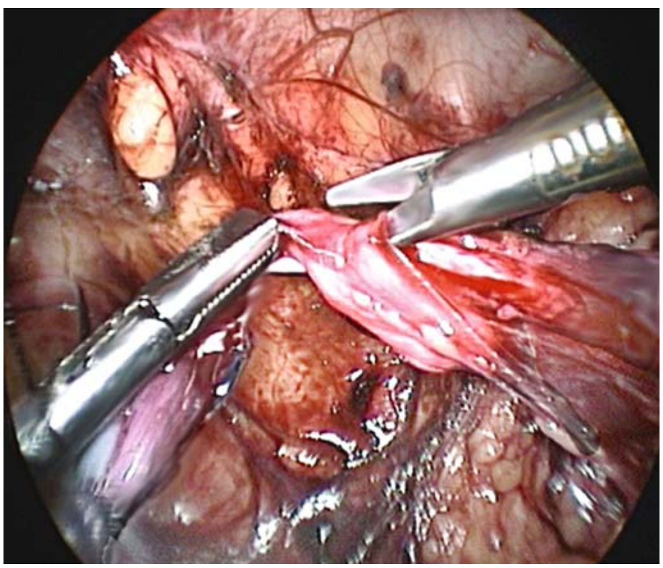


Fig. 5.38. Incision is continued across the UPJ until normal-caliber ureter is seen for about a centimeter

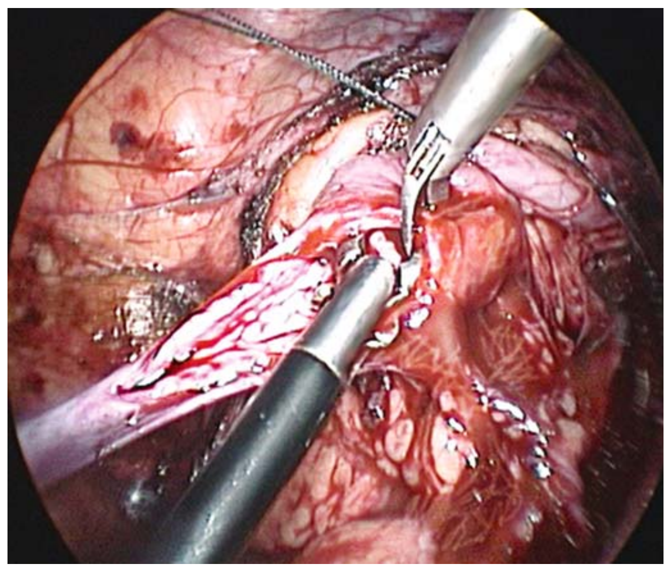


Fig. 5.39. Pyelotomy can be extended for an equal distance from the UPJ

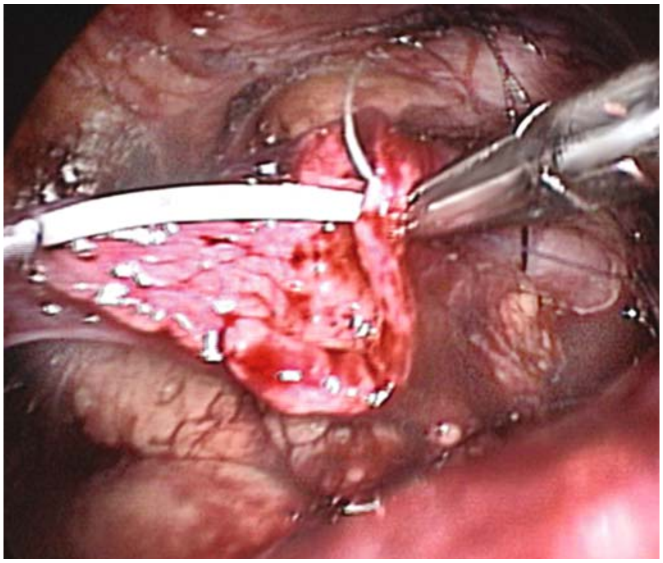


FIG. 5.40. Fengerplasty: initial suture (outside-in) through the pelvis

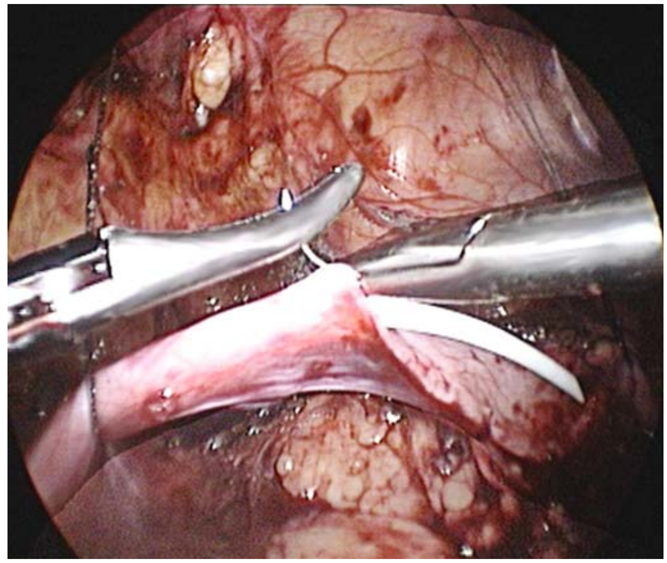


FIG. 5.41. Corresponding suture (inside-out) through the spatulated end of the ureter

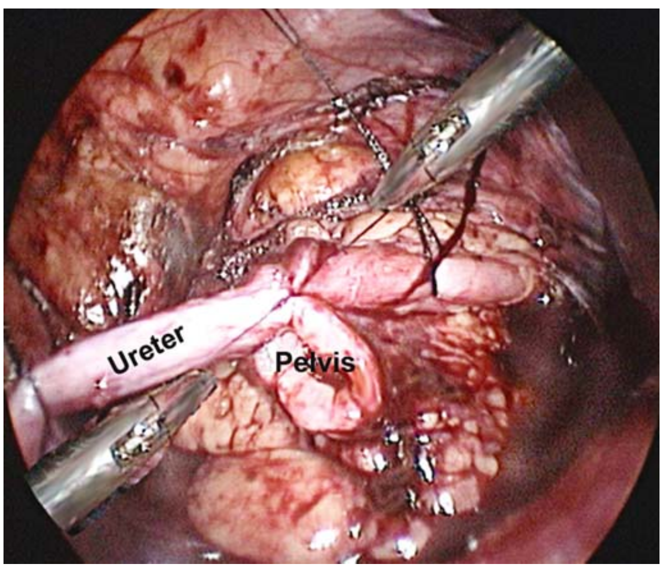


FIG. 5.42. Initial suture completed

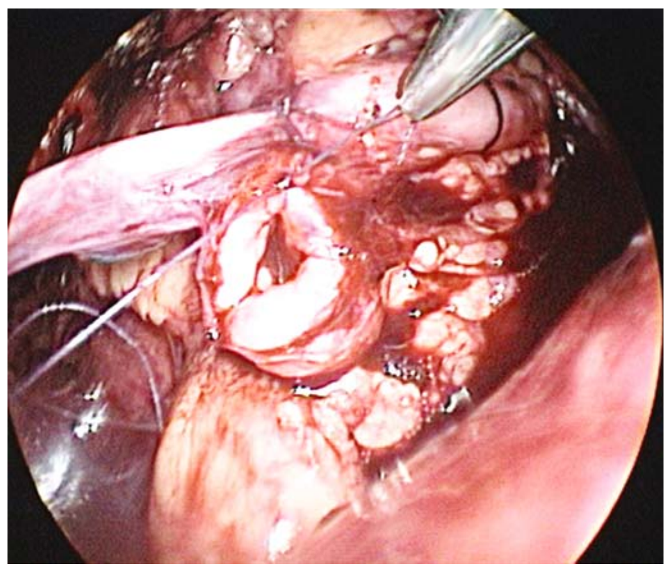
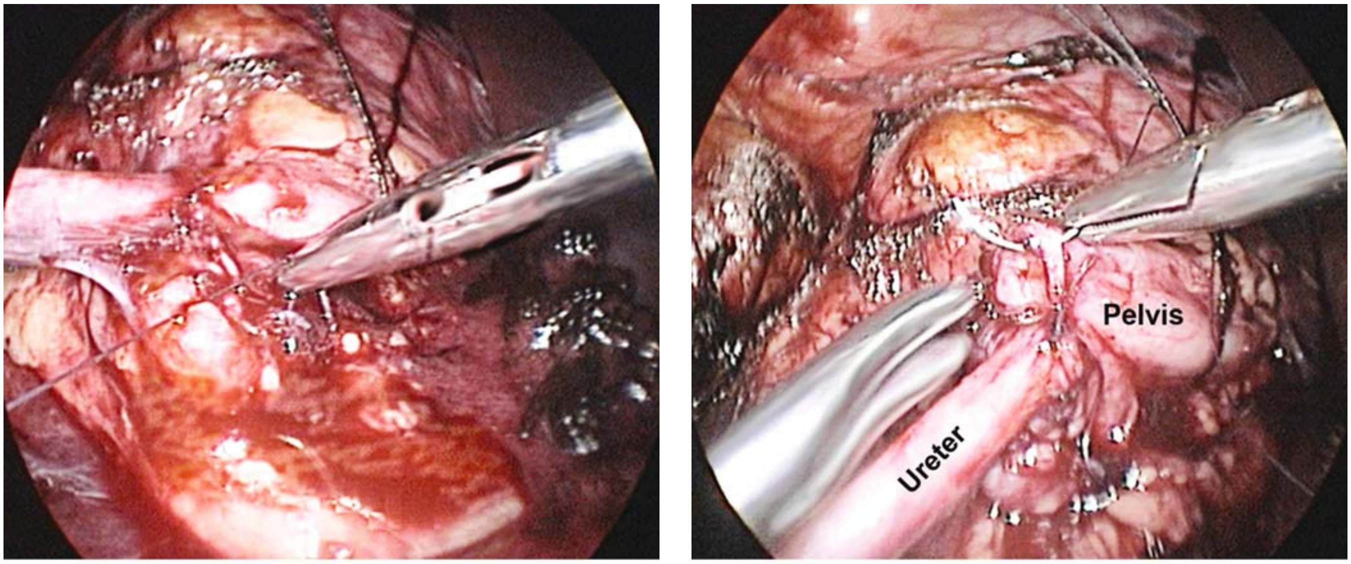
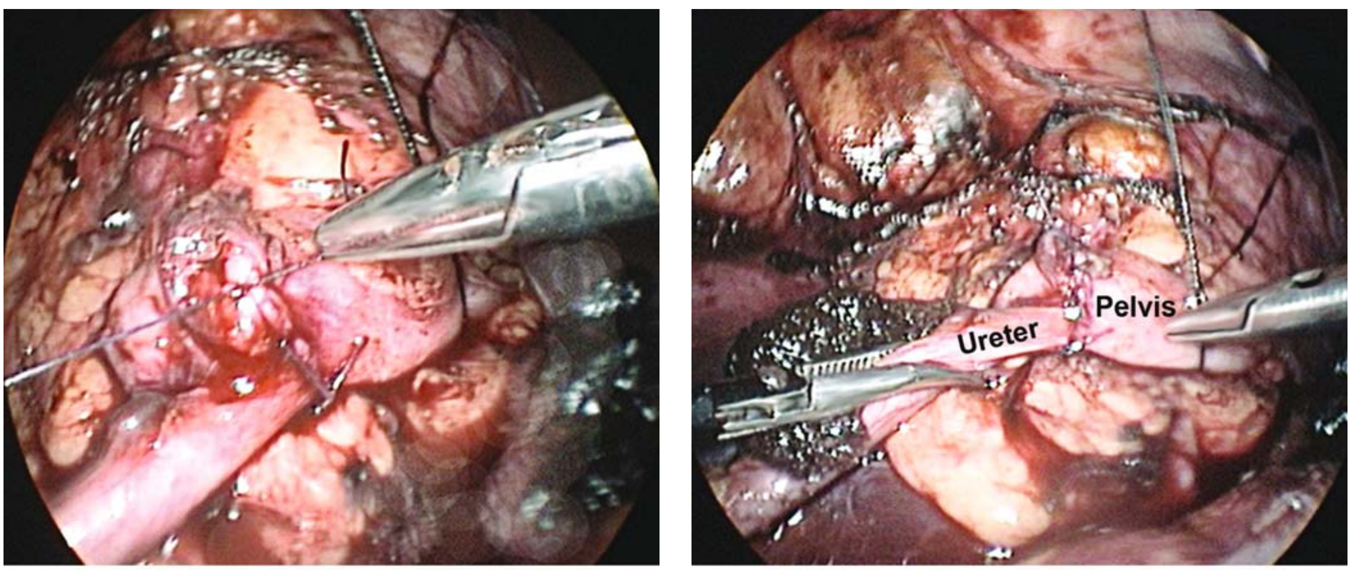


FIG. 5.43. Fengerplasty in progress using 5-0 interrupted Vicryl sutures placed on either side of the initial suture at an equal distance



A B

Fig. 5.44. Fengerplasty in progress



A B

Fig. 5.45. Final view of Fengerplasty

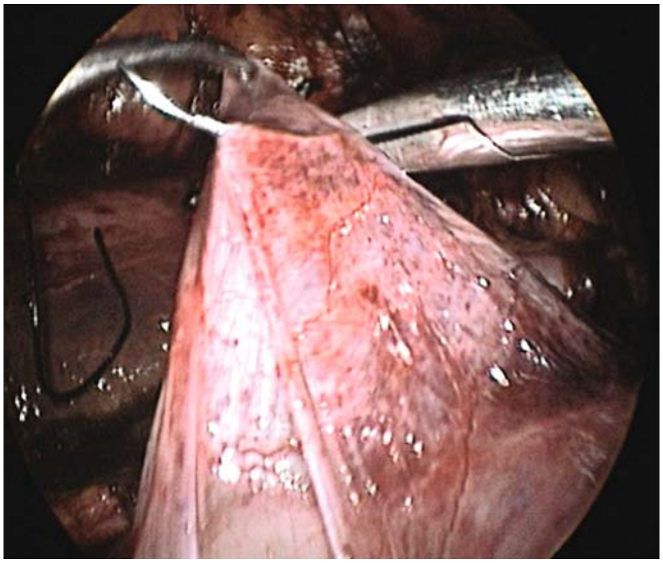


Fig. 5.46. Retroperitonealization

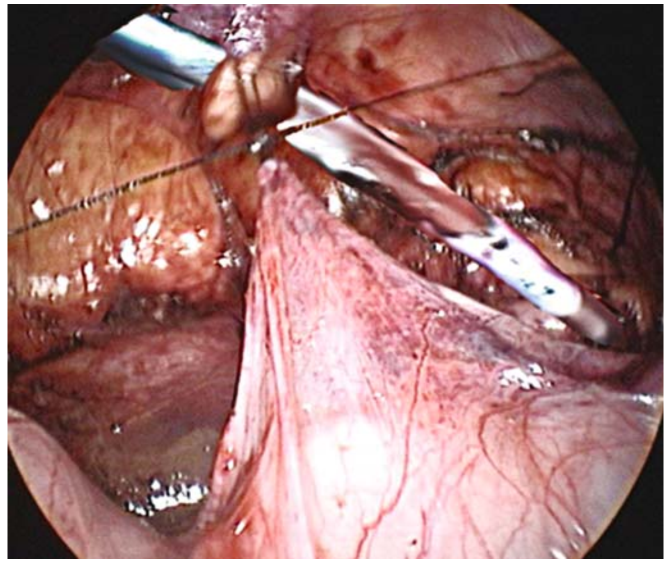


Fig. 5.47. Tube drain coming through the flank port

Nondismembered (Y-V) Pyeloplasty

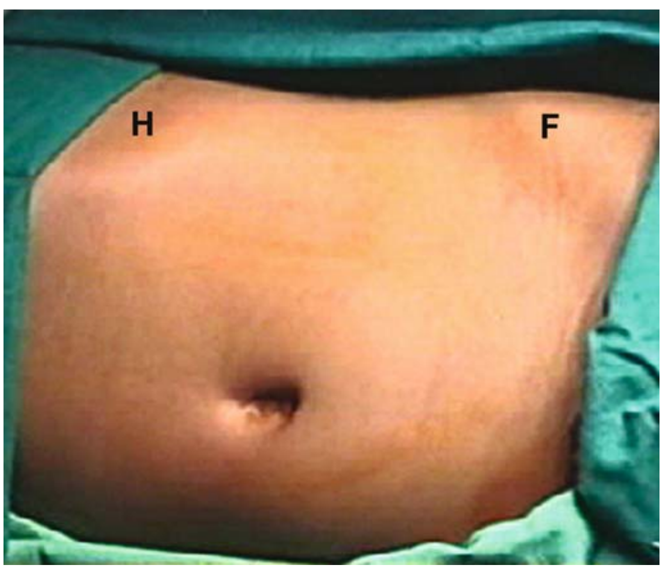


Fig. 5.48. Flank position for transperitoneal approach in a child; the kidney bridge need not be elevated in a child

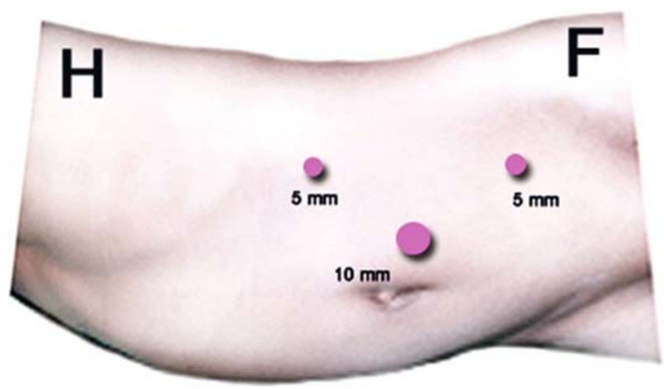


Fig. 5.49. External view of the port positions

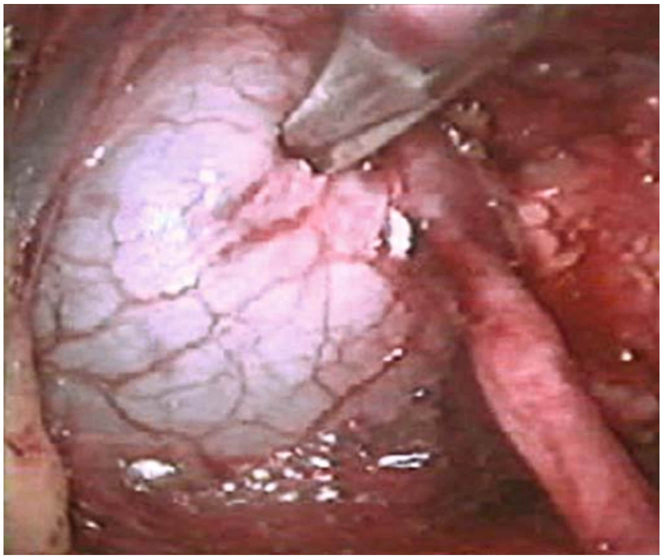


FIG. 5.50. Laparoscopic view shows a short UPJ stenosis

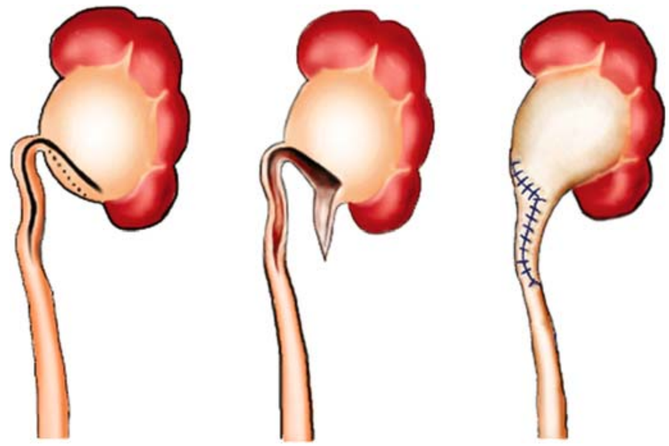


FIG. 5.51. Diagrammatic representation of Y-V plasty

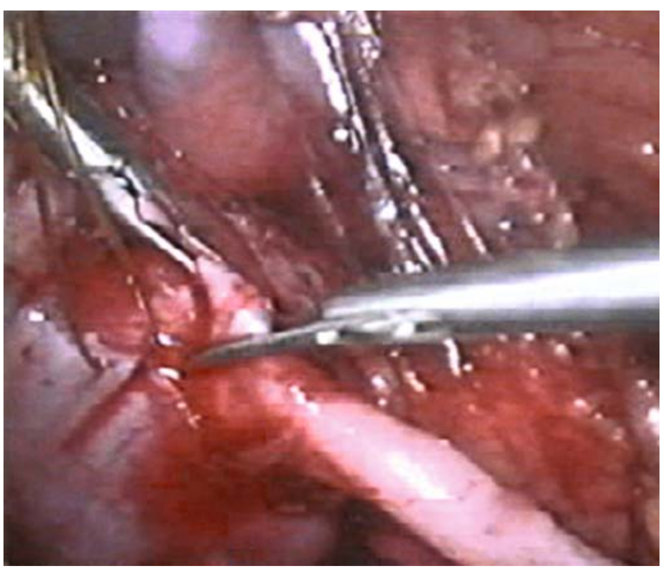


FIG. 5.52. V flap of the pelvis made on the lateral aspect (apex of the V being at the level of the UPJ)

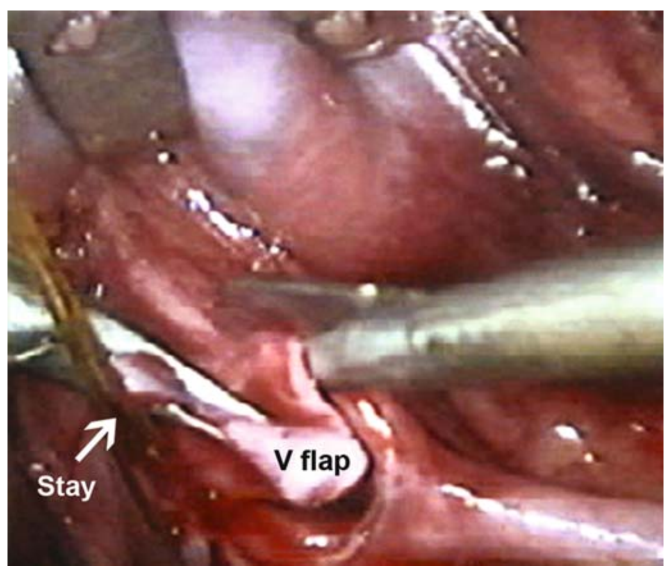


FIG. 5.53. Extending incision laterally for about 2 cm

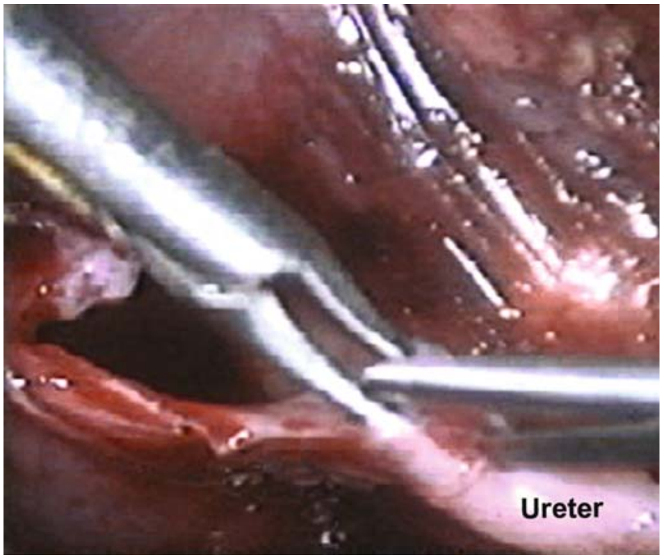


FIG. 5.54. Lateral ureterotomy is made (the vertical part of the Y) until normal-caliber ureter is reached

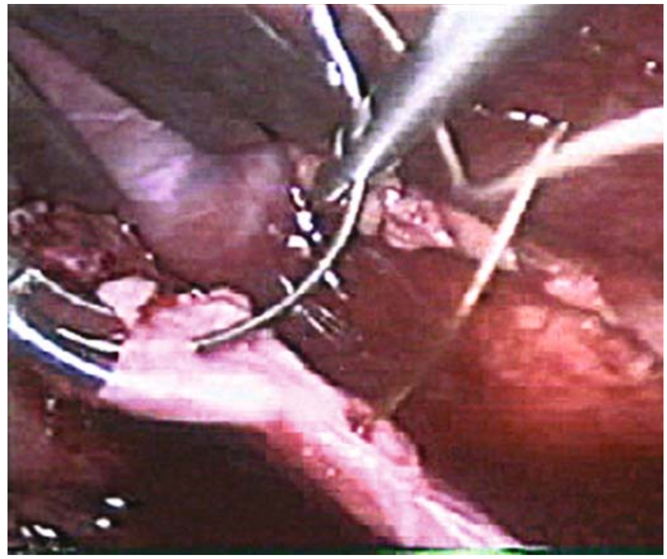


FIG. 5.55. Initial suture taken through the spatulated ureter (after placing a stent)

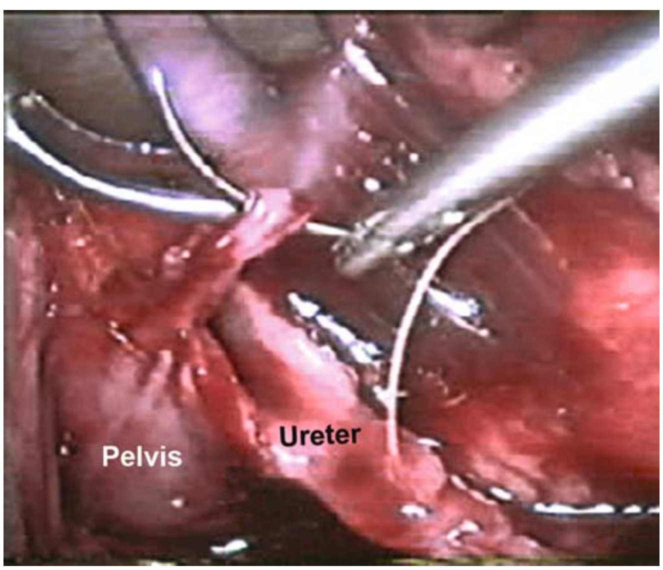


FIG. 5.56. The initial suture taken through the apex of the V flap of the pelvis

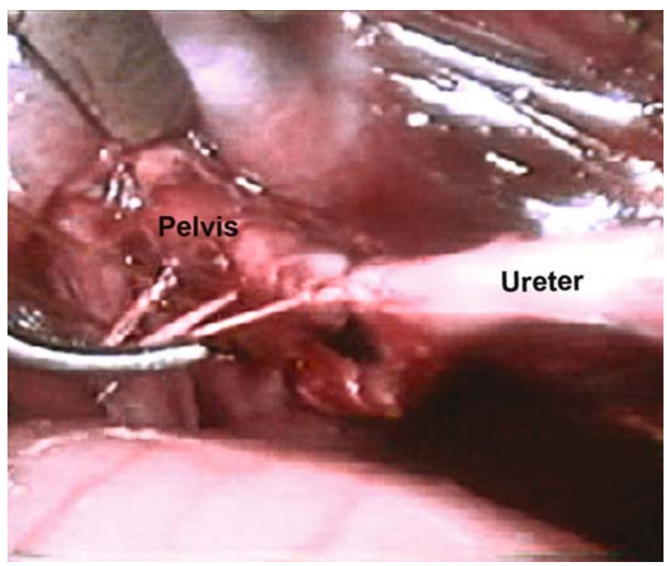


FIG. 5.57. A wide neo-UPJ

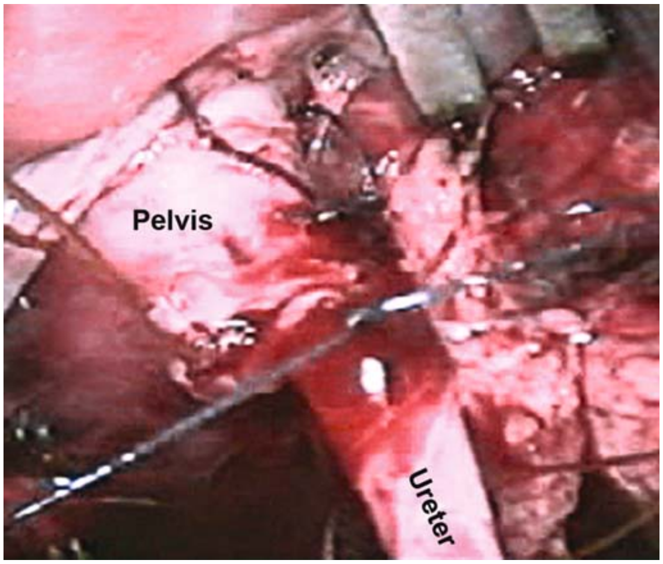


FIG. 5.58. A few more interrupted sutures create good funneling

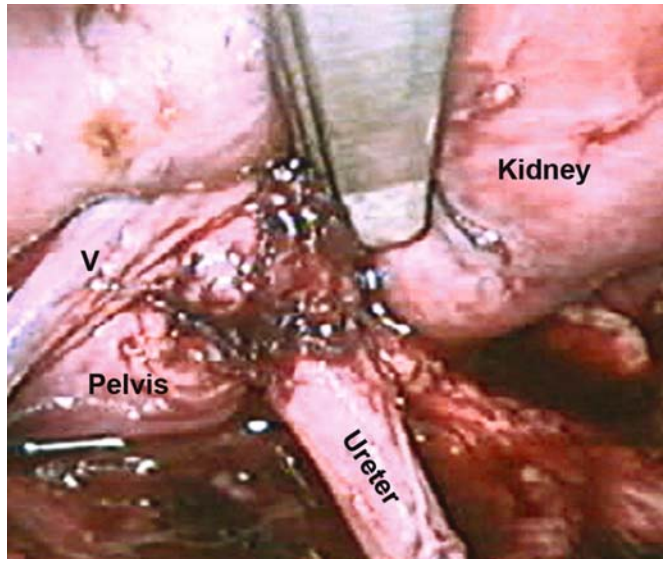


FIG. 5.59. Final appearance of the Y-V pyeloplasty (V, renal vein)

Transperitoneal Transmesocolic Pyeloplasty in Adults

FIG. 5.60. Left retrograde pyelogram (RGP) shows a moderately dilated pelvis; note that the colonic shadow is seen well away laterally, which gives us guidance in choosing a transmesocolic approach (a guidewire is preplaced for subsequent easy advancement of the stent)

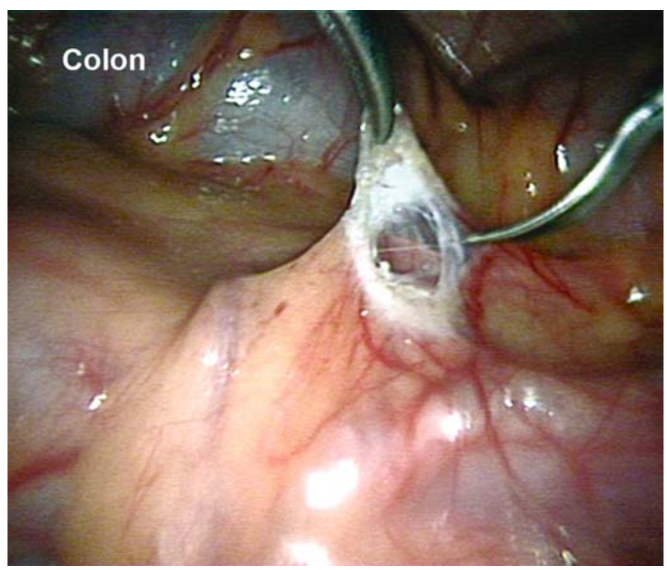


FIG. 5.61. Initial view of bulging pelvis seen through the mesocolon

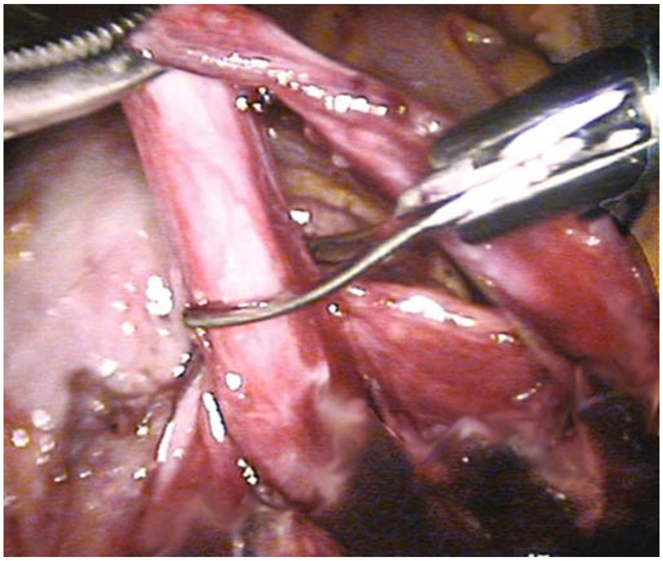


Fig. 5.62. Dissection of upper ureter

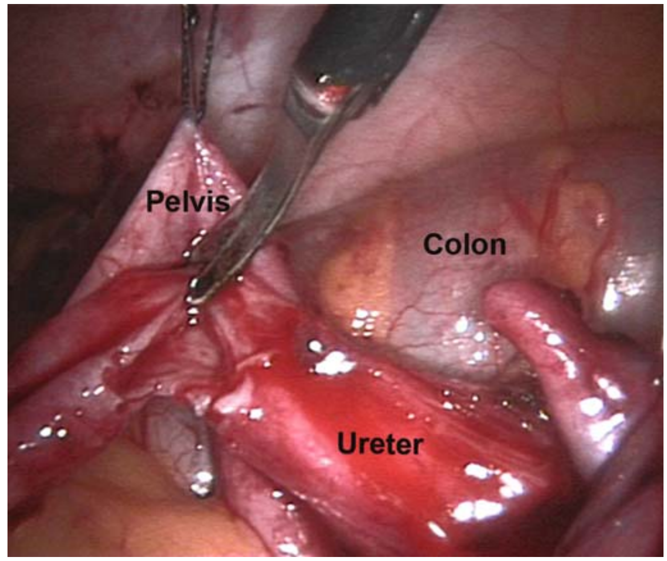


Fig. 5.63. Pyelotomy after the stay is inserted in the pelvis

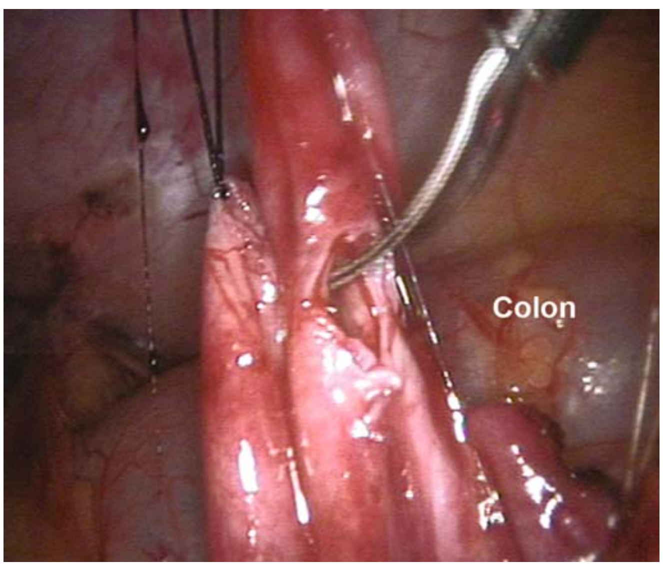


Fig. 5.64. Excision of the UPJ and redundant pelvis

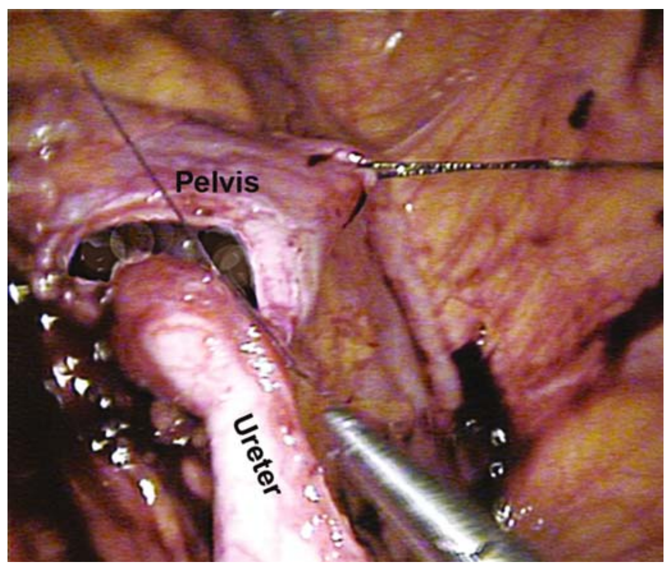


Fig. 5.65. Apical suture

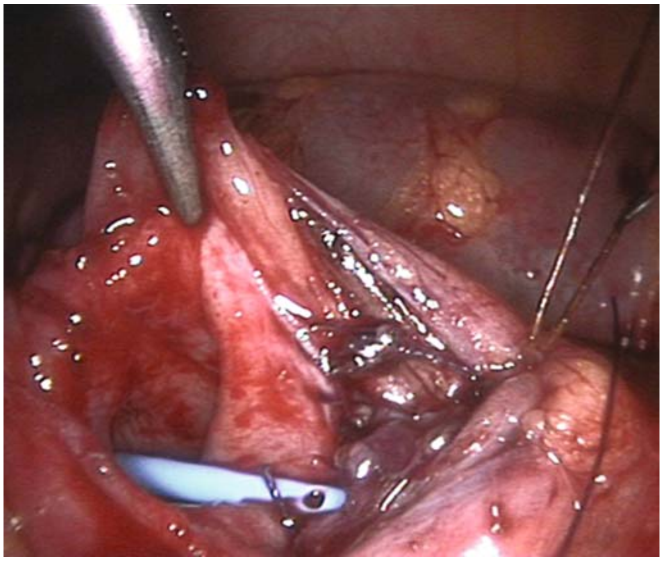


FIG. 5.66. Stent advancement after suturing posterior layer

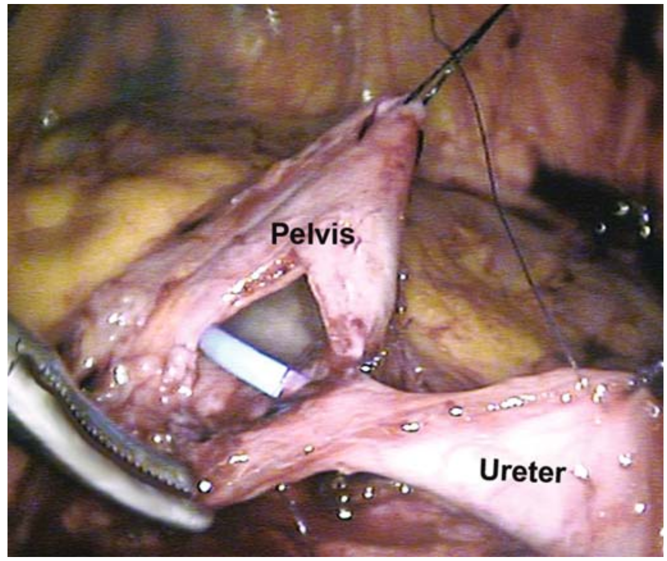


FIG. 5.67. Suturing of posterior layer completed

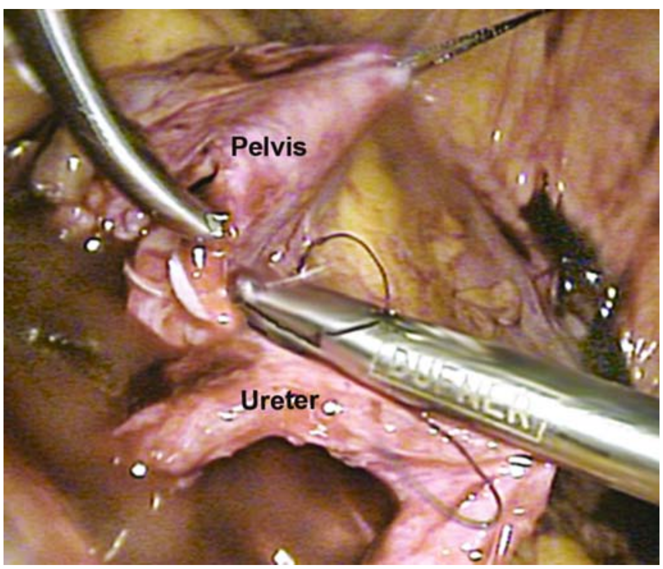


FIG. 5.68. Suturing anterior layer in progress

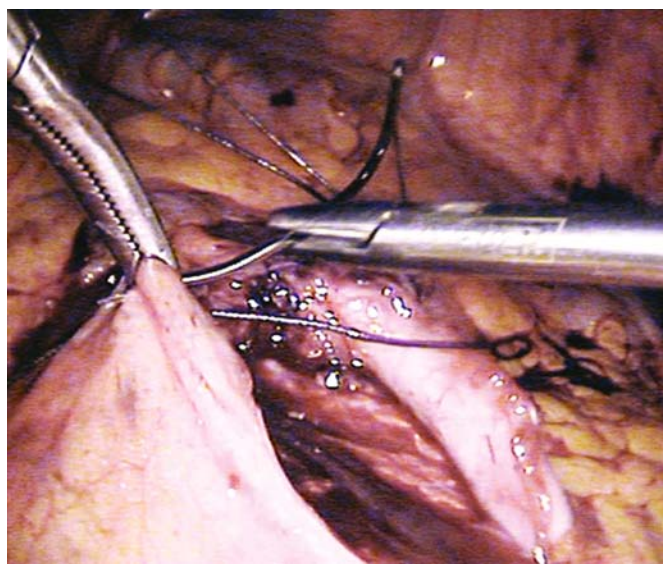


FIG. 5.69. Mesocolonic rent closure after completing pyeloplasty

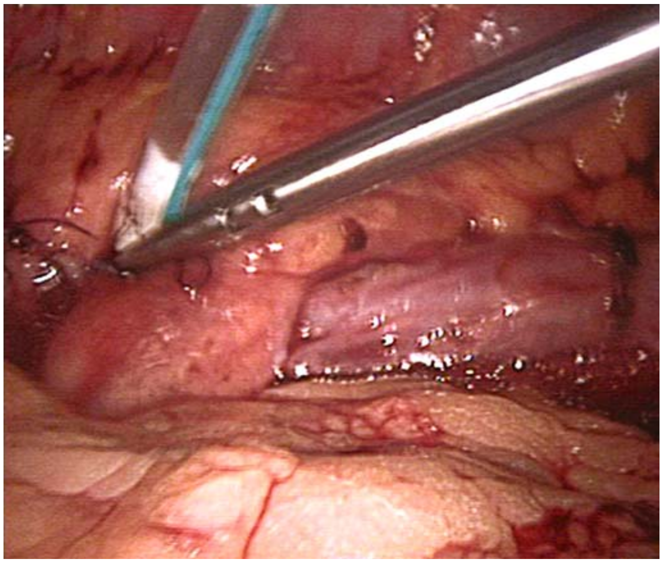


FIG. 5.70. Intraperitoneal drain left near the mesocolic rent

FIG. 5.71. Tube drain exiting through the port in the left iliac fossa

Transperitoneal Transmesocolic Pyeloplasty in Children

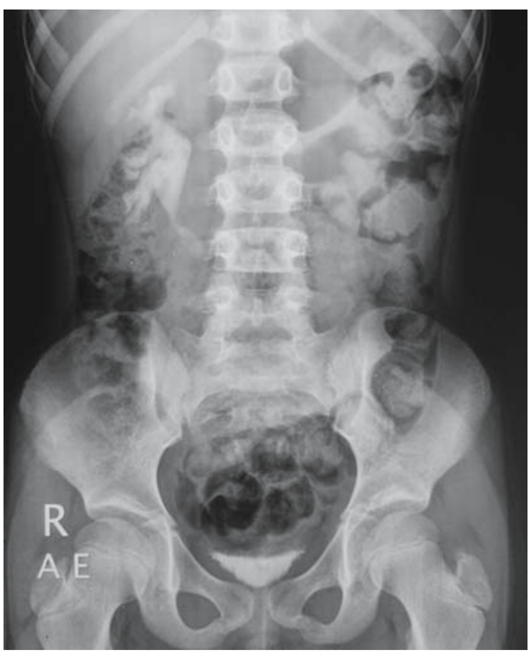


FIG. 5.72. An IVU reveals delayed left renal function

FIG. 5.73. An RGP confirms left UPJ obstruction

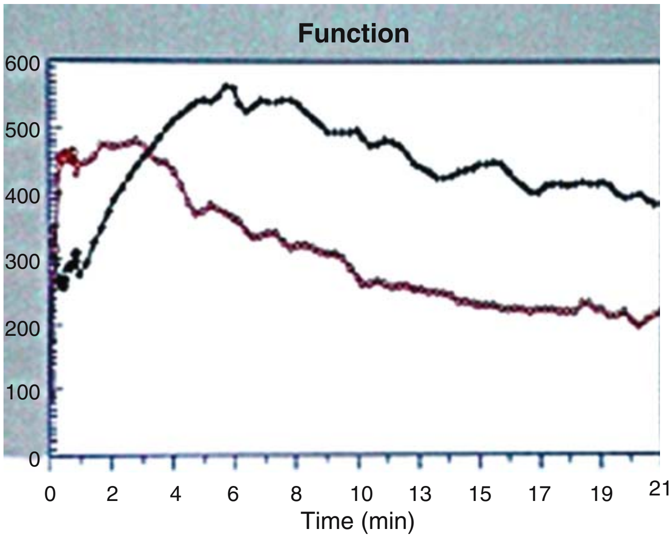


FIG. 5.74. Isotope renogram shows delayed drainage on the left side

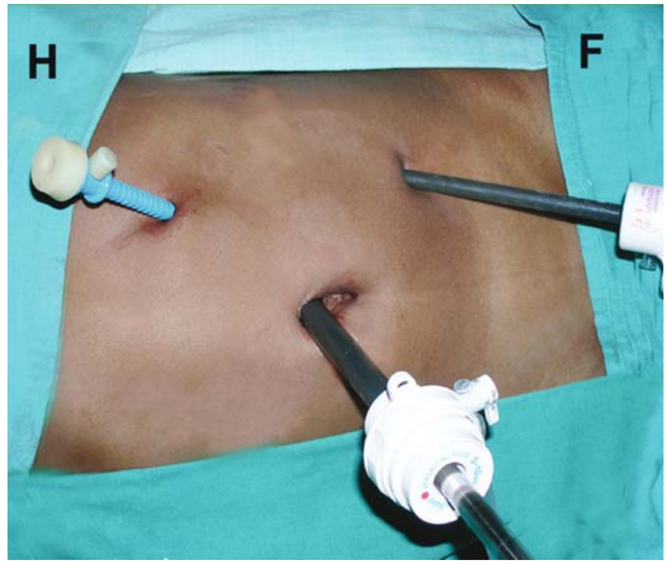


FIG. 5.75. External view of the port positions

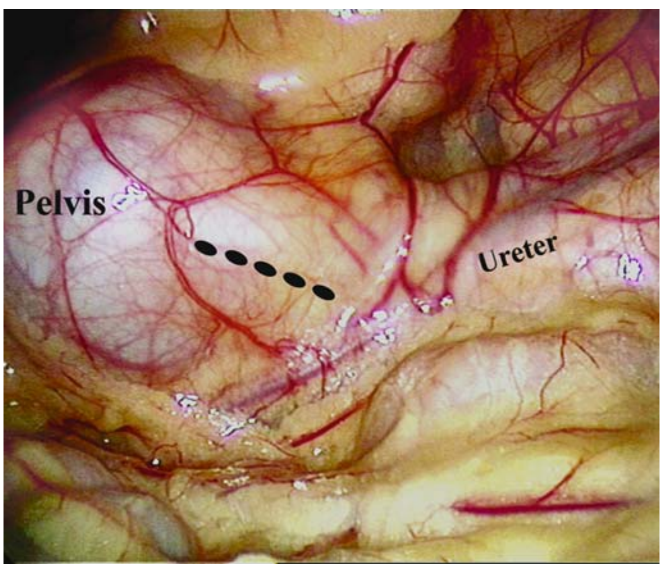


FIG. 5.76. Bulge appreciated through the mesocolon (this is suitable for a transmesocolic approach, avoiding the need for colonic mobilization)

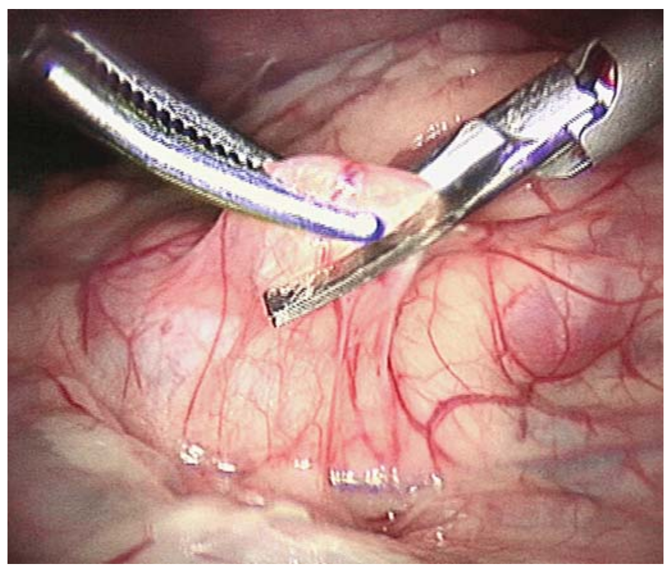


FIG. 5.77. Incision of mesocolon

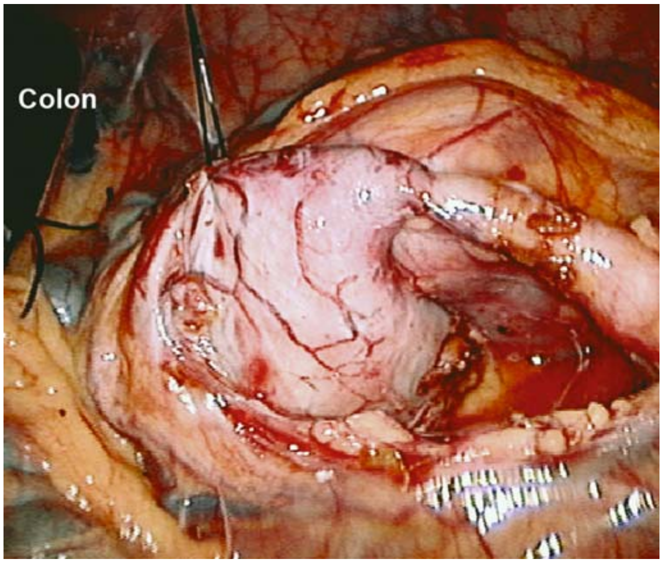


FIG. 5.78. Incision of mesocolon exposes the pelvis, which can be easily mobilized and dissected along with the ureter for an adequate distance

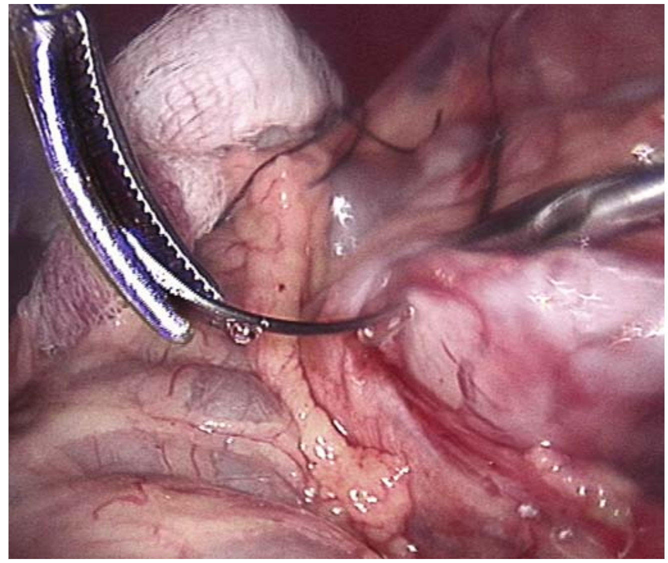


FIG. 5.79. A stay in the pelvis (otherwise the UPJ may recede into the mesocolon)

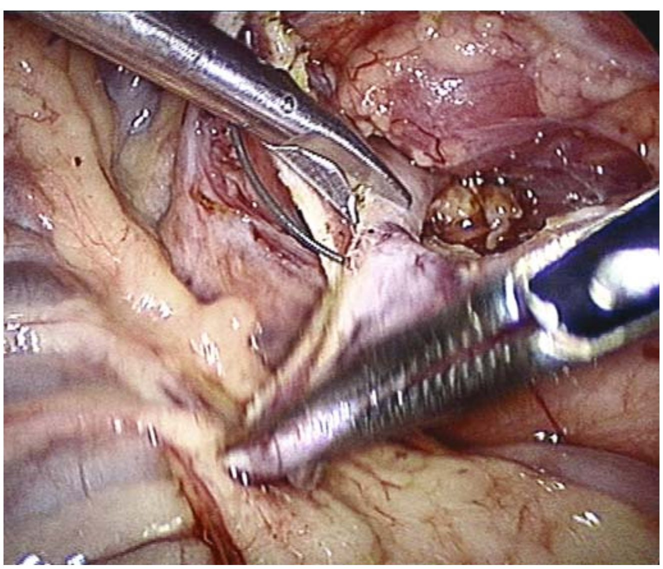


FIG. 5.80. Pyelotomy in progress

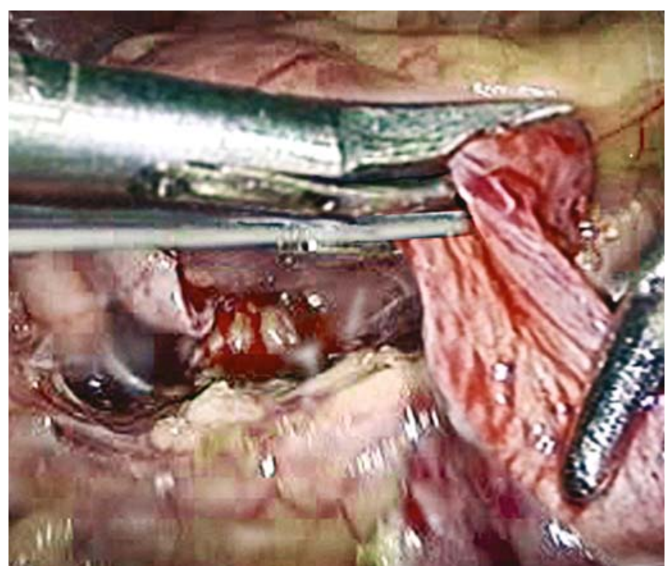


FIG. 5.81. Spatulation of the ureter made posterolaterally across the UPJ and for about 1 cm of normal ureter

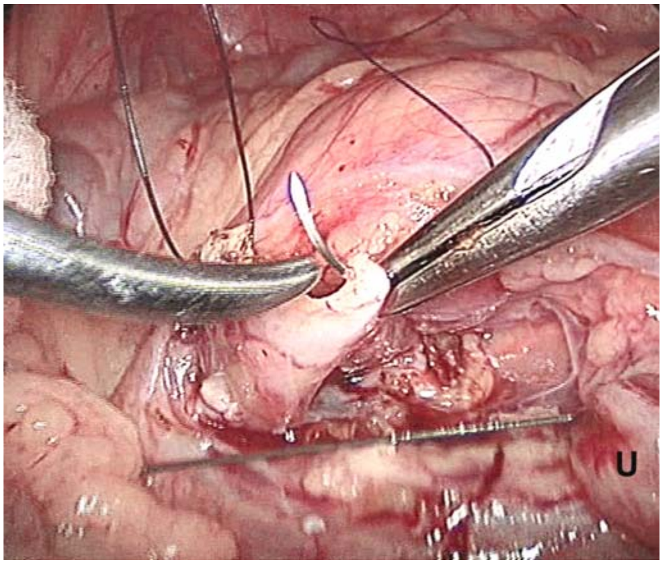


FIG. 5.82. Initial suture with 5-0 Vicryl taken outside-in through the pelvis (U, ureter with a preplaced guidewire)

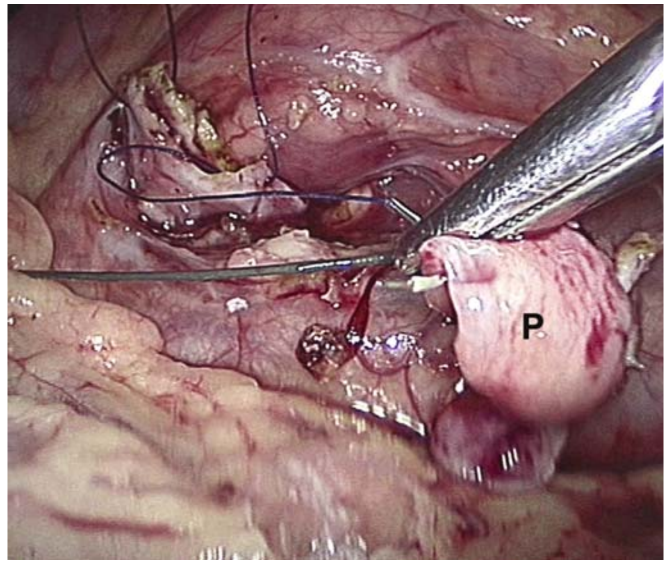


FIG. 5.83. Corresponding suture inside-out taken through the spatulated ureter (P, pyelum flap)

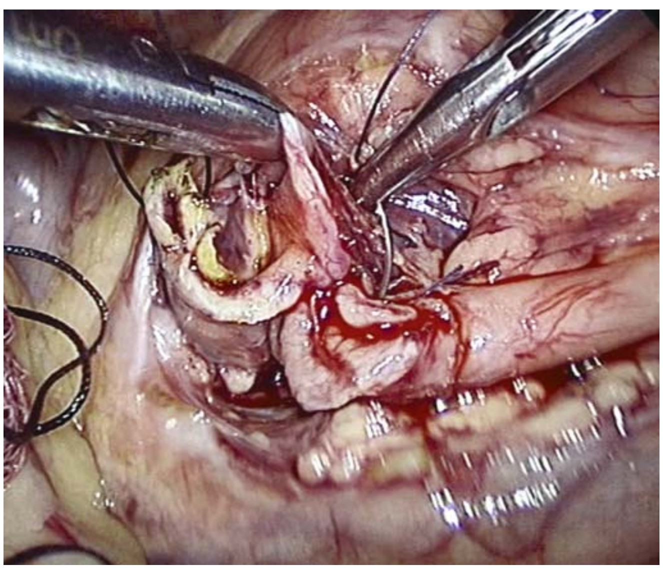


FIG. 5.84. Subsequent posterior layer suture

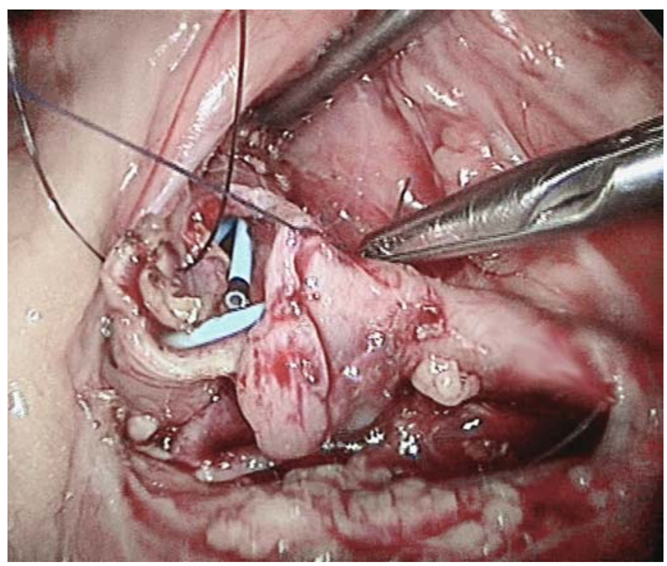


FIG. 5.85. Apical suture in progress

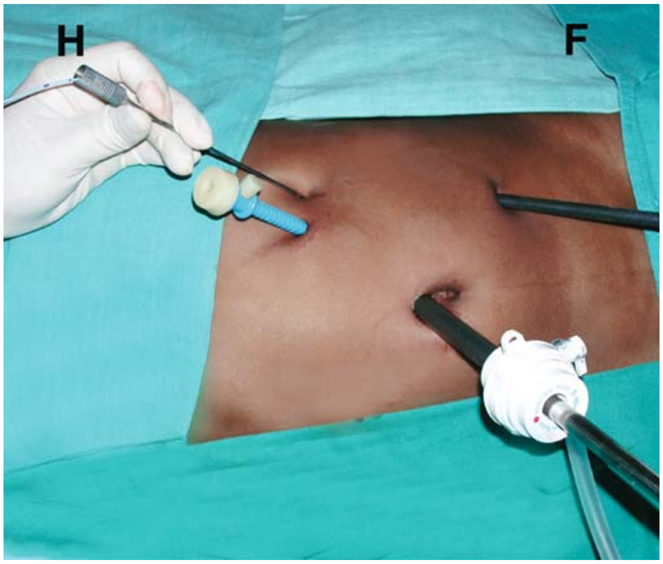


FIG. 5.86. External view of antegrade stenting through a Veress needle

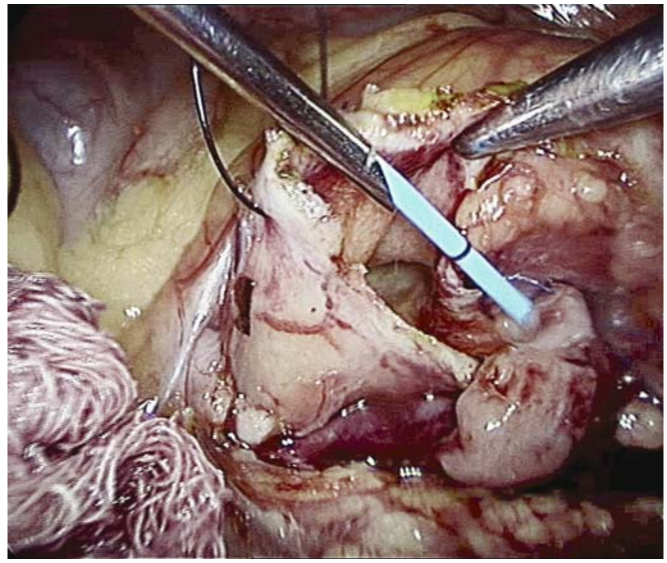


FIG. 5.87. Endoview of stent placement using the cannula of the Veress needle

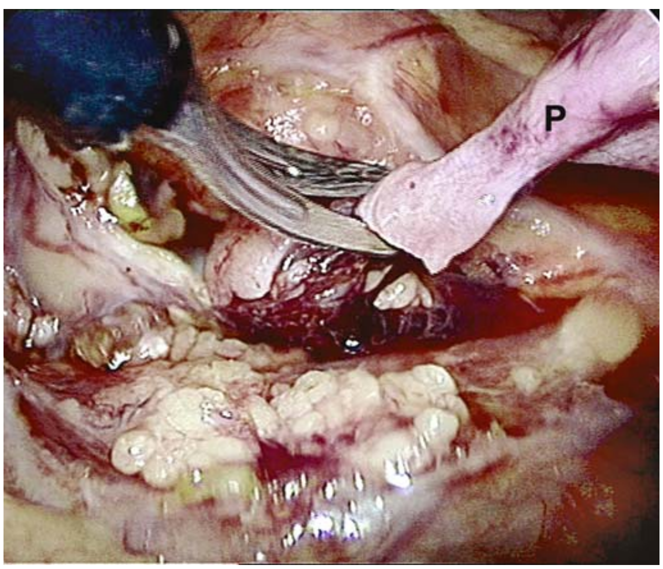


FIG. 5.88. Excision of pyelum flap (P) with UPJ

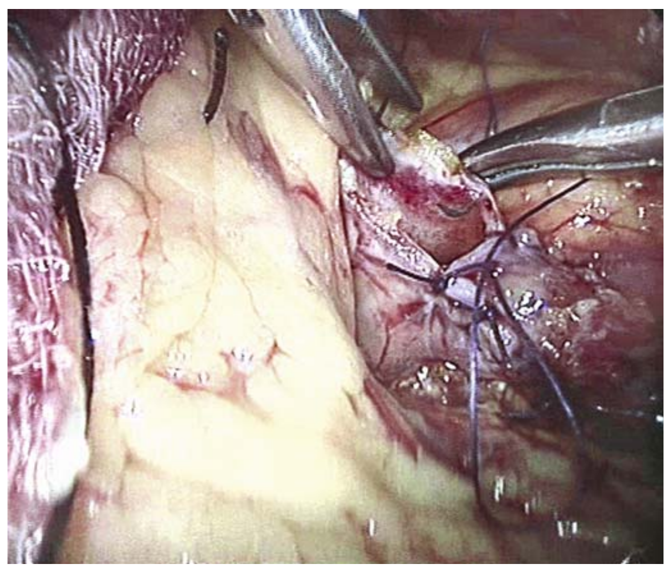


FIG. 5.89. Subsequent interrupted sutures of anterior layer

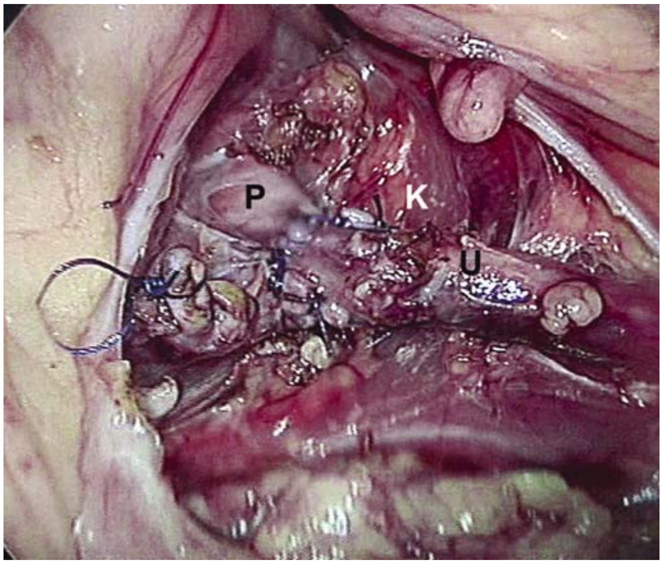


FIG. 5.90. Once the ureteral anastomosis with the pelvis is completed, the remaining opening in the pelvis is closed with continuous sutures (P, pelvis; U, ureter; K, lower pole of kidney)

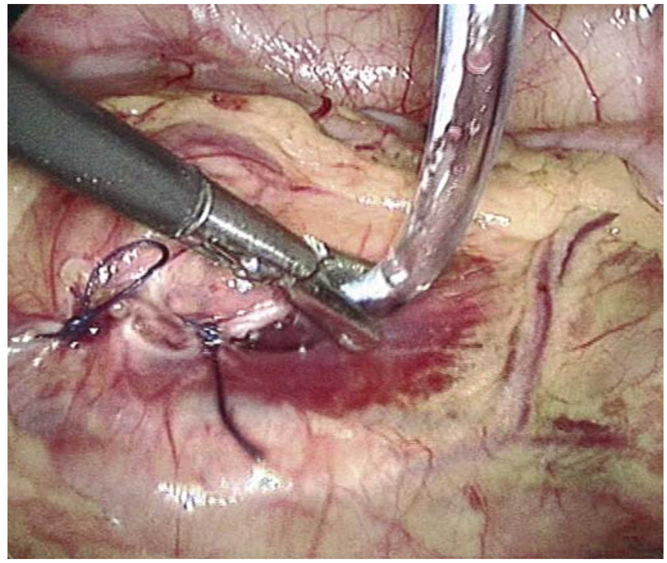


FIG. 5.91. Rent in mesocolon is closed and tube drain left in

Retroperitoneoscopic Nondismembered Pyeloplasty

FIG. 5.92. An IVU shows a right UPJ obstruction

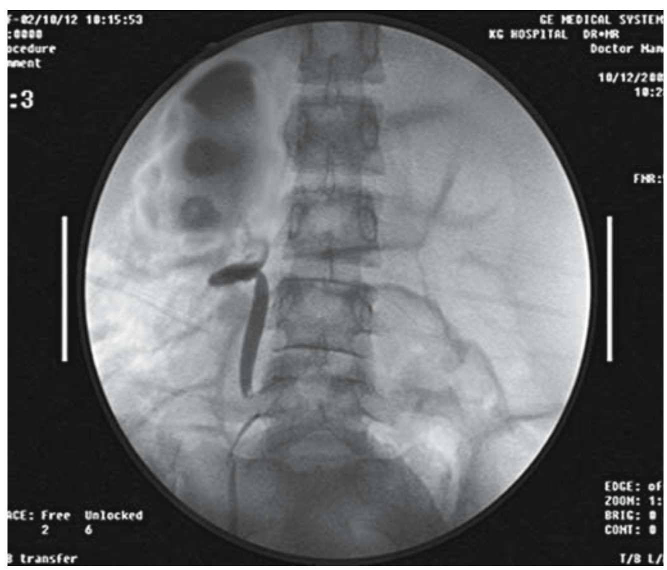


FIG. 5.93. Right RGP confirms an UPJ obstruction

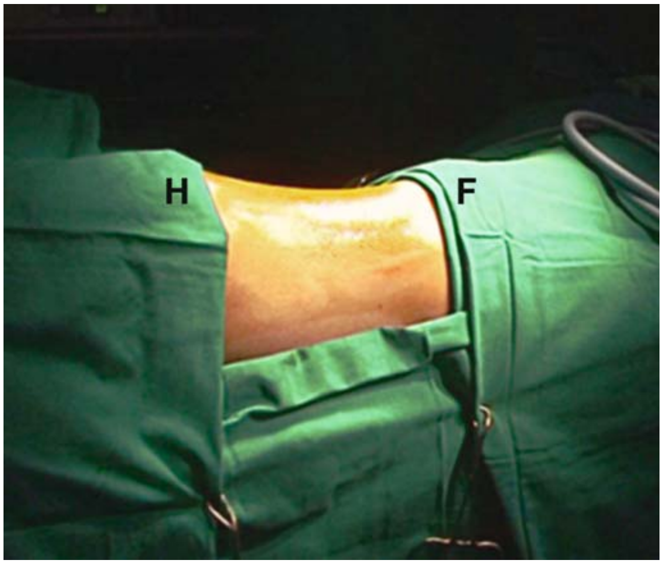


FIG. 5.94. The patient is positioned in the lateral kidney position with a 90-degree tilt

FIG. 5.95. Primary port is made below the tip of the twelfth rib

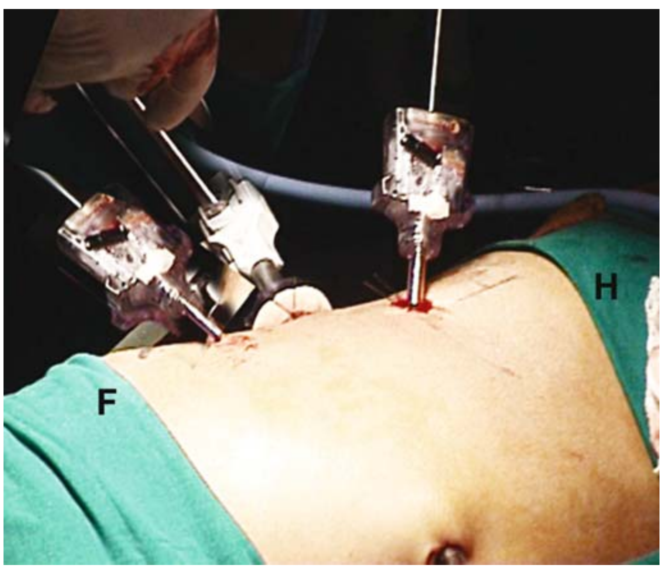


FIG. 5.96. External view of the port positions as seen from the front

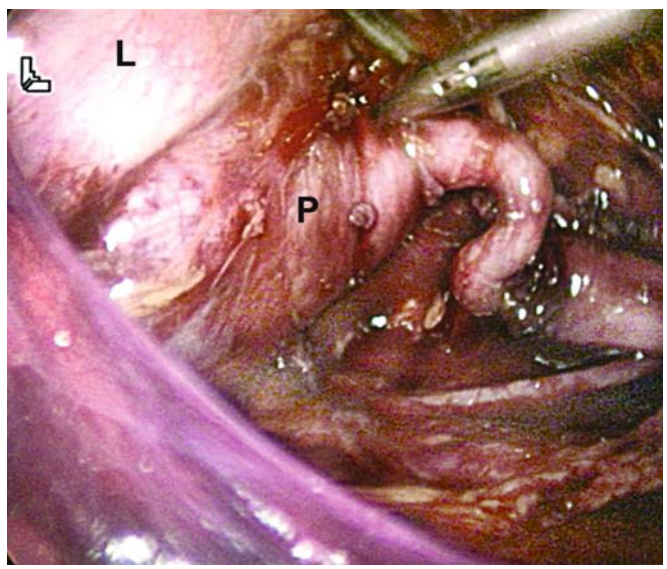


FIG. 5.97. Retroperitoneoscopic view of ureter and pelvis (P, pelvis; U, ureter; L, lower pole of kidney)

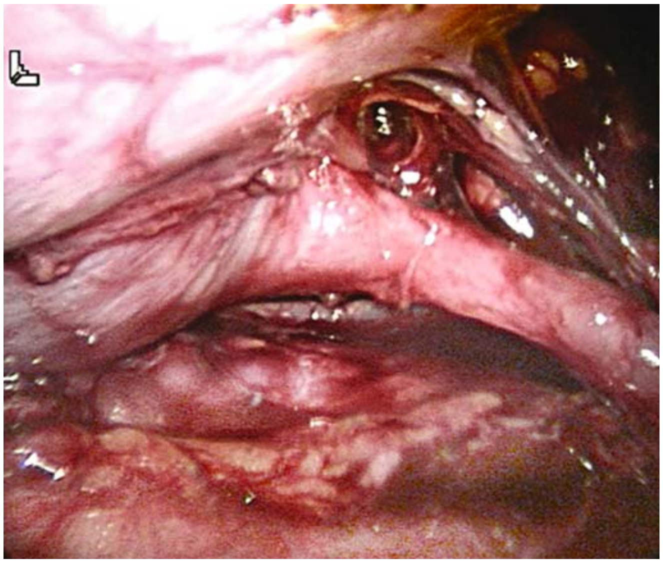


FIG. 5.98. On retraction of the lower pole, the UPJ becomes straightened (if the pelvis is not much dilated, Fengerplasty may be preferable)

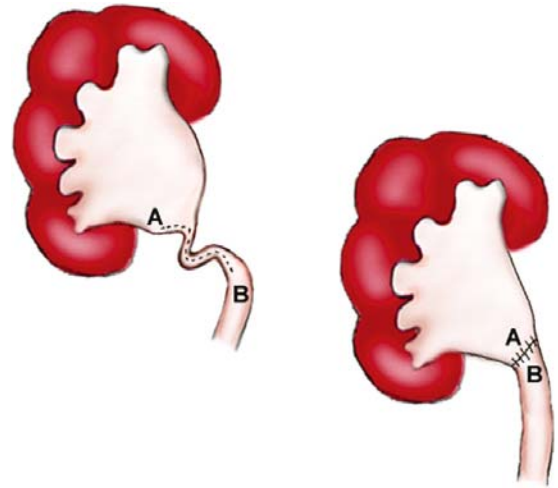


FIG. 5.99. Diagrammatic representation of the planned Fengerplasty

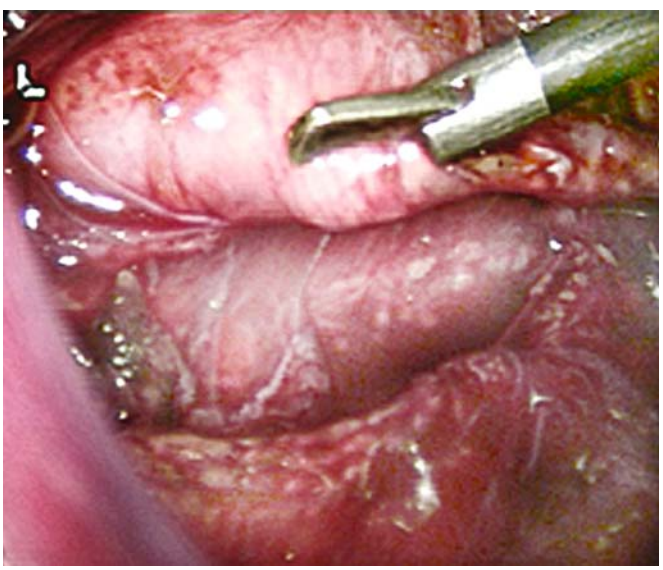


FIG. 5.100. Pyelotomy on lateral aspect in preparation for Fengerplasty

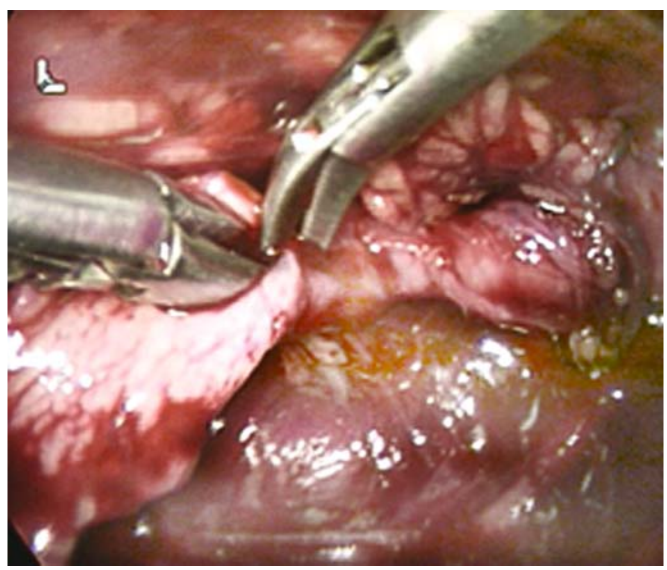


FIG. 5.101. Spatulation continues across the UPJ and normal-caliber ureter adequately

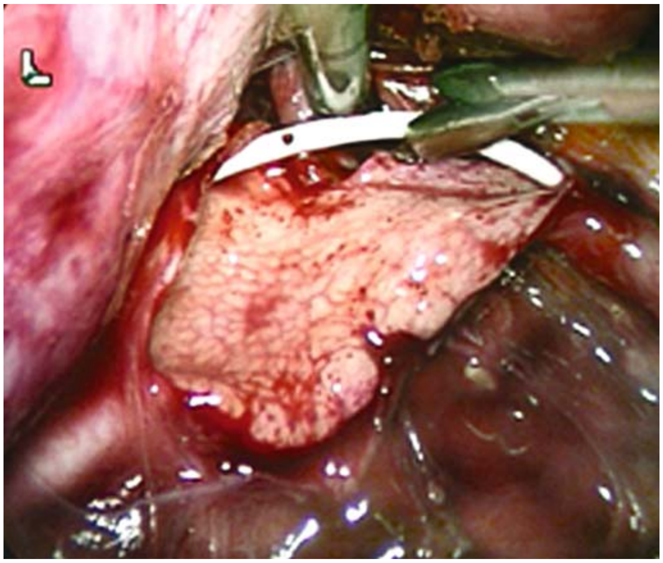


Fig. 5.102. Preplaced stent being advanced cephalad

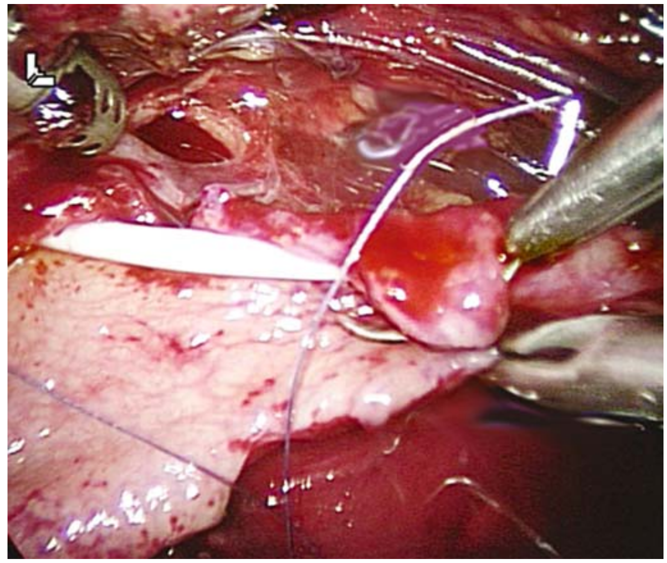


Fig. 5.103. Initial suture taken outside-in through the spatulated ureter with 5-0 Vicryl

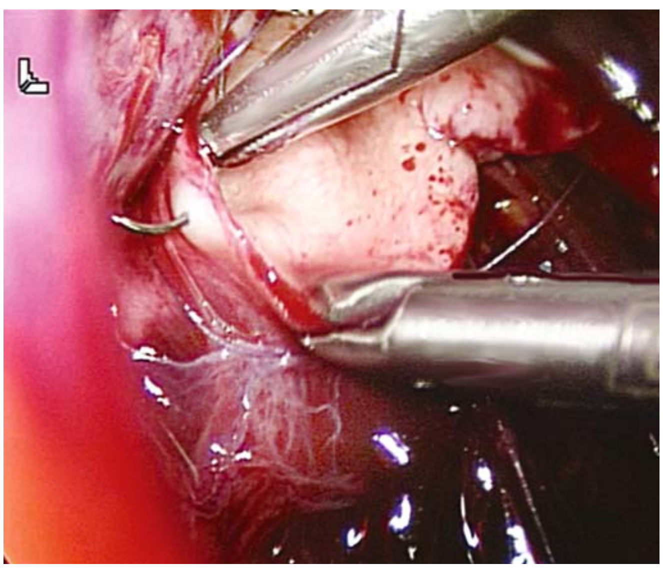


Fig. 5.104. Initial suture taken inside-out through the proximal end of the pyelotomy

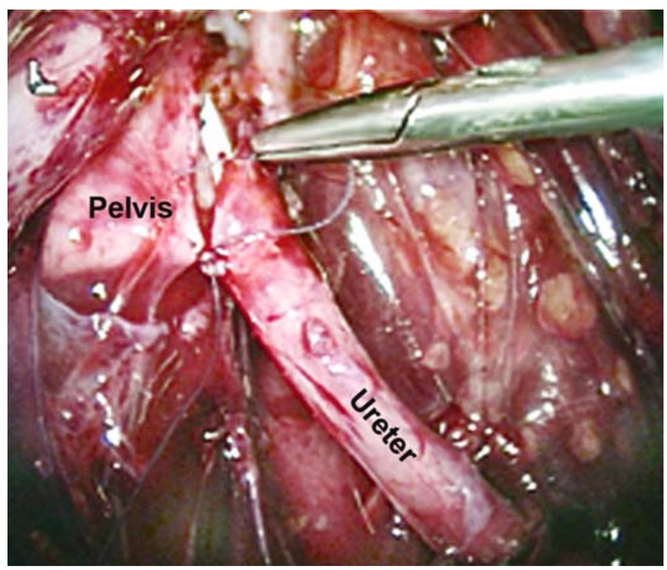


Fig. 5.105. The funneling of the Fengerplasty seen after the initial suture

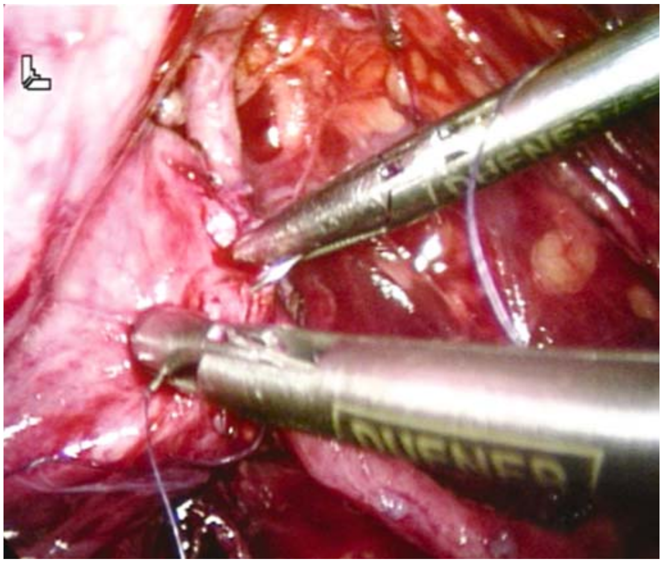


FIG. 5.106. Subsequent sutures on either side of the initial suture

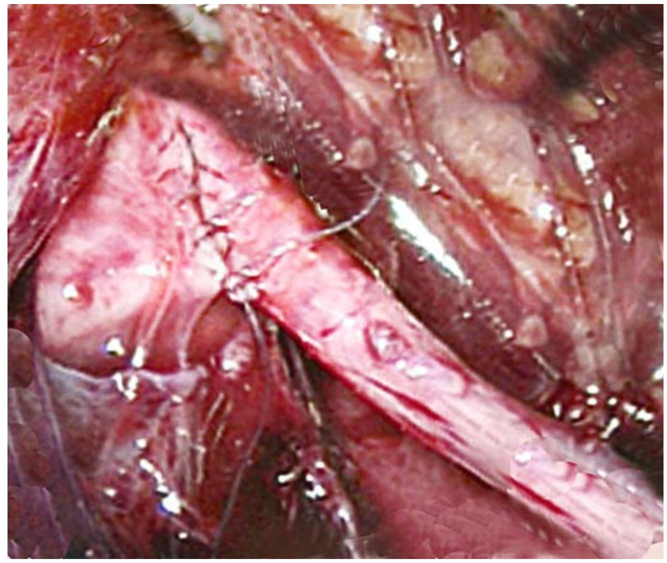


FIG. 5.107. View after completing the Fengerplasty

Retroperitoneoscopic Y-V Plasty

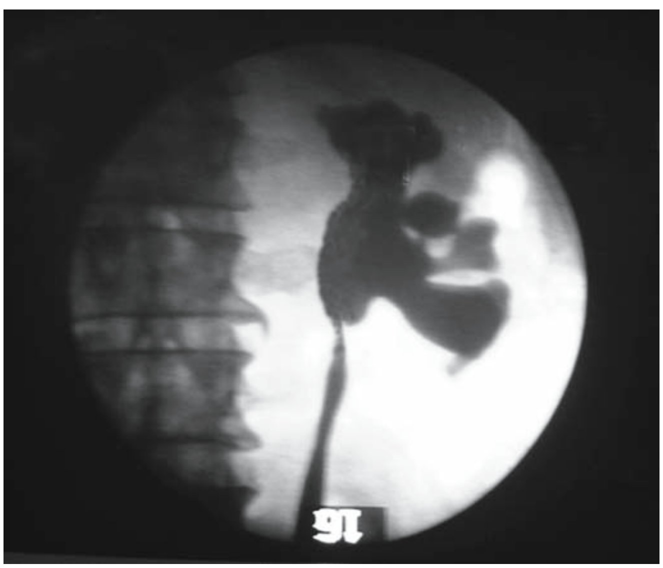


FIG. 5.108. An RGP shows a short UPJ narrowing on the left side

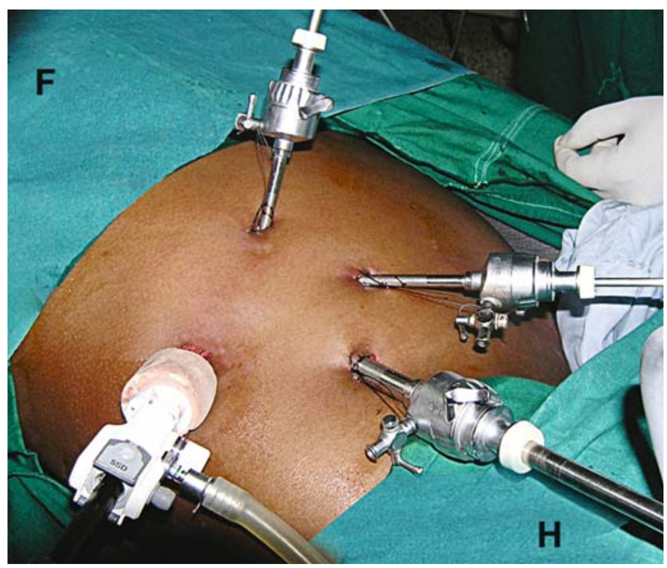


FIG. 5.109. External view of the port positions

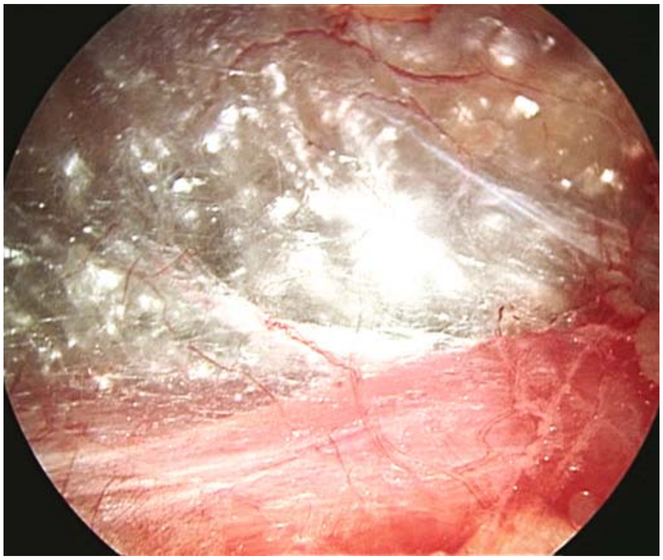


FIG. 5.110. Initial retroperitoneoscopic view shows the landmarks

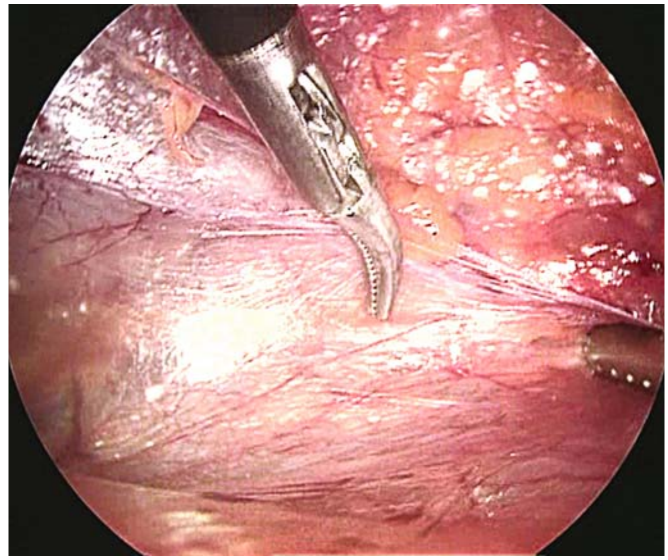


FIG. 5.111. Blunt dissection continues medial to the psoas to look for the ureter

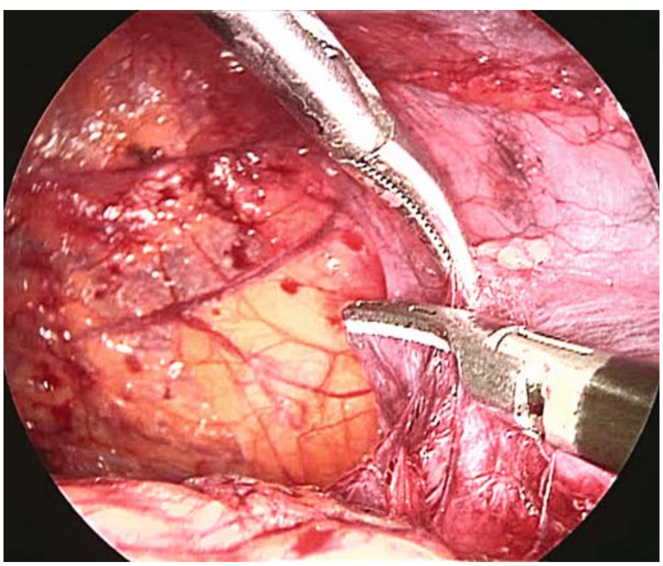


FIG. 5.112. Gerota's fascia is being divided

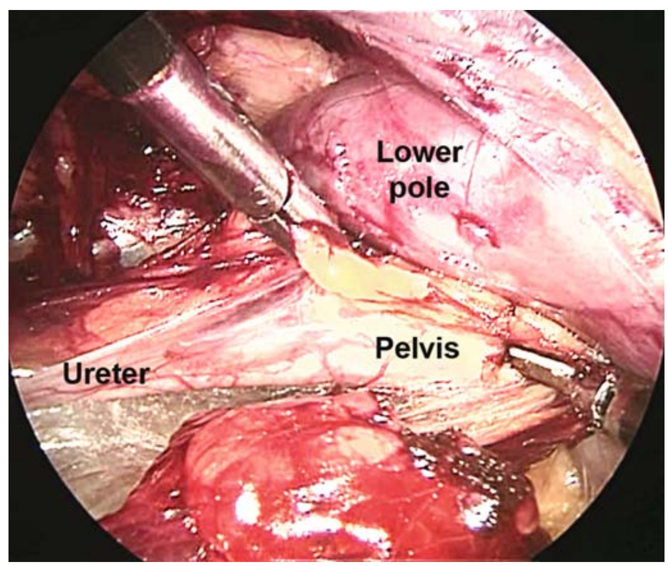


FIG. 5.113. On division of Gerota's fascia, the lower pole of kidney, the pelvis, and the ureter come into view

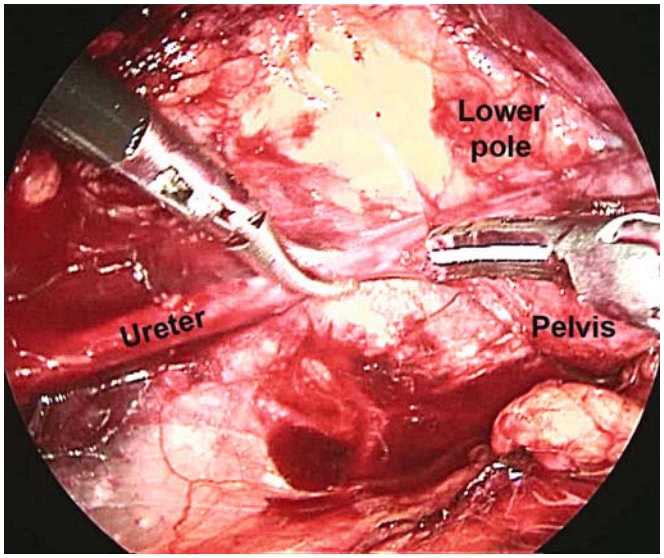


FIG. 5.114. Mobilization of the pelvis, UPJ, and upper ureter

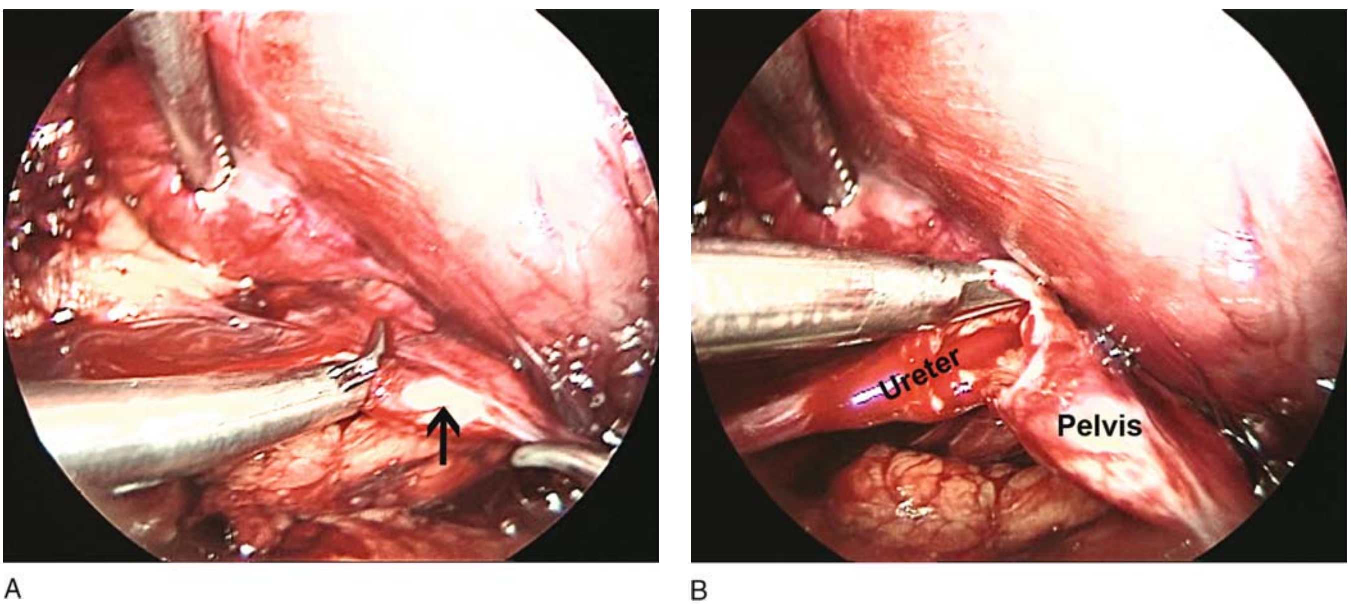
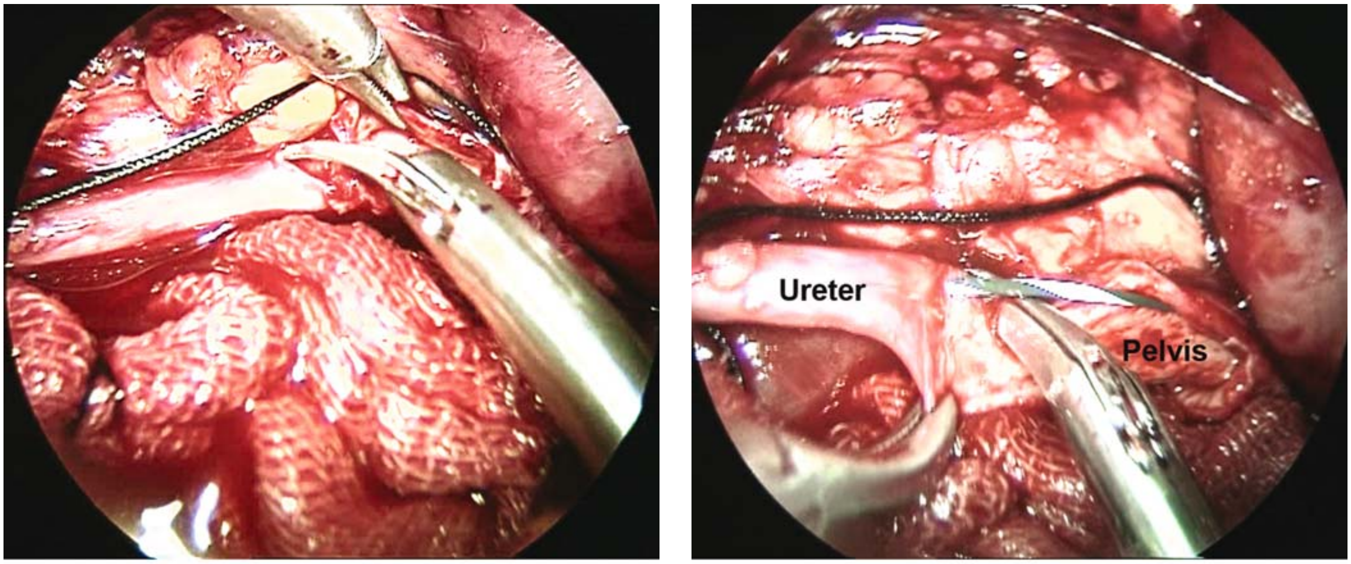
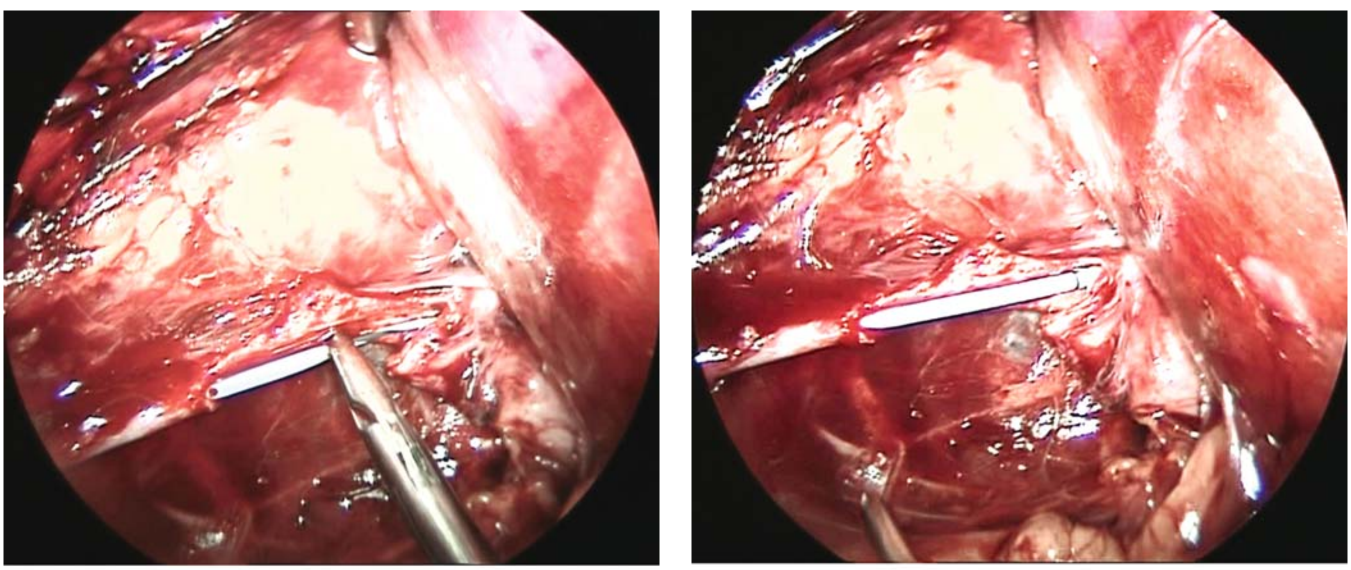


FIG. 5.115. Raising a V-shaped flap (arrow) with a cold scissors in the pelvis on the lateral aspect



A B

FIG. 5.116. Ureterotomy on the lateral aspect is being done to complete the Y cut (note that the gauze piece brought inside can be used to mop the bleeding edges to give a better field view)



A B

FIG. 5.117. A double pigtail stent is advanced over the guidewire antegrade

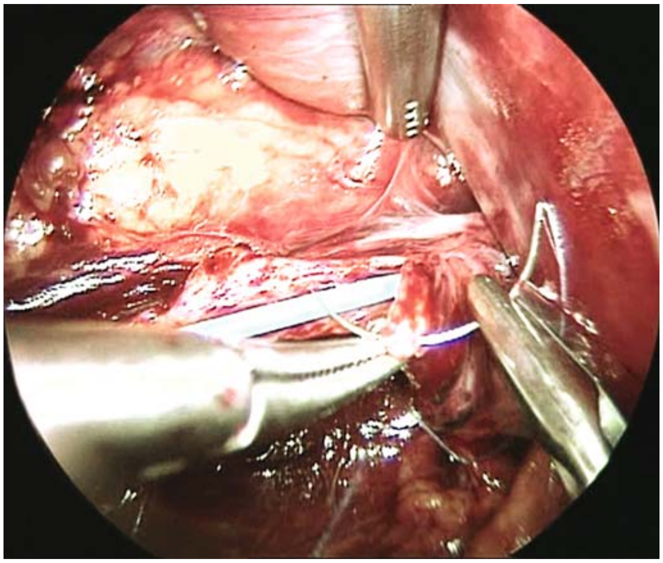


FIG. 5.118. Initial apical suture taken outside-in through the V flap of pelvis

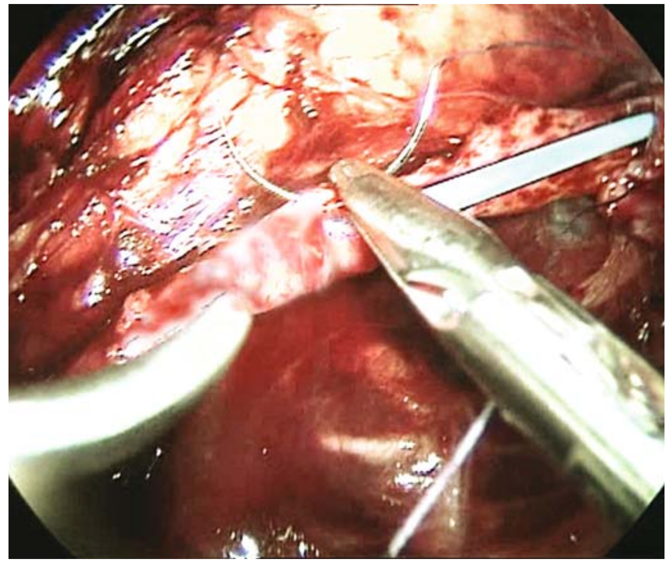


FIG. 5.119. Corresponding suture taken inside-out through the spatulated ureter

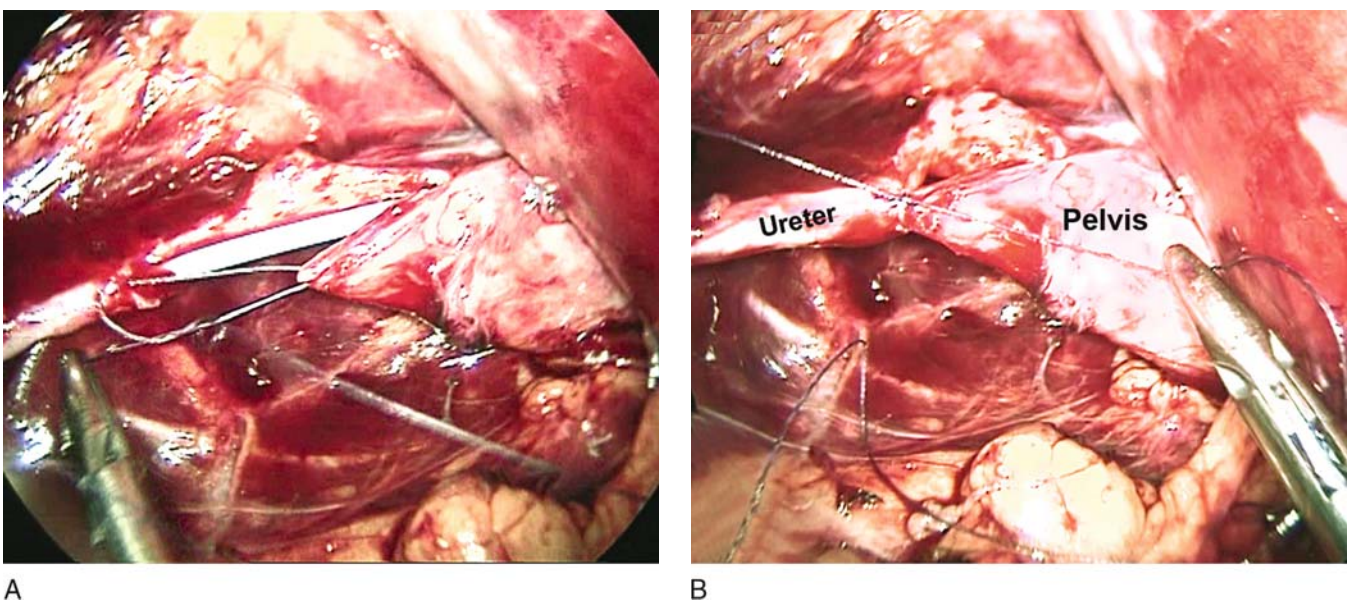
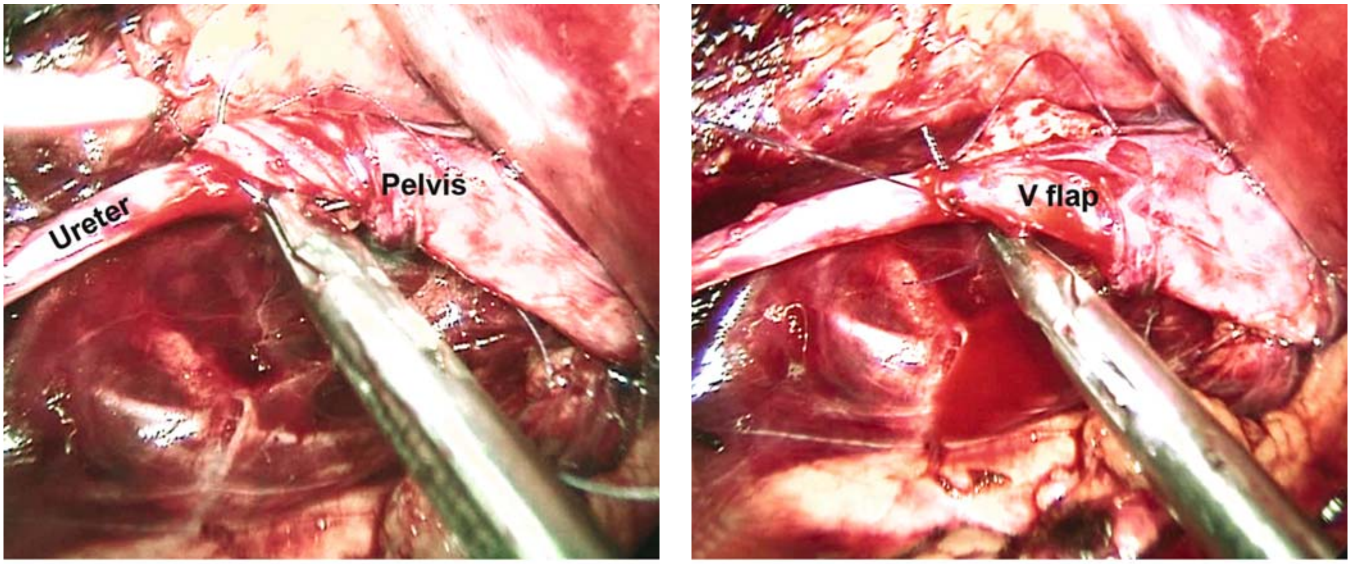
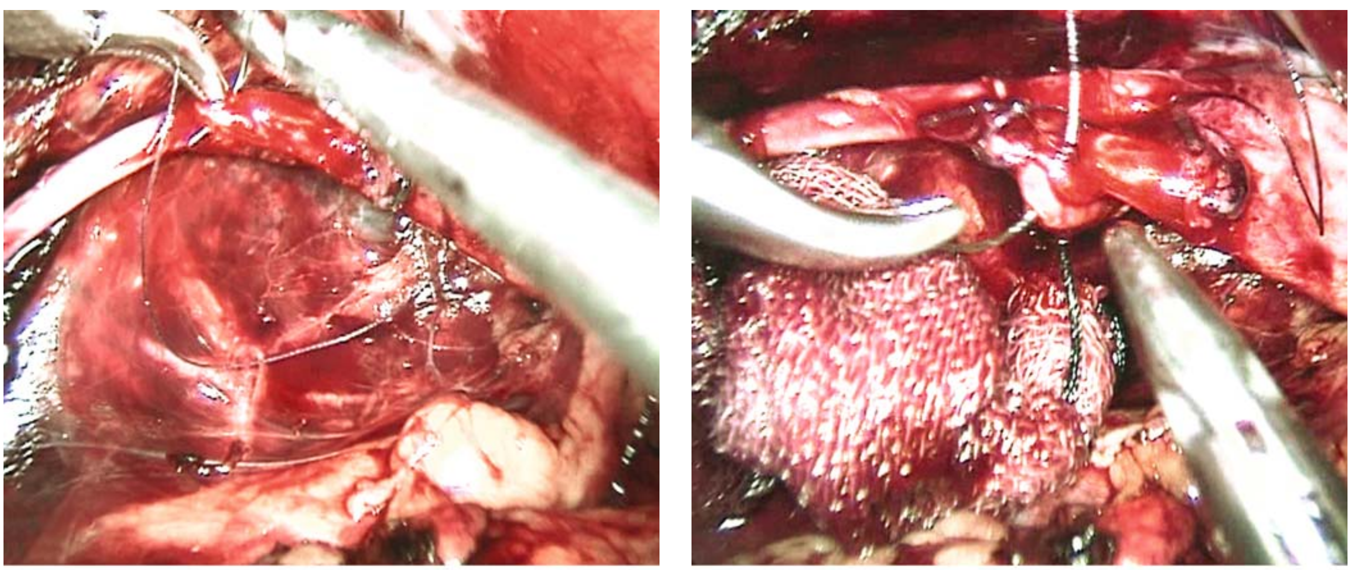


FIG. 5.120. View after initial suture



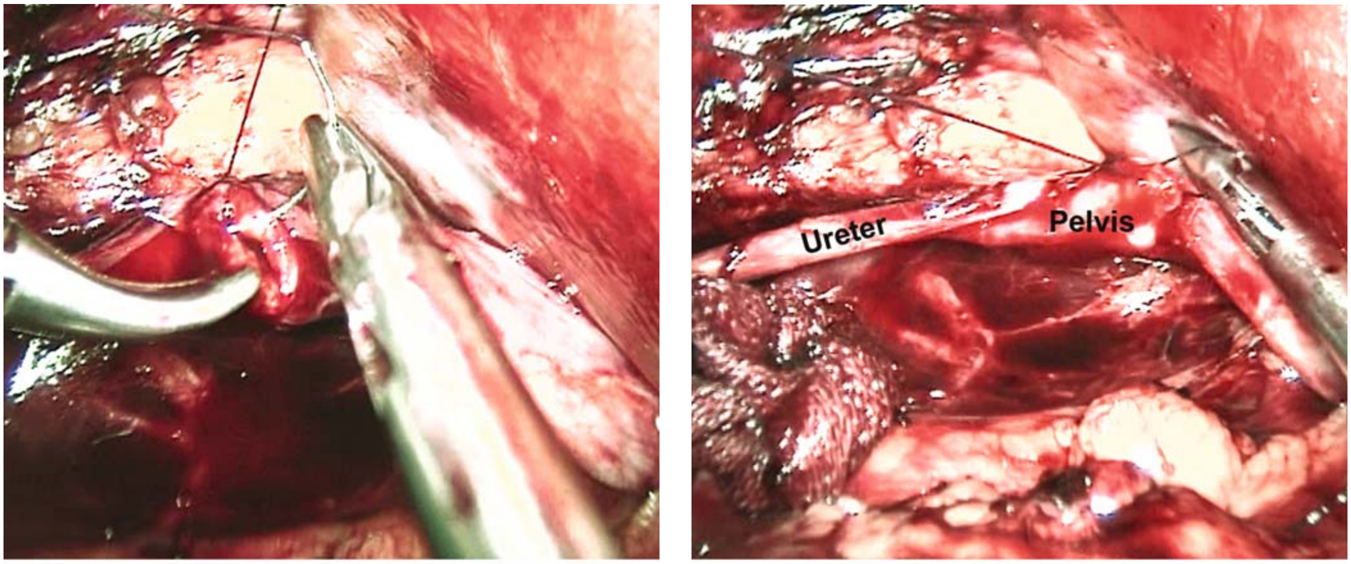
A B

Fig. 5.121. Subsequent interrupted sutures on the posterior edges of the ureter and pelvic flap



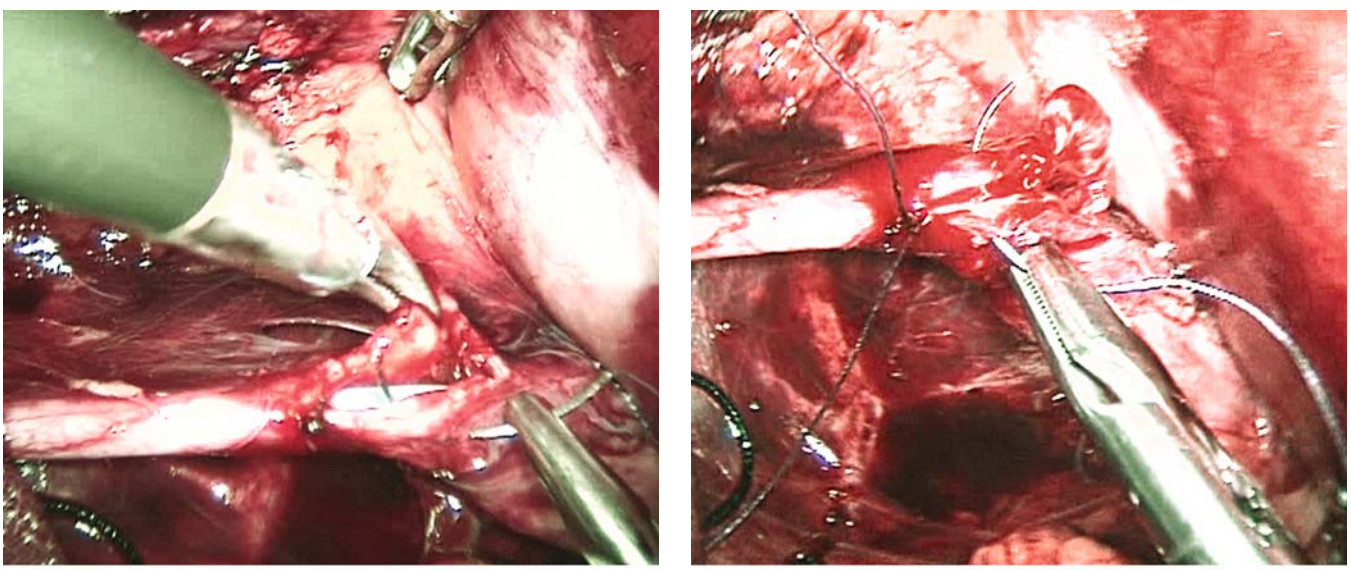
A B

Fig. 5.122. Flipping the suture line medially as subsequent interrupted sutures are carried out



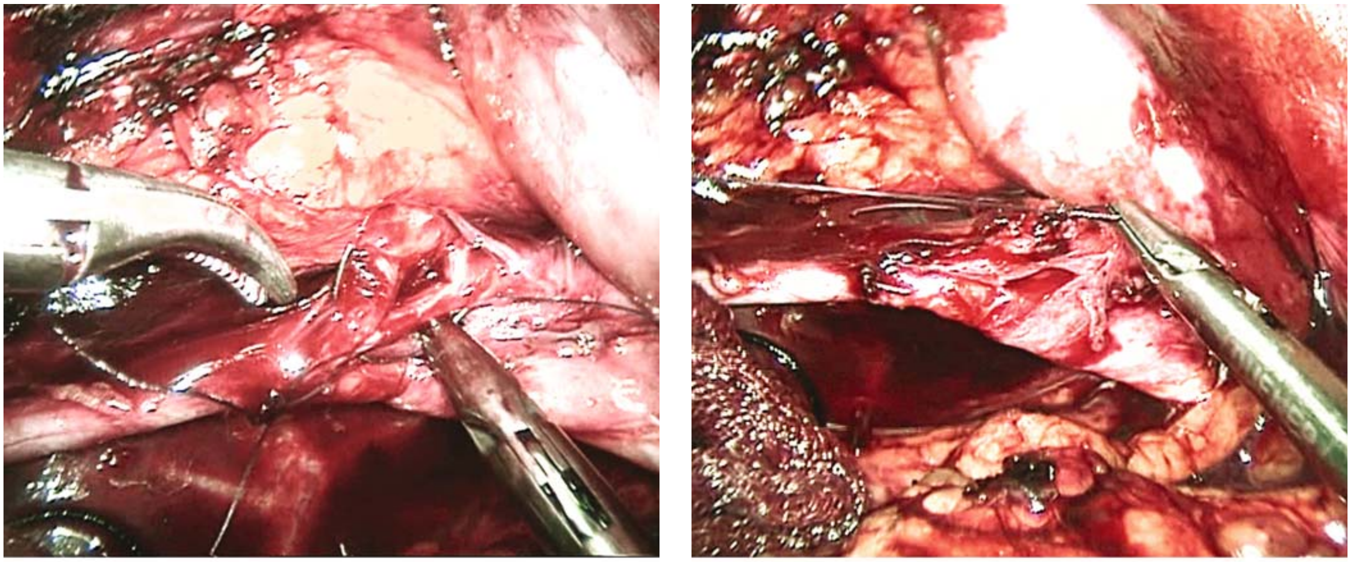
A B

Fig. 5.123. Pyelotomy is closed with continuous suture



A B

Fig. 5.124. Similarly, medial edges of the ureter and pelvis are approximated with continuous sutures



A B

FIG. 5.125. Pyelotomy closure

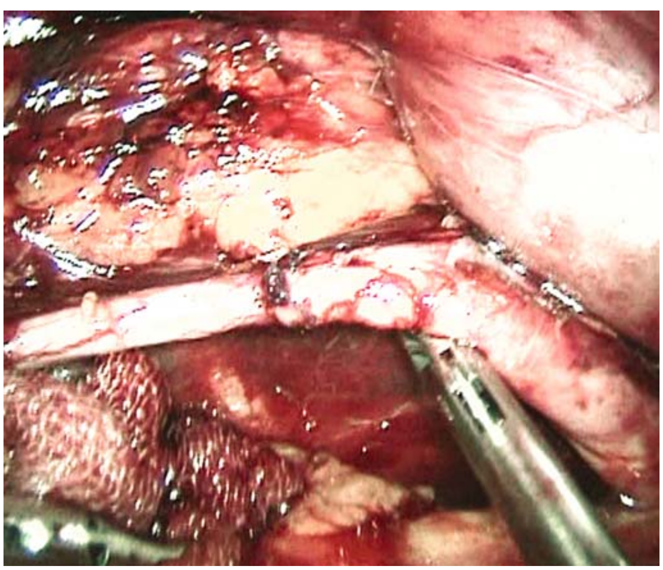


FIG. 5.126. Final appearance of the Y-V plasty

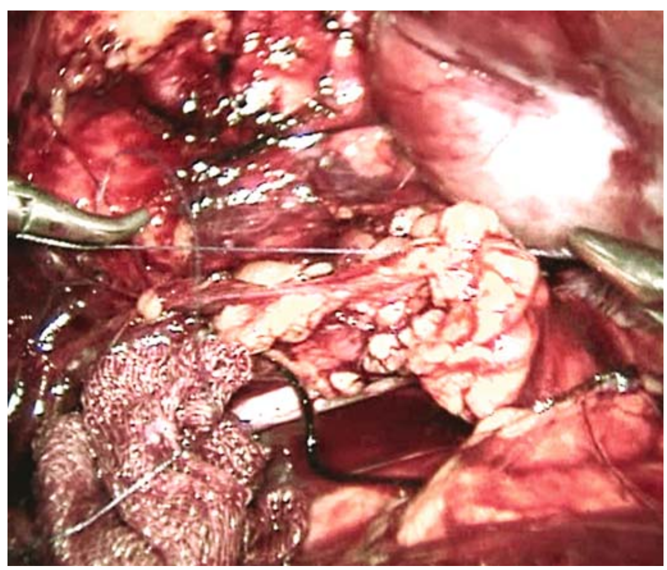


FIG. 5.127. Perirenal fat tacked over the sutural line

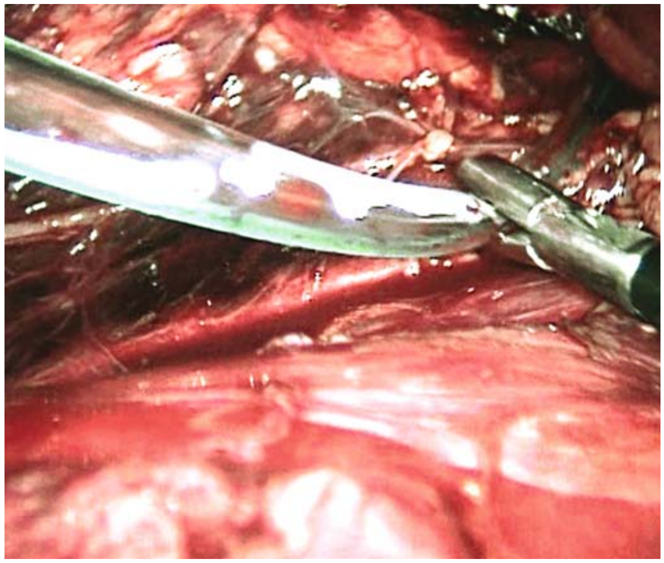


Fig. 5.128. Tube drain is being introduced through the lower anterior port

Retroperitoneoscopic Dismembered Pyeloplasty

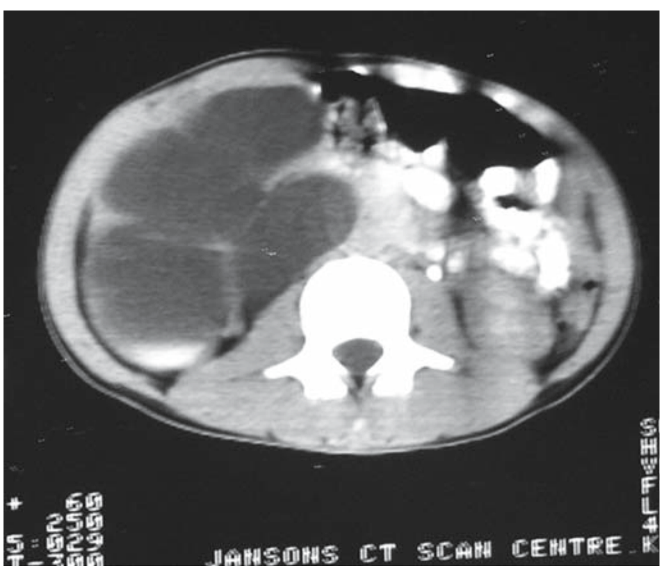


Fig. 5.129. A CT scan shows a large hydronephrotic kidney in a 15-year-old boy

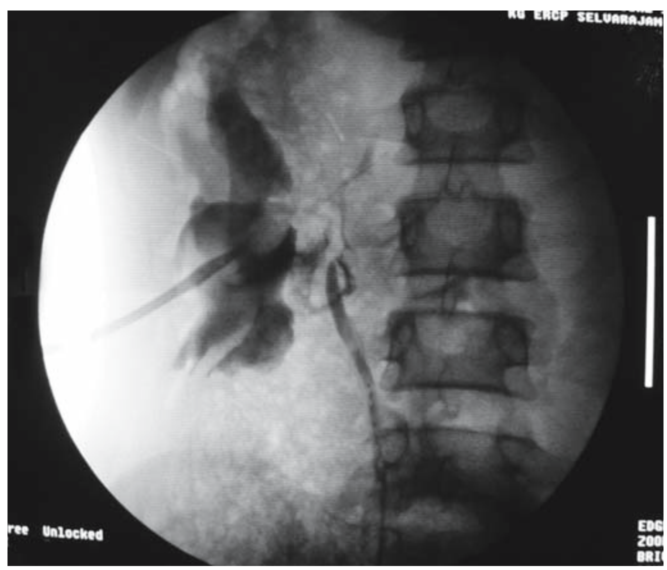


Fig. 5.130. A right RGP confirms UPJ narrowing (note that the patient had a percutaneous nephrostomy (PCN) for impending pyonephrosis 3 weeks earlier)

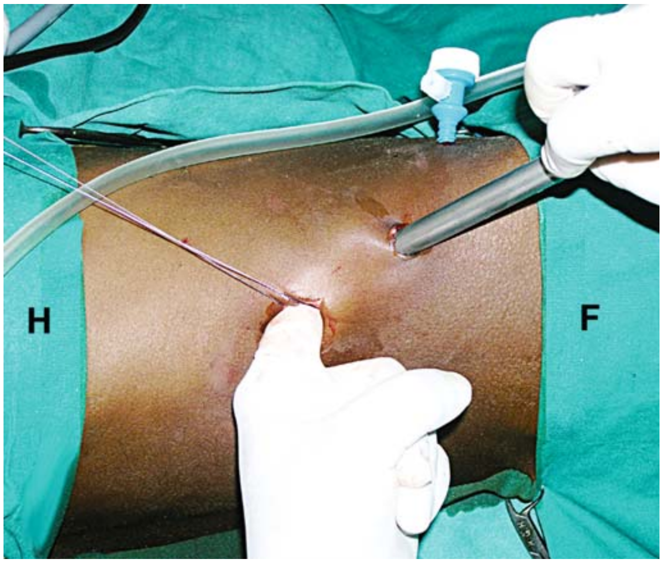


FIG. 5.131. Secondary port insertion using finger guidance

FIG. 5.132. External view of the port positions

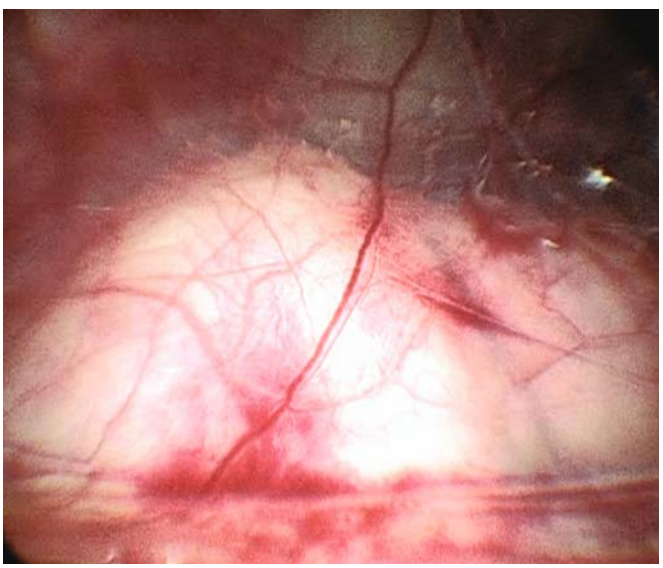


FIG. 5.133. Initial retroperitoneoscopic view of renal bulge

FIG. 5.134. Dissection started from the lower pole in an attempt to identify the pelvis

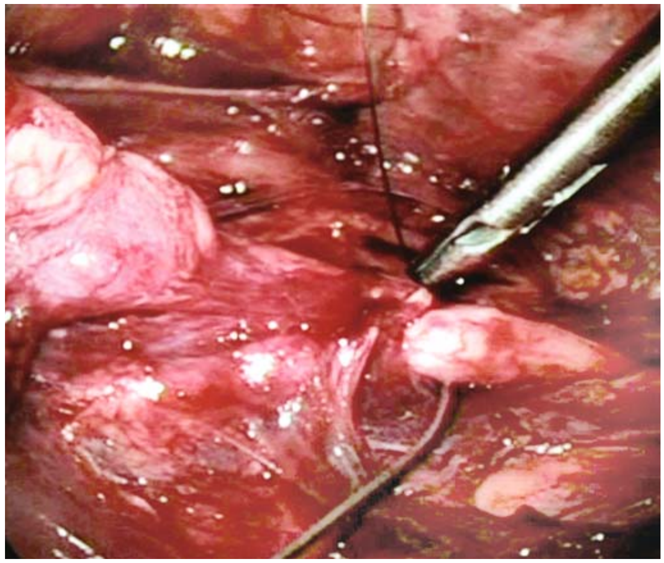
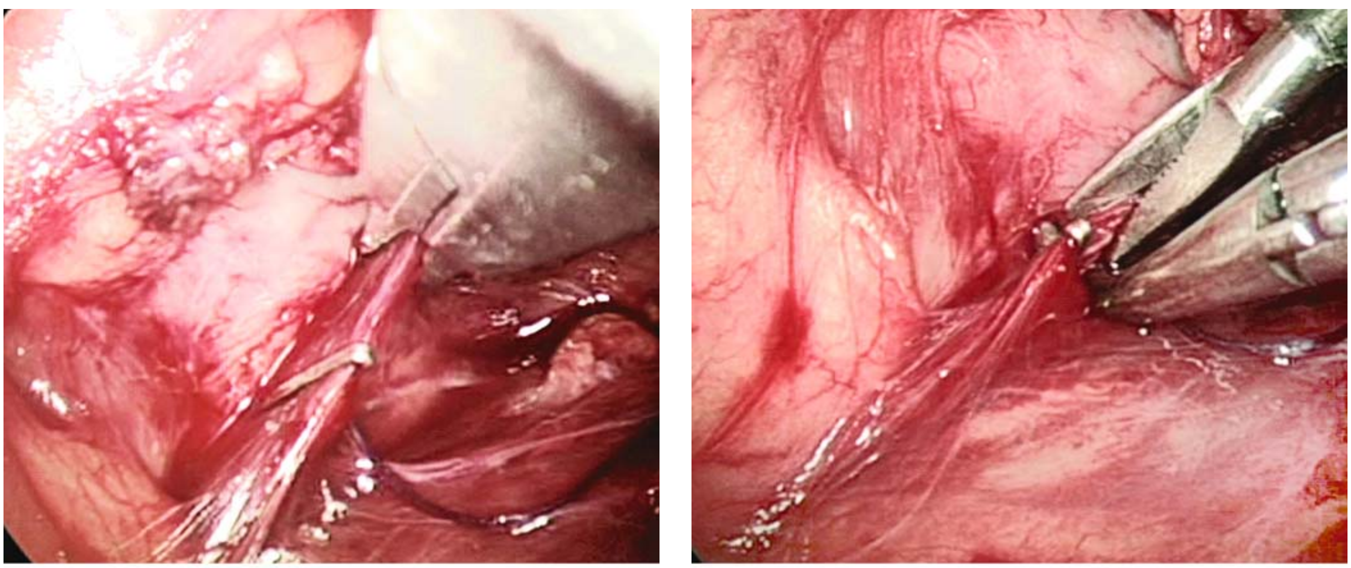


Fig. 5.135. The ureter is mobilized and a sling (monofilament suture) passed around it



A B

Fig. 5.136. The accessory vein may be sacrificed if found

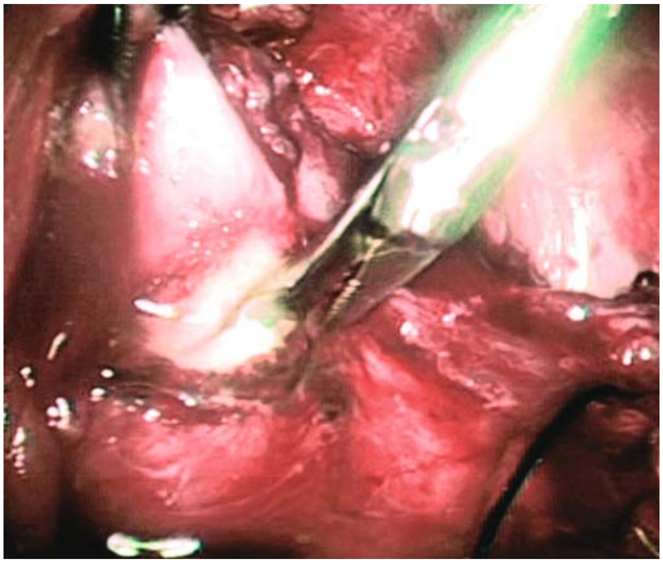


FIG. 5.137. Pyelotomy in progress

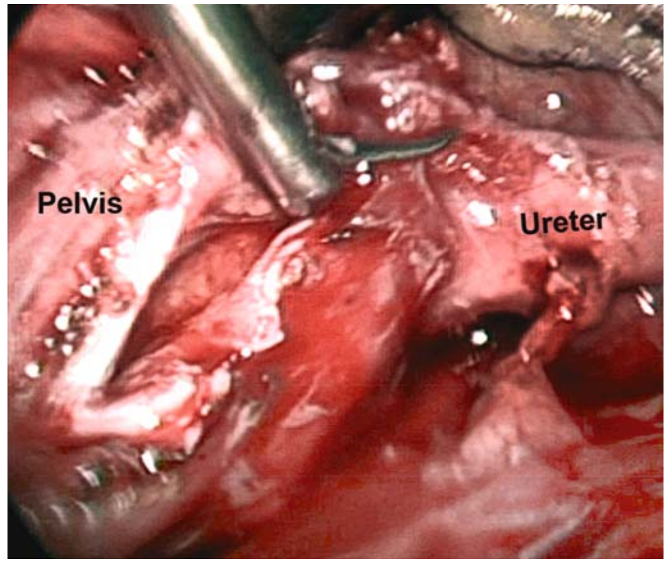
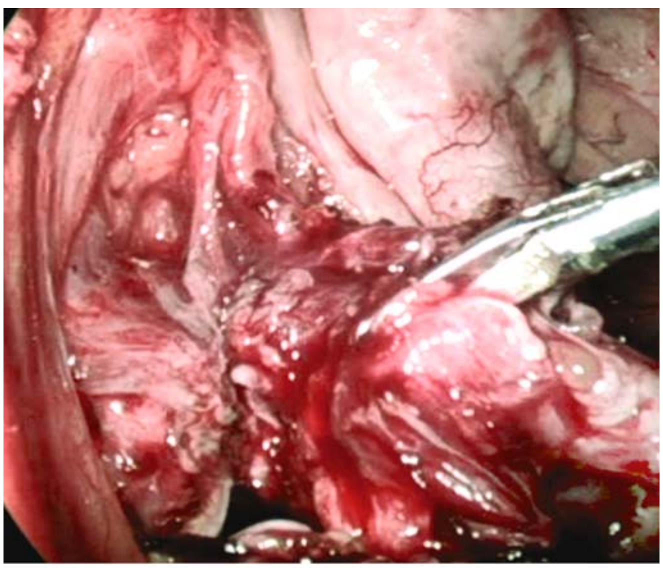
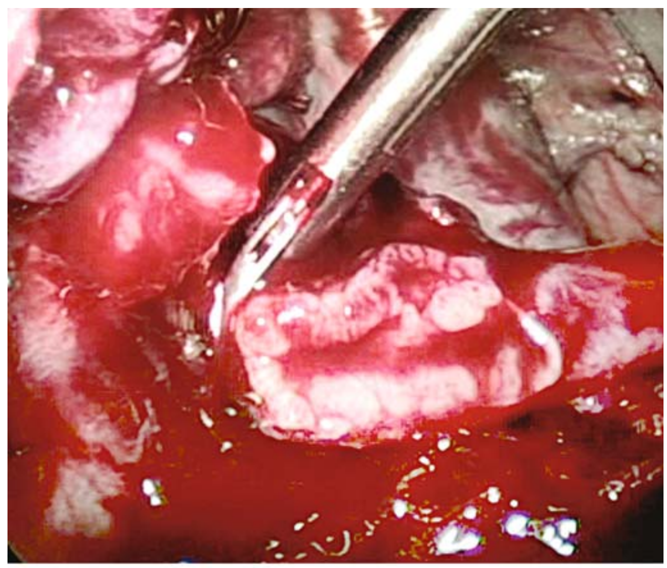


FIG. 5.138. The pyelotomy extended toward a probable UPJ



A



B

FIG. 5.139. Ureterotomy being done on the lateral aspect

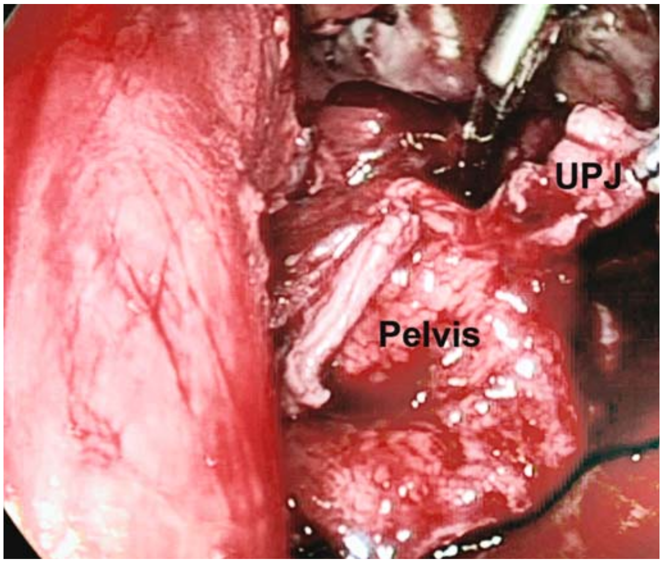


Fig. 5.140. Excision of the UPJ (short and adherent because of prior infection)

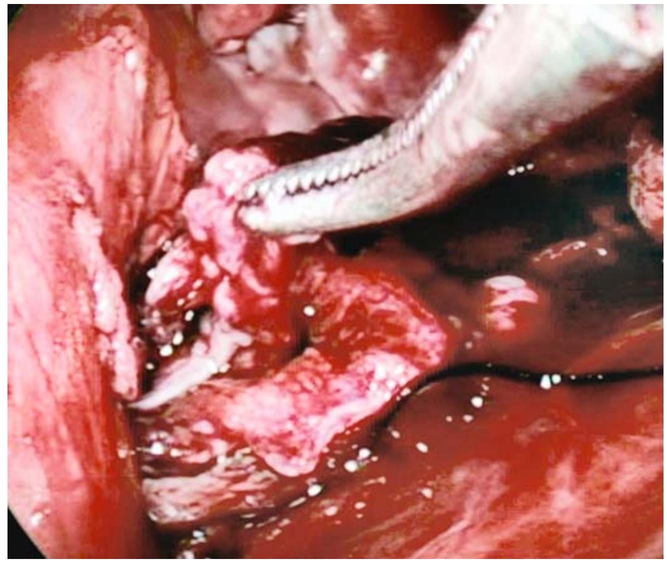


Fig. 5.141. UPJ specimen retrieval

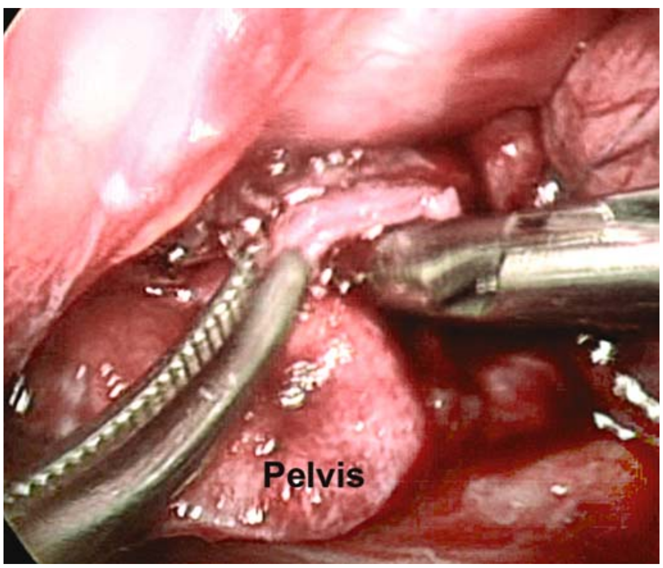


Fig. 5.142. Initial 4-0 Vicryl suture taken outside-in through the posterior edge of the pelvis

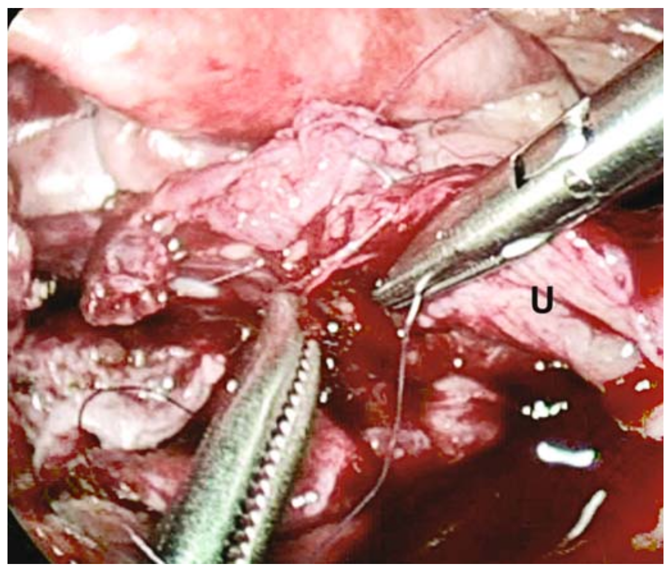
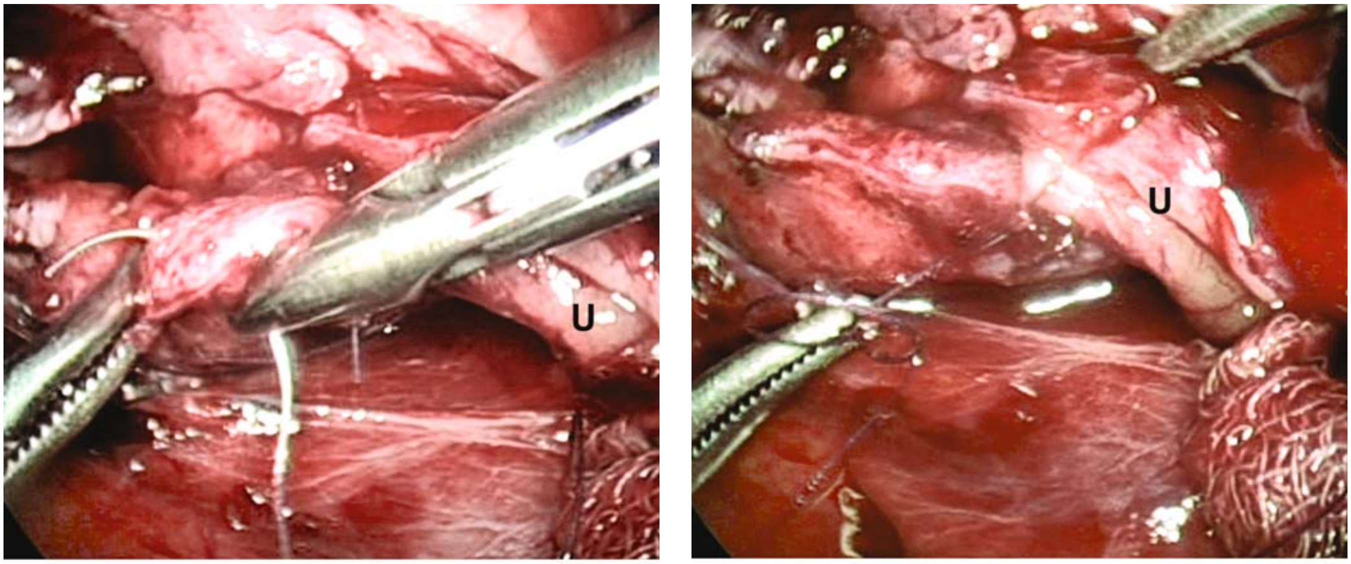
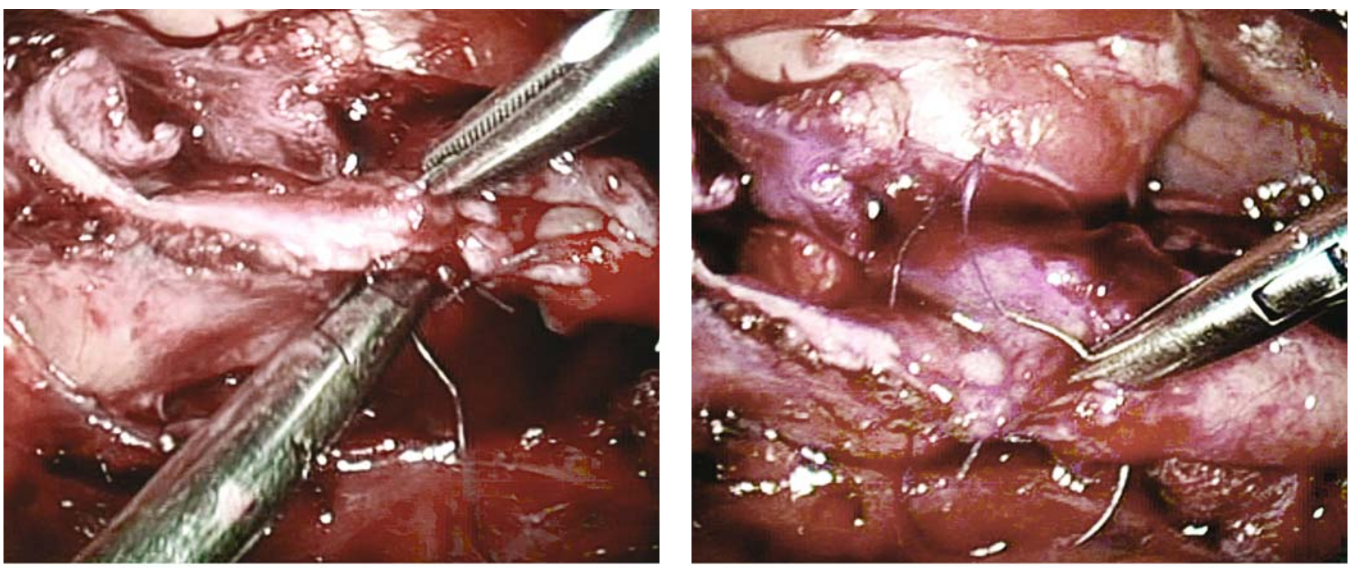


Fig. 5.143. Corresponding suture taken inside-out through the posterior edge of the spatulated ureter (U)



A B

FIG. 5.144. Subsequent interrupted sutures through the posterior edges of the pelvis and ureter (U, spatulated ureter)



A B

FIG. 5.145. Subsequent interrupted sutures through the posterior edges of the pelvis and ureter

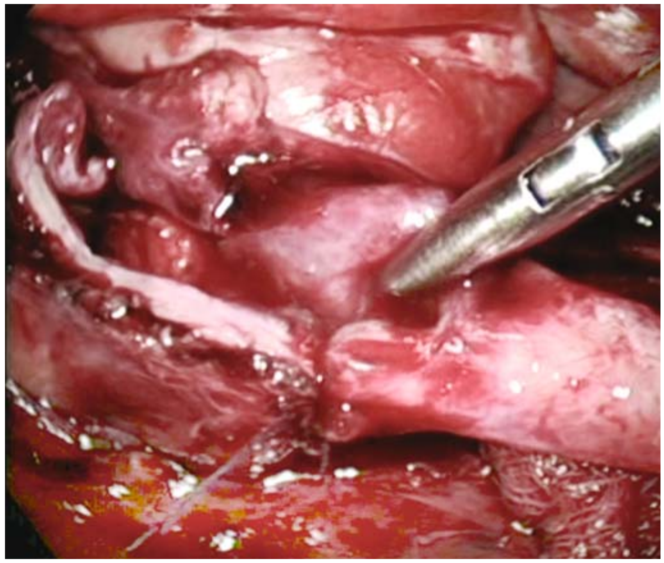
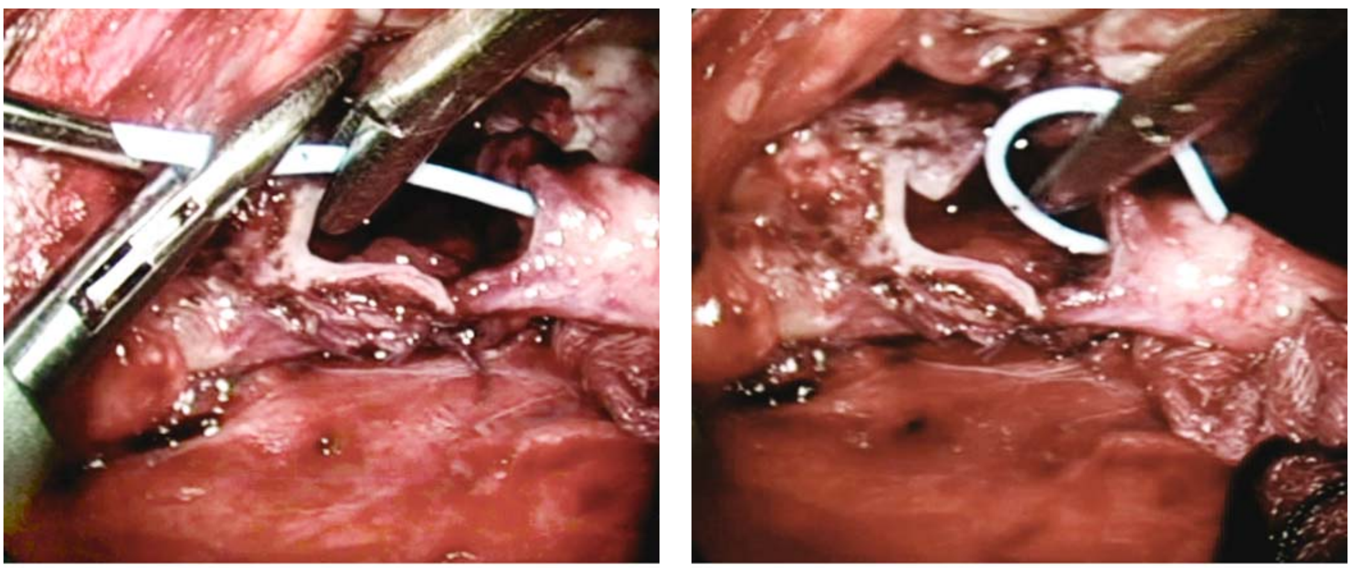
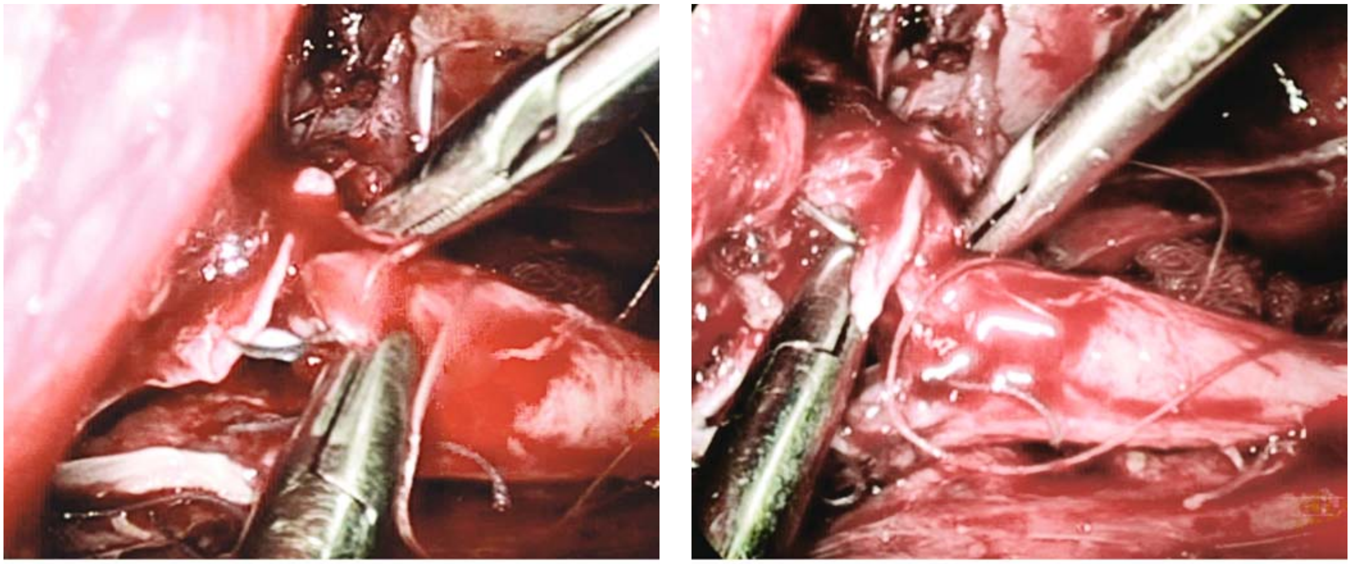


Fig. 5.146. View after completion of the posterior layer



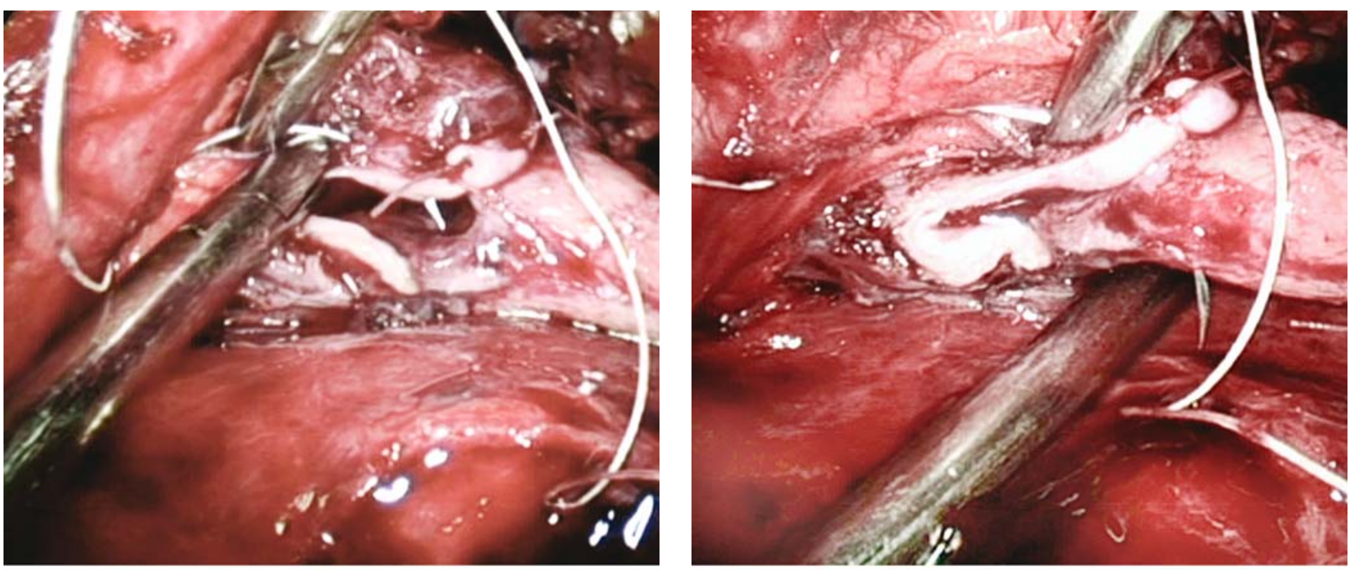
A B

Fig. 5.147. Antegrade advancement of a double pigtail catheter



A B

FIG. 5.148. Subsequently the anterior layer is closed with interrupted sutures



A B

FIG. 5.149. Closure of anterior layer with 4-0 Vicryl is nearly completed

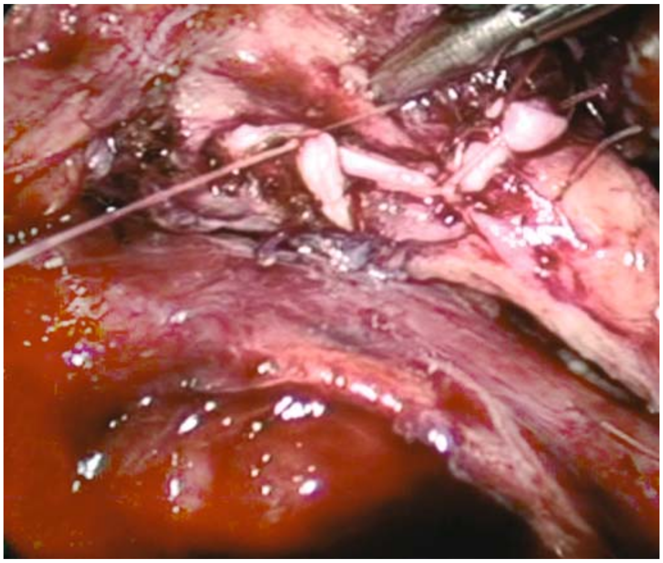


Fig. 5.150. Pyelotomy closure

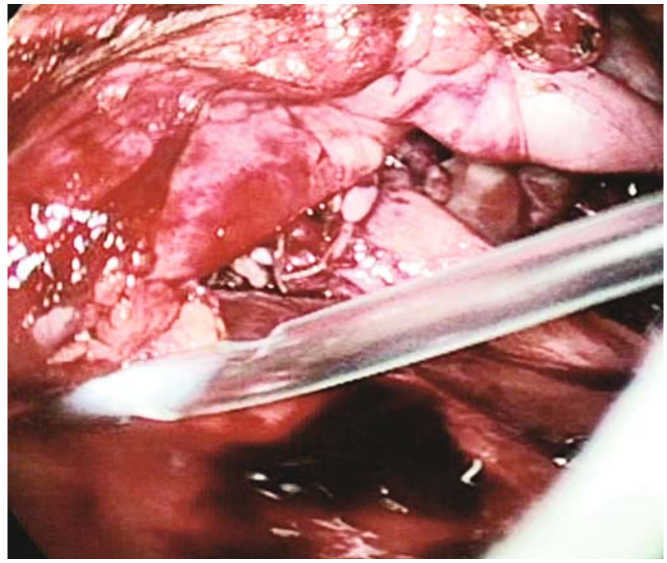


Fig. 5.151. Tube drain is introduced through one of the 5-mm ports

Problems and Solutions

Ureteropelvic Junction Obstruction with Secondary Calculi

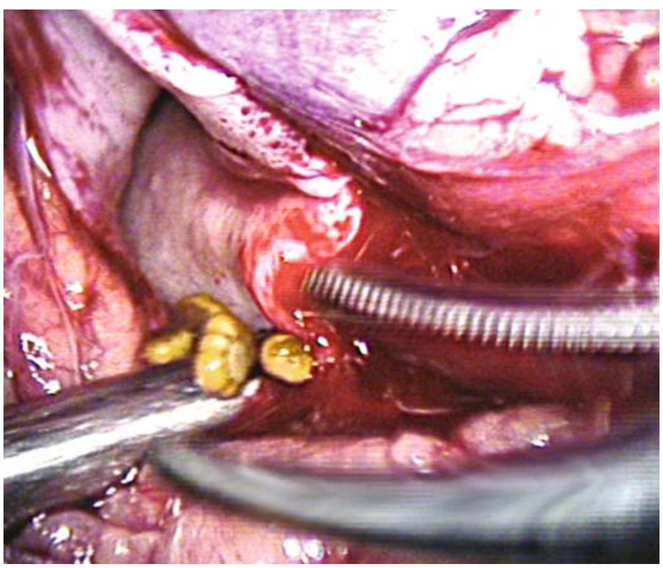


Fig. 5.152. After a pyelotomy, secondary stones can be retrieved using a grasper

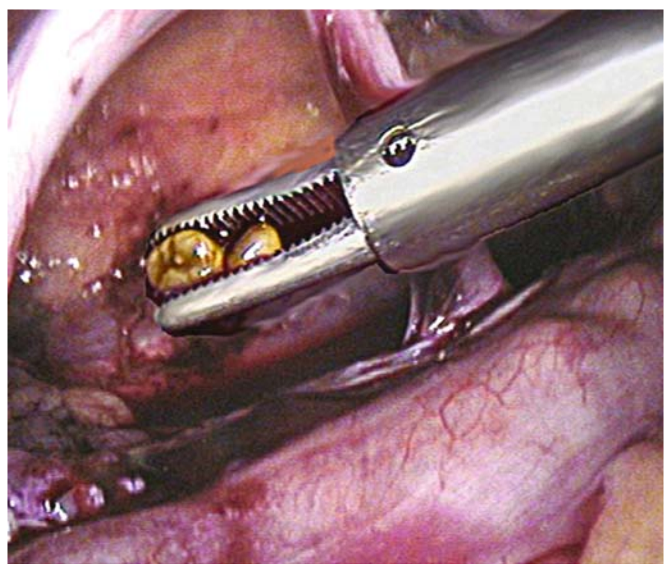


Fig. 5.153. Stone retrieval through a 10-mm port

FIG. 5.154. External view of flexinephroscope introduction through a 10-mm port (to retrieve stones that migrate into the calyx)

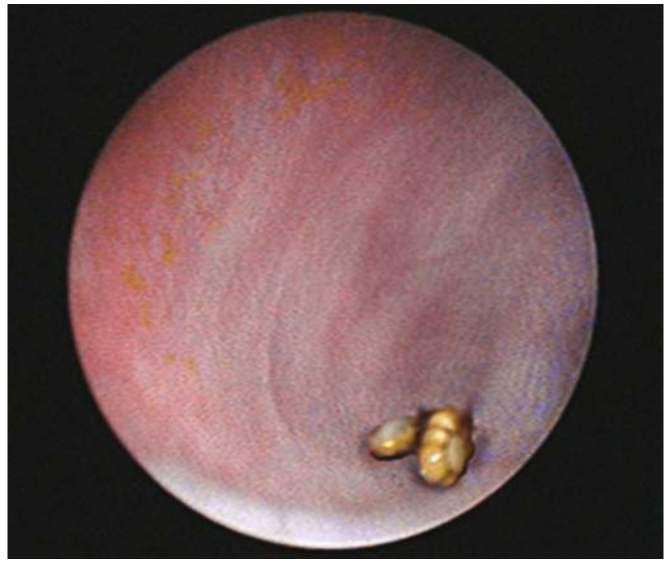


FIG. 5.155. Nephroscopic view of secondary stones that can be basketed out

Redo Laparoscopic Pyeloplasty (in Failed Open Pyeloplasty)

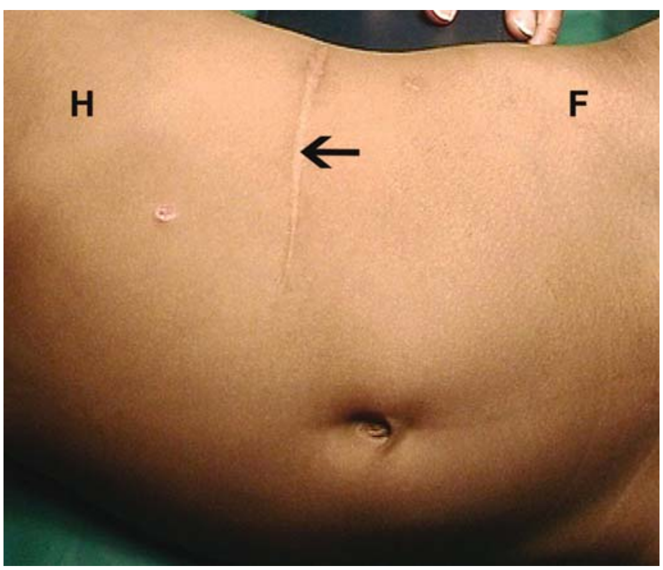


FIG. 5.156. Patient position: 45-degree lateral tilt (loin scar is seen)

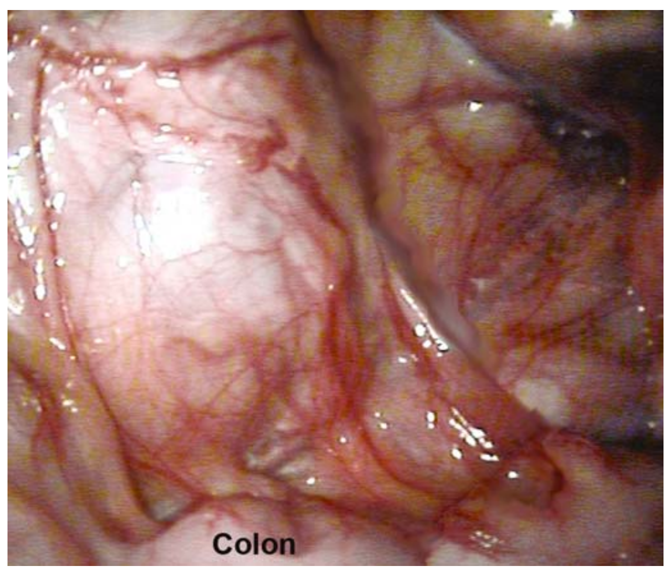


FIG. 5.157. Initial view of a left renal bulge

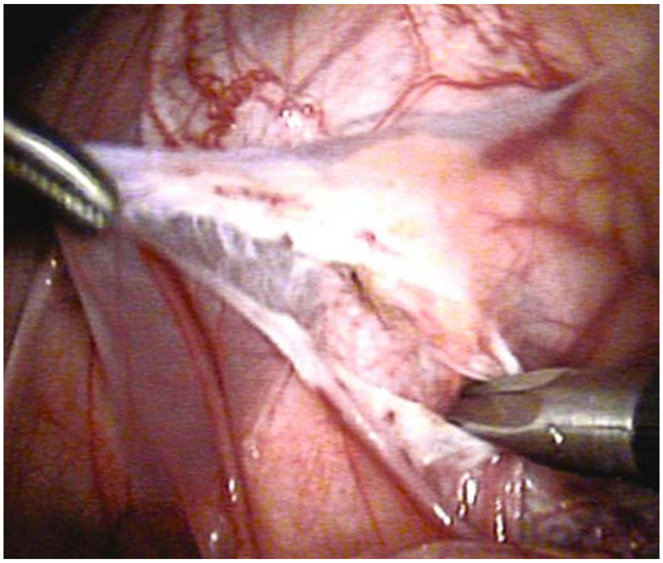


Fig. 5.158. Colonic mobilization in progress

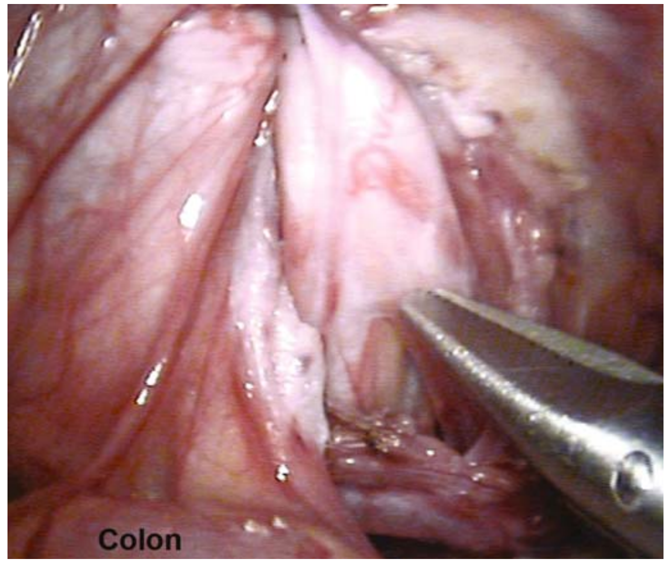


Fig. 5.159. Dissection is started from the lower pole of the kidney to avoid dissecting in a scarred area initially

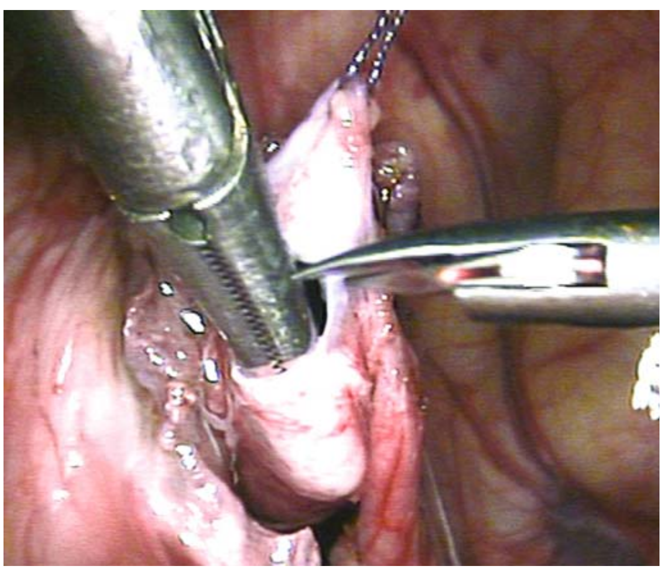


Fig. 5.160. Pyelotomy in progress

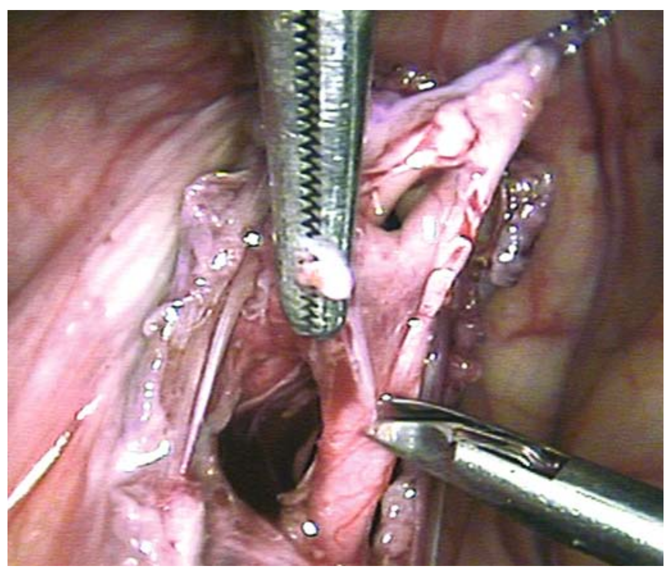


Fig. 5.161. Spatulation of the ureter in a scarred UPJ (a stay in pelvis is seen); mobilization of the ureter and pelvis may be minimized

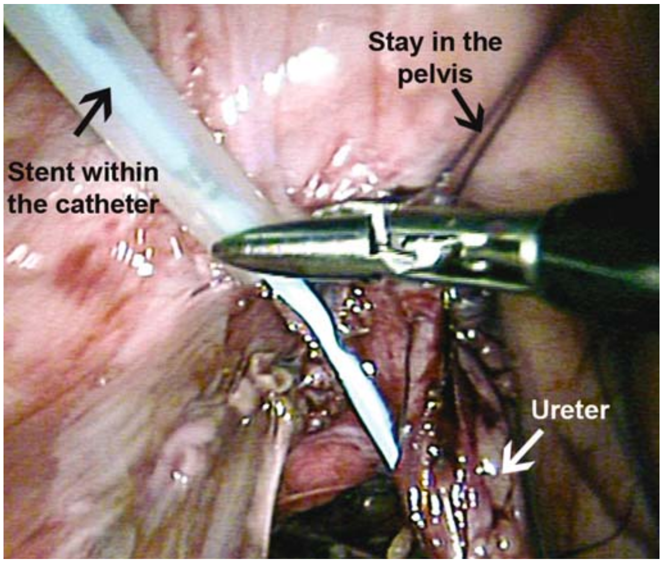


FIG. 5.162. Antegrade stent advancement (stent passed through a 14-French catheter to prevent pneumo leak)

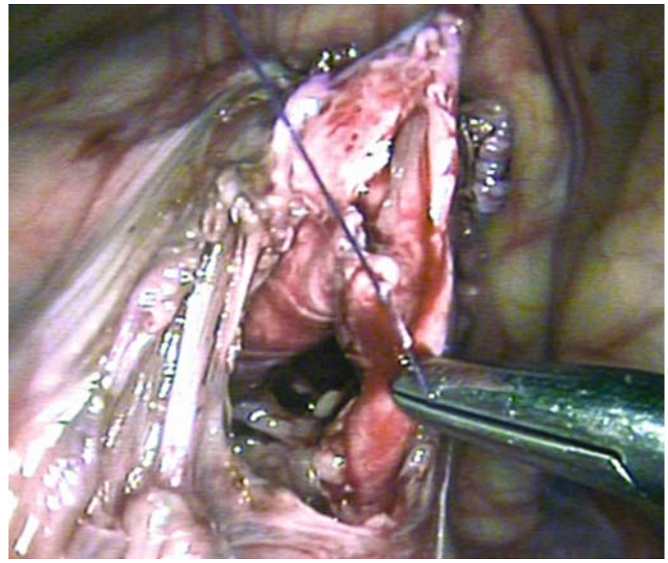


FIG. 5.163. Suturing in progress

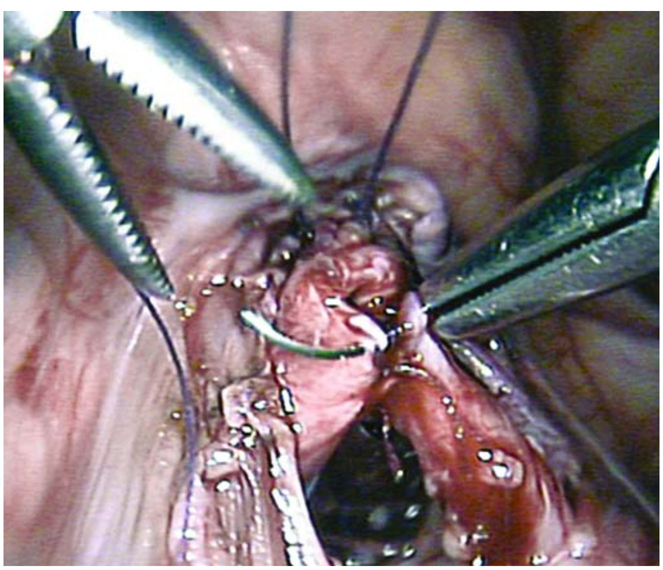


FIG. 5.164. Dismembering should be avoided if possible (as it can result in circumferential scar, as before)

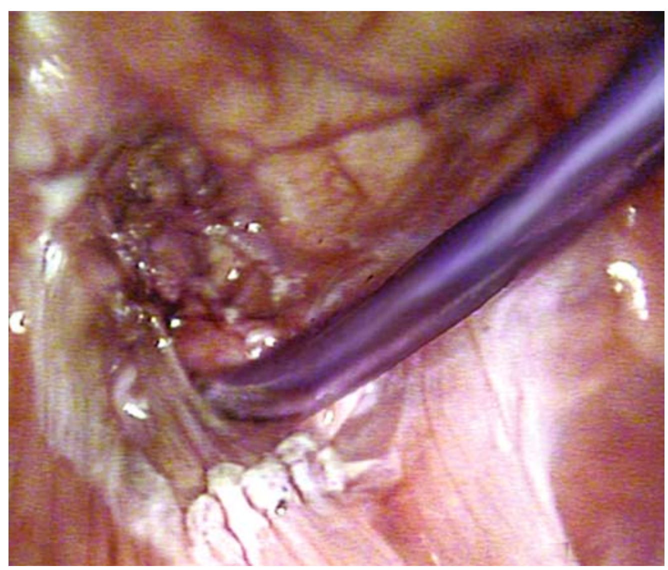


FIG. 5.165. Tube drain at the level of the UPJ

Vessel Crossing the Ureteropelvic Junction

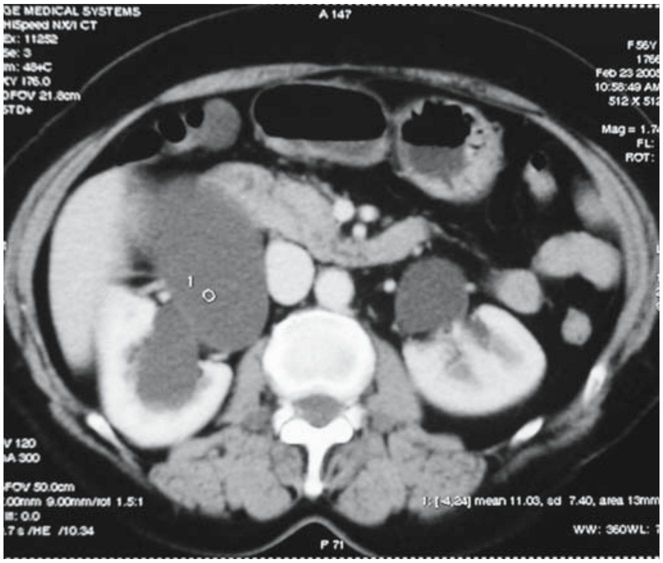


FIG. 5.166. A CT scan reveals a malrotated right kidney with pyelocaliectasis and a doubtful UPJ narrowing on the left side

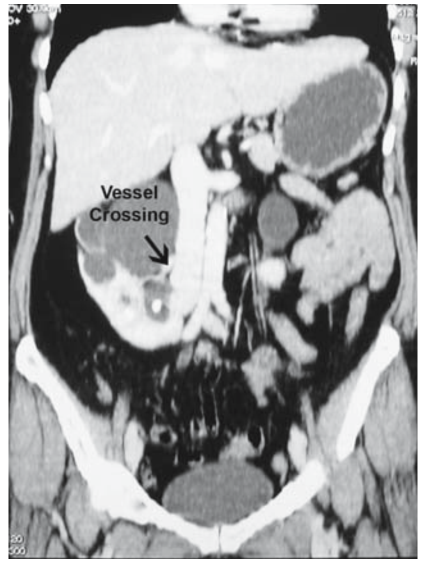


FIG. 5.167. A spiral CT scan shows a lower polar vessel crossing the ureter on the right side

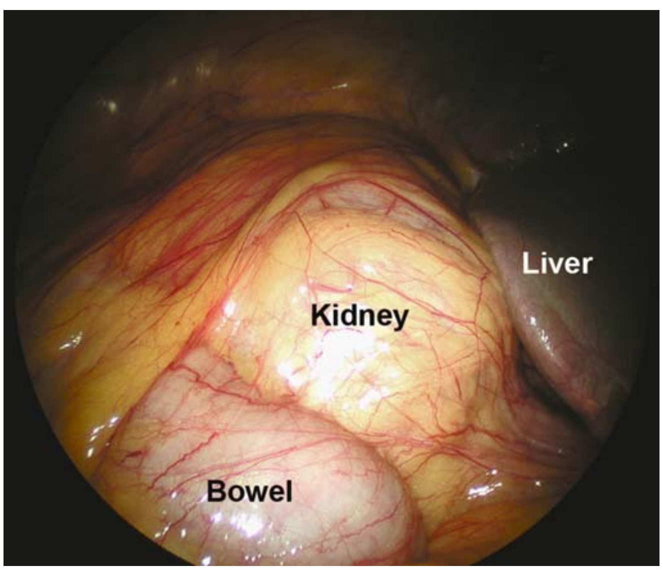


FIG. 5.168. Laparoscopic view of the bulge of the right kidney

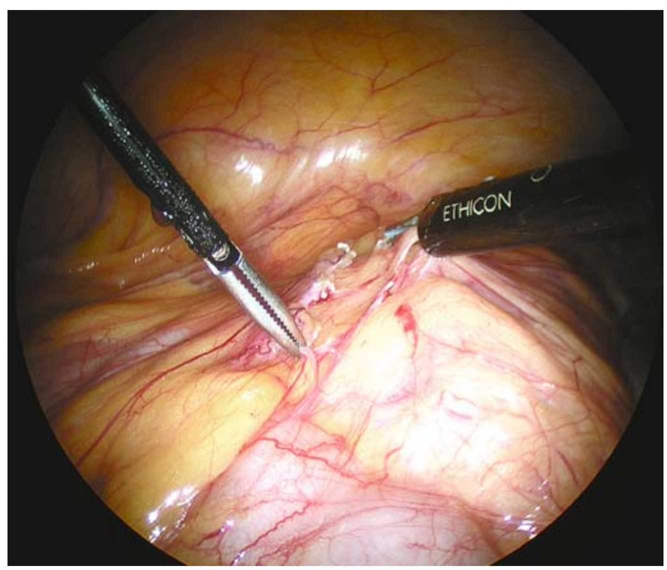


FIG. 5.169. Mobilization of the hepatic flexure of the colon

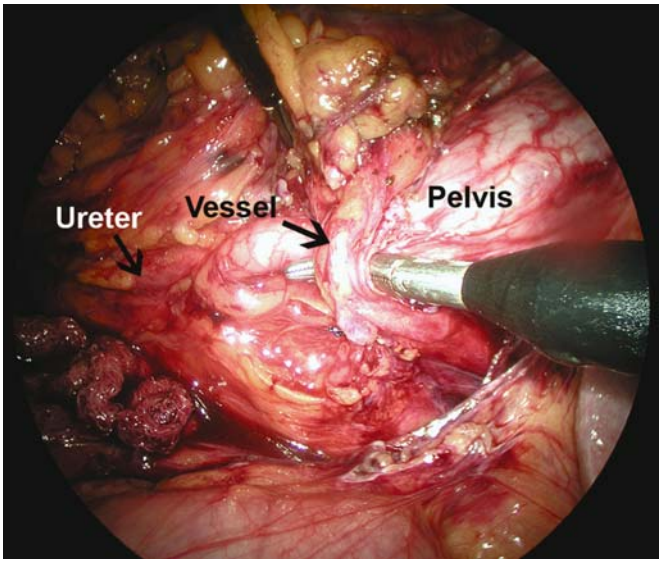


FIG. 5.170. Vessel crossing the UPJ; in this situation it is preferable to mobilize the ureter off the crossing vessel in preparation for a dismembered pyeloplasty

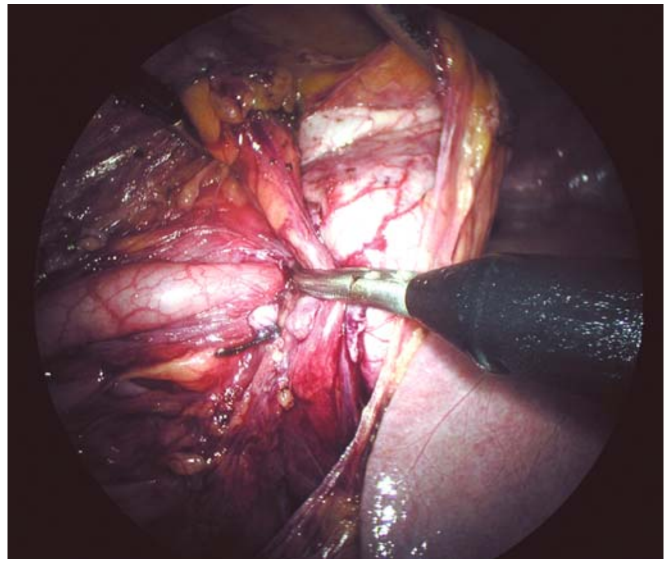


FIG. 5.171. Mobilization of the ureter

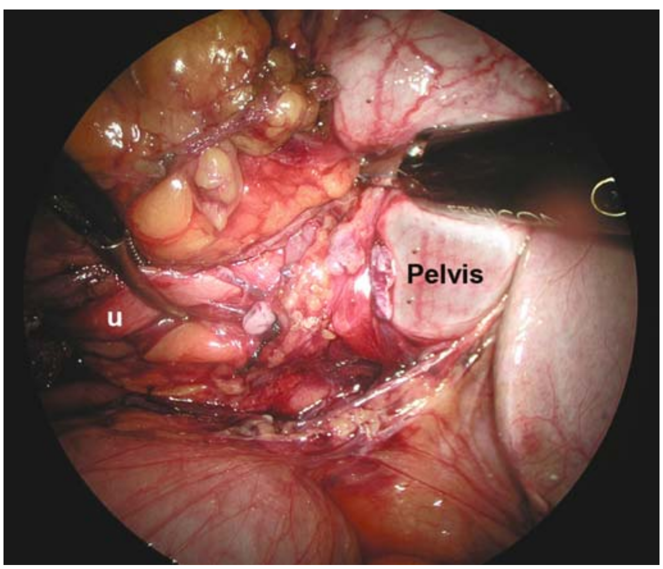


FIG. 5.172. An attempt of transpositioning the crossing vessel to a higher level does not decompress the pelvis (after a diuretic); hence, a dismembered pyeloplasty is done (U, ureter)

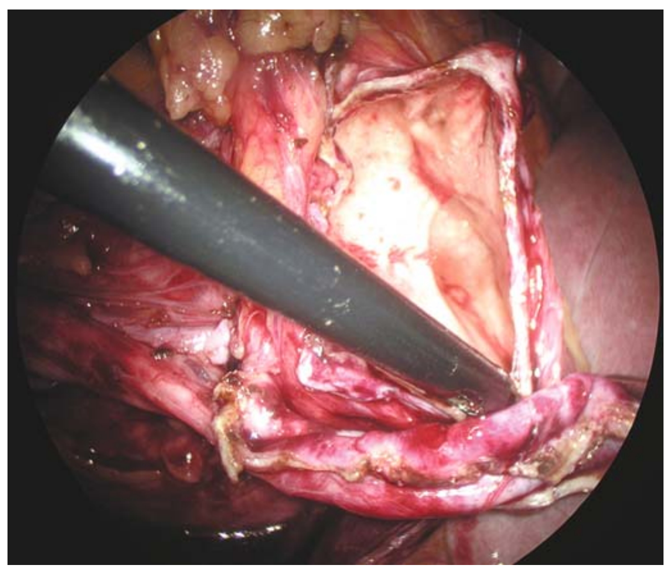


FIG. 5.173. Pyelotomy in progress

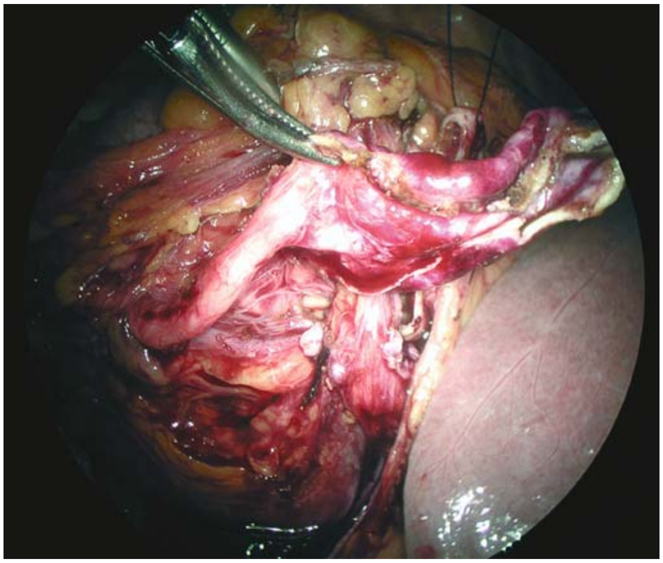


Fig. 5.174. Transpositioning the UPJ along with the redundant pelvis (by pulling caudally)

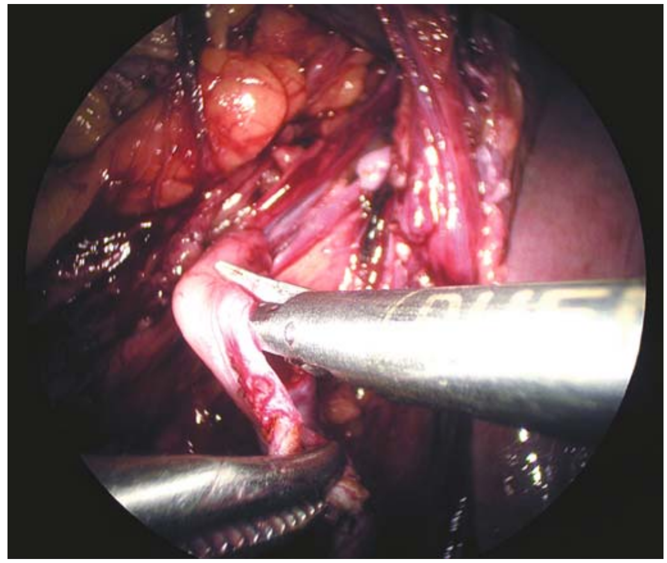


Fig. 5.175. A spatulating ureter on the lateral aspect

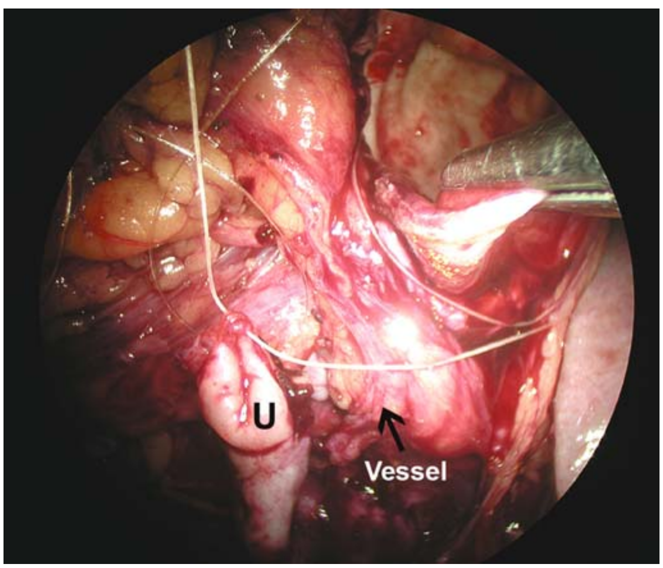


Fig. 5.176. An apical suture through the ureter with 4-0 Vicryl (U, spatulated ureter)

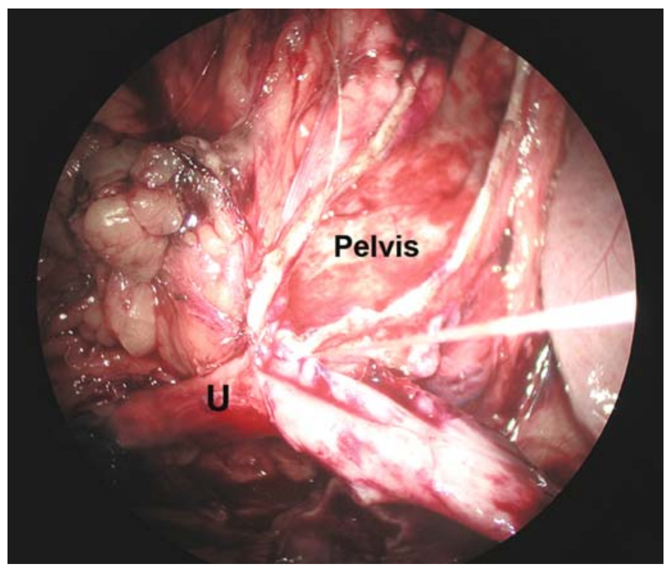


Fig. 5.177. Posterior layer suturing (continuous 4-0 Vicryl) (U, ureter)

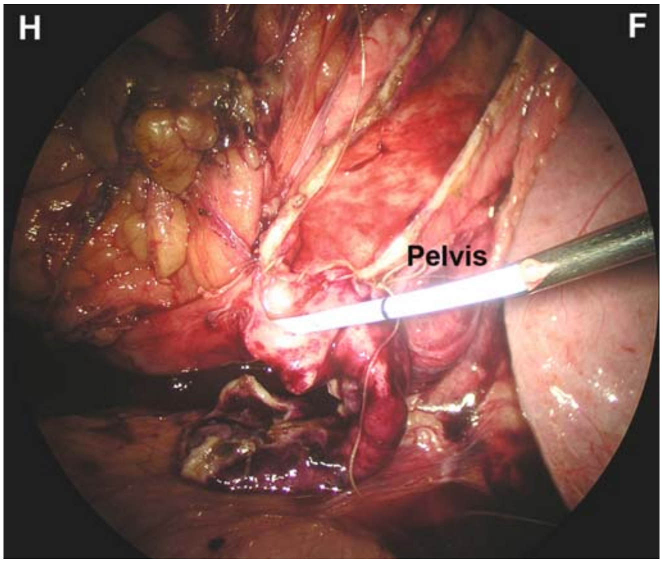


FIG. 5.178. Antegrade stent advancement

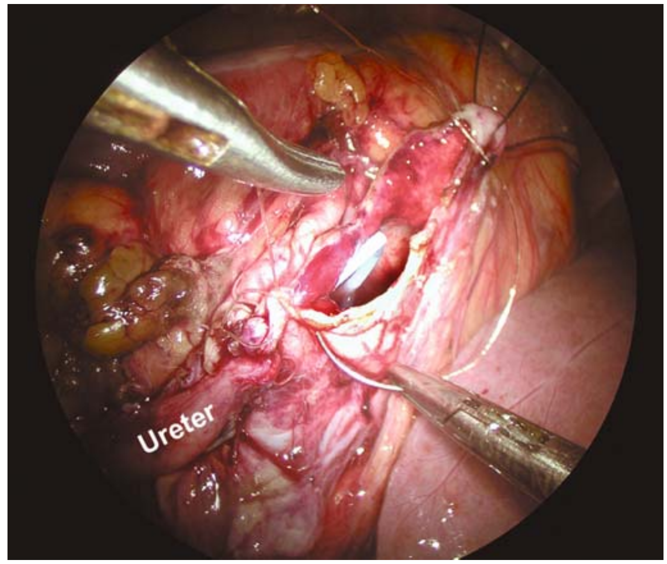


FIG. 5.179. Suturing anterior layer (stent seen within the pelvis)

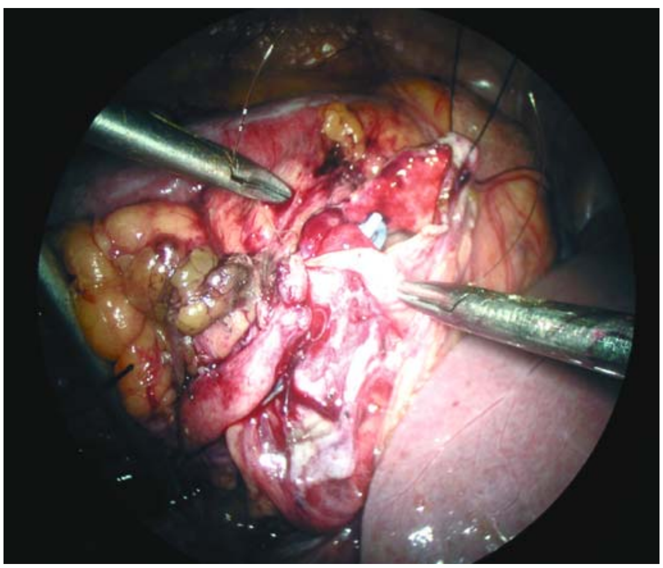


FIG. 5.180. Pyelotomy closure in progress

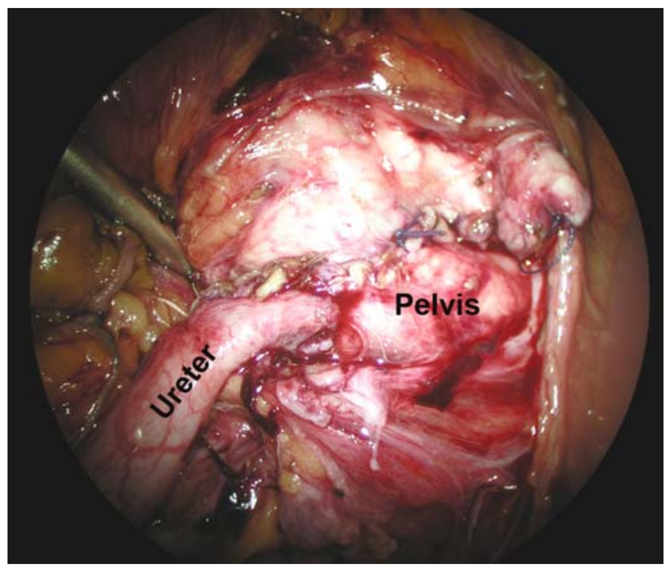
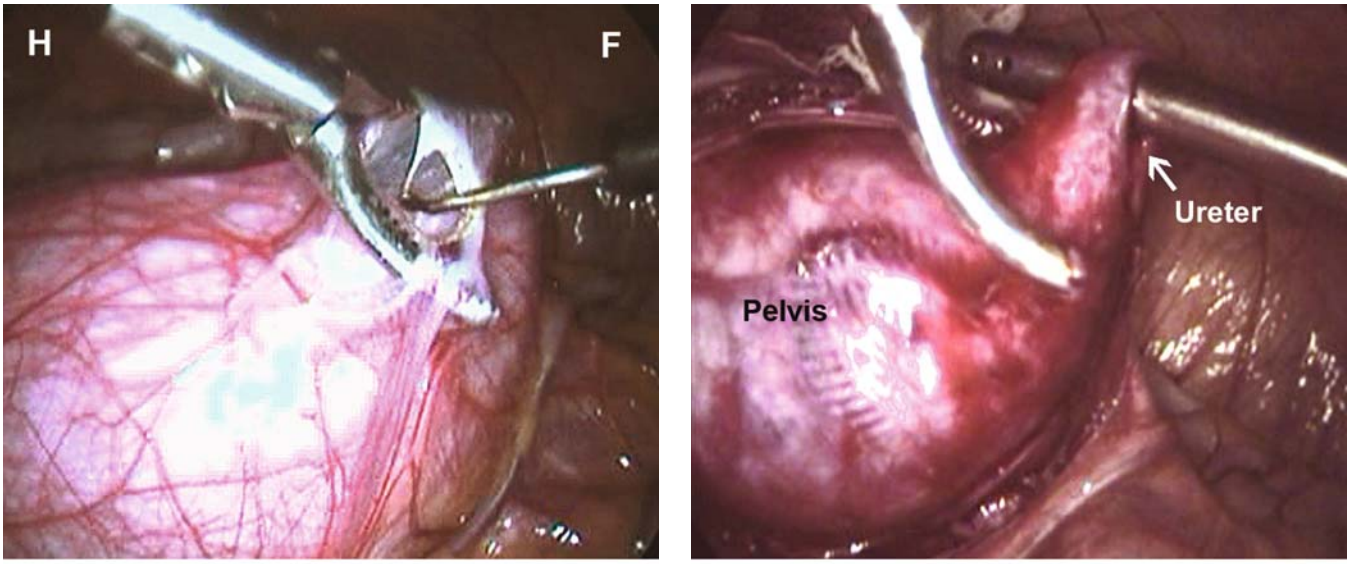


FIG. 5.181. Completed view of pyeloplasty

Ureteropelvic Junction with Infected Hydronephrosis



A B

FIG. 5.182. Pyeloplasty in a child with a left UPJ obstruction with recurrent urinary tract infection (UTI) in progress

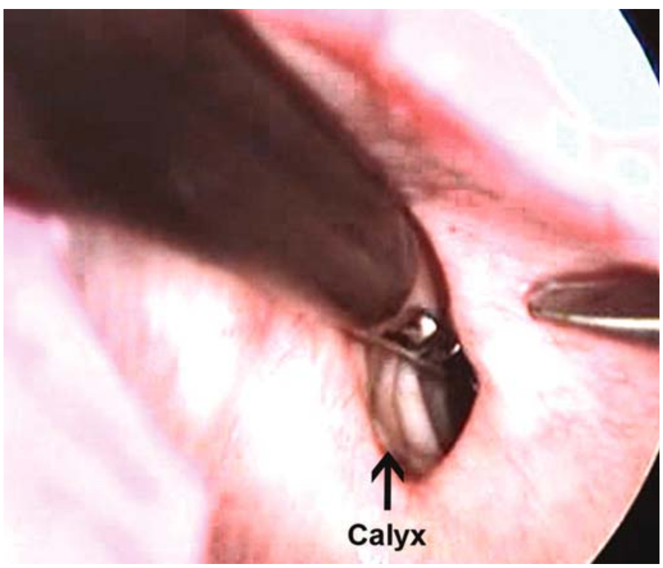


FIG. 5.183. In an infected system a nephrostomy is preferable; a dissector is advanced through one of the calices to exit in the flank

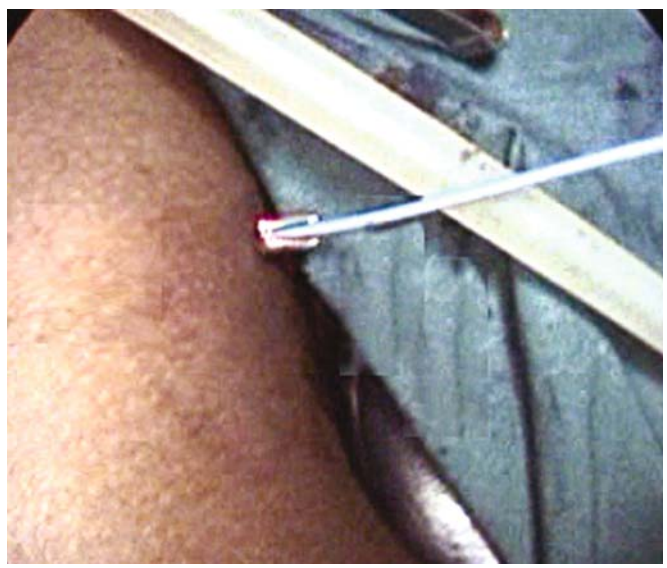


FIG. 5.184. Tip of a dissector maneuvered toward the flank to pick up the nephrostomy catheter

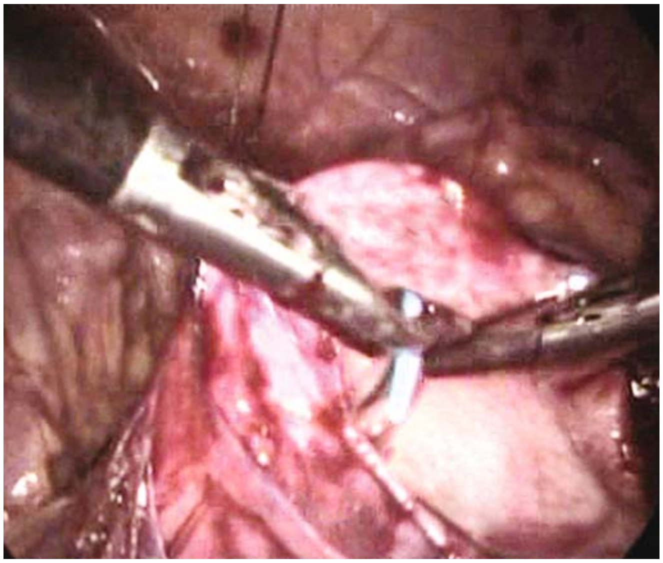


FIG. 5.185. A nephrostomy catheter brought inside the pelvis

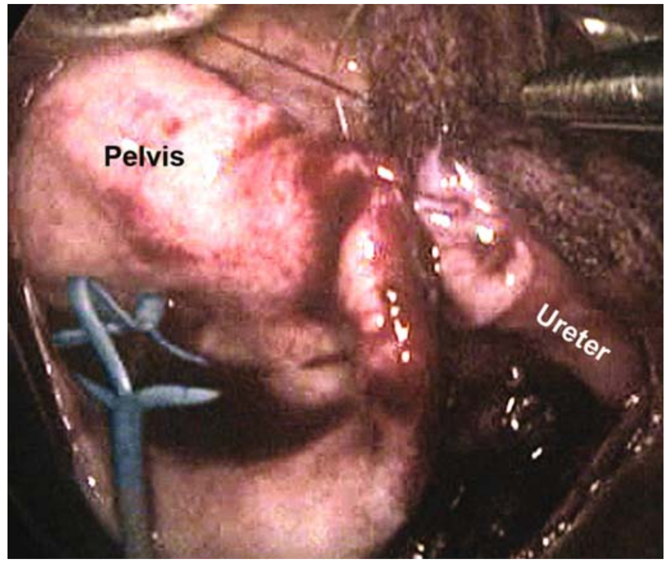


FIG. 5.186. Subsequently the posterior layer is sutured

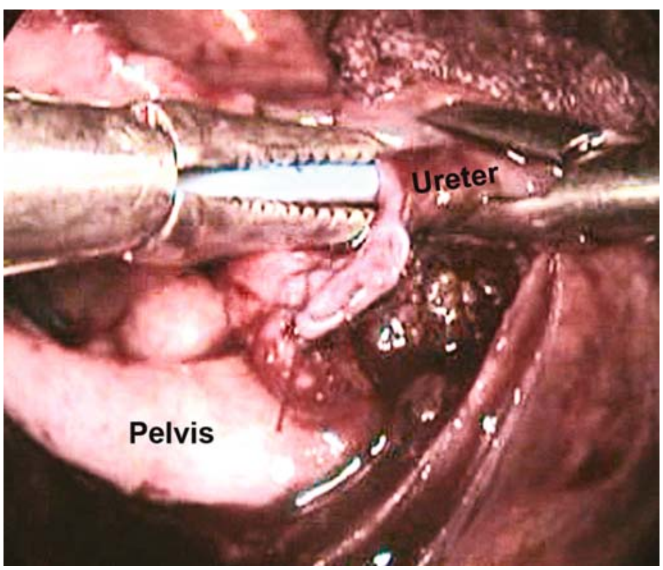


FIG. 5.187. The ureteric component of Cummings stent passed antegrade

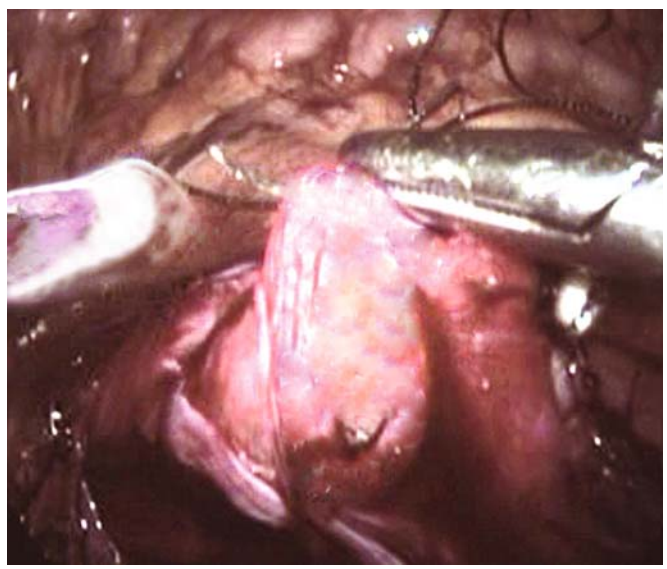


FIG. 5.188. The rest of the pyeloplasty is completed as usual

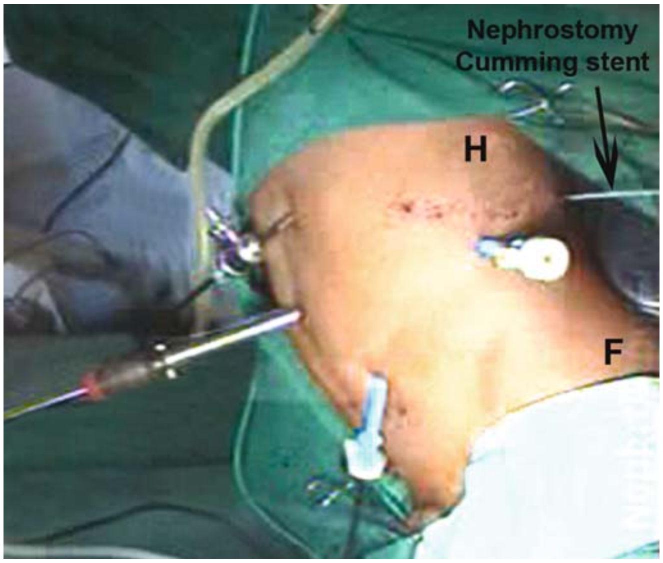


FIG. 5.189. The stent exiting through the flank

FIG. 5.190. A postoperative nephrostogram does not show any extravasation

Difficulties in Antegrade Stenting

FIG. 5.191. An IVU of a left UPJ obstruction

FIG. 5.192. An RGP shows high insertion of the ureter

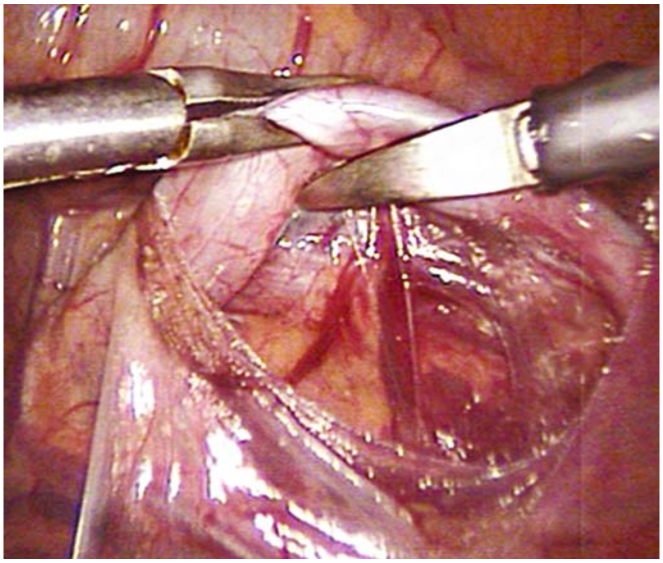


Fig. 5.193. Laparoscopic view of ureteric mobilization

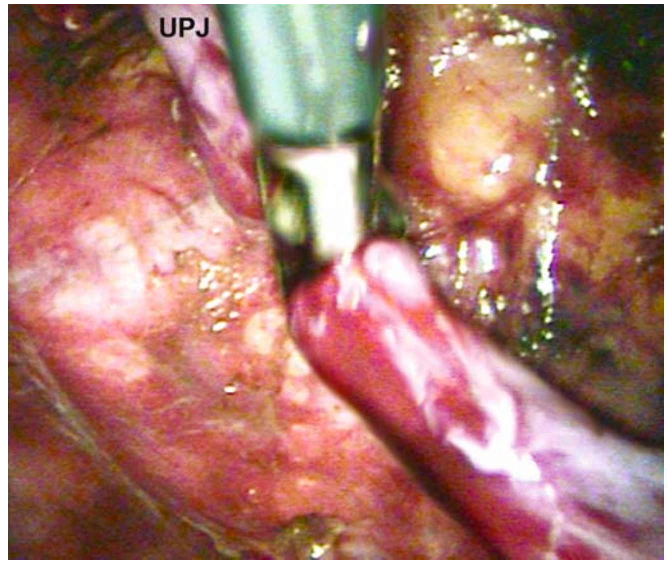


Fig. 5.194. Excision of the UPJ

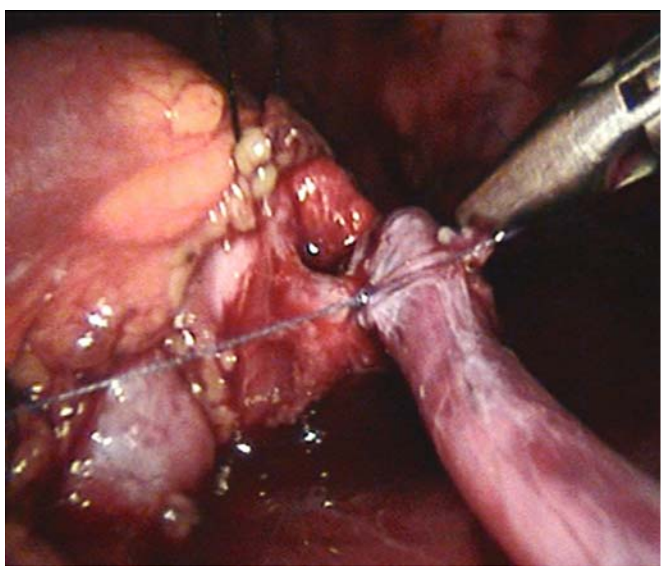


Fig. 5.195. The angle of insertion of the stent is not in alignment with the subcostal trocar due to which stenting is difficult

Antegrade Stenting Using a Ureteroscope

FIG. 5.196. External view of a ureteroscope introduced through the left subcostal port to place the guidewire down the ureter

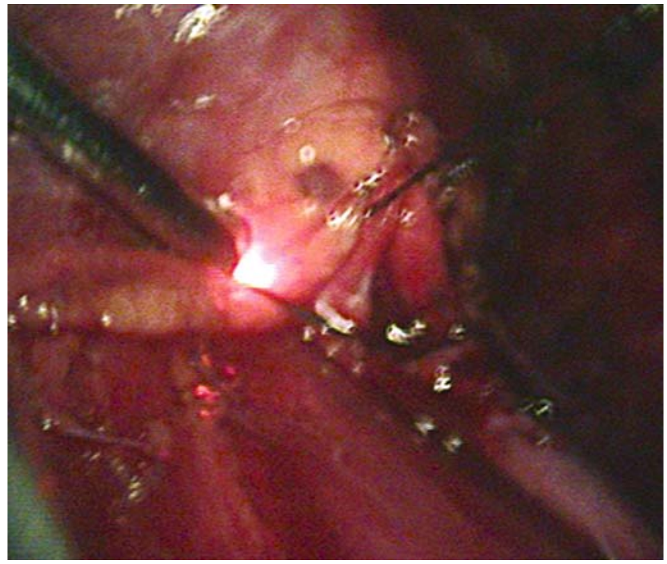


FIG. 5.197. Endo view of a ureteroscope introduced through the left subcostal port to place the guidewire down the ureter

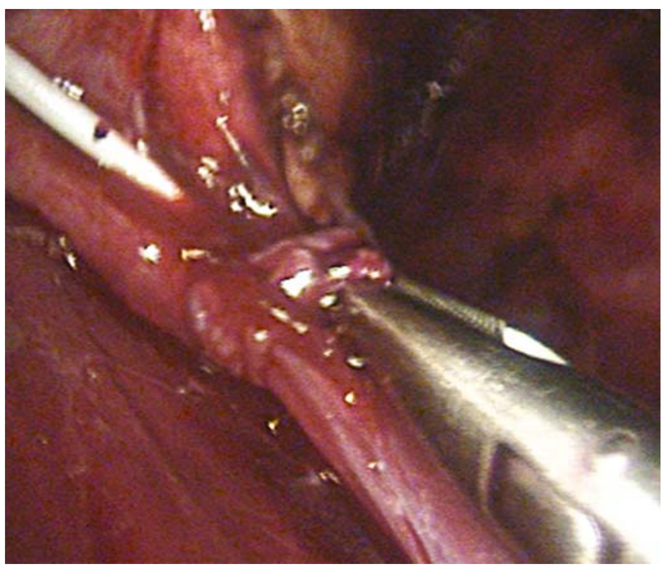
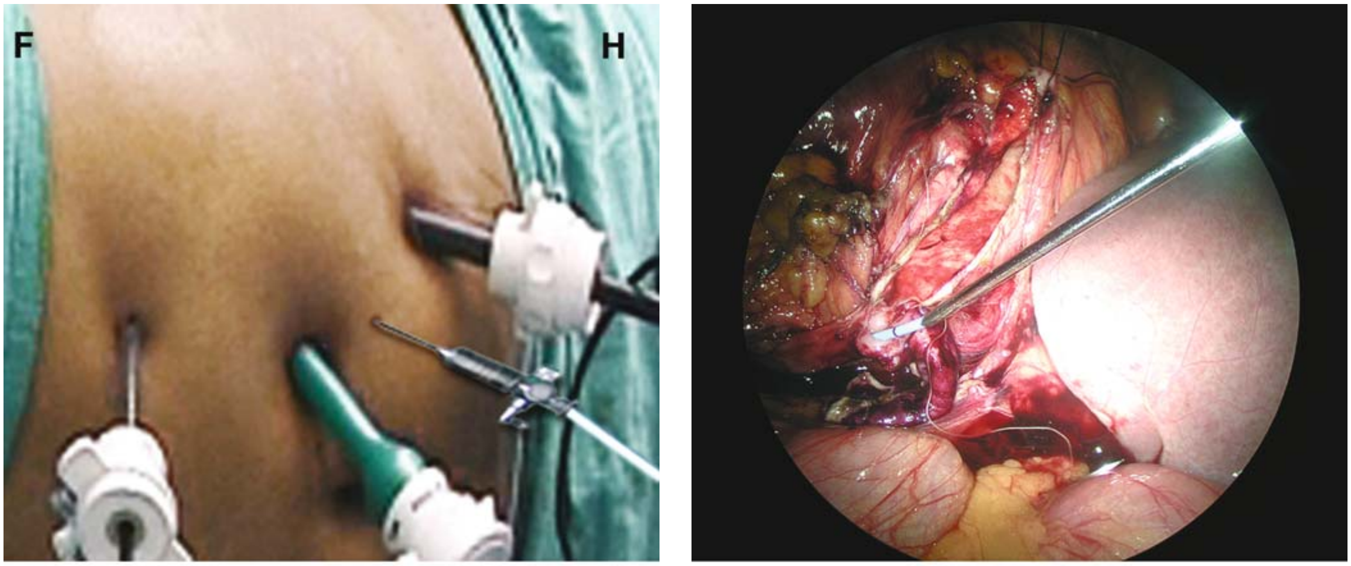


FIG. 5.198. Stent advanced over the guidewire

Antegrade Stenting Through a Veress Needle



A B

Fig. 5.199. Antegrade stent advancement percutaneously through the outer sheath of a Veress needle (both external and endo view in another case of right pyeloplasty)

Horseshoe Kidney with Ureteropelvic Junction

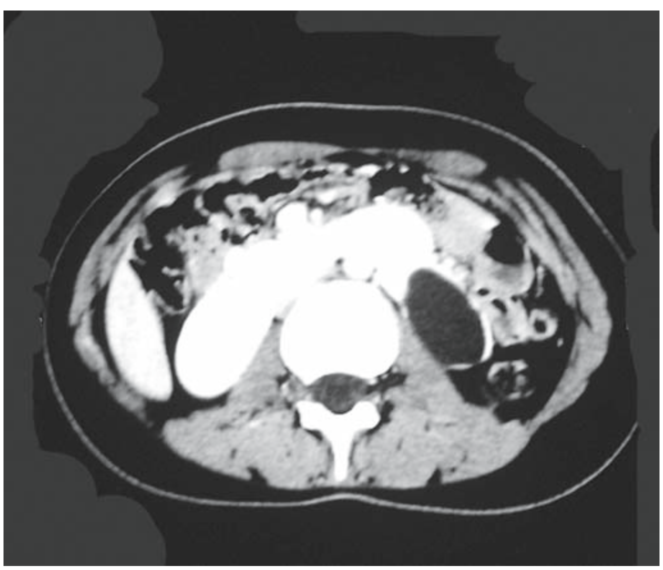


Fig. 5.200. A CT scan shows a horseshoe kidney with a very thick isthmus and left moiety UPJ obstruction

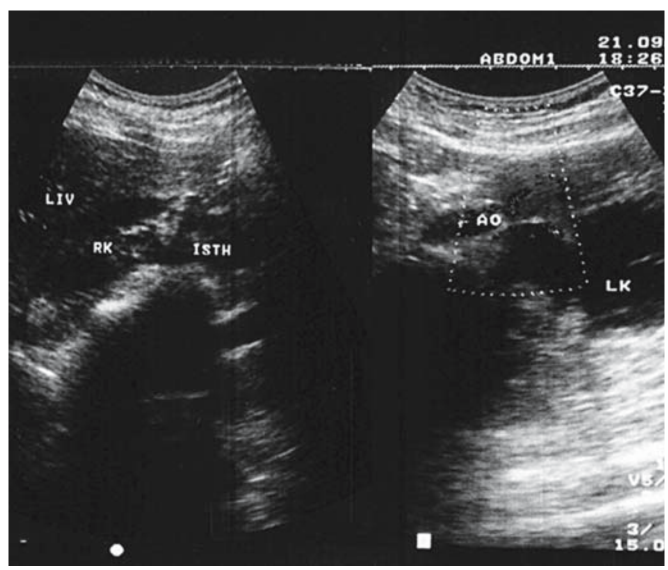


Fig. 5.201. Ultrasound scan shows a horseshoe kidney with very thick isthmus and left moiety UPJ obstruction

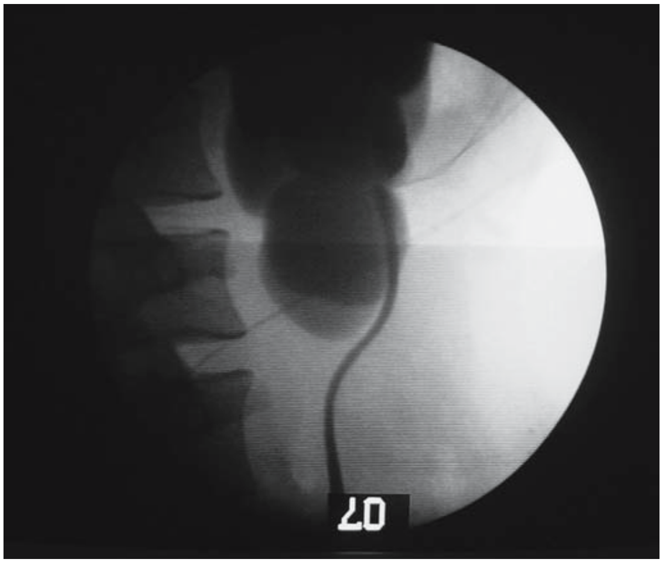


Fig. 5.202. A left RGP shows a nondependent UPJ and narrowing

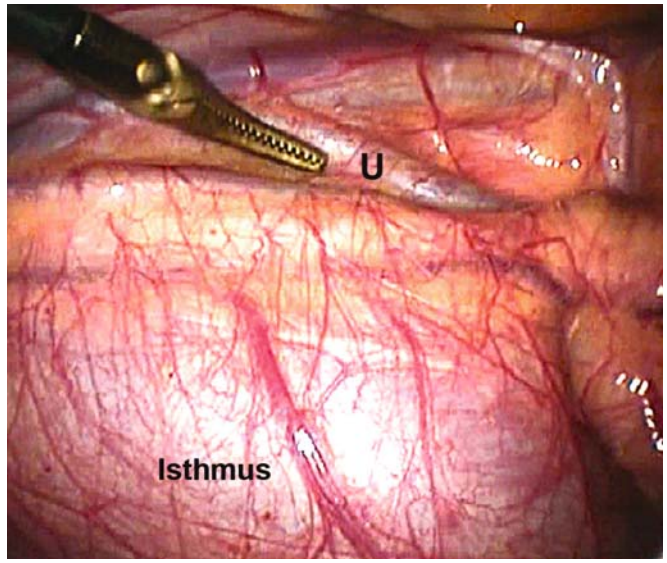


Fig. 5.203. Initial laparoscopic view shows a thick isthmus and left moiety ureter as seen through the left mesocolon (U, ureter)

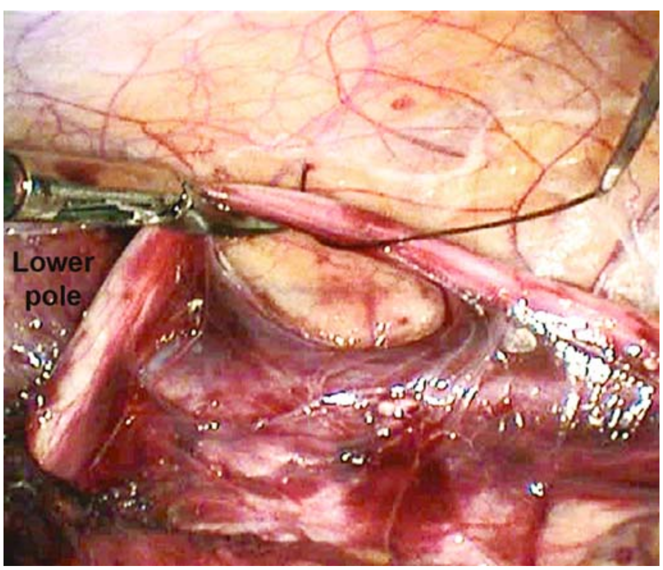


Fig. 5.204. Ureter being isolated; the lower pole of obstructed moiety is also seen bulging; note the sling passed around the ureter

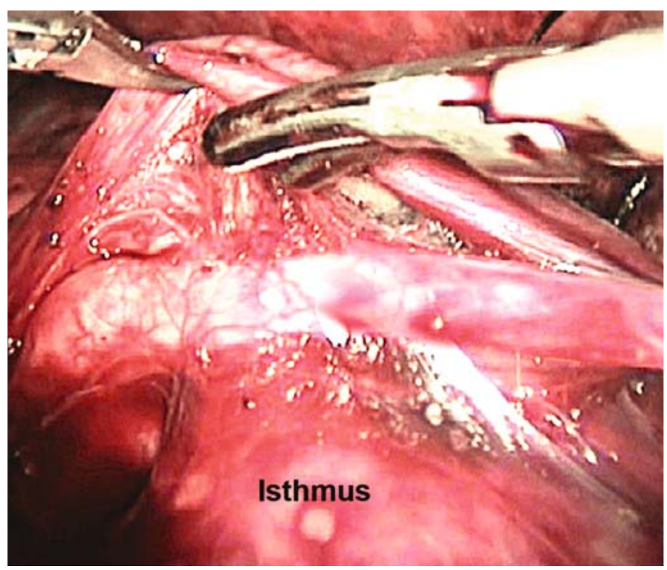


Fig. 5.205. Isolation of the UPJ

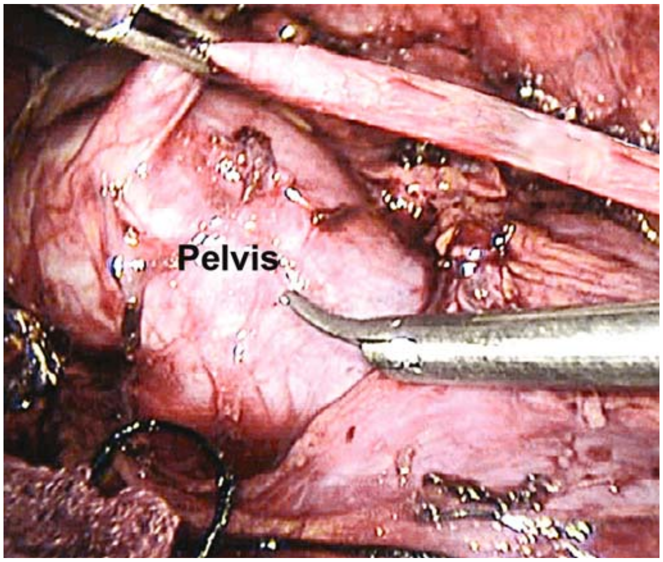


FIG. 5.206. Isolation of the UPJ

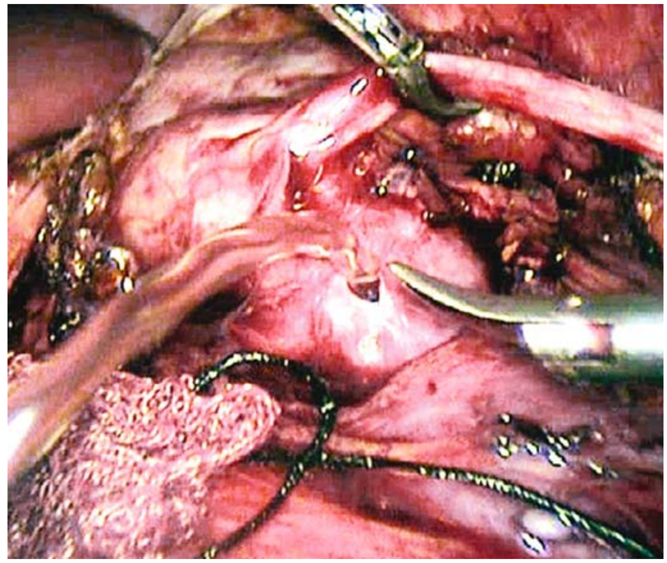


FIG. 5.207. A pyelotomy made in a dependent area

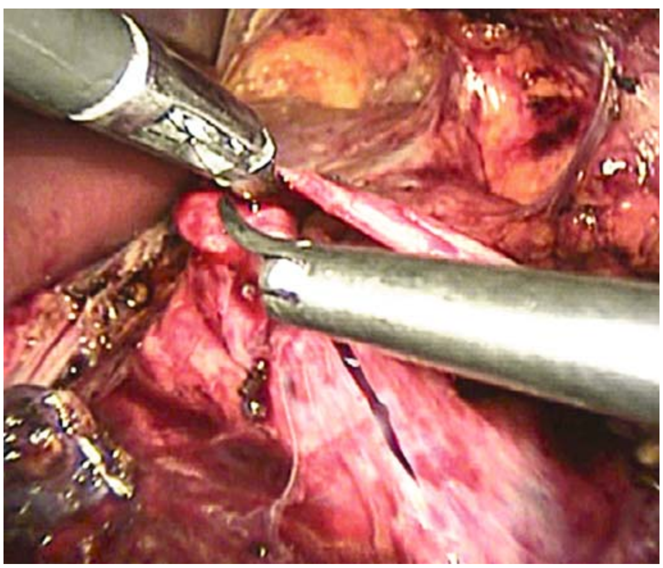


FIG. 5.208. A pyelotomy extended toward the UPJ in preparation for a Fenger plasty

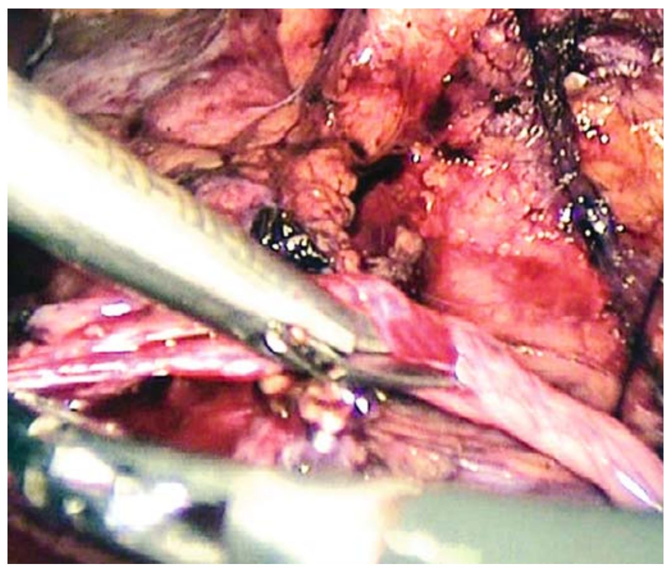


FIG. 5.209. A ureterotomy of adequate length is made

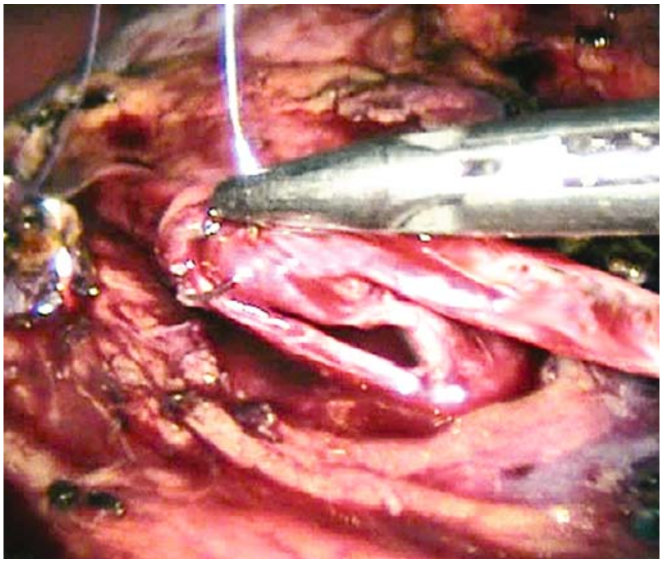


FIG. 5.210. An initial suture is placed outside-in through the posterior edge of the pyelotomy

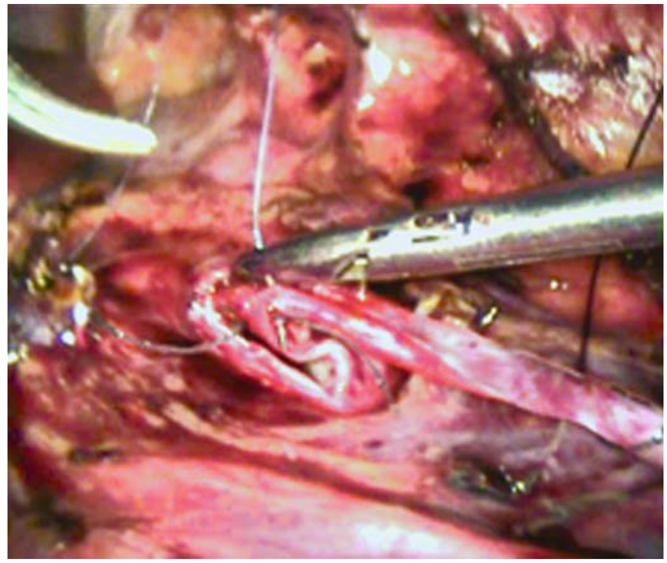


FIG. 5.211. A corresponding initial suture inside-out through the posterior edge of the ureter

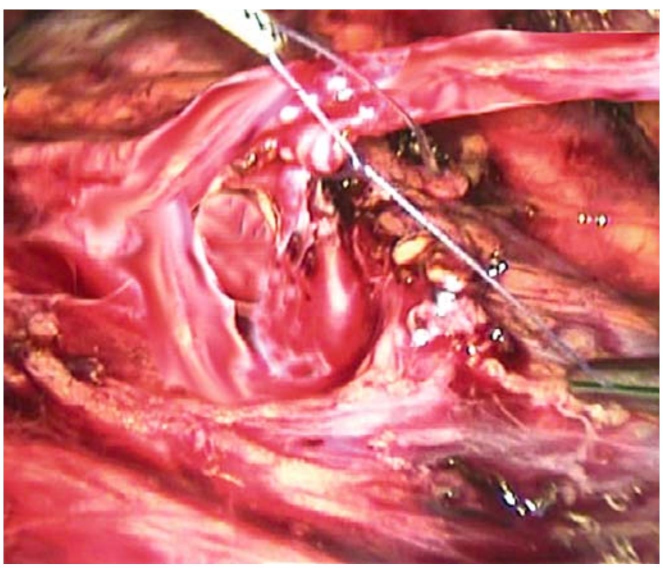


FIG. 5.212. Subsequent interrupted sutures with 4-0 Vicryl

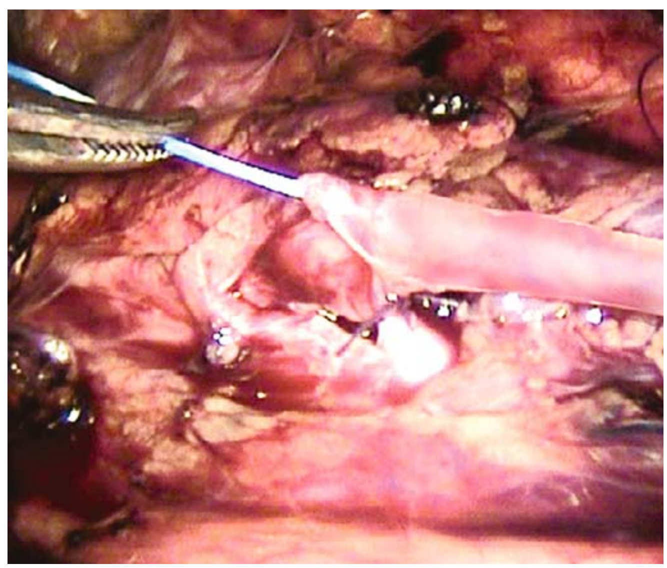


FIG. 5.213. After closure of posterior edges, the stent is advanced retrograde (over the preplaced guidewire)

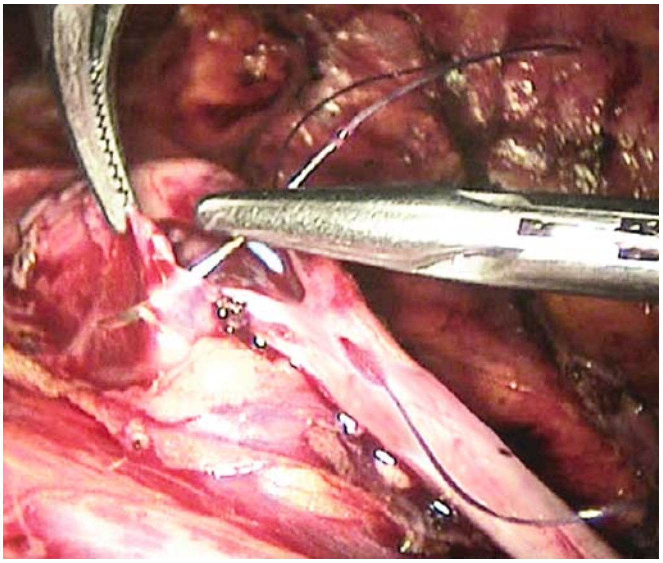


FIG. 5.214. An apical stitch in progress

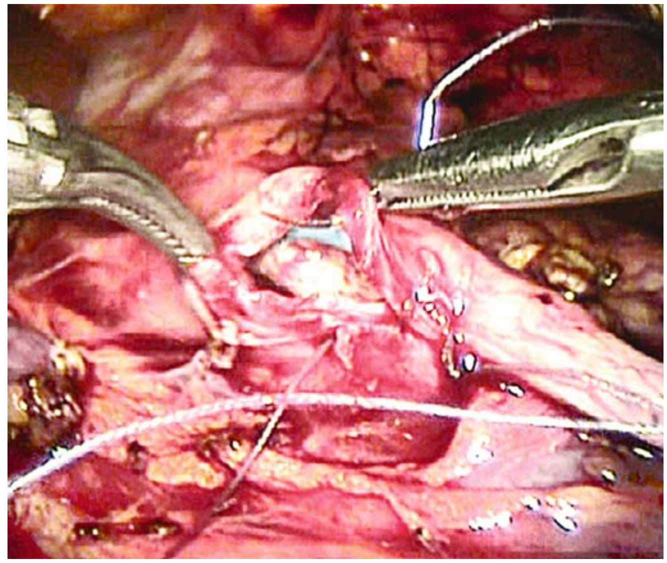
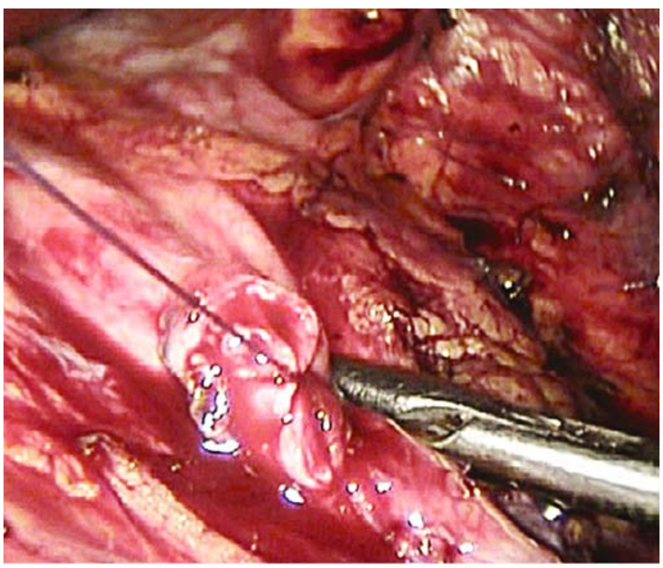
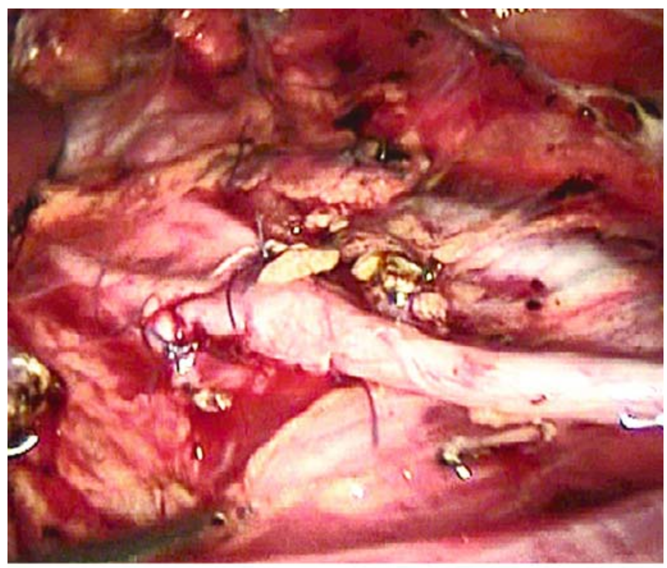


FIG. 5.215. Subsequent sutures through the anterior edges



A



B

FIG. 5.216. View of the completed Fenger plasty; note the good funneling at the end of the Fenger plasty

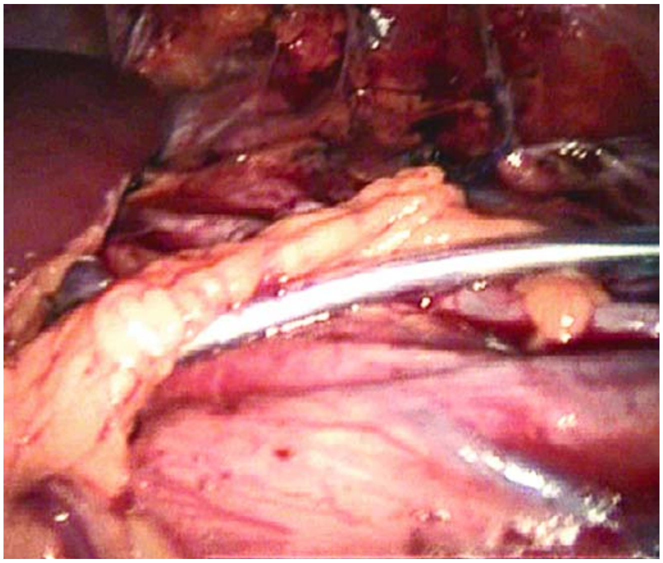


FIG. 5.217. Omental tacking is done; a tube drain is left in the perirenal area

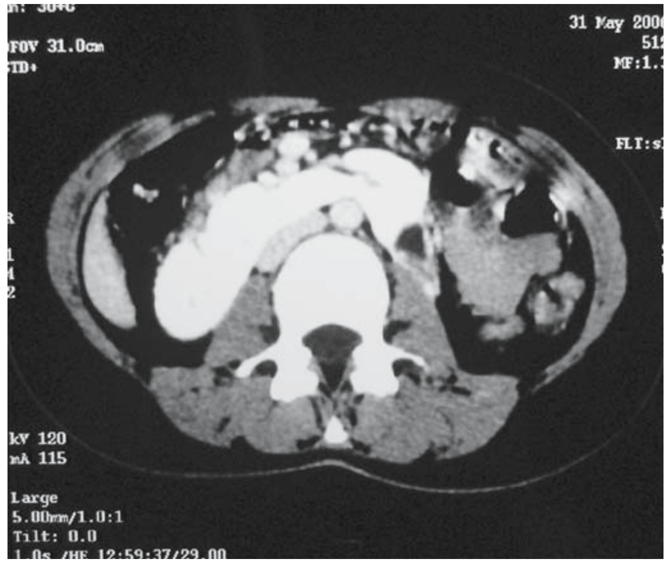


FIG. 5.218. Postoperative CT scan (3 months) shows better functioning left moiety

Culp Flap Pyeloplasty for Long Segment Obstruction

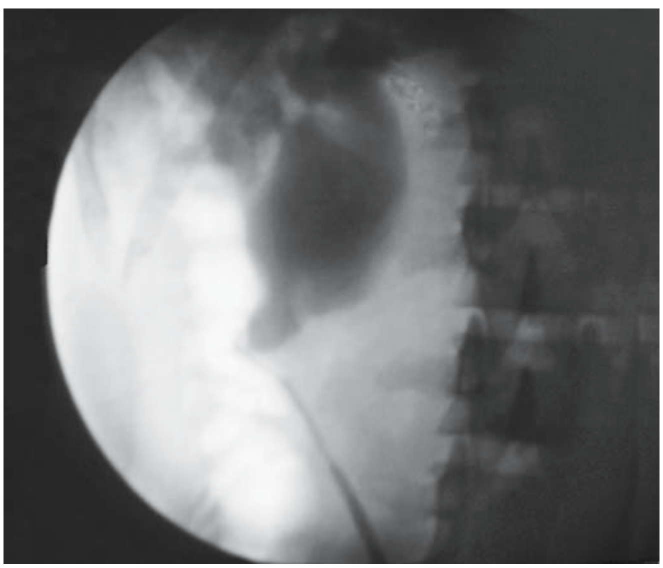


FIG. 5.219. An RGP shows long segment obstruction

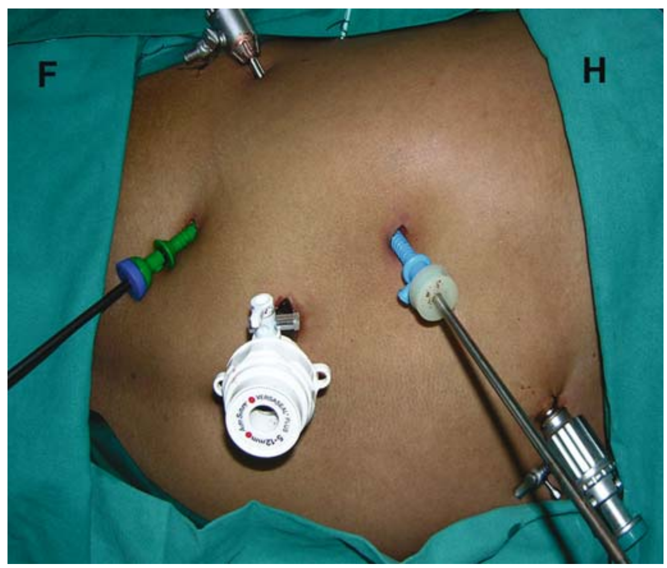


FIG. 5.220. External view of the port positions

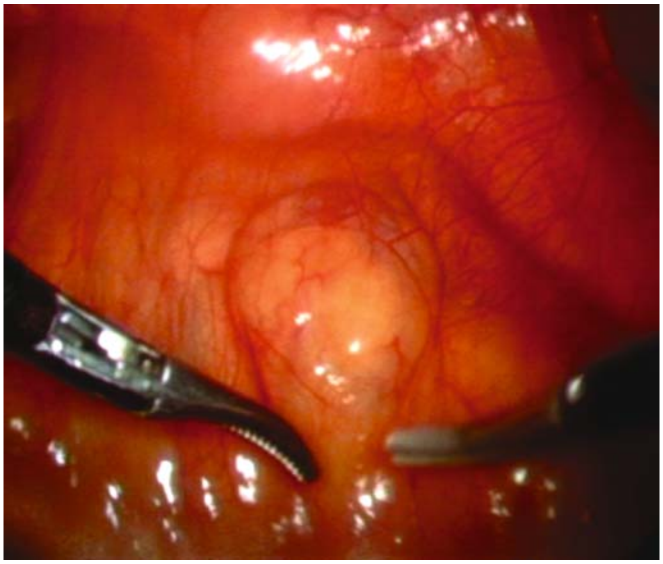


Fig. 5.221. Initial view exposing the right kidney and pelvis

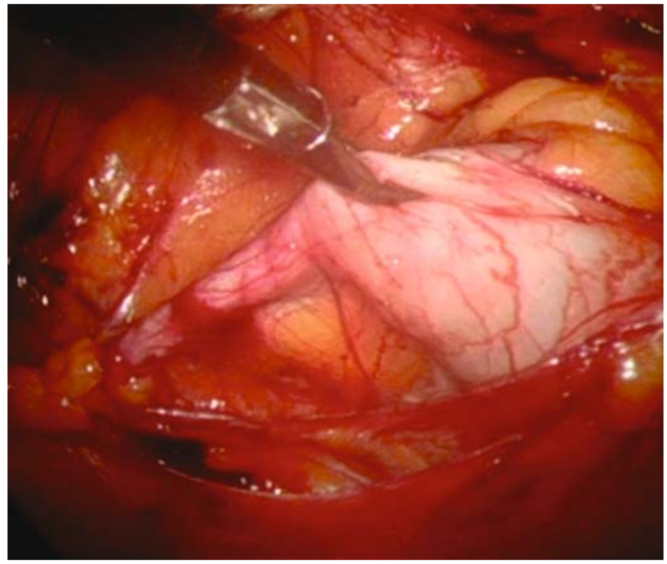


Fig. 5.222. Mobilized right pelvis and ureter

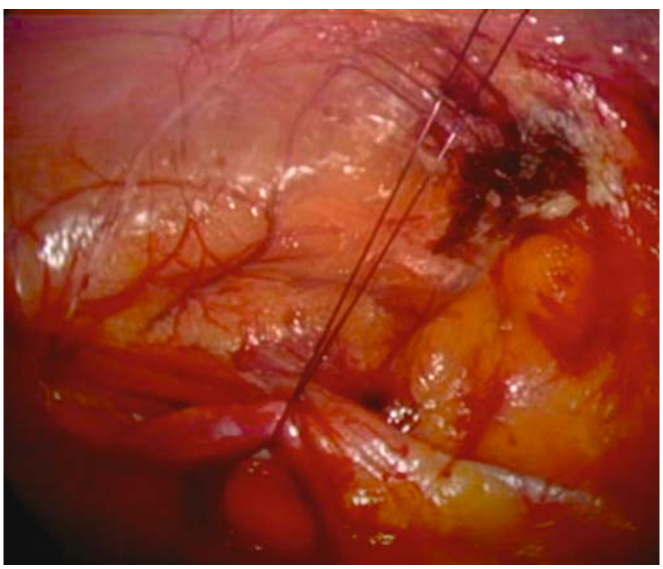


Fig. 5.223. Sling around the right upper ureter

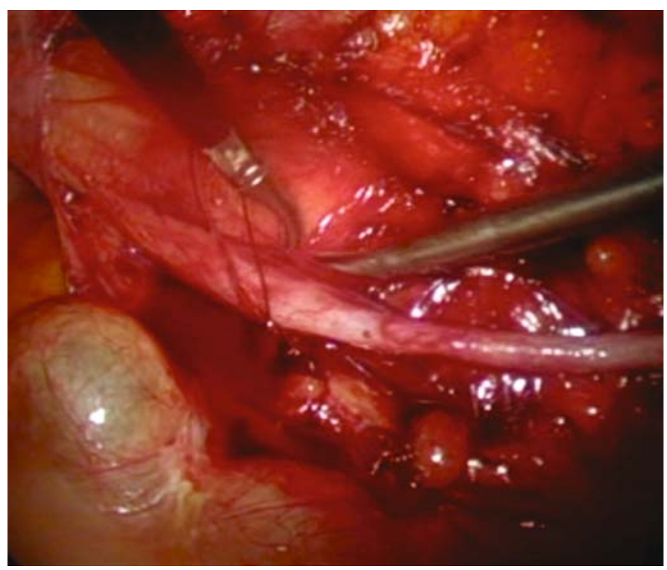


Fig. 5.224. Adequately mobilized upper ureter shows long segment narrowing

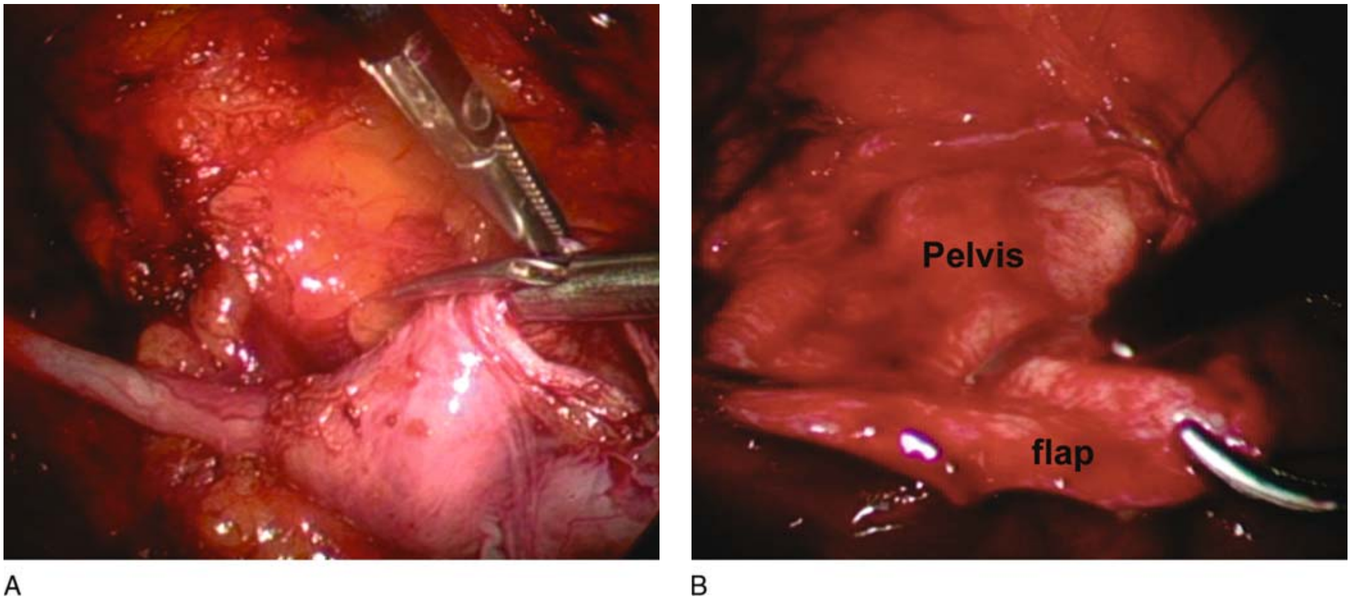


FIG. 5.225. A vertical flap from the pelvis is fashioned

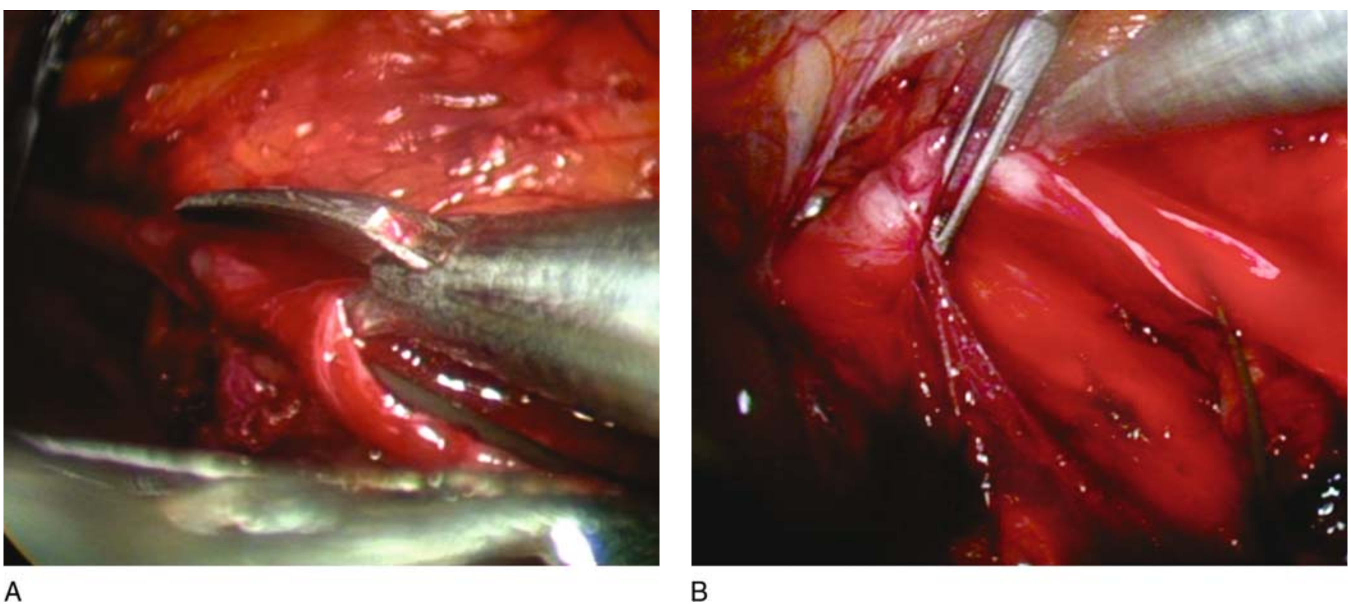
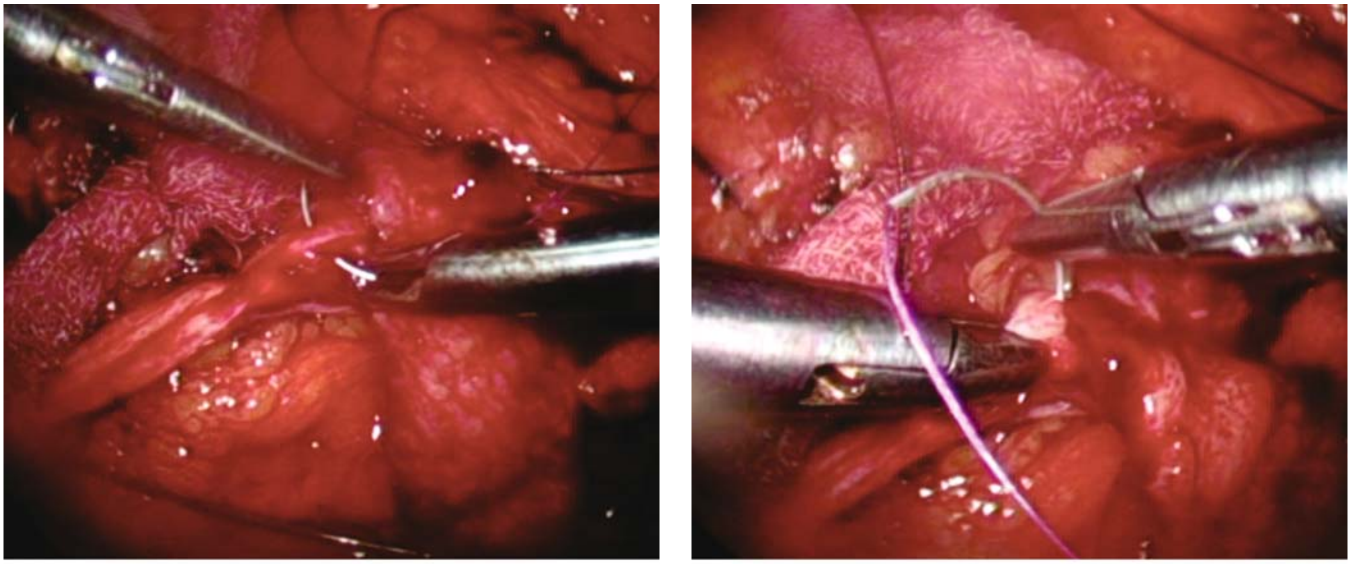
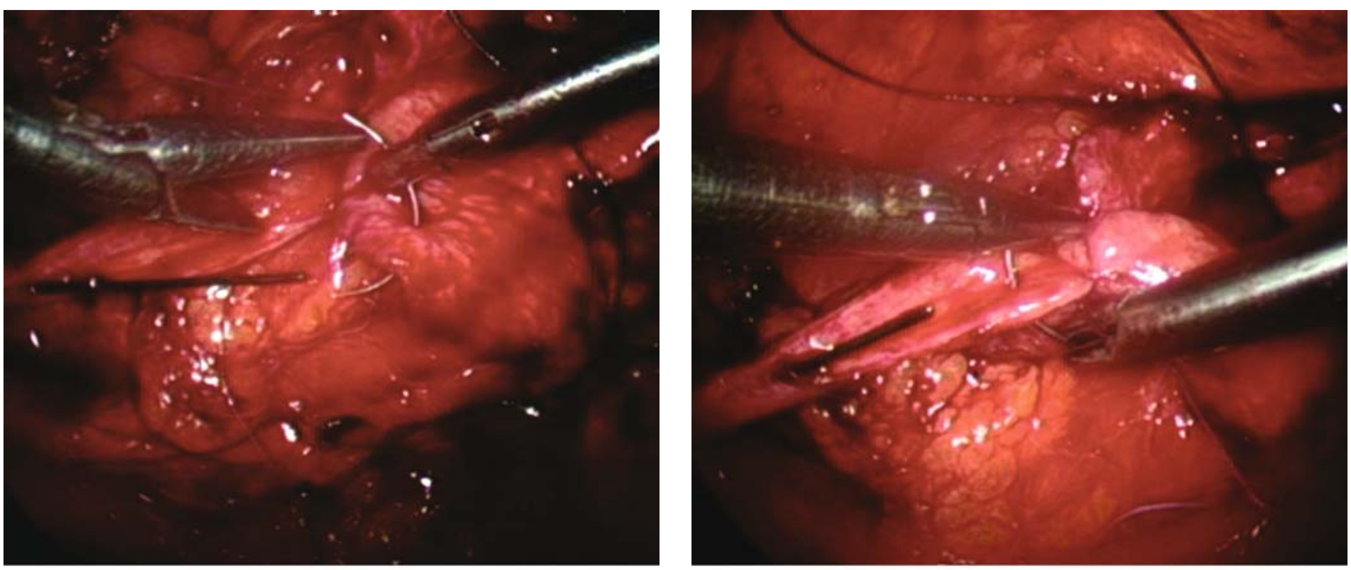


FIG. 5.226. A pyelotomy extended over the UPJ until normal-caliber ureter is seen



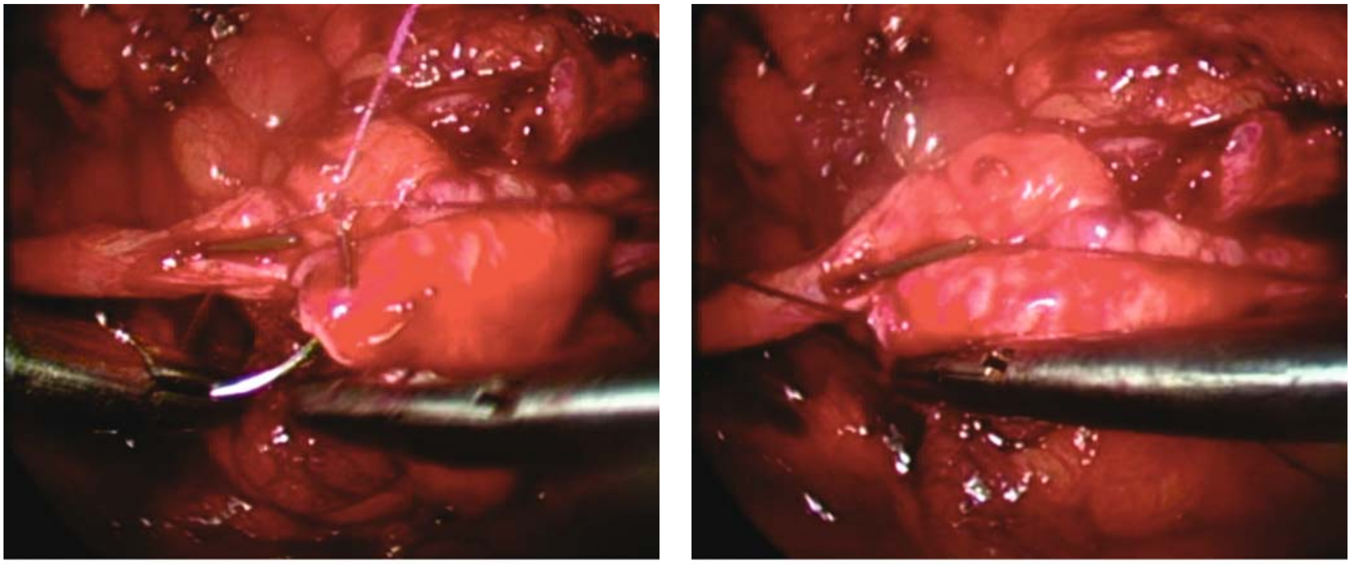
A B

Fig. 5.227. A vertical pelvic flap is flipped and sutured to the narrowed UPJ with interrupted 4-0 Vicryl



A B

Fig. 5.228. Subsequent sutures through the flap and anterior lip of the spatulated ureter



A B

FIG. 5.229. The lateral margin of the flap is being sutured to the medial margin of the spatulated ureter

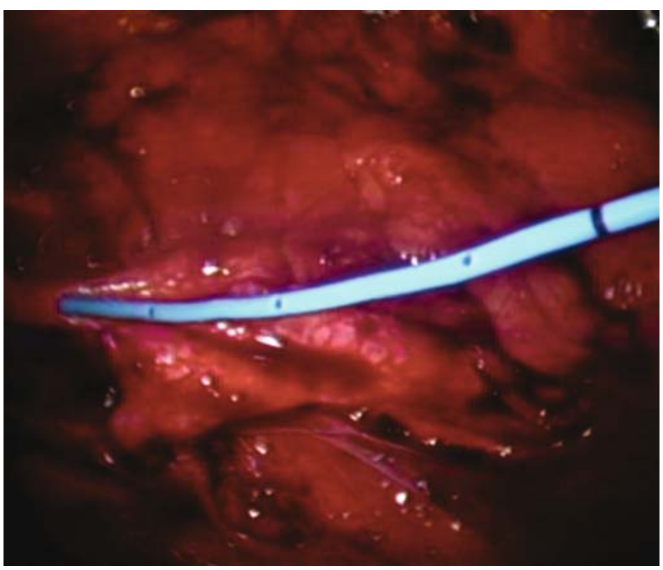


FIG. 5.230. Antegrade advancement of the stent

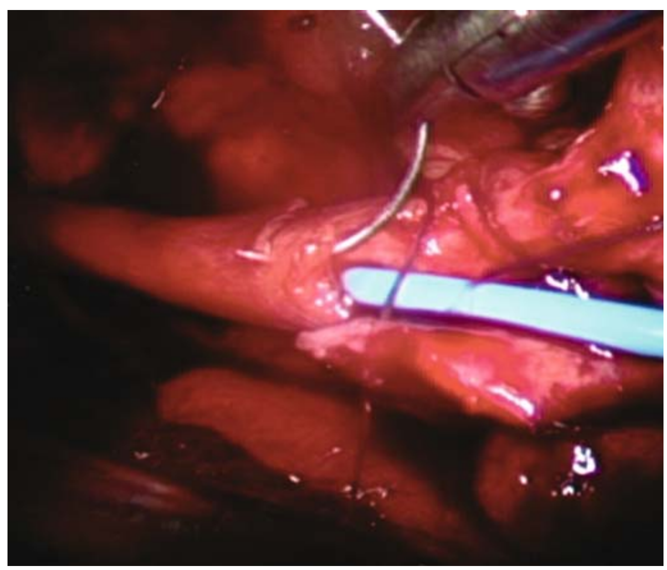
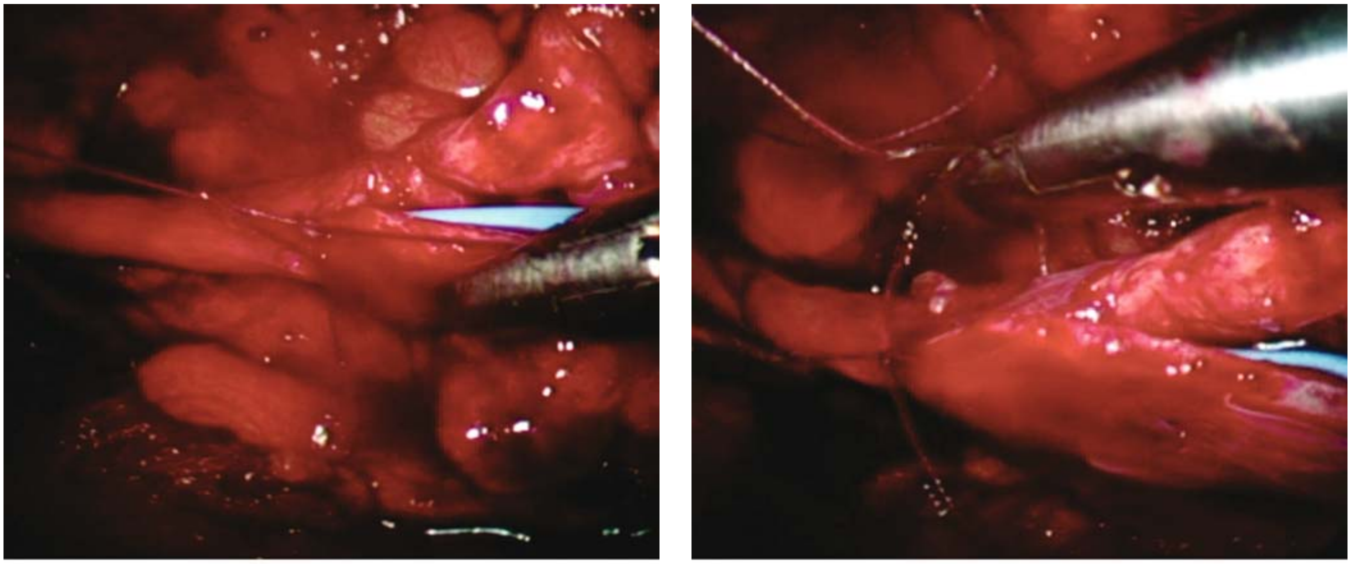
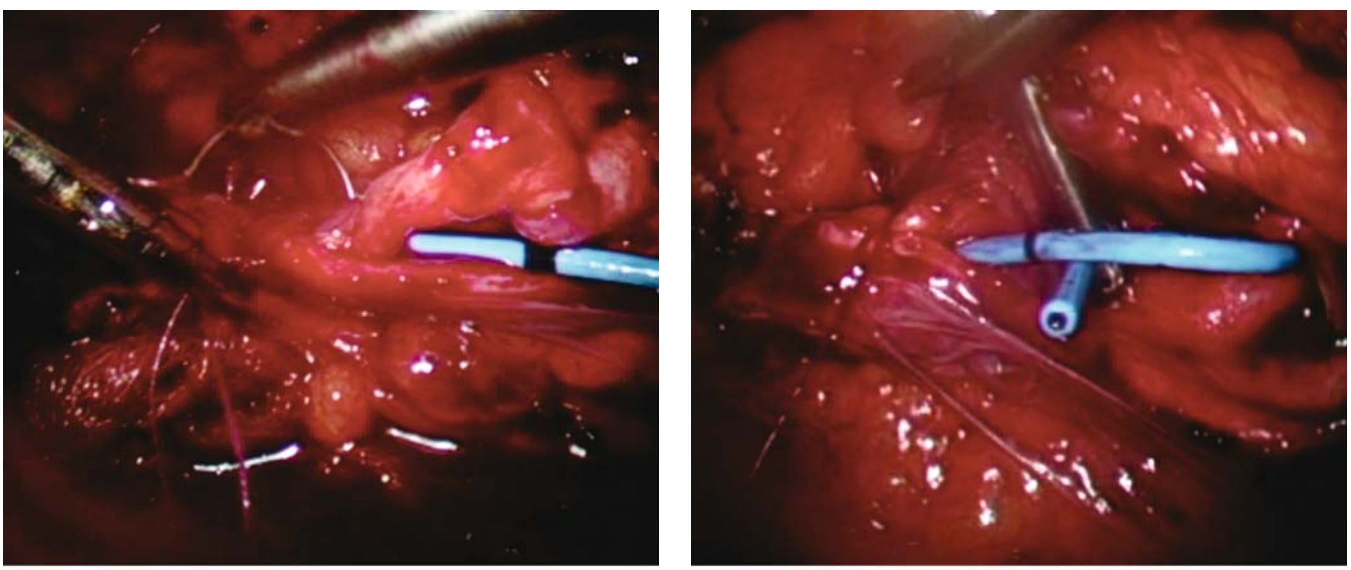


FIG. 5.231. An apical suture



A B

FIG. 5.232. Suturing the lateral edge of the spatulated ureter with the flipped (medial margin) Culp flap



A B

FIG. 5.233. Pyelotomy closure in progress

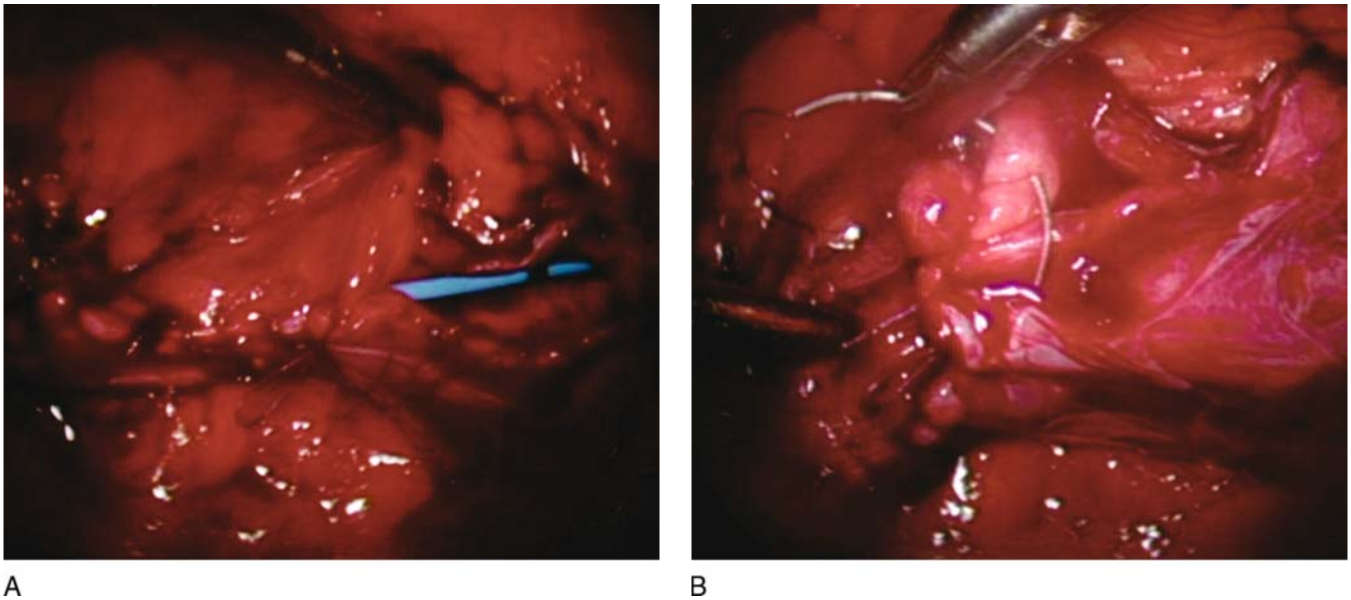


Fig. 5.234. Pyelotomy closure is continued

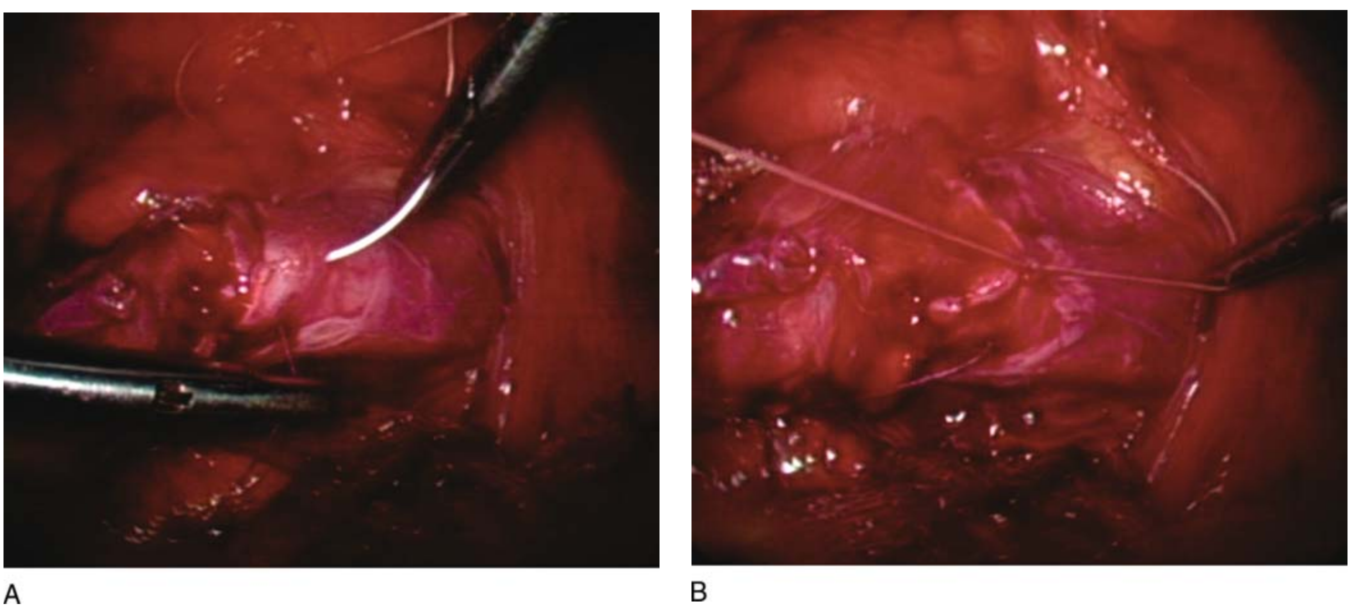


Fig. 5.235. Pyelotomy nearly closed

Fig. 5.236. Completed view of the Culp pyeloplasty

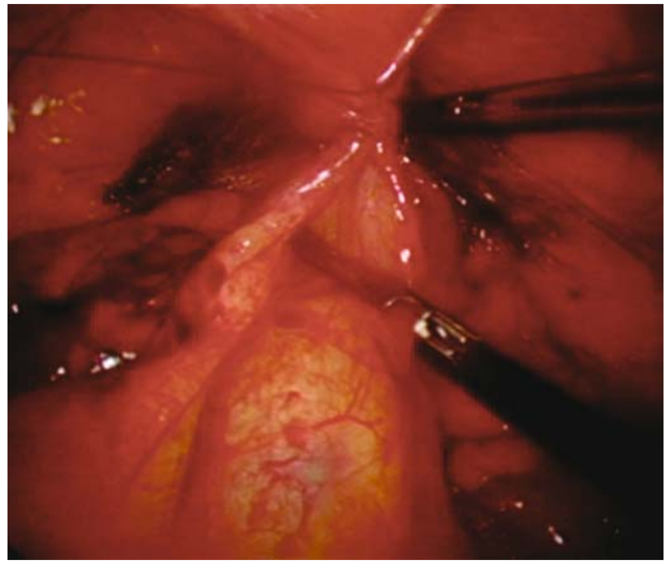


Fig. 5.237. Perinephric fat used to cover the sutured area

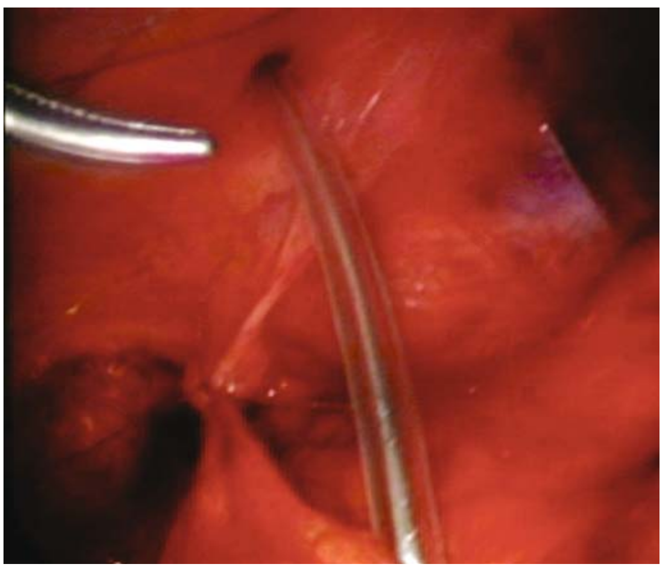


Fig. 5.238. A tube drain in the perirenal area

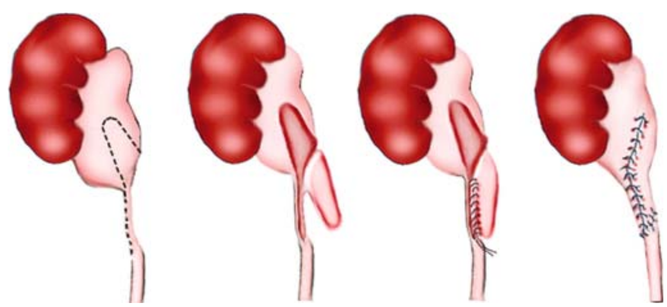


Fig. 5.239. Diagrammatic representation of a Culp flap pyeloplasty executed

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Robotic Laparoscopic Pyeloplasty

Vipul R. Patel and Mario F. Chammas, Jr.

Laparoscopic pyeloplasty has now been performed successfully for over a decade. Since its introduction in 1993 by Schuessler et al [22], it has rapidly become part of the urologic armamentarium for the treatment of primary ureteropelvic junction obstruction (UPJO) [17]. The success rates with this modality are apparently equivalent to those reported for open UPJO repair [18] but the long learning curve has prevented widespread clinical application.

Feasibility of laparoscopic robotic pyeloplasty was first reported by Sung et al [23] using female farm pigs randomized to surgery with or without the Zeus robot. When comparing robotic versus nonrobotic procedures, differences in operative time, suturing time, or number of suture-bites per ureter were not significant [19]. When applied to humans, robotic-assisted laparoscopic pyeloplasty has been described with both the DaVinci and Zeus robotic systems [20]. Initial reported series have shown good results in both short- [21] and long-term [22] studies.

While the cost of a robotic pyeloplasty may be higher than that of a standard laparoscopic procedure, the advantages of robotic surgery may outweigh this drawback. Our results were published recently in *Urology* [23]. Fifty patients underwent a successful robotic dismembered pyeloplasty without open conversion or transfusion. Average estimated blood loss was minimal at 40 cc. Operative time averaged 122 (60–330) minutes overall. Crossing vessels were present in 30% of patients and were preserved in all cases. Time for the anastomosis averaged 20 minutes (10–100). Intraoperatively there were no complications. Postoperatively the average hospital stay was 1.1 days. Stents were removed at an average of 20 days (14–28). Average follow-up is currently 11.7 months; each patient is doing well. Forty-eight of 50 patients have had one or more renograms demonstrating stable renal function, improved drainage, and no evidence of recurrent obstruction.

Indications

The indications to perform a robotic pyeloplasty follow the same criteria as for the open approach. Those include the presence of symptoms associated with renal obstruction, the progressive impairment of renal function, the development of upper tract stones or infection, and, rarely, causal hypertension. Thus, the main goal of intervention should be to repair the obstruction, achieve resolution of symptoms, and preserve or improve renal function.

Surgical Technique

At the time of surgery a retrograde pyelogram and stent placement or exchange is performed under fluoroscopic guidance. The pyeloplasty is then performed with the patient positioned in a modified lateral decubitus position at 45 degrees to the table. The robot is placed on the ipsilateral side of the kidney being operated upon (Fig. 5.240). After creating a pneumoperitoneum with a Veress needle, four trocars are inserted (Fig. 5.241). A dismembered pyeloplasty is then performed robotically. The procedure is performed using the Maryland bipolar and the monopolar scissors. The colon is mobilized medially to expose the kidney. This is followed by dissection of the lower pole and subsequent isolation of the ureter, which is then dissected up to the area of the UPJ obstruction (Fig. 5.242). Great care is taken not to devascularize the ureter, and the renal pelvis should be freed up in its entirety (Fig. 5.243).

If crossing vessels are encountered, they can be preserved by dismembering the UPJ and allowing the vessel to regress posteriorly. Once the UPJ is dismembered, the ureter is spatulated laterally and a reduction of the renal pelvis performed if necessary (Figs. 5.244 and 5.245). The anastomosis can then be performed with either a single knot running stitch utilizing two 3-0 Monocryl sutures that are tied together or with two separate sutures running anteriorly and posteriorly (Fig. 5.246). Starting at the apex of the ureteral spatulation, first the posterior anastomosis is completed followed by the anterior closure (Fig. 5.247). The two sutures are then tied superiorly (Fig. 5.248).

Conclusion

Laparoscopic pyeloplasty is a complex reconstructive surgery that requires technical expertise. This approach, which was once limited to only a few specialized centers is becoming more widespread. The adoption of robotic technology with its inherent advantages will only hasten this process. As the learning curve is surmounted, the true advantages of robotic surgery can be appreciated, allowing surgeons to accomplish these complex procedures in a safe and effective manner.

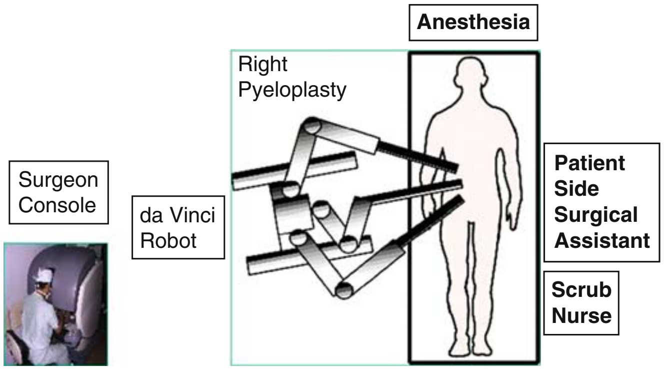

FIG. 5.240. Operating room layout

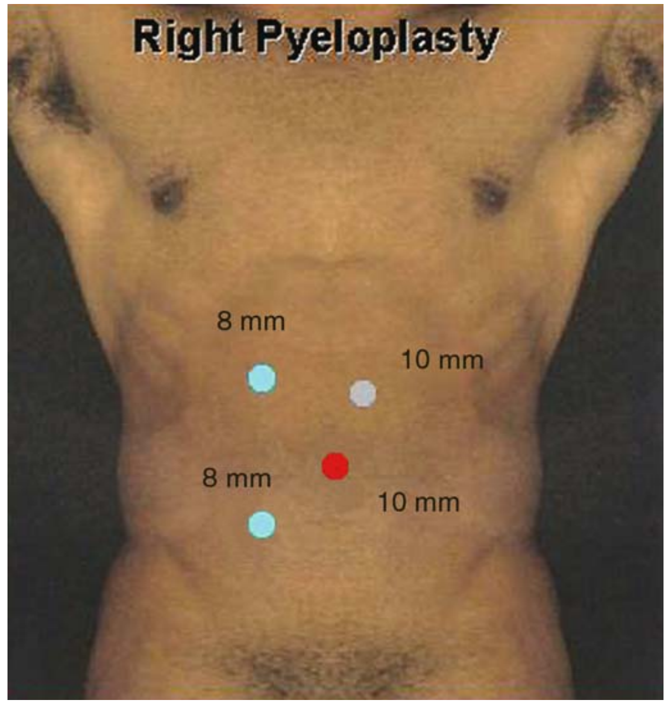

FIG. 5.241. Port positions

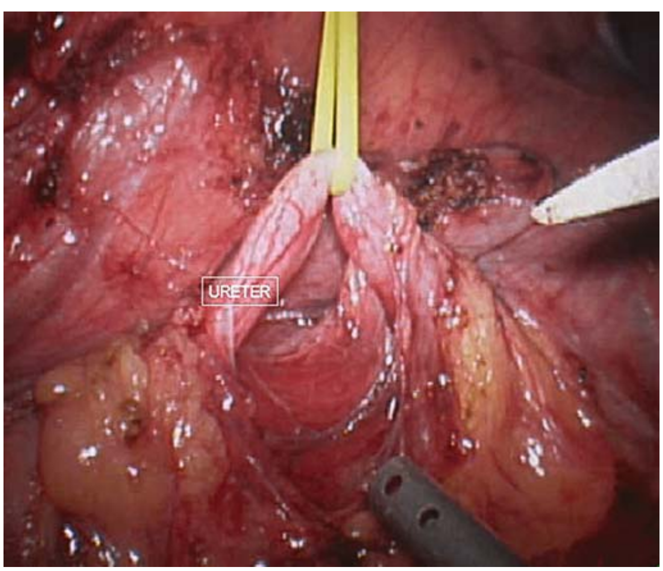

FIG. 5.242. Sling around the mobilized ureter

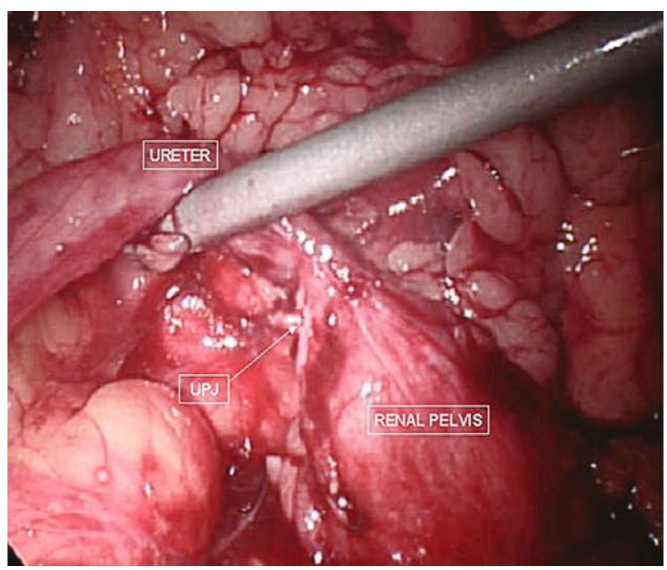

FIG. 5.243. The ureter, UPJ, and pelvis mobilized adequately

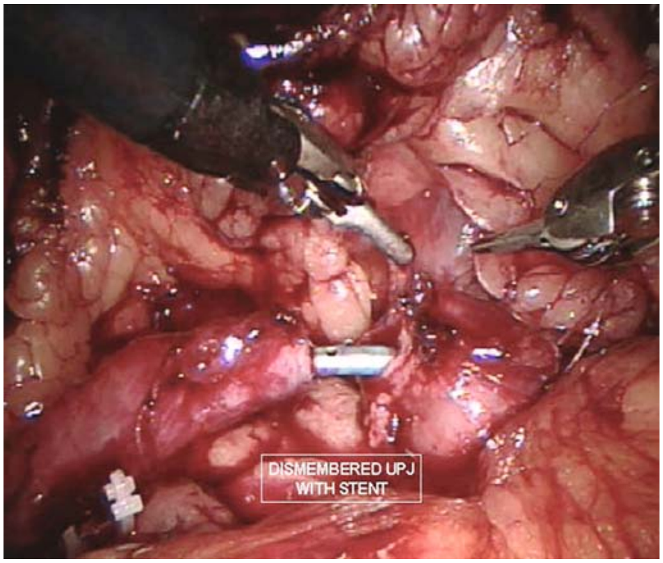

FIG. 5.244. Division of UPJ reveals the preplaced stent in situ

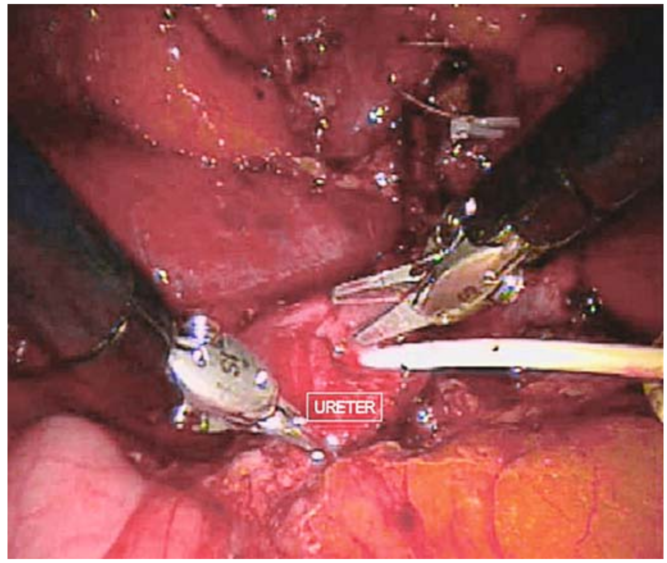

FIG. 5.245. Spatulation on the lateral aspect of the ureter

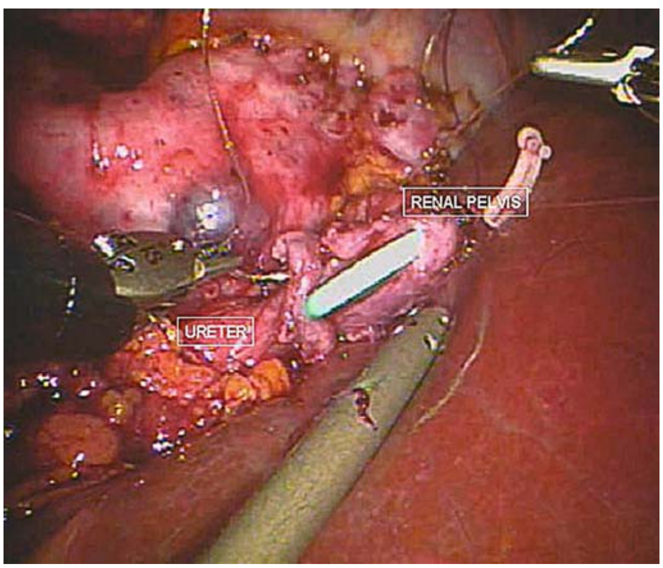

FIG. 5.246. An apical suture of the pyeloplasty

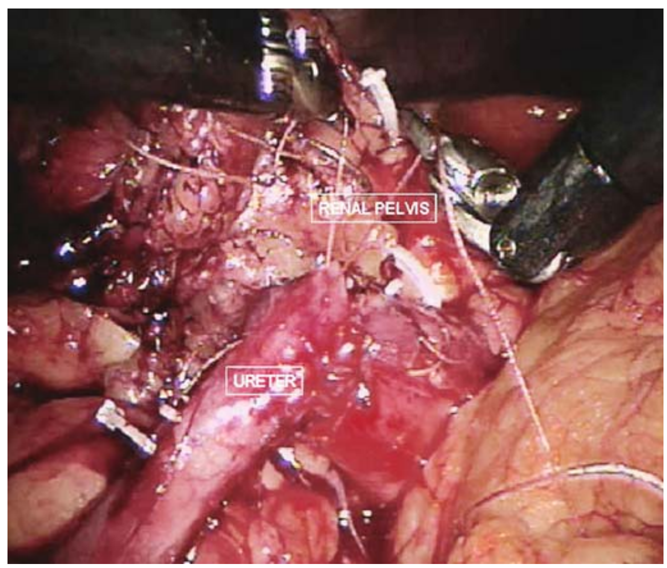

FIG. 5.247. Subsequent interrupted sutures

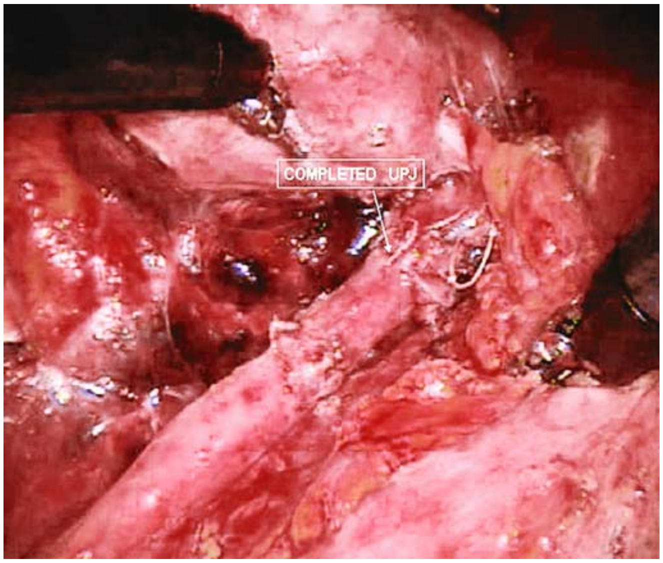

FIG. 5.248. View of completed pyeloplasty

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6
Laparoscopic Ureteropyelostomy

M. Ramalingam and K. Selvarajan

Historically, the majority of the duplications of the ureter go unnoticed. Anomalies of duplication of the ureter with clinical implications are less common. Incomplete duplication of the ureter with lower moiety ureteropelvic junction obstruction is very uncommon. Patients present with recurrent loin pain and urinary tract infection. In cases of complete duplication, urinary tract infection may be the presenting feature [1–4]. Each patient requires individualized treatment. Management considerations depend on several factors including the functional status of the portion of the kidney.

Laparoscopic ureteropyelostomy appears to be an evolving reconstructive procedure.

Operative Technique

Ureteropyelostomy for Incomplete Duplex System with Lower Moiety Ureteropelvic Junction Obstruction

An 18-year-old woman presented with dull right loin pain of 3 months' duration. There was no overt urinary tract infection. Intravenous urogram confirmed normal left kidney and incomplete duplication of right kidney with lower moiety ureteropelvic junction obstruction.

Under general anesthesia a right retrograde pyelogram was done, which confirmed the anomaly. A double-J stent was preplaced (the upper end went into the upper moiety rather than the desired lower moiety). The patient was placed in the right lateral position with a 70-degree tilt for the transperitoneal approach. Pneumoperitoneum was created. A transperitoneal four-port technique was employed. A 10-mm supraumbilical port was inserted for the camera. A 5-mm subcostal port and 5-mm port in the right iliac fossa were used for hand instruments. Another 5-mm port in the right flank was used for suction and irrigation.

The ascending colon was mobilized until the upper ureter. The Y–junction of the duplex system was well visualized. The dilated pelvis of the lower moiety was mobilized adequately. Part of the pelvis lying close to the upper moiety was incised for about 2.5 cm, and the ureteropelvic junction along with the lower moiety ureter was excised up to the Y-junction. The upper moiety ureter opposing the pyelotomy was vertically incised on the lateral aspect. The posterior layer of the ureteropyelostomy was done by continuous suture using 5-0 absorbable sutures. Then the preplaced stent seen in the upper moiety was withdrawn and repositioned into the lower moiety pelvis. The ureteropelvic junction (UPJ) with redundant pelvis was excised and retrieved. The anterior layer of the ureteropyelostomy was closed in a similar manner. A tube drain was introduced through the flank port and left in the peripelvic area. Ports were closed with 2-0 absorbable sutures.

Postoperatively the drainage was 60 mL on the first day, which gradually reduced over the next 3 days to almost negligible quantities. An ultrasound scan done on the fourth postoperative day revealed no perirenal collection and hence the drainage tube and Foley catheter were removed. The patient remained afebrile and was discharged on the fifth postoperative day. The ureteral stent was removed after 3 weeks. An intravenous urogram done after 6 months showed better function and good drainage of the right lower moiety ureter. A urine culture remained sterile.

Ureteropyelostomy for Incomplete Duplex System with Lower Moiety Ureteropelvic Junction Obstruction with Secondary Calculus

A 50-year-old man presented with right loin pain. An intravenous urogram showed incomplete duplication of the right pelvis with lower moiety ureteropelvic junction obstruction with a large secondary calculus. Appropriate antibiotics were administered for urinary infection as per the culture and sensitivity reports. Subsequently the patient was taken to the operating room for a laparoscopic repair.

Under general anesthesia, a right retrograde pyelogram was done, which confirmed the intravenous urogram findings. The patient was placed in the right loin position with a 70-degree tilt. The port positions and mobilization of ureters and pelvis were similar to those in the previous case. Once the pyelotomy was made, the large stone was removed. Subsequent steps of the ureteropyelostomy were similar to those in the previous case. A double-J stent was left in. A tube drain was also placed. Postoperatively, the patient made an uneventful recovery except for a short episode of fever on the second postoperative day. Drainage settled gradually.

Ureteropyelostomy for Complete Duplex System with Grade IV Vesicoureteral Reflux of the Lower Moiety

A 4-month-old boy presented with recurrent urinary tract infection. Imaging studies revealed complete duplication of the right ureter with reflux of the lower moiety ureter. Cystoscopy revealed two right ureteric orifices. The lower moiety ureter was opening laterally and appeared gaping. The lower moiety pelvis and ureter were mobilized, the whole ureter excised, and the pelvis of the lower moiety anastomosed to the ureter of the upper moiety. Additionally, the lower moiety ureter was dissected from the ureteropelvic junction down to the bladder and excised. The postoperative period was uneventful. Postoperative imaging revealed good drainage on the intravenous urogram.

Results

The procedure was well tolerated by all the patients including the 4-month-old baby. The mean operating time was about 180 minutes. The blood loss was insignificant. Except for the second patient, with secondary calculi who developed postoperative fever and slightly prolonged drainage, there were no significant immediate or delayed postoperative complications. The mean hospital stay was 5 days. Follow-up ranges from 7 to 18 months. A postoperative intravenous urogram in the first patient done at the end of 6 months revealed good drainage and function of the lower moiety. A postoperative intravenous urogram done in the second patient revealed no deterioration in function. The postoperative analgesic requirement was minimal. An intravenous urogram and micturating cystourethrogram were done in the baby. The lower moiety was functioning and draining well.

Discussion

Duplication of the ureter, although common, may not be symptomatic. Management is determined by the function of the affected moiety and by whether the affected ureter is obstructed or refluxing. In incomplete duplication of the ureter with a functioning moiety and ureteropelvic junction obstruction, a ureteropyelostomy is the treatment of choice. In a nonfunctioning moiety, heminephrectomy is done. In the presence of reflux in a completely duplicated system, there are two options, ureteropyelostomy or single-sheath reimplantation.

Principles of reconstructive surgery can be meticulously followed in laparoscopic surgery. Laparoscopic ureteropyelostomy is technically feasible with minimal morbidity.

Conclusion

Though such laparoscopic reconstructive procedures are challenging, it is feasible as one gains confidence in intracorporeal suturing.

Laparoscopic Ureteropyelostomy in Incomplete Duplication

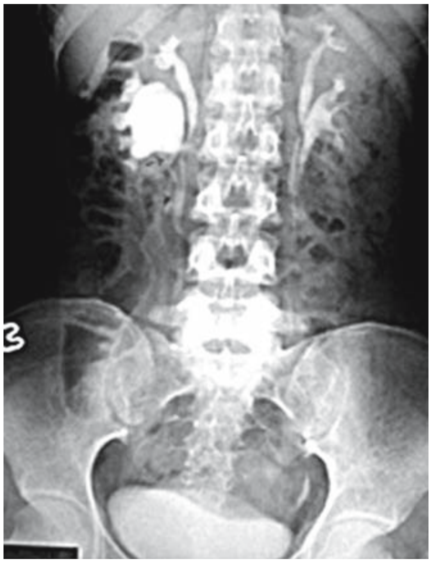


Fig. 6.1. An intravenous urogram (IVU) shows the bilateral duplex system with the right lower moiety ureteropelvic junction (UPJ) obstruction

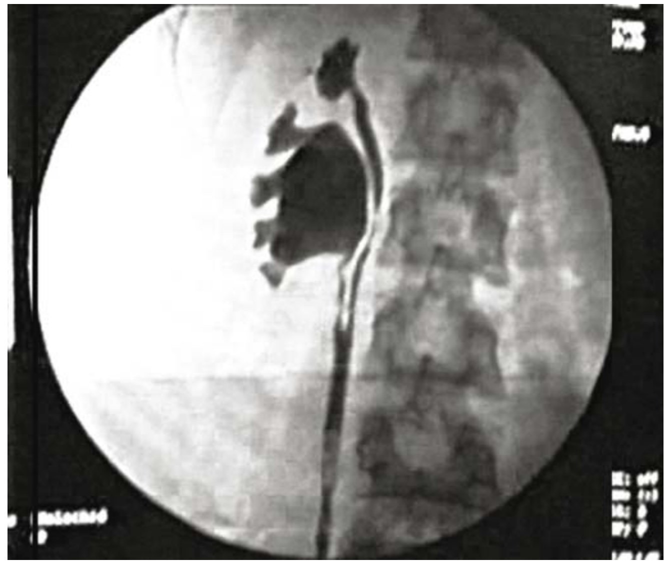


Fig. 6.2. A right retrograde pyelogram (RGP) confirms incomplete duplication with lower moiety UPJ obstruction

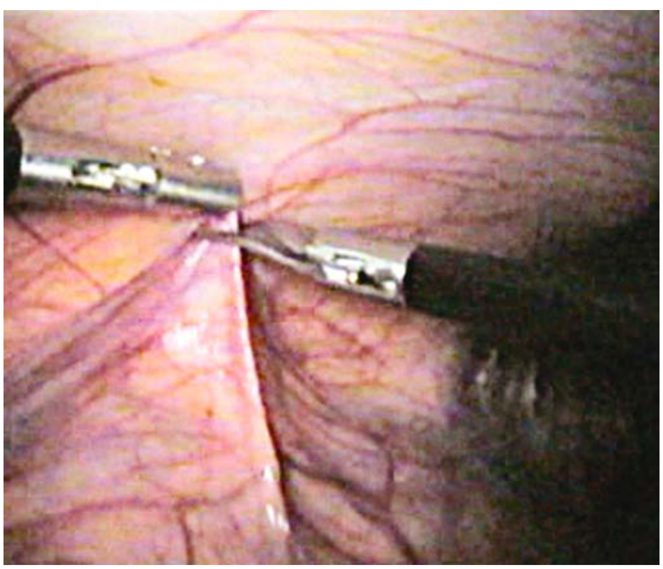


Fig. 6.3. Incision of the peritoneum in the paracolic area

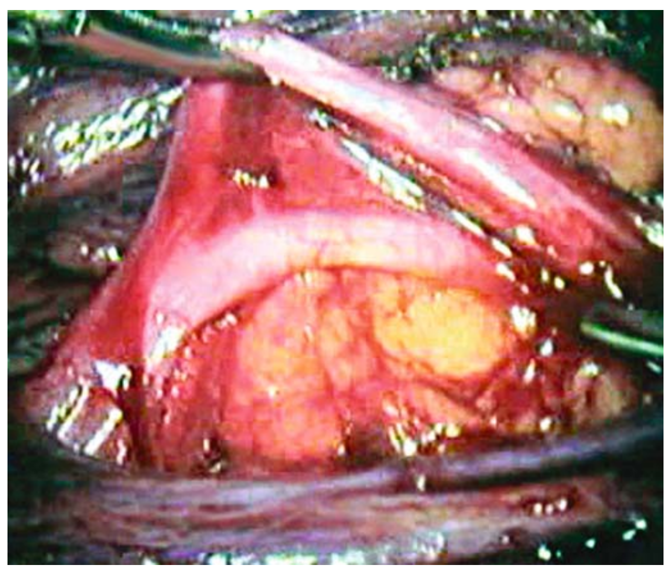


Fig. 6.4. After colonic mobilization, the Y-junction of incomplete duplication can be appreciated

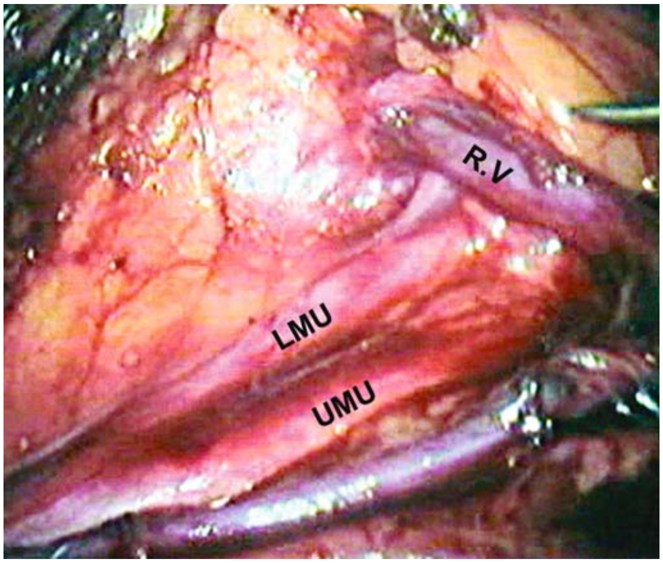


FIG. 6.5. Colonic mobilization reveals a double ureter and renal vein (RV, renal vein; UMU, upper moiety ureter; LMU, lower moiety ureter)

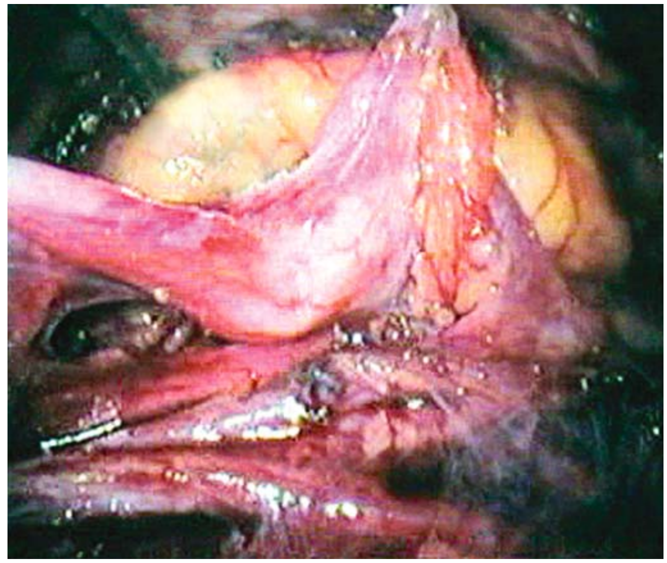


FIG. 6.6. Further mobilization of the lower moiety reveals a dilated pelvis

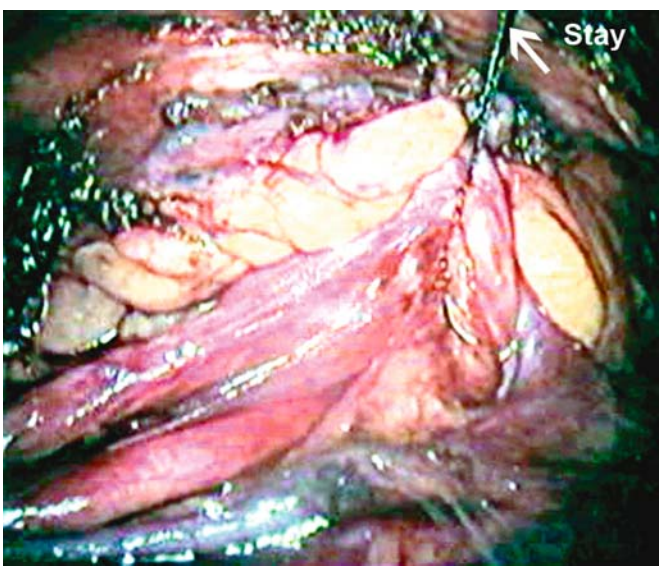


FIG. 6.7. A stay taken through the pelvis of the lower moiety to avoid injury to the renal vein

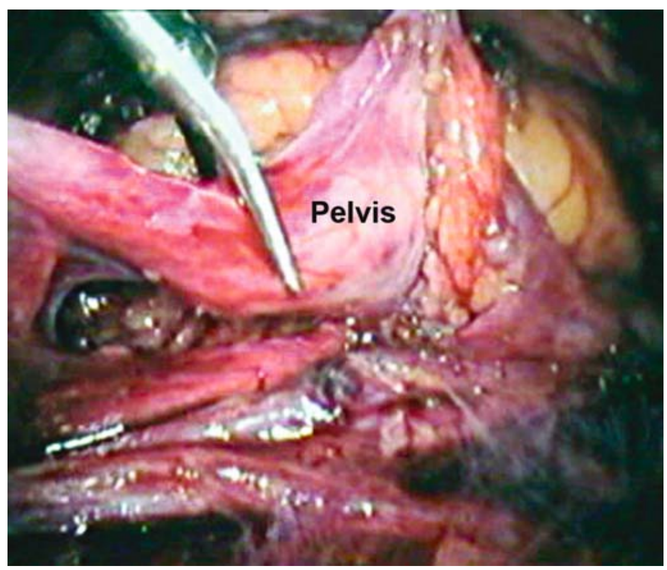


FIG. 6.8. Pyelotomy of the lower moiety with scissors in preparation for excision of the UPJ

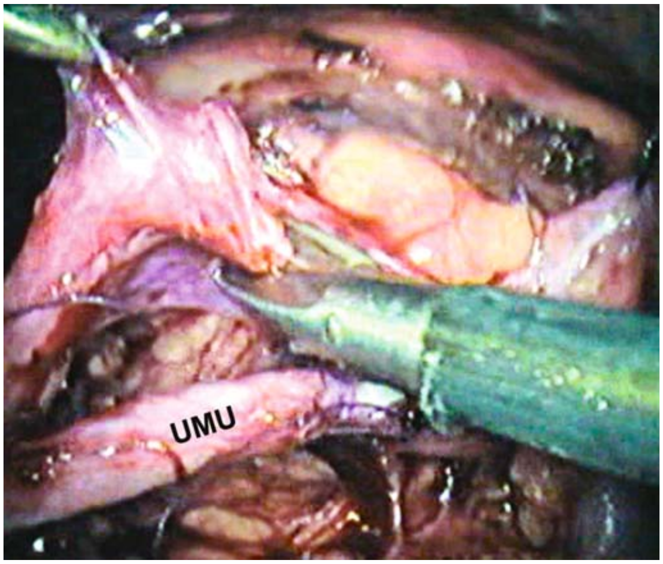


FIG. 6.9. Pyelotomy in progress (UMU, upper moiety ureter)

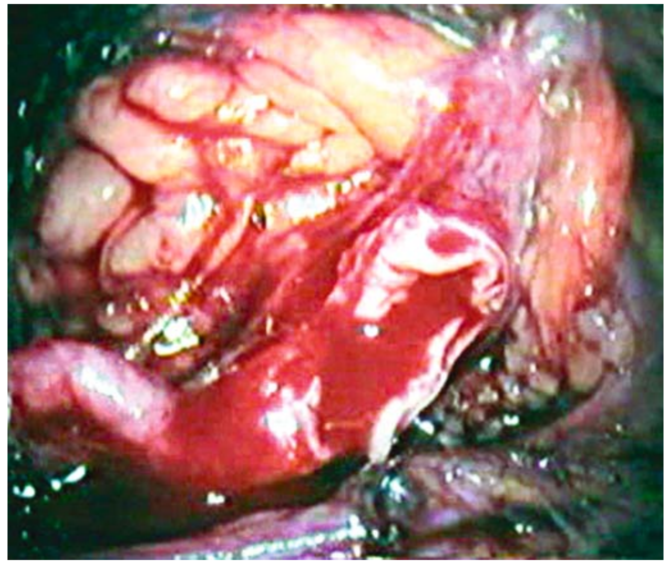


FIG. 6.10. Redundant pelvis to be excised

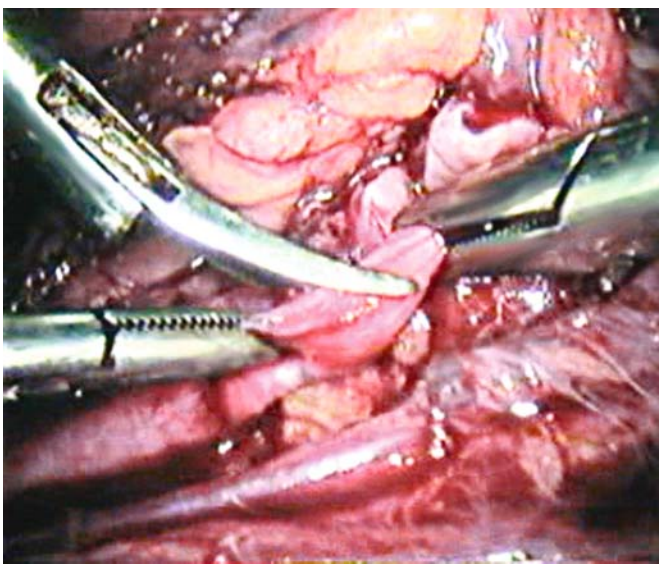


FIG. 6.11. Ureterotomy of the upper moiety at the level of the pyelotomy for a tension-free anastomosis

FIG. 6.12. A ureterotomy extended cephalad in such a manner as to lie opposing the pyelotomy; this makes the ureteropyelostomy sutures tension free

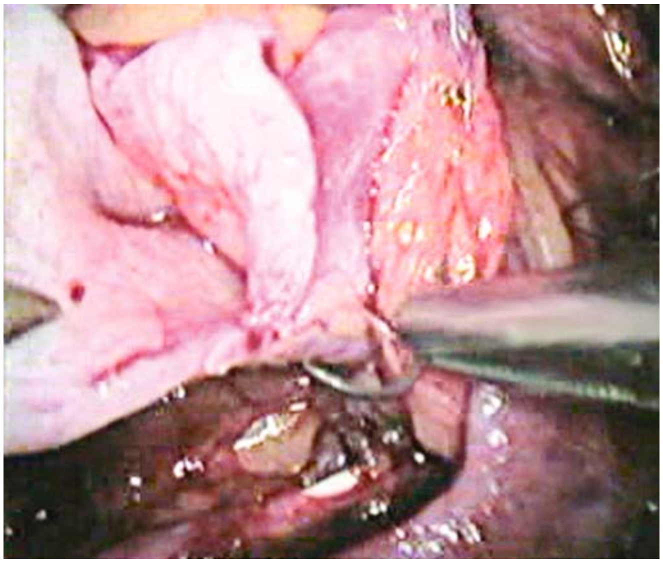


FIG. 6.13. A ureteropyelostomy started with an outside-in suture through the pelvis at the cephalic end with 4-0 absorbable suture

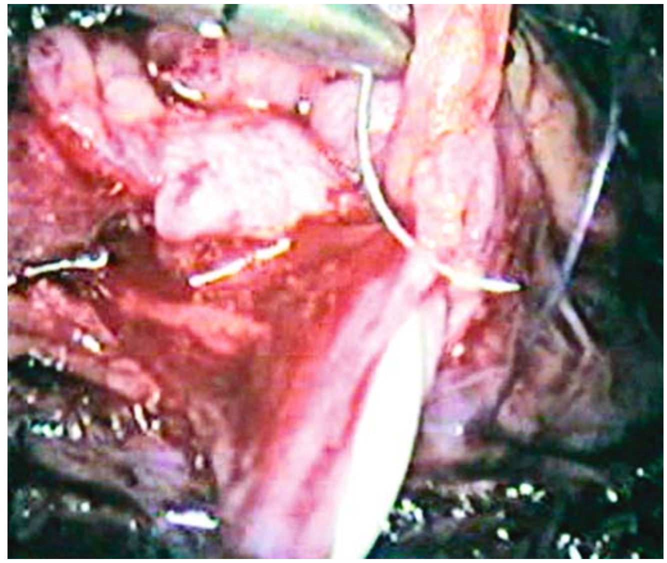


FIG. 6.14. Corresponding initial suture is taken through the posterior edge of the ureterotomy starting at the cephalic end

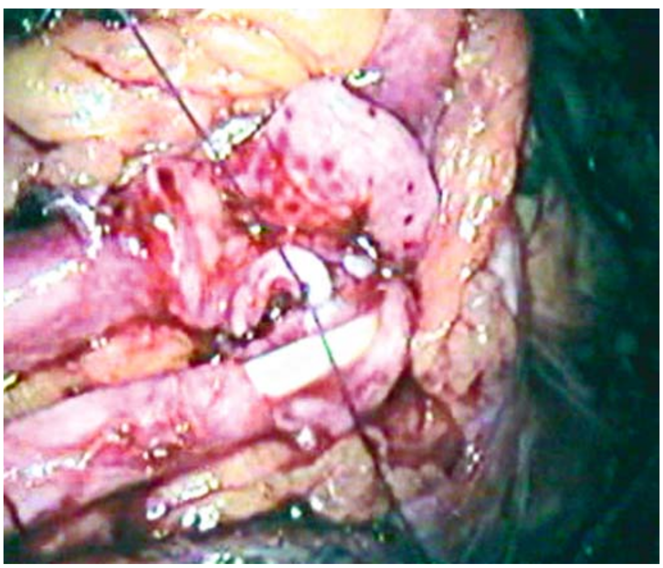


FIG. 6.15. A posterior layer continuous suture in progress (preplaced stent seen in the upper moiety)

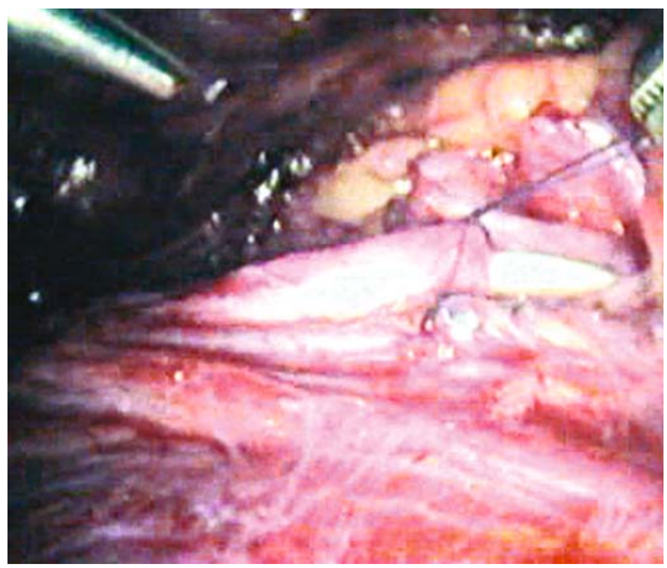


FIG. 6.16. Posterior layer suturing completed

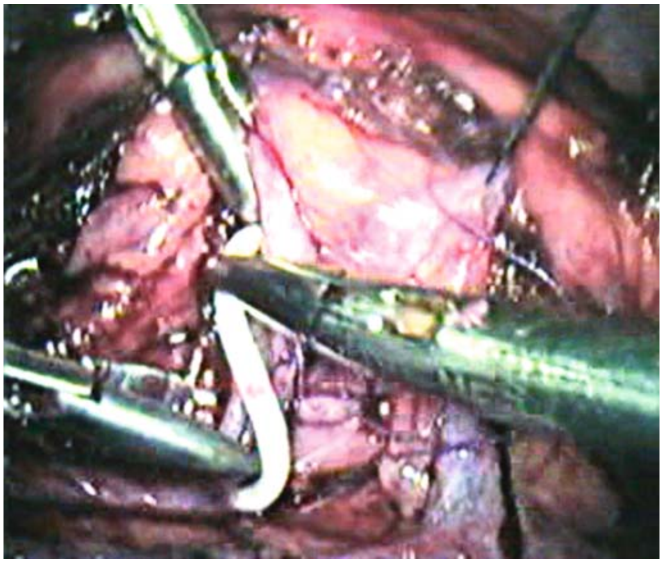


Fig. 6.17. The stent is repositioned into the lower moiety pelvis

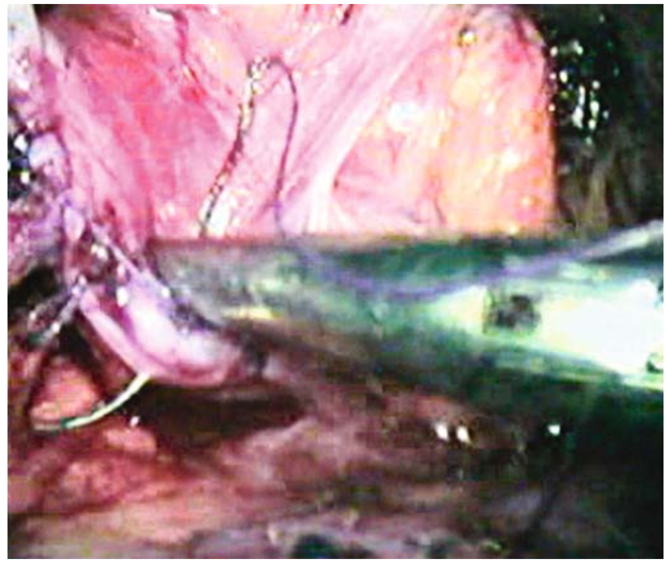


Fig. 6.18. The anterior layer of suturing is being carried out from below upward

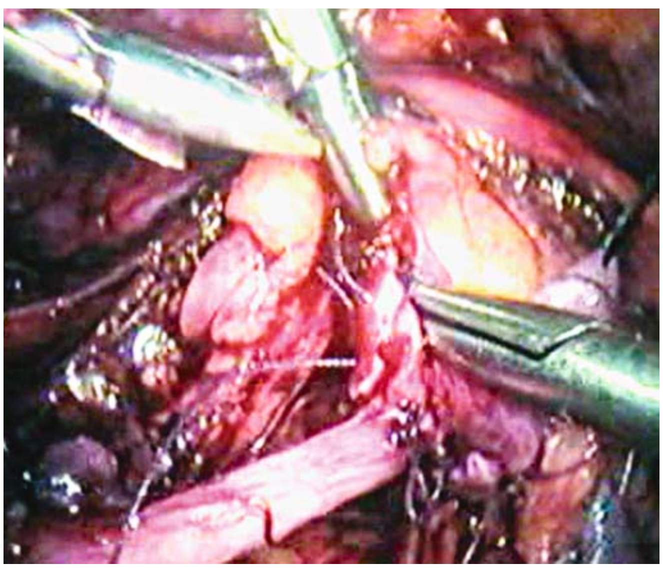


Fig. 6.19. The remaining pyelotomy wound is closed with 3-0 Vicryl suture

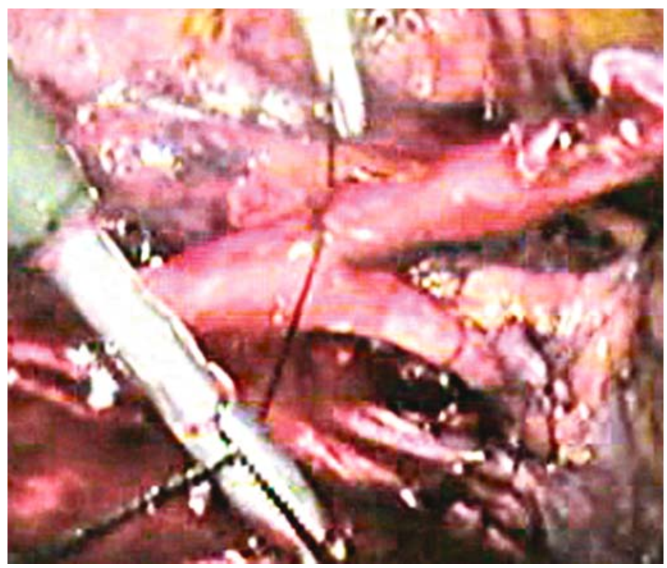


Fig. 6.20. Lower moiety ureter is ligated flush at the Y-junction

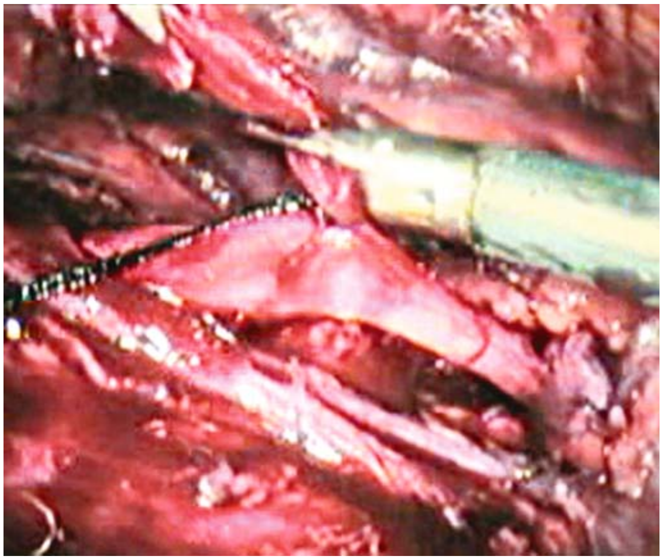


Fig. 6.21. A UPJ and redundant pelvis excised

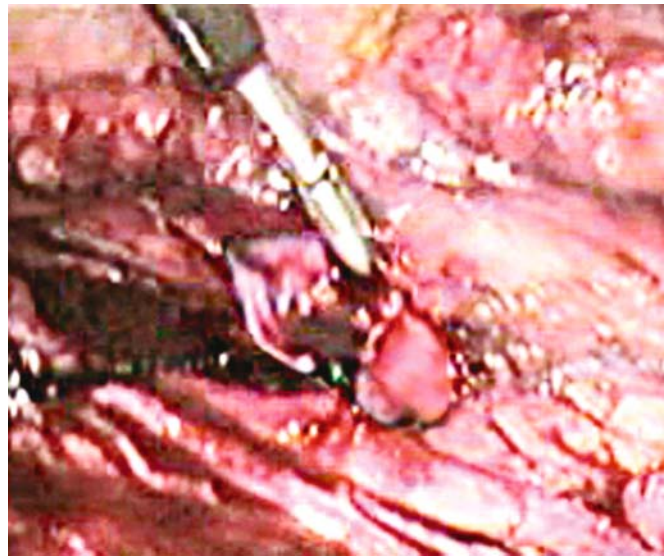


Fig. 6.22. Specimen retrieval

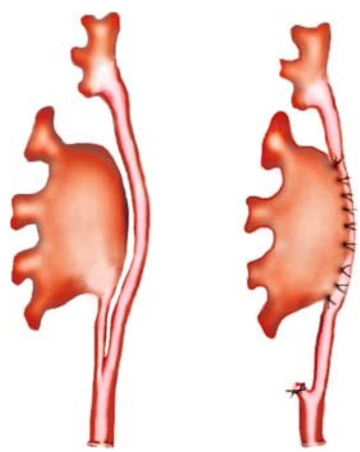


Fig. 6.23. Diagrammatic representation of executed ureteropyelostomy

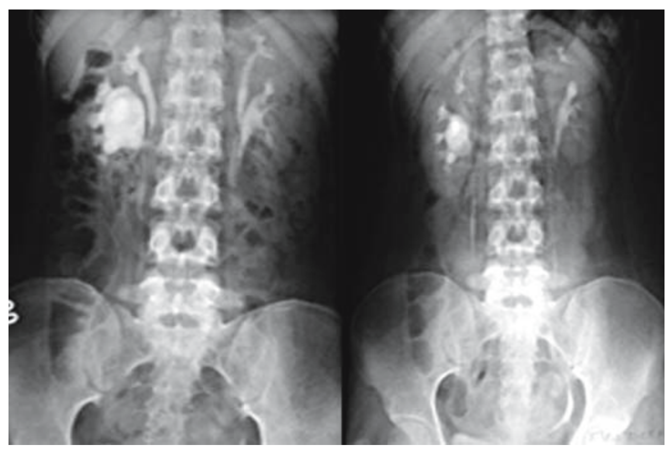


Fig. 6.24. Preoperative and postoperative IVU show better drainage

Laparoscopic Ureteropyelostomy in Complete Duplication

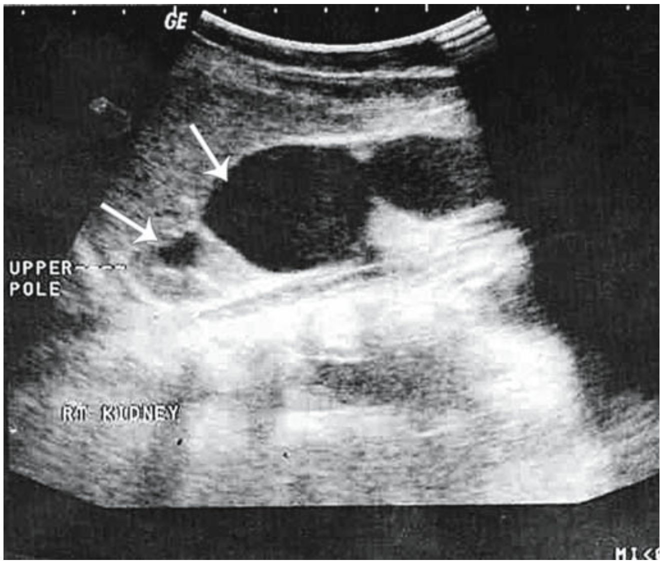


Fig. 6.25. Ultrasound scan shows the duplex system (arrows) with a grossly dilated lower moiety

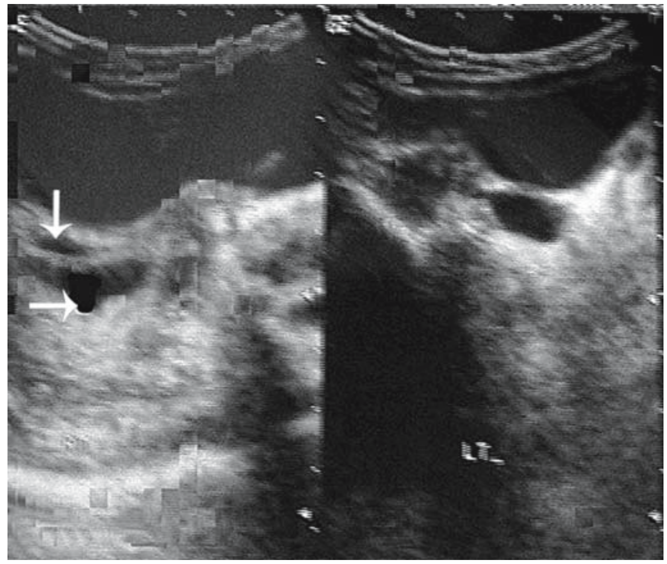


Fig. 6.26. Ultrasound scan shows double ureters (arrows) extending up to the bladder

Fig. 6.27. A micturating cystourethrography (MCU) shows a refluxing lower moiety

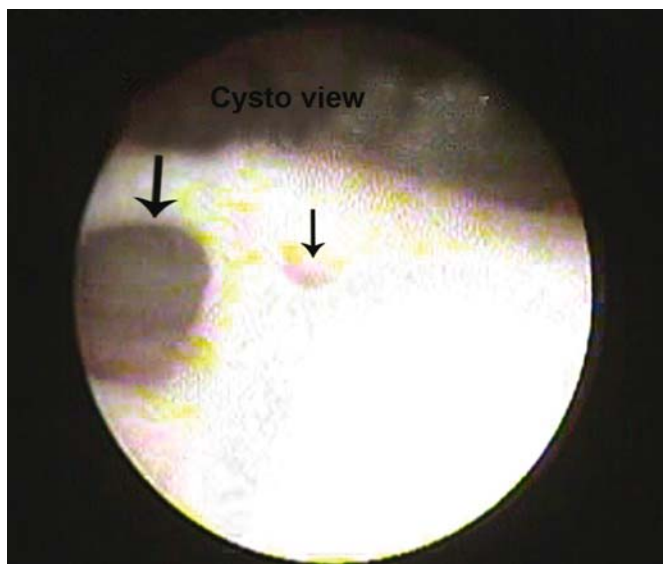


Fig. 6.28. Cystoscopy shows double ureteric orifices (arrows)

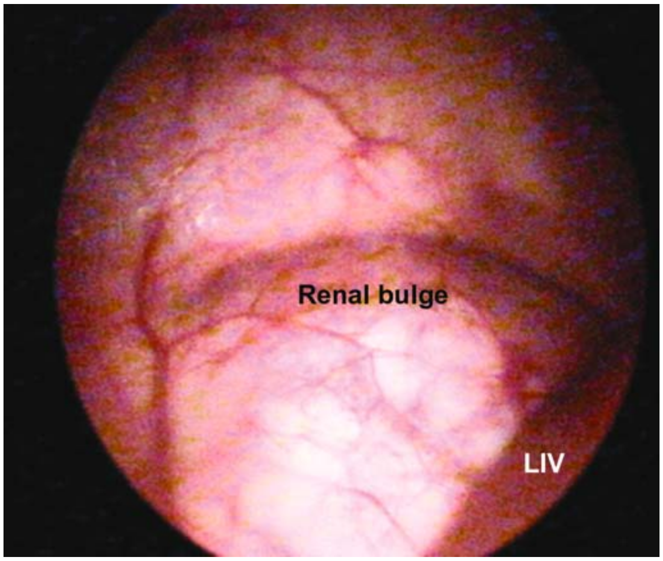


FIG. 6.29. Initial laparoscopic view shows a bulge in the right subhepatic area (LIV, liver)

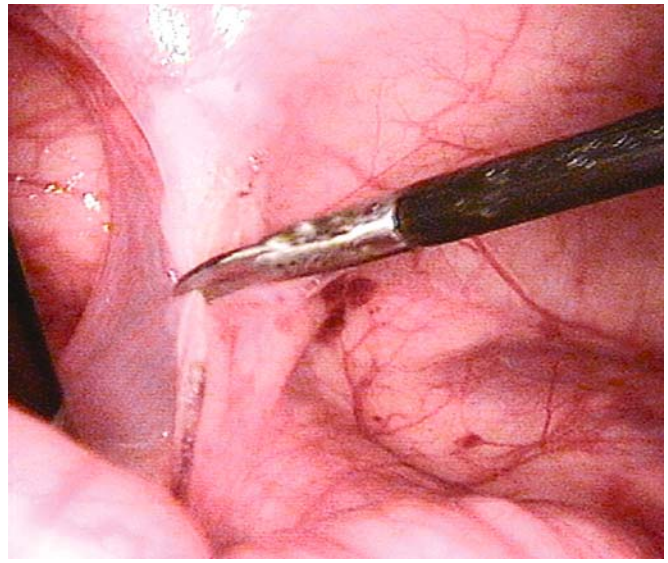
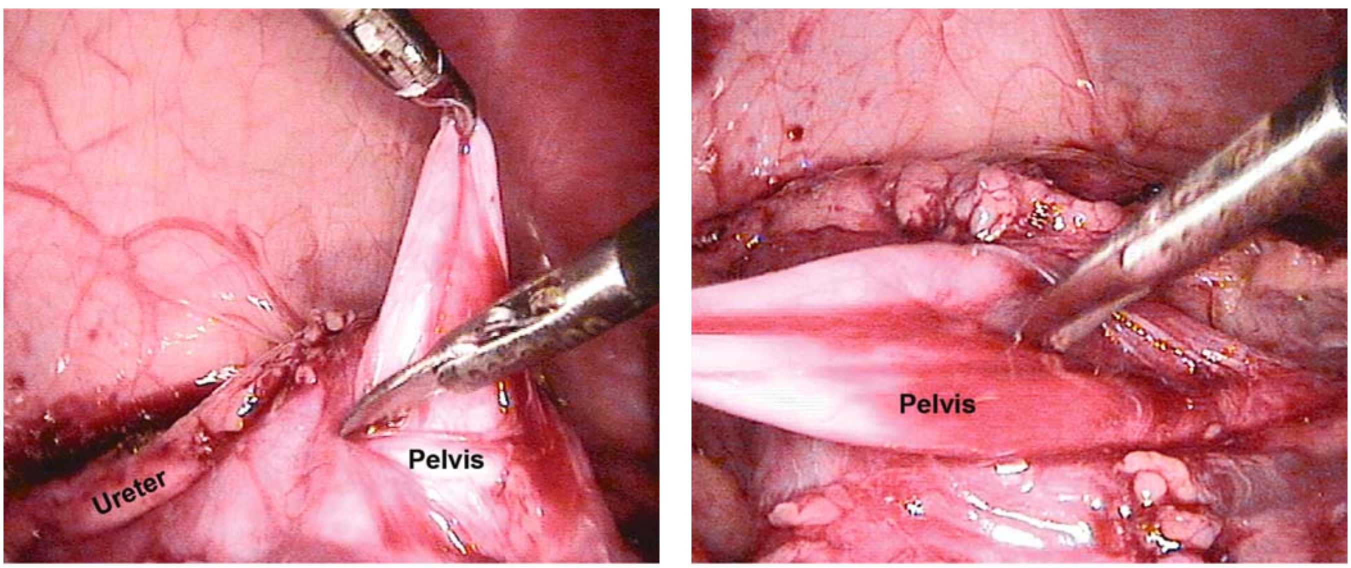


FIG. 6.30. Incision along the paracolic gutter



A B

FIG. 6.31. A flabby dilated pelvis comes into view

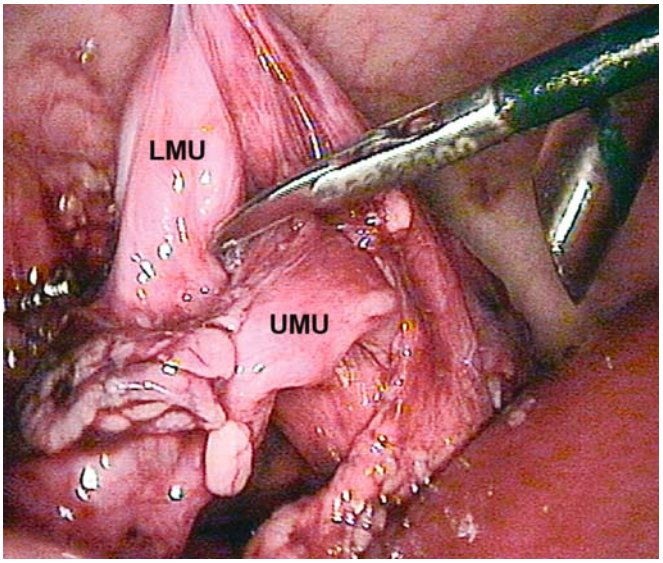


Fig. 6.32. Double ureters seen at the level of the pelvic brim (LMU, lower moiety ureter; UMU, upper moiety ureter)

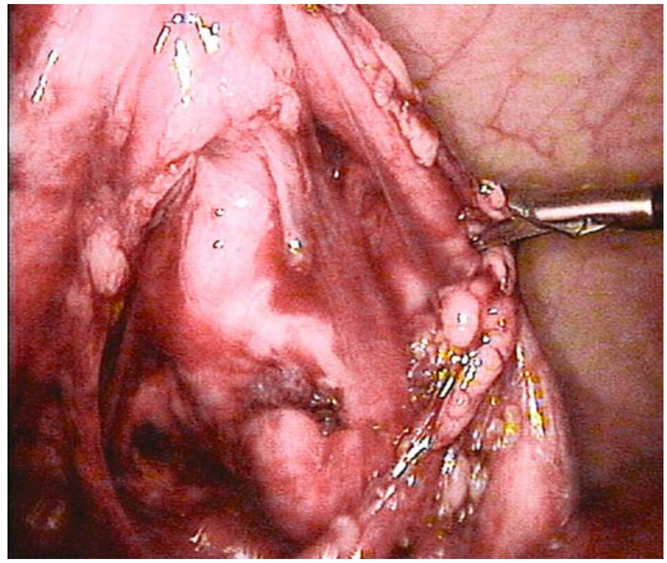


Fig. 6.33. Dissection extended downward

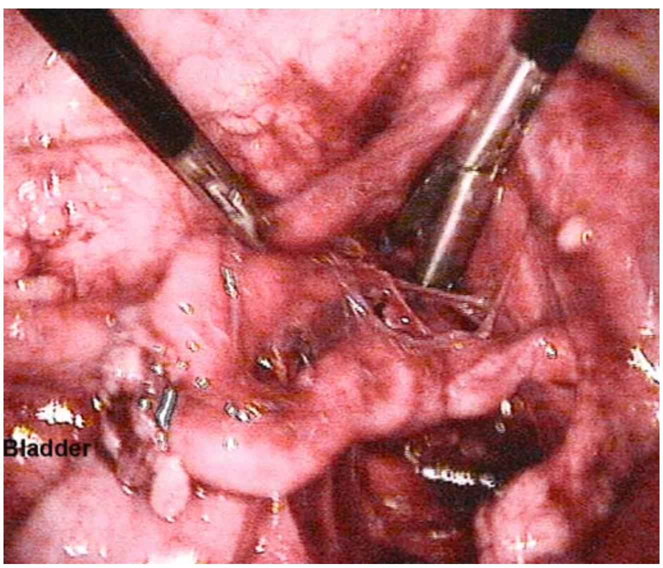


Fig. 6.34. Dissection at the level of the bladder

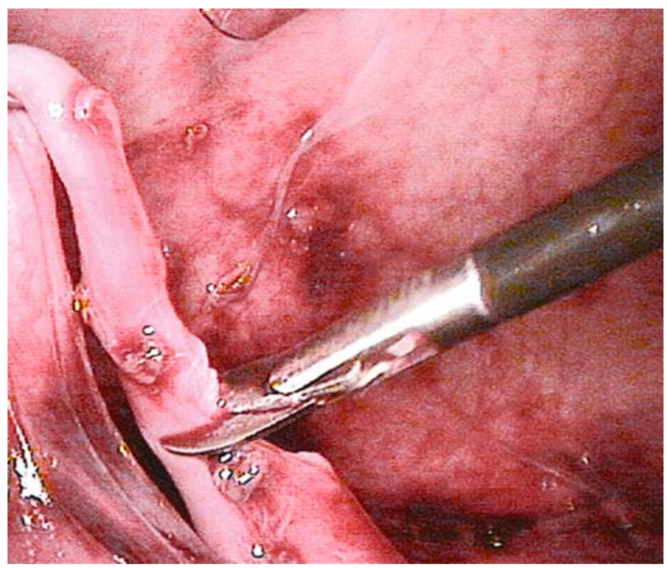


Fig. 6.35. The lower moiety ureter divided partially at the level of the renal pelvis

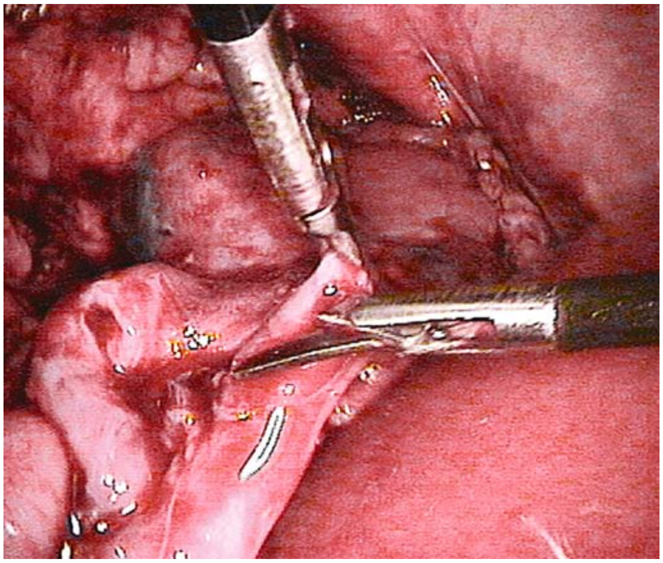


FIG. 6.36. Linear ureterotomy of the upper moiety ureter at the level of pyelotomy

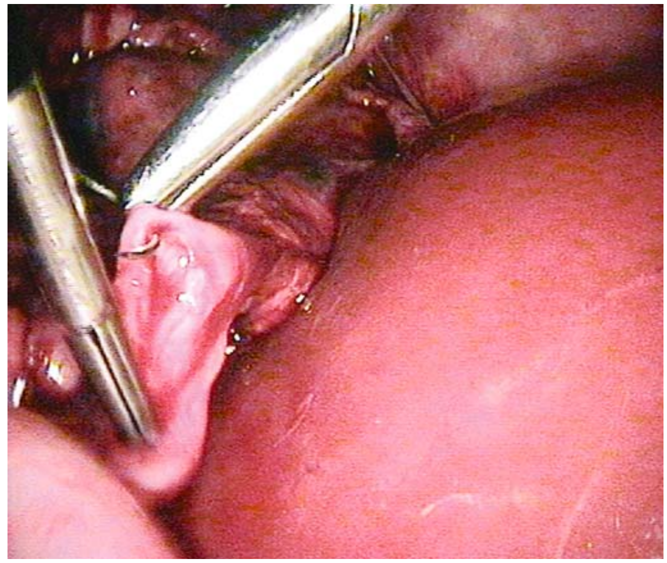


FIG. 6.37. The initial suture outside-in through the pelvis with 5-0 Vicryl

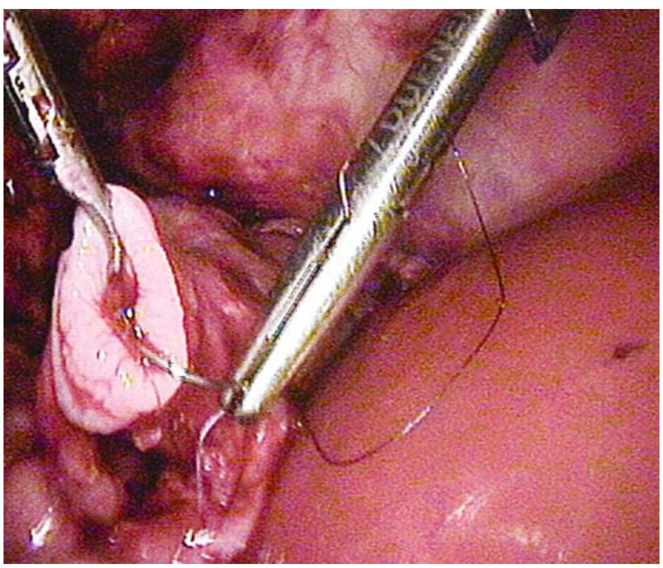


FIG. 6.38. A corresponding suture taken inside-out through the lateral lip of the ureterotomy

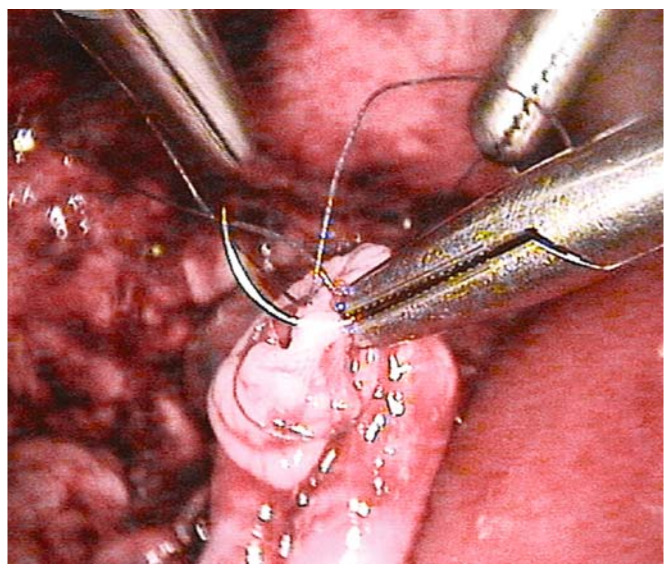


FIG. 6.39. Subsequently a continuous suture being carried out

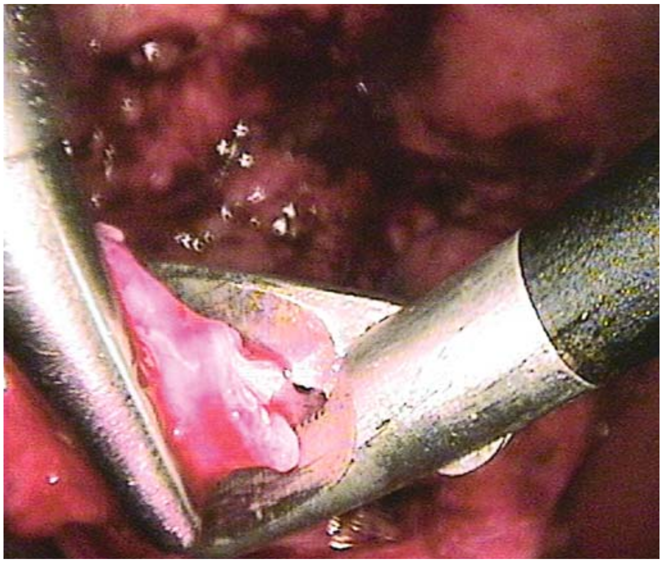


FIG. 6.40. Once an adequate length (about 1.5 cm) is sutured, the partially attached lower moiety ureter is divided completely

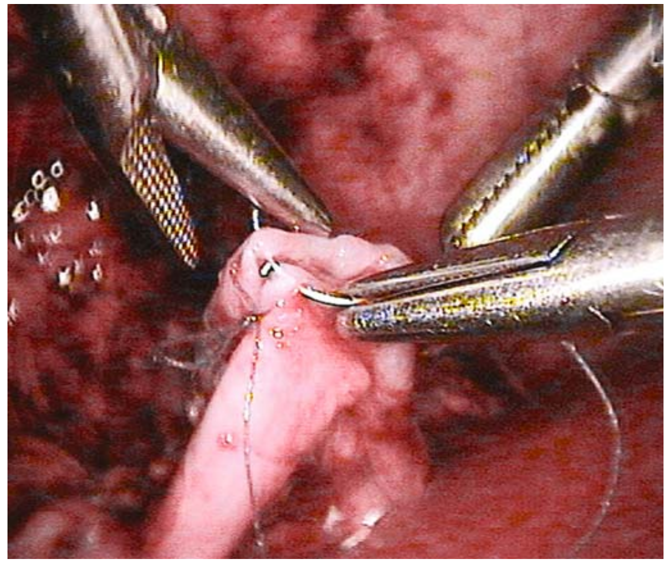


FIG. 6.41. Subsequently the anterior layer of suturing is continued

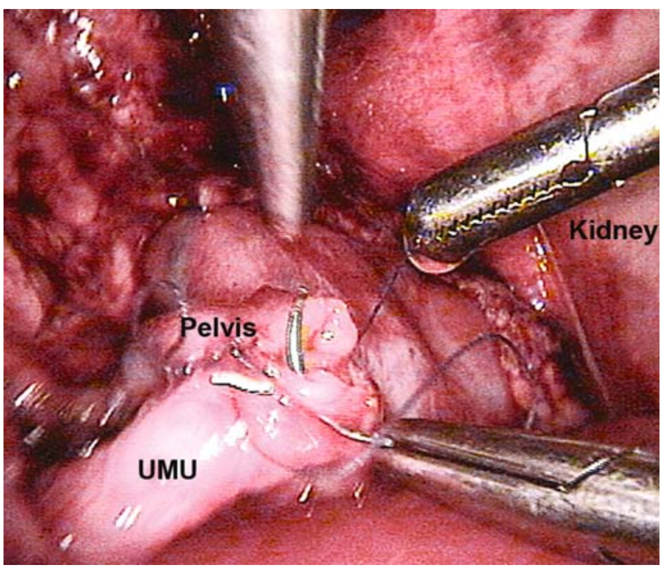


FIG. 6.42. Anterior layer suturing continues; note the useful stay at the cephalic end (UMU, upper moiety ureter)

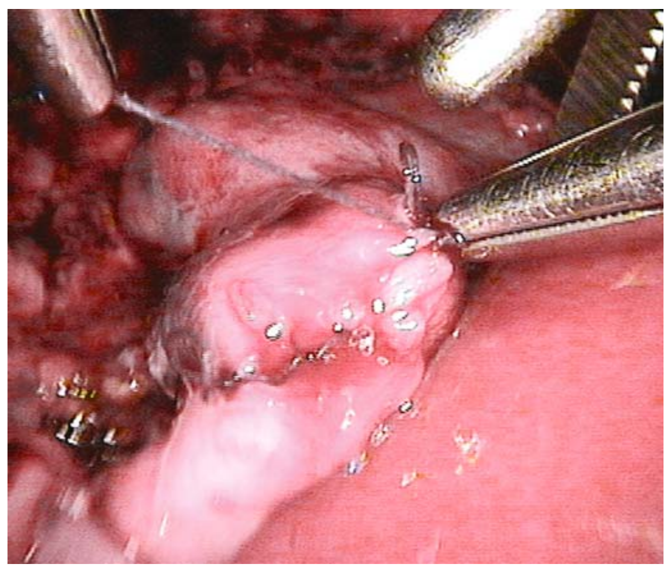


FIG. 6.43. Completed view of the ureteropyelostomy

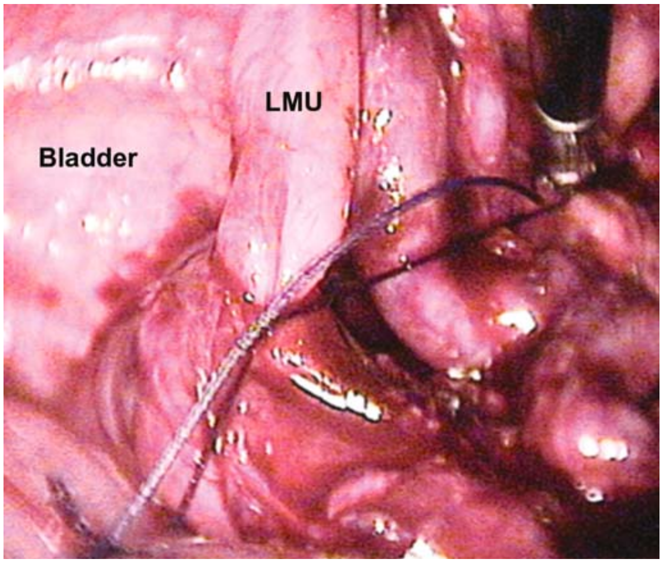


FIG. 6.44. A refluxing lower moiety ureter is ligated at the juxtahiatal level with 2-0 Vicryl (LMU, lower moiety ureter)

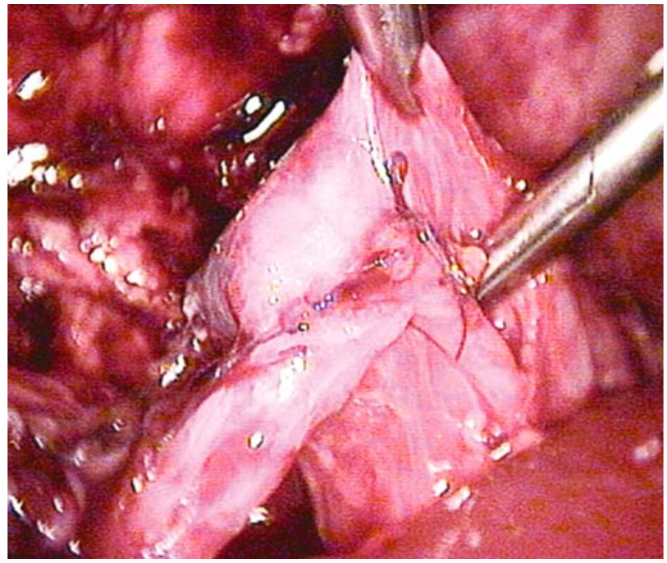


FIG. 6.45. Completed view of the ureteropyelostomy

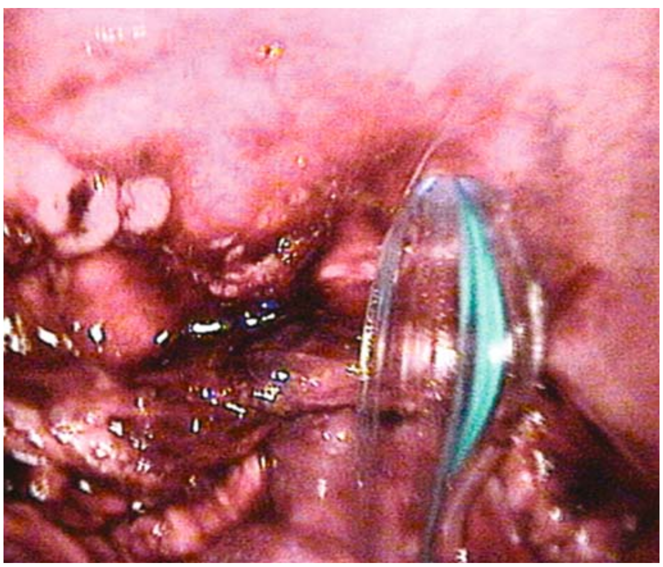


FIG. 6.46. Corrugated drain exiting through the flank

FIG. 6.47. Completely excised refluxing ureter

Fig. 6.48. Port sites

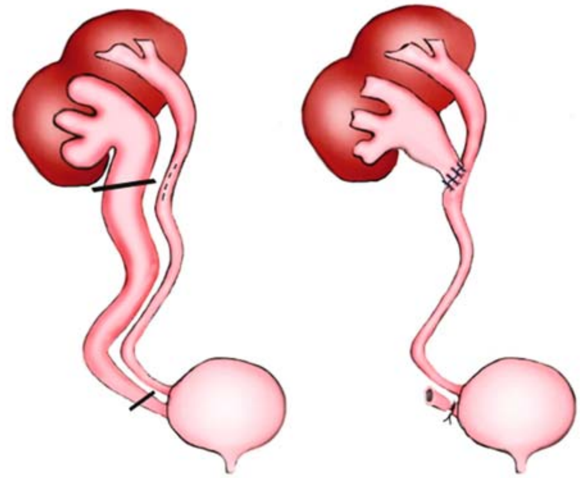


Fig. 6.49. Diagrammatic representation of the executed ureteropyelostomy

Fig. 6.50. Preoperative IVU shows poor function of the right kidney

Fig. 6.51. An IVU done 4 years postoperatively shows fair function and drainage

References

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2. Belman AB, Filmer RB, King LR (1974) Surgical management of duplication of the collecting system. J Urol 112:316.
3. Caldamone AA (1985) Duplication anomalies of the upper urinary tract in infants and children. Urol Clin North Am 12:75.
4. Ramalingam M, Selvarajan K, Pai M.G, Senthil K (2006) Laparoscopic ureteropyelostomy. J Endourol 10:115.

7 Laparoscopic Ureterocalicostomy

M. Ramalingam and K. Senthil

Ureteropelvic junction (UPJ) narrowing with an intrarenal pelvis and grossly dilated calices may be a challenging problem especially in failed pyeloplasty. When there is a long stenotic UPJ segment or the area is too scarred to permit a tension-free pyeloplasty, ureterocalicostomy is a good option [1–3].

Newer hemostatic technologies allow better visibility and less blood loss during renal parenchymal transection, and with experience in laparoscopic suturing techniques laparoscopic ureterocalicostomy can be performed safely and effectively.

Surgical Technique

A preliminary cystoscopy and retrograde pyelogram are performed. A ureteral catheter is placed along with a guidewire so that a stent can be placed easily halfway through the anastomosis. A 10-mm primary camera port is inserted above and lateral to the umbilicus. Two 5-mm ports are inserted in the subcostal region and right iliac fossa. The proximal ureter is dissected free of surrounding structures as far proximally as possible toward the renal hilum to see if pyeloplasty is feasible. The UPJ at the hilar area is ligated and the stenotic ureter excised. Then the cut end of the ureter is spatulated for 1 cm. The segment of the calyx that needs to be anastomosed to the ureter is identified and a buttonhole calicotomy is performed. The posterior layer of suturing can be started first with 4-0 interrupted Vicryl sutures. Then the guidewire and stent are advanced retrograde. Now the anterior layer suturing is done in a similar manner. Perirenal fat or omentum can be tacked around the ureterocalicostomy area. A tube drain can be introduced through the flank port.

Clinical application of a laparoscopic ureterocalicostomy provides the benefits of a minimally invasive approach in patients where standard laparoscopic pyeloplasty is not technically feasible. It is a viable alternate to major procedures such as those for an ileal ureter, which has its own inherent problems.

Laparoscopic Ureterocalicostomy

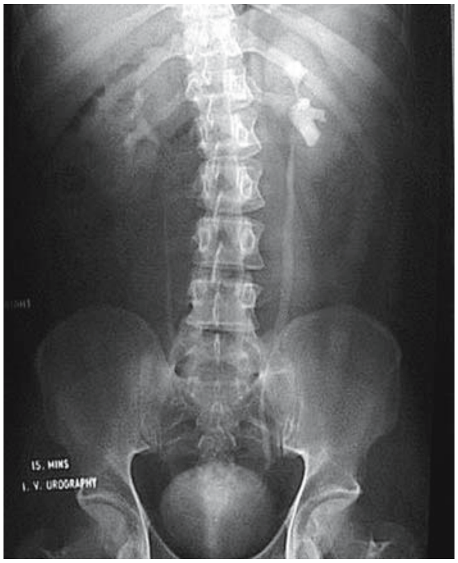


FIG. 7.1. An intravenous urogram (IVU) shows a left UPJ stenosis and intrarenal pelvis

FIG. 7.2. A computed tomography (CT) scan shows thinned-out parenchyma over lower calyx

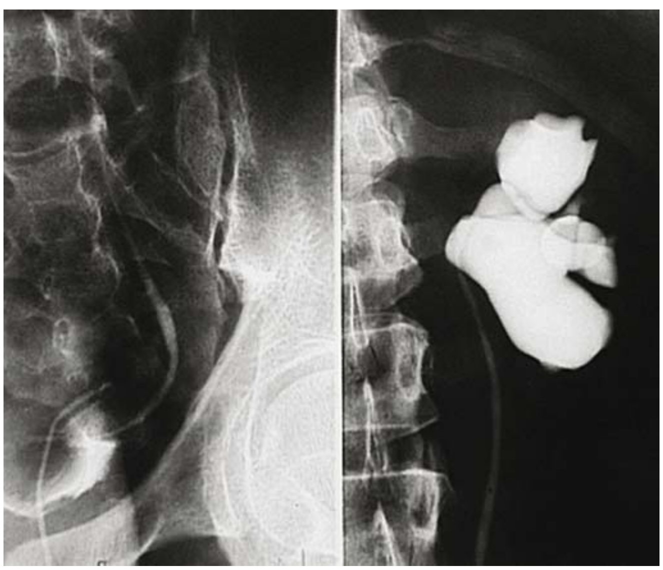


FIG. 7.3. A retrograde pyelogram (RGP) confirms a smooth left upper ureteric stricture and intrarenal pelvis

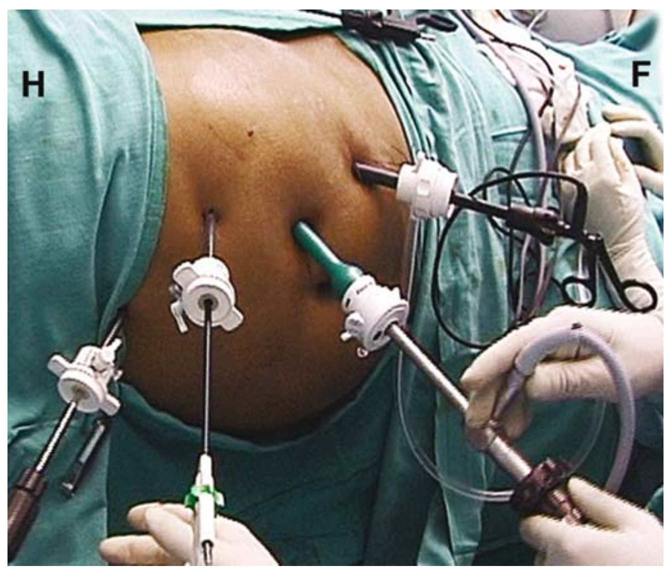


FIG. 7.4. External view of the port positions (H, head end; F, foot end)

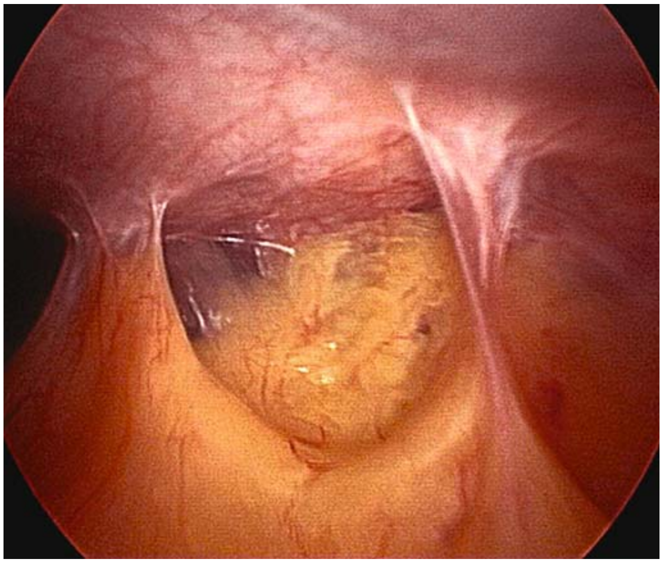


FIG. 7.5. Laparoscopic view of the left renal area

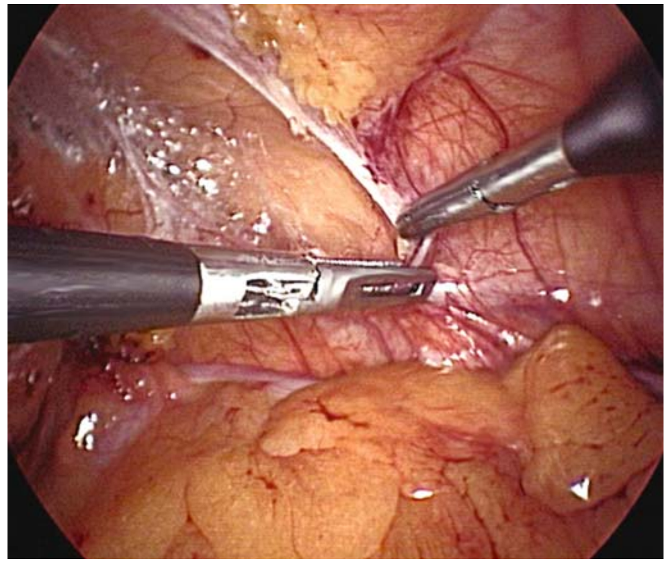


FIG. 7.6. Incision along the paracolic gutter to mobilize the colon

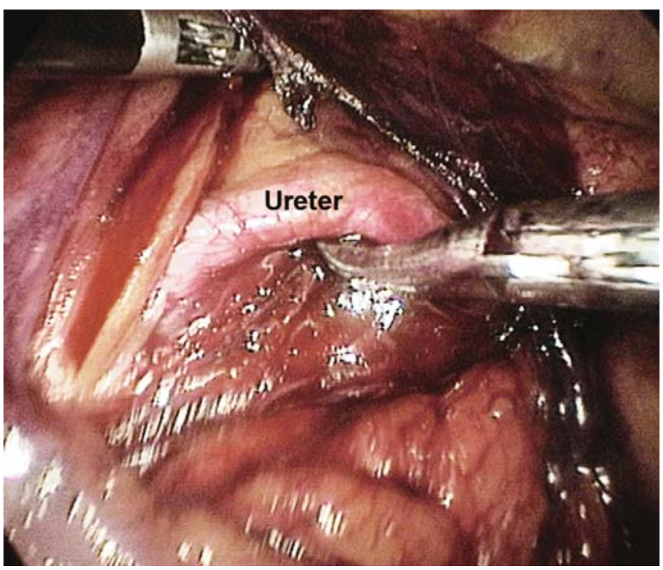


FIG. 7.7. Ureteric isolation at the level of the lower pole of kidney

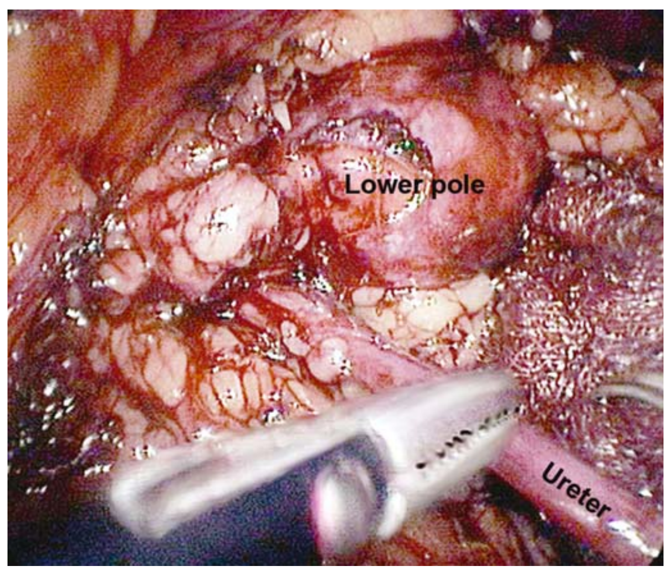


FIG. 7.8. Dissection on the ureter cephalad reveals an intrarenal pelvis

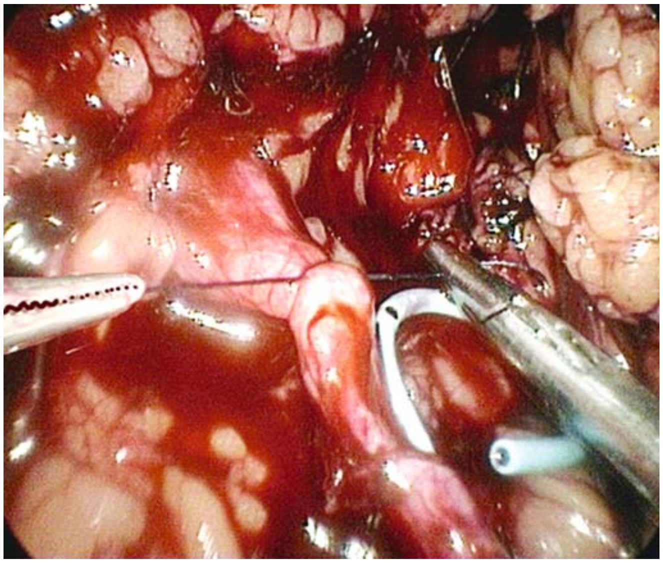


FIG. 7.9. Ligation of UPJ with 2-0 Vicryl; a ureterotomy has been done to bring out the preplaced stent

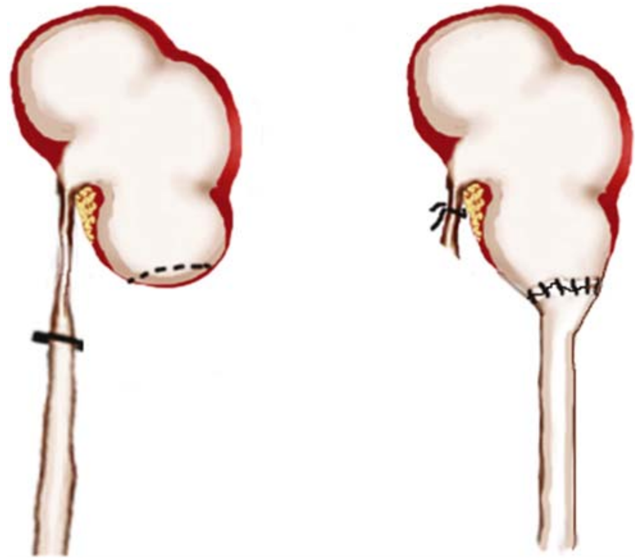


FIG. 7.10. Diagrammatic representation of the planned end-to-side ureterocalicostomy

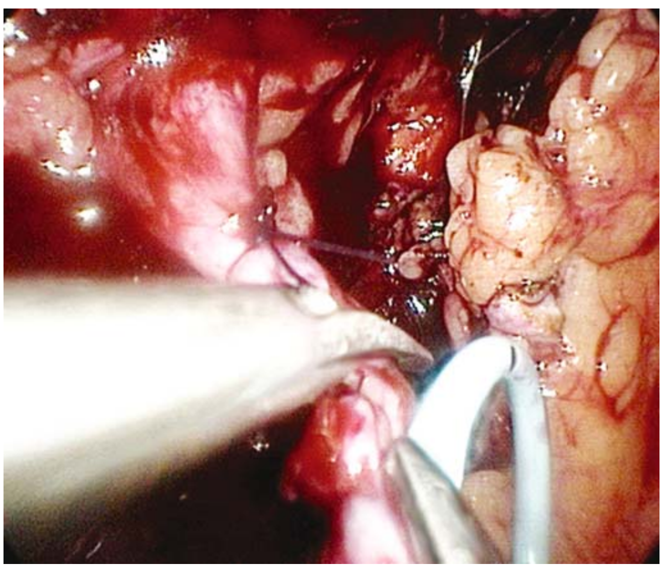


FIG. 7.11. Division of the UPJ with a scissors (a part of the strictured ureter is excised and sent for biopsy)

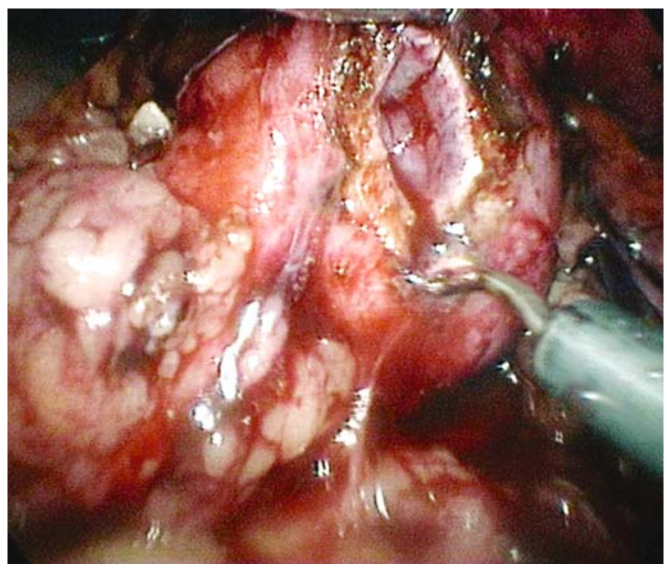


FIG. 7.12. Incision into the lower calyx, with L-hook cautery done at a dependent area

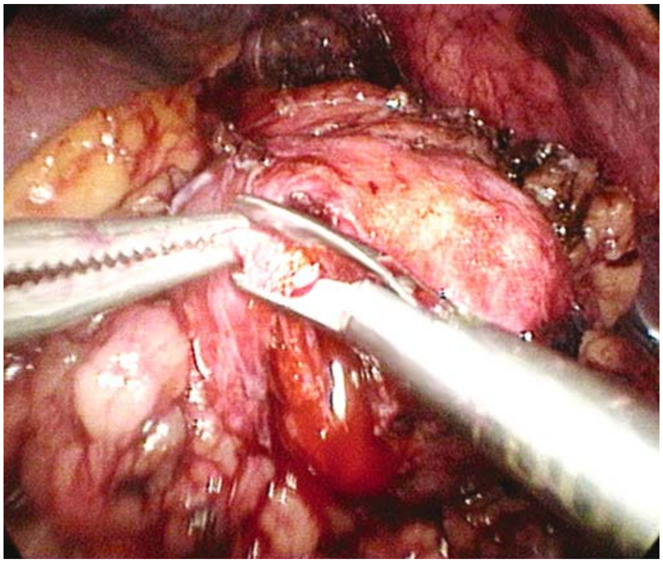


FIG. 7.13. Excision of a button of the parenchyma over the lower calyx

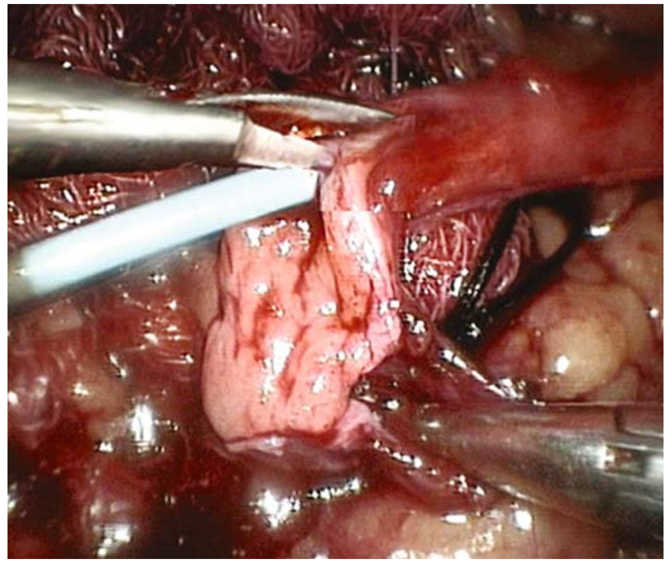


FIG. 7.14. Lateral spatulation of the divided upper ureter can be done for about 1.5 cm

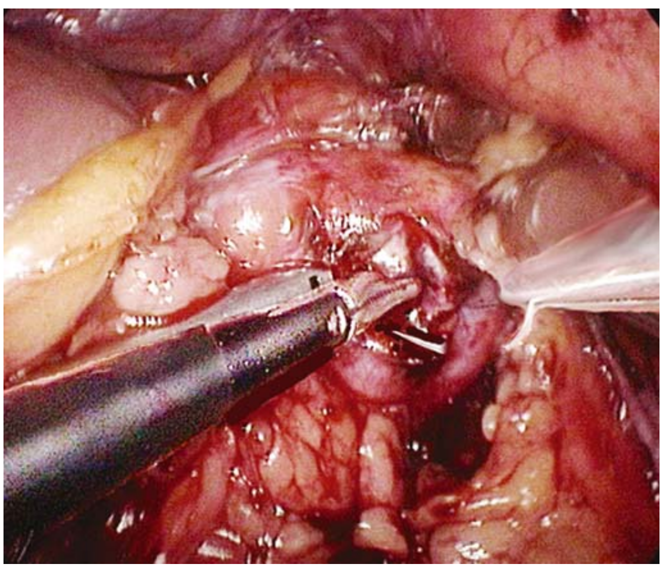


FIG. 7.15. Vicryl suture (4-0) taken outside-in through the lateral aspect of the calicotomy

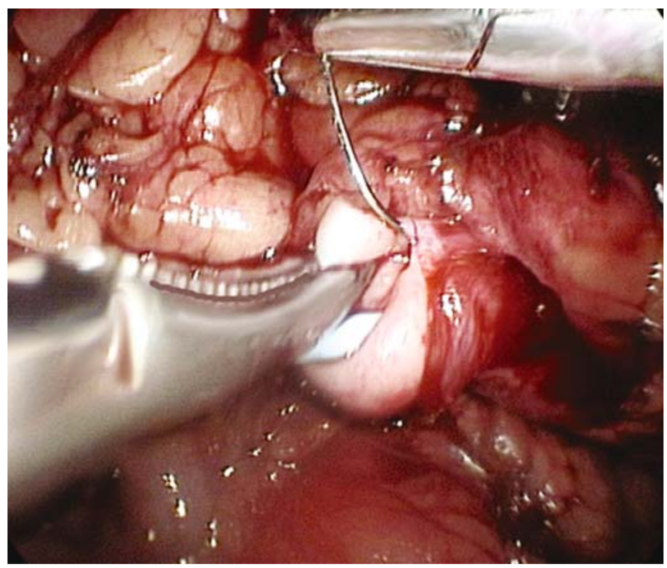


FIG. 7.16. A corresponding apical suture taken inside-out through the spatulated ureter

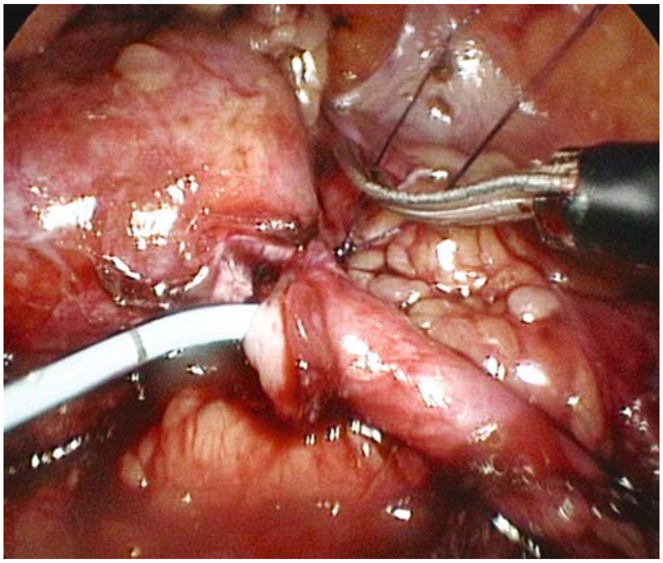


Fig. 7.17. The ureter lying tension-free after the first lateral suture

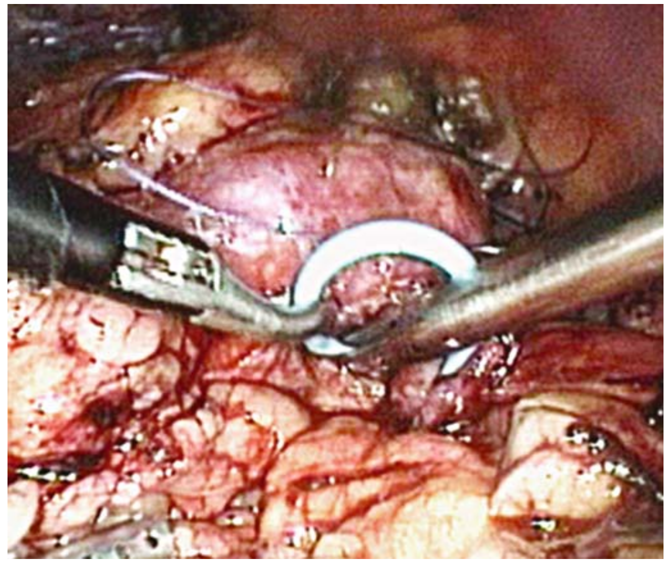


Fig. 7.18. Repositioning of a double-J stent into the renal pelvis through the calicotomy

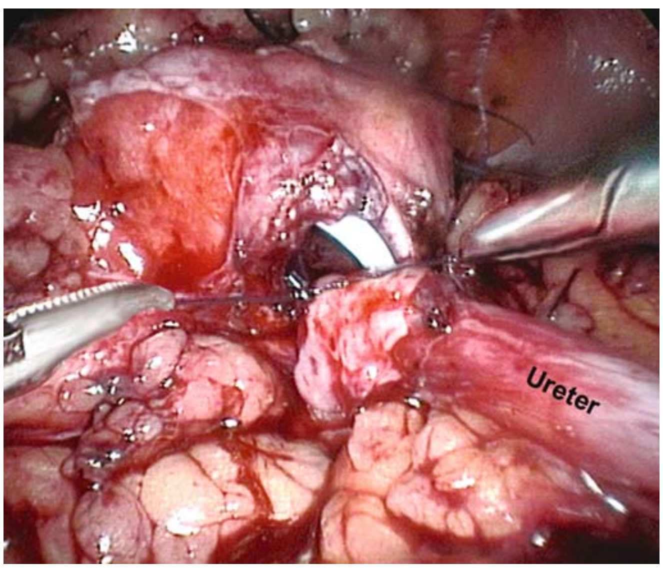


Fig. 7.19. Posterior layer suturing in progress with interrupted 4-0 Vicryl

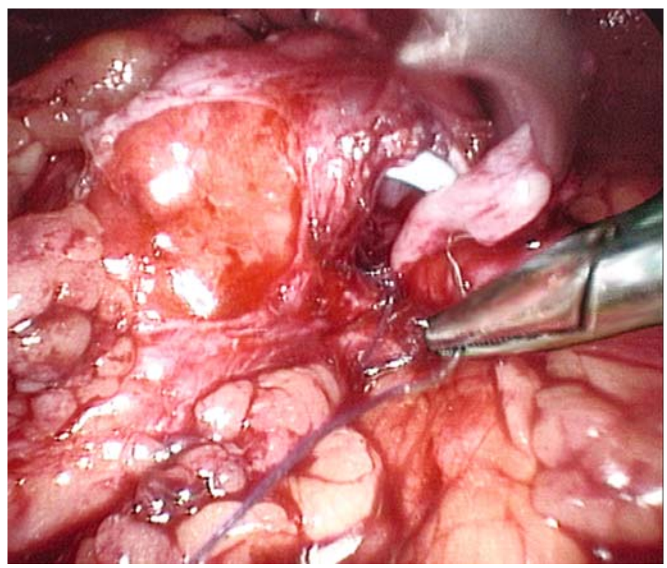


Fig. 7.20. Ureterocalicostomy (posterior layer suturing)

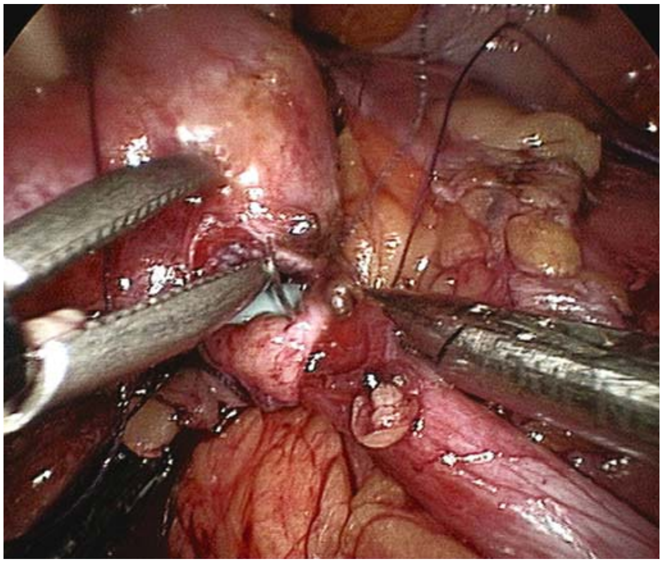


FIG. 7.21. Ureterocalicostomy (anterior layer suturing started from the spatulated area upward)

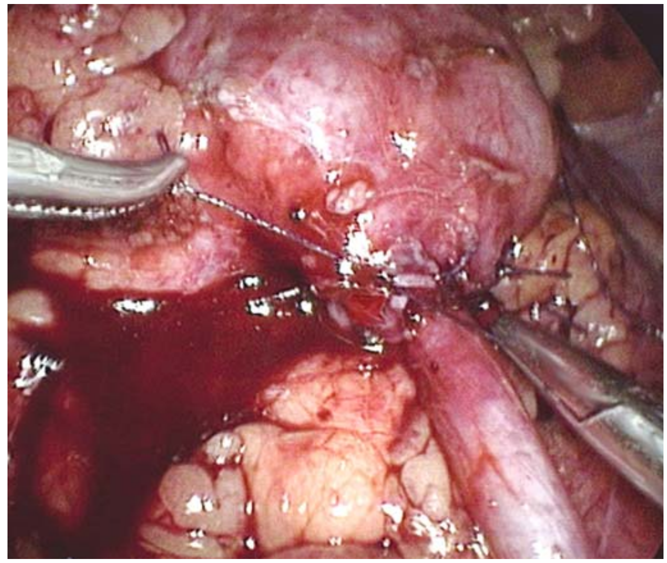


FIG. 7.22. Ureterocalicostomy, nearly completed

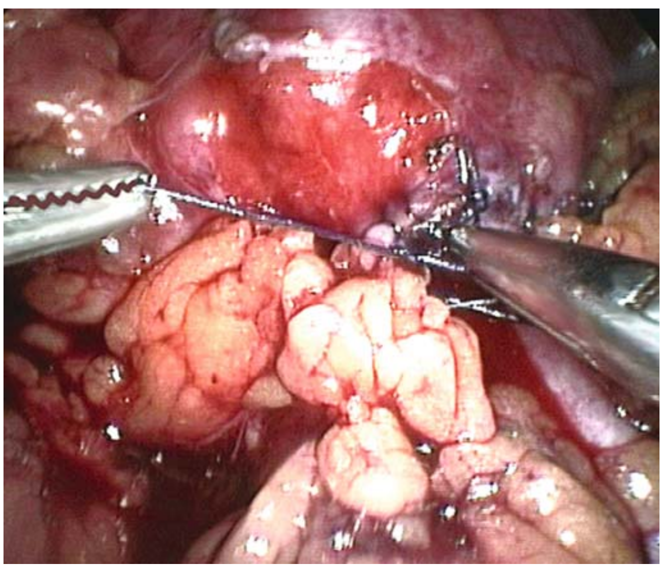


FIG. 7.23. Tacking perirenal fat over the ureterocalicostomy

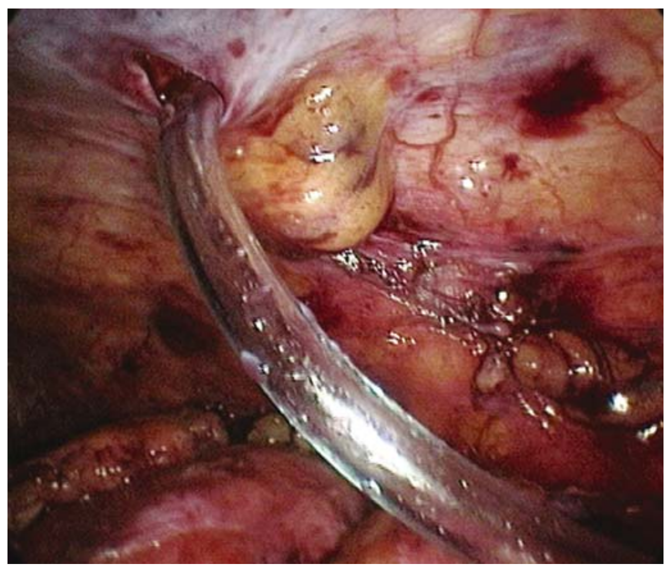


FIG. 7.24. Tube drain from the flank

Ureterocalicostomy (Side to Side) for the Intrarenal Pelvis

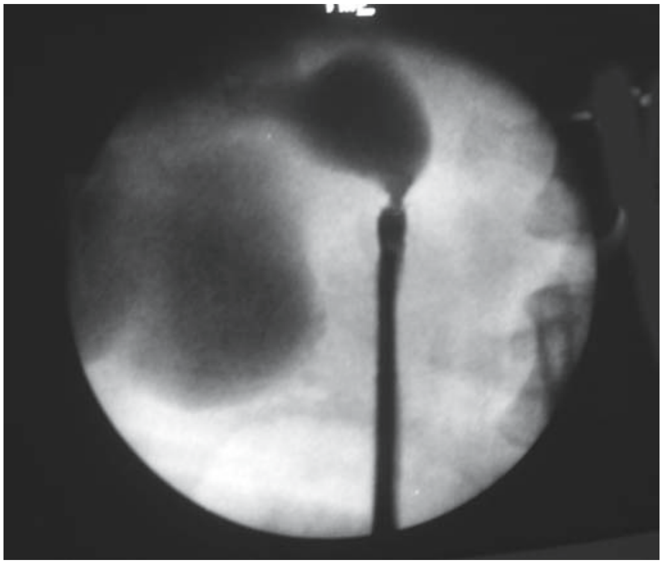


Fig. 7.25. Right RGP shows a UPJ stenosis and small intrarenal pelvis with grossly dilated calices indicating that a ureterocalicostomy will be more dependent than a pyeloplasty

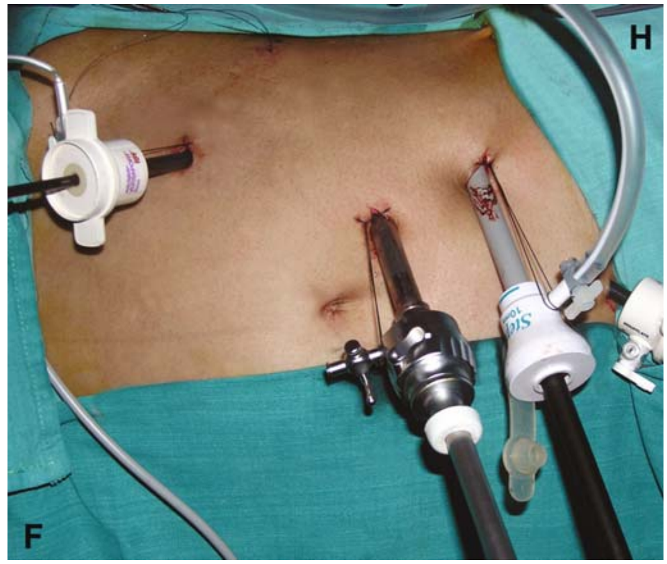


Fig. 7.26. External view of the port positions

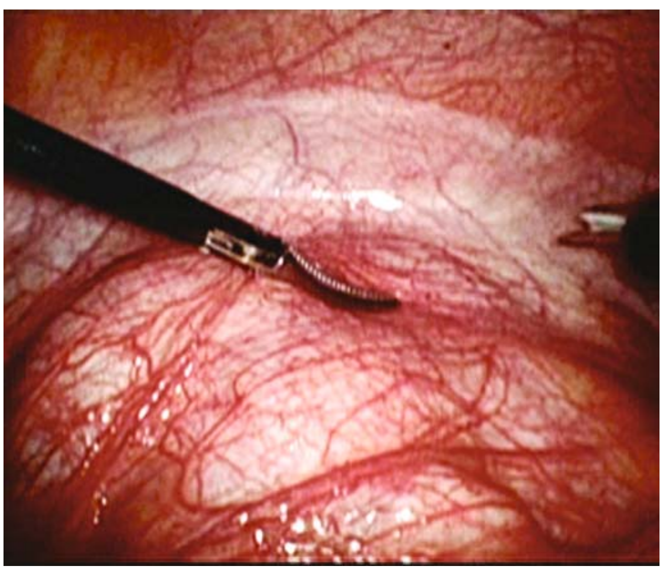


Fig. 7.27. Initial laparoscopic view shows a right renal bulge

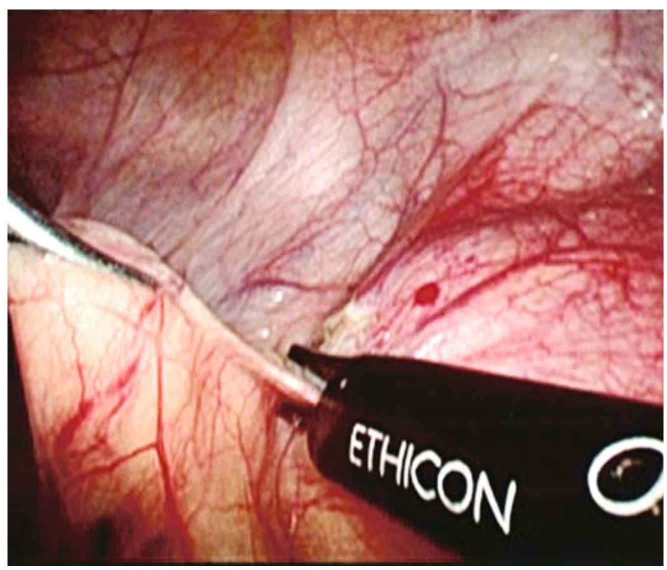
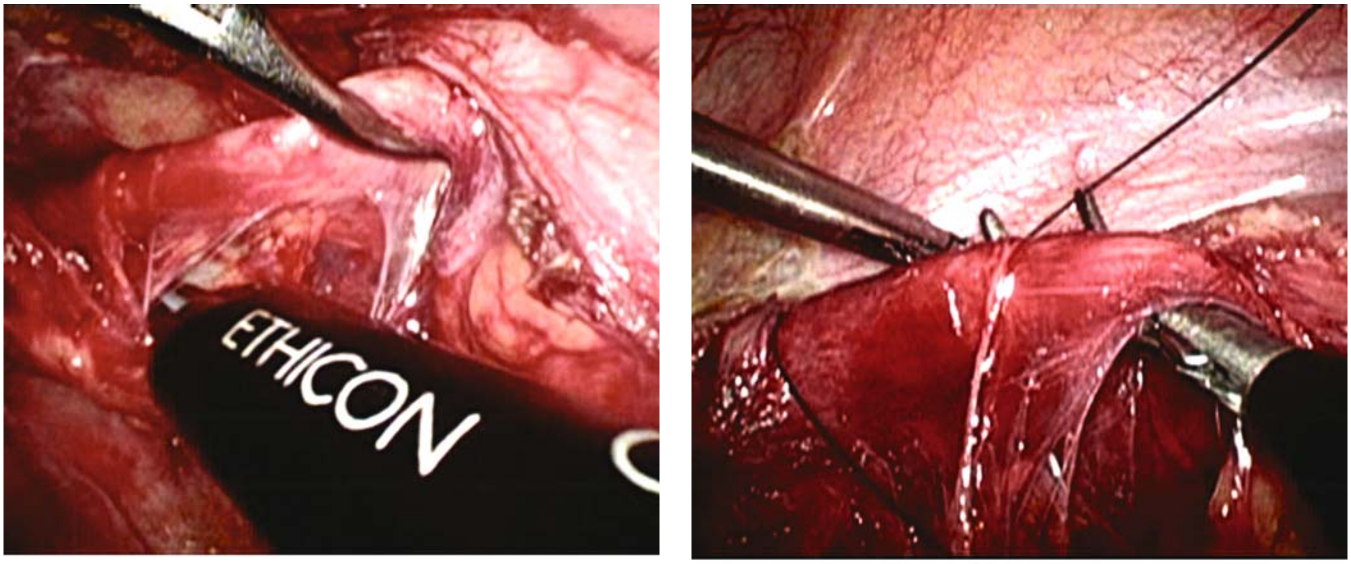


Fig. 7.28. A colonic mobilization in progress



A B

FIG. 7.29. A ureteric mobilization in progress

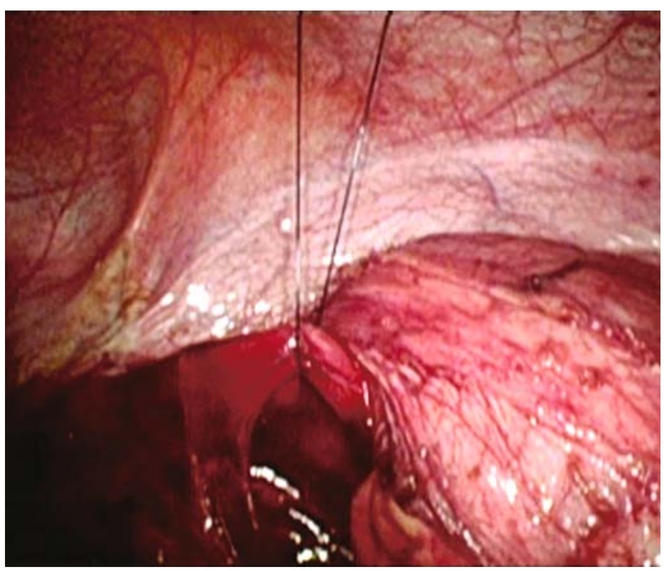
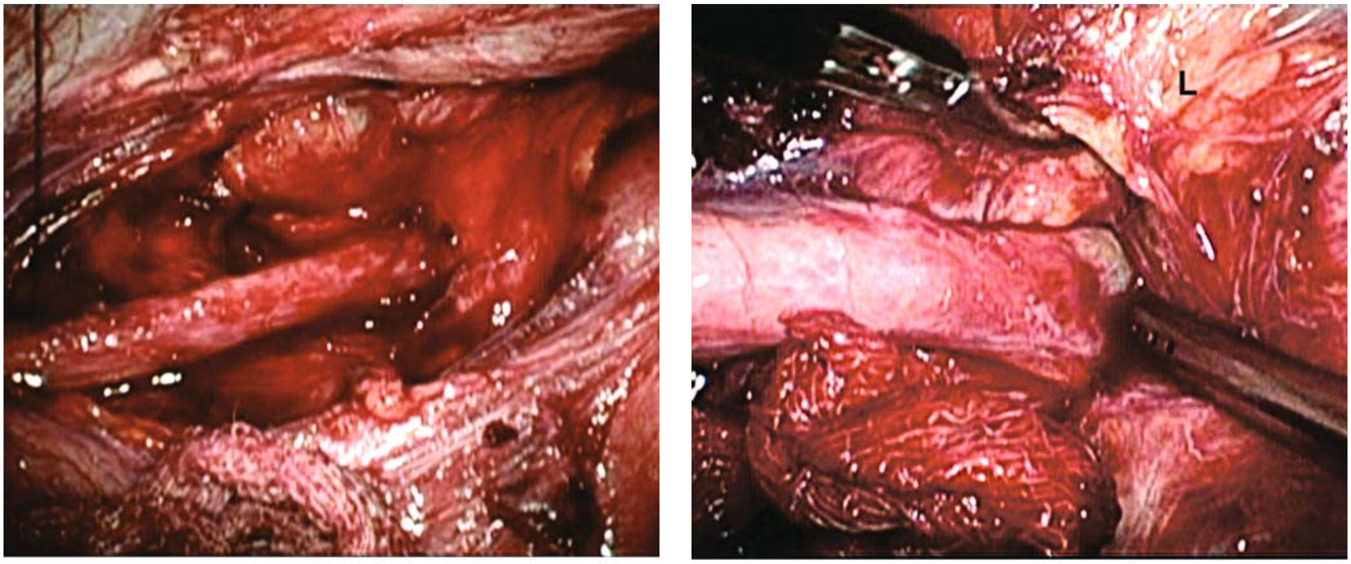


FIG. 7.30. A sling around the ureter



A B

Fig. 7.31. A ureteric mobilization (as cephalad as possible) in progress (L, lower pole of kidney)

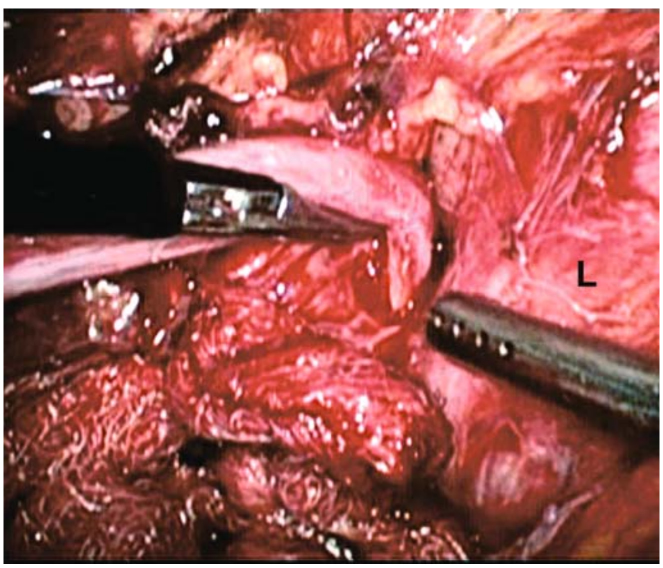


Fig. 7.32. Even intrarenal dissection does not reveal the pelvis; hence a decision is made to do a side-to-side ureterocalicostomy

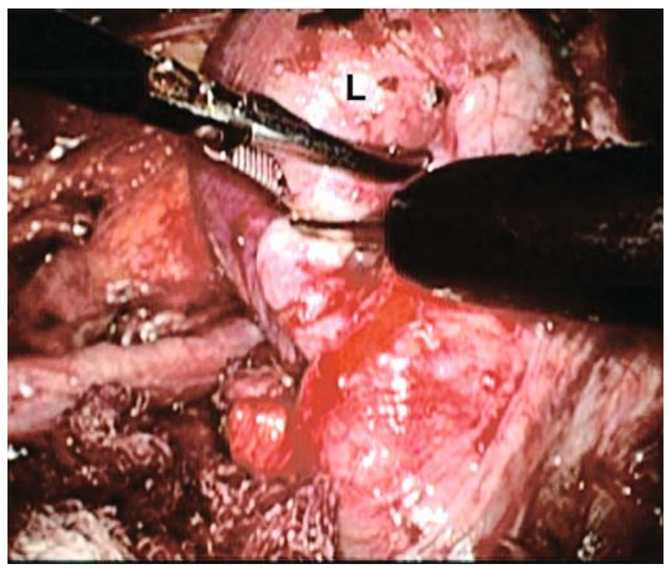
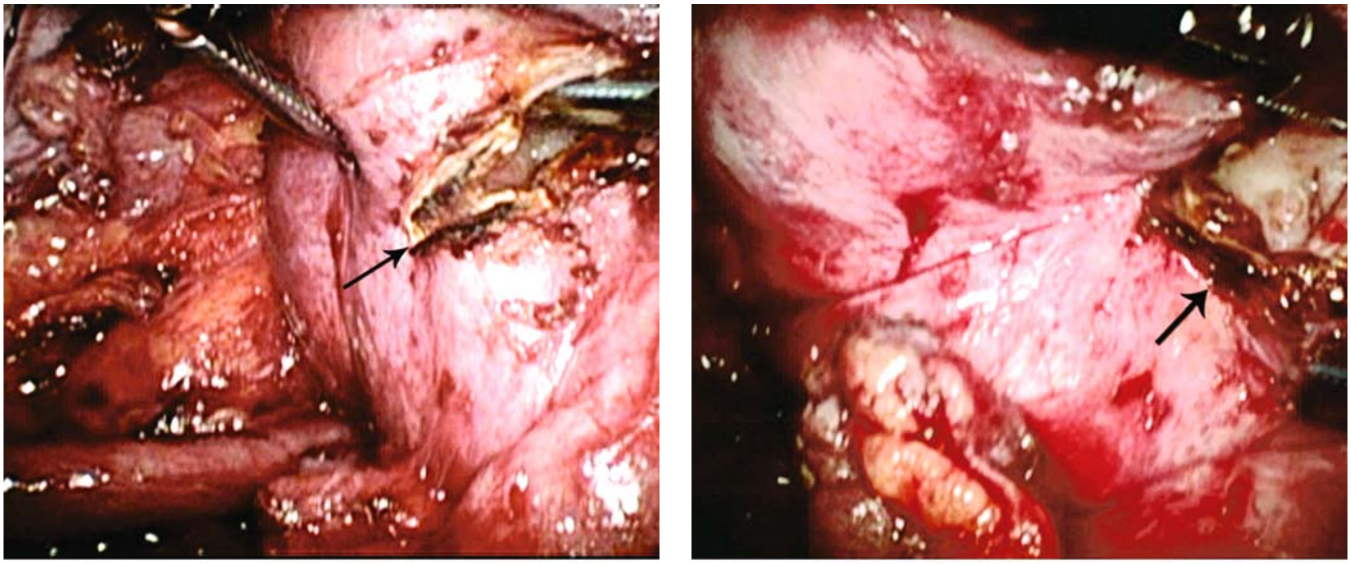
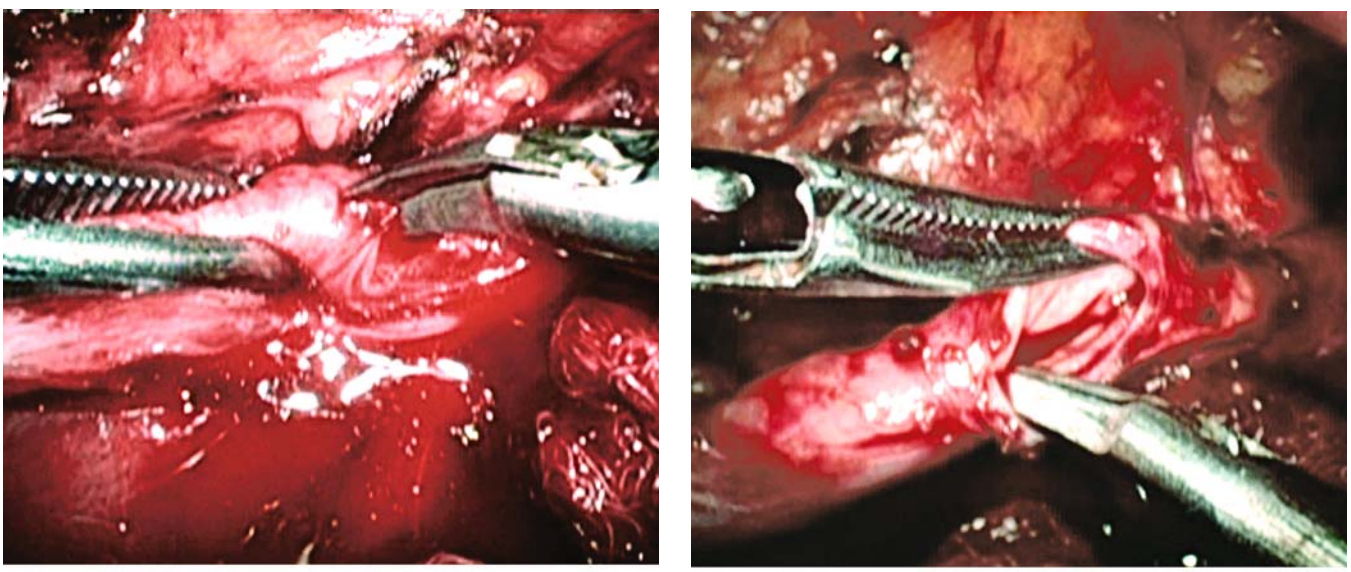


Fig. 7.33. Site for the calicotomy is along the lie of the ureter



A B

FIG. 7.34. A linear calicotomy (arrow) in progress



A B

FIG. 7.35. A linear ureterotomy is performed to oppose and match the length of the calicotomy

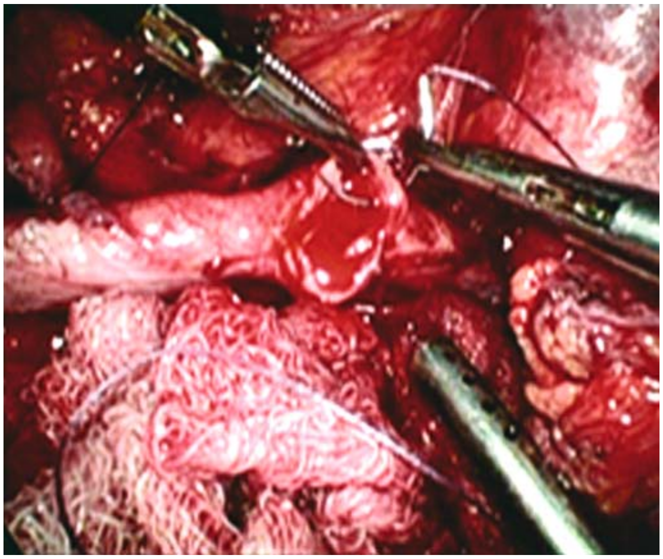


FIG. 7.36. Initial suture (4-0 Vicryl) outside-in through the proximal end of the lateral edge of the ureterotomy

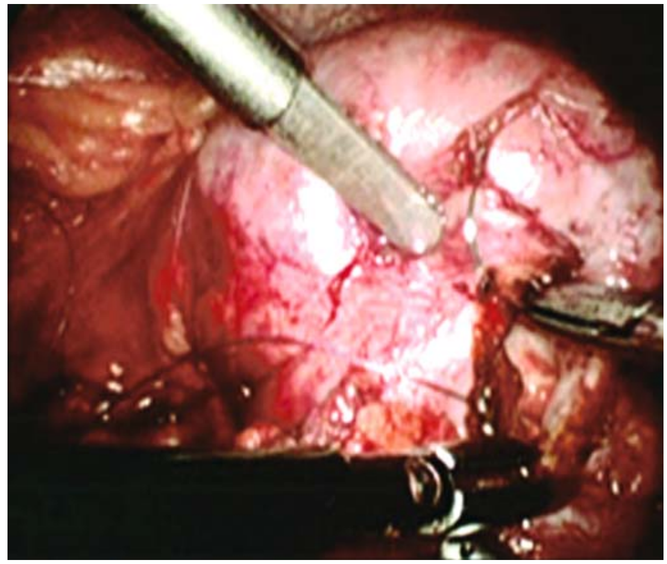


FIG. 7.37. A corresponding suture is taken inside-out of the lateral edge of the calicotomy

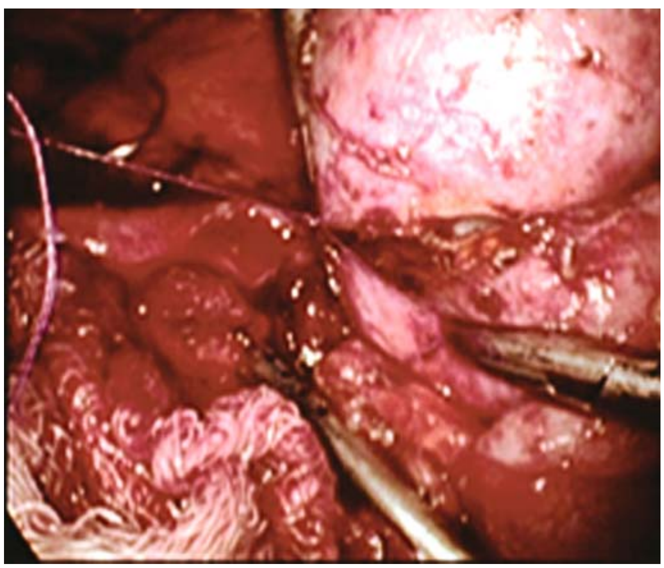
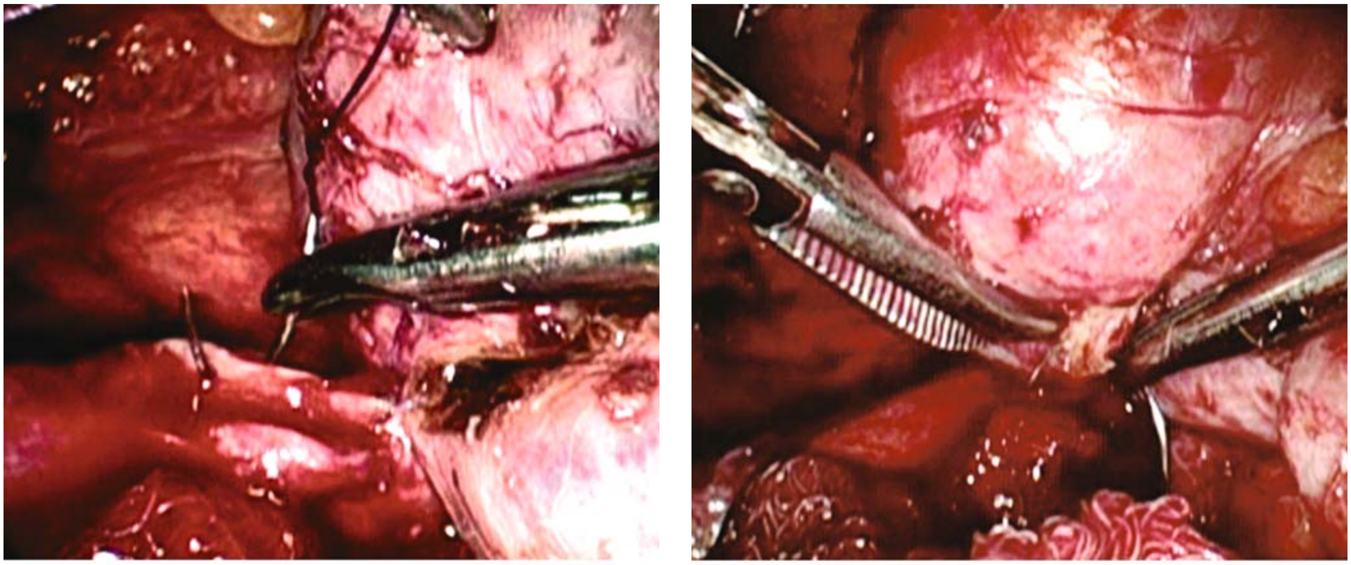
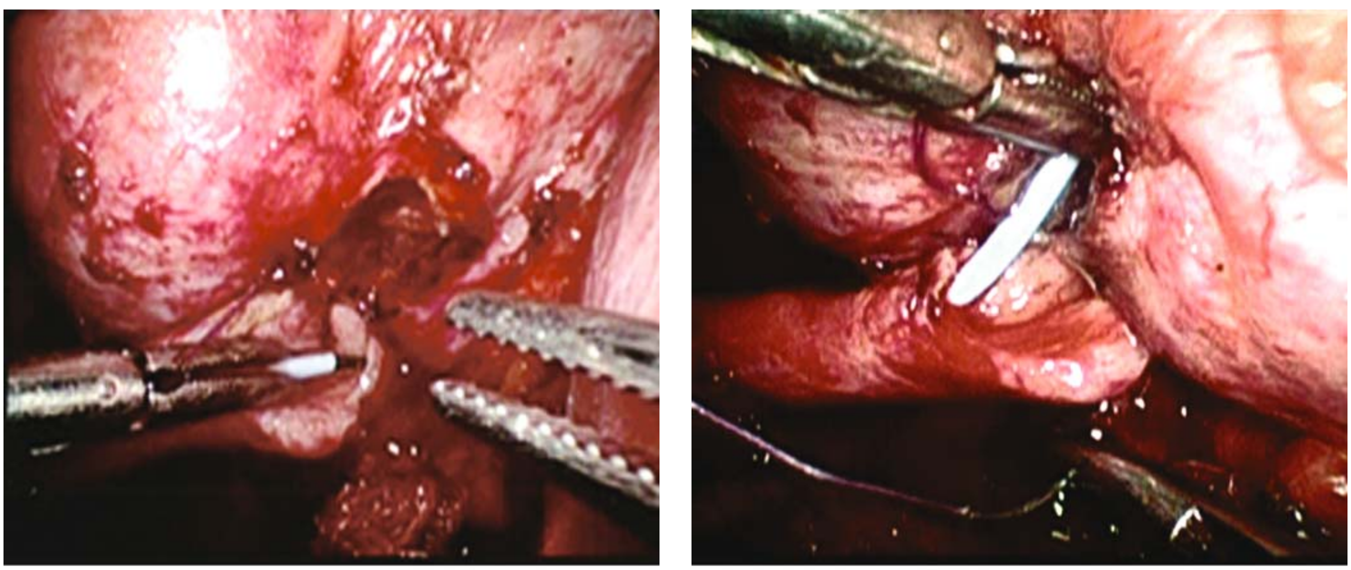


FIG. 7.38. View after the initial knot



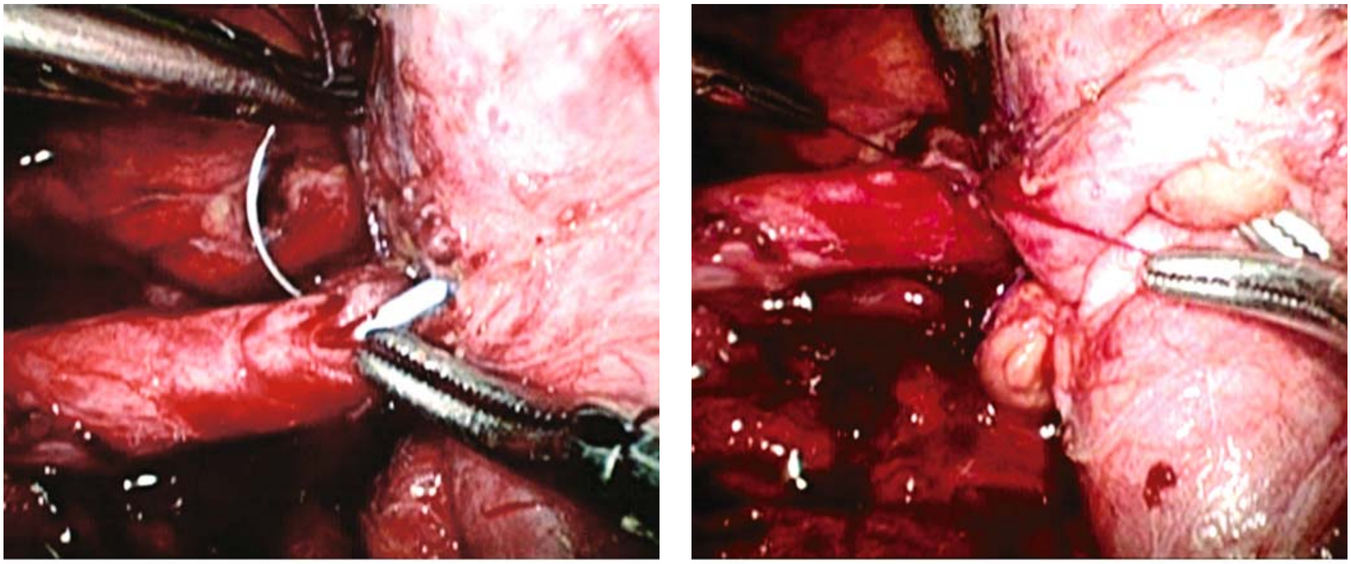
A B

FIG. 7.39. Subsequently a few interrupted sutures are placed on the lateral edges



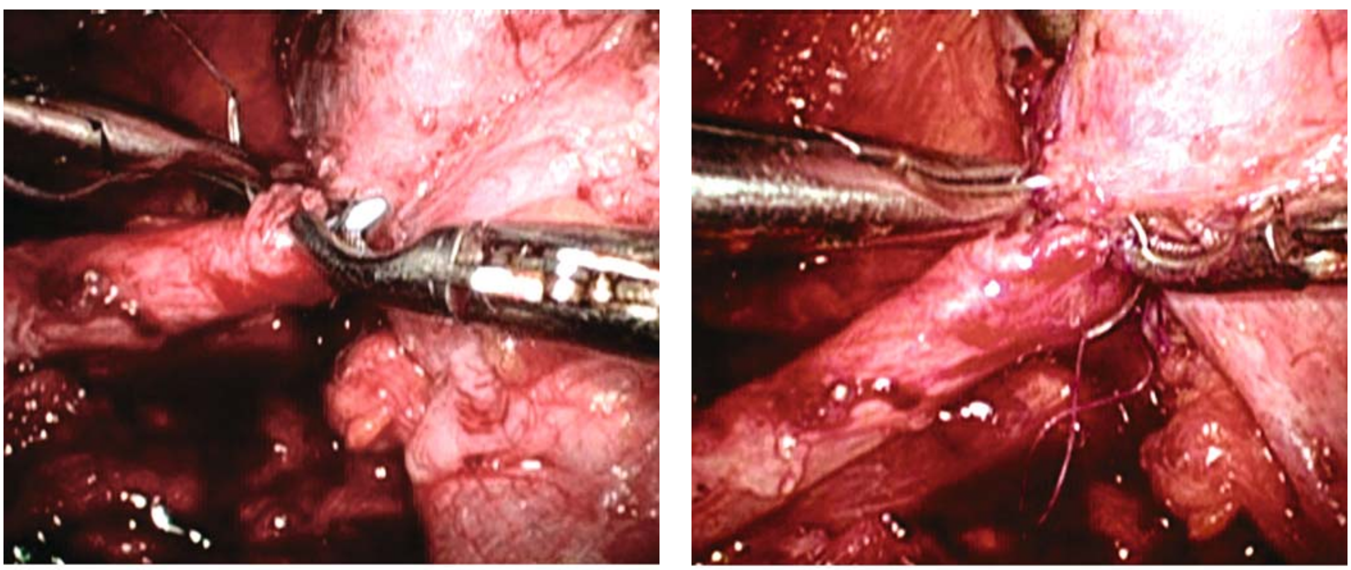
A B

FIG. 7.40. A double pigtail stent is advanced retrograde over a preplaced guidewire



A B

FIG. 7.41. Completing the lateral layer suture



A B

FIG. 7.42. An apical suture in progress

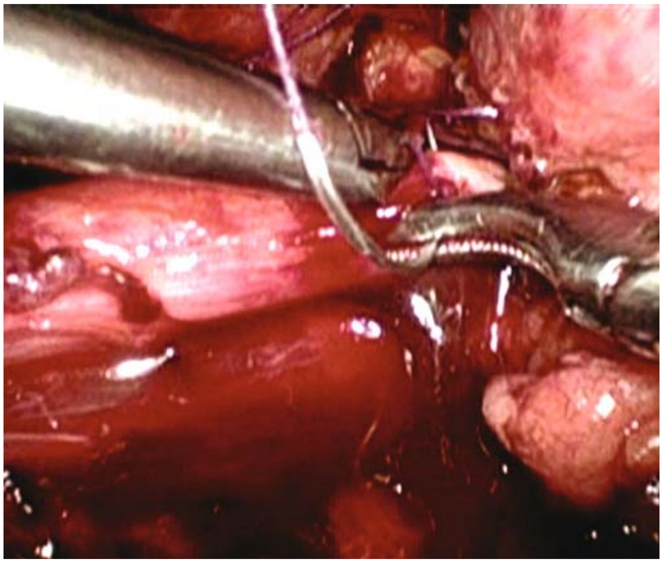


FIG. 7.43. A medial layer suture outside-in through the ureter

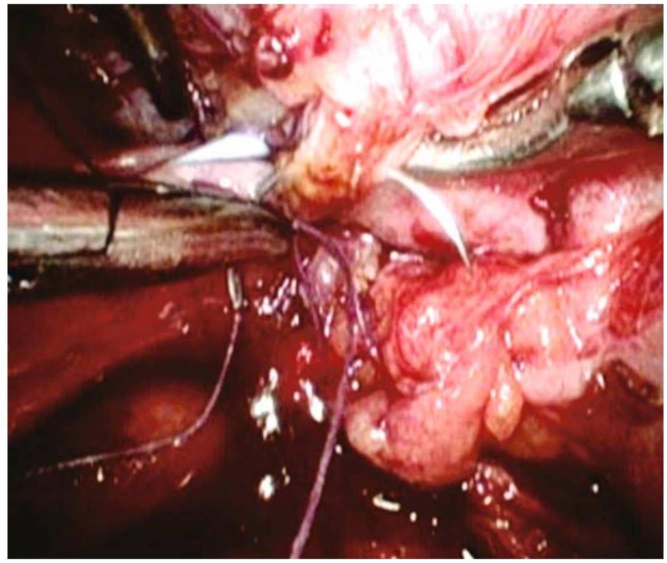


FIG. 7.44. A backhand suture inside-out through the medial edge of the calicotomy

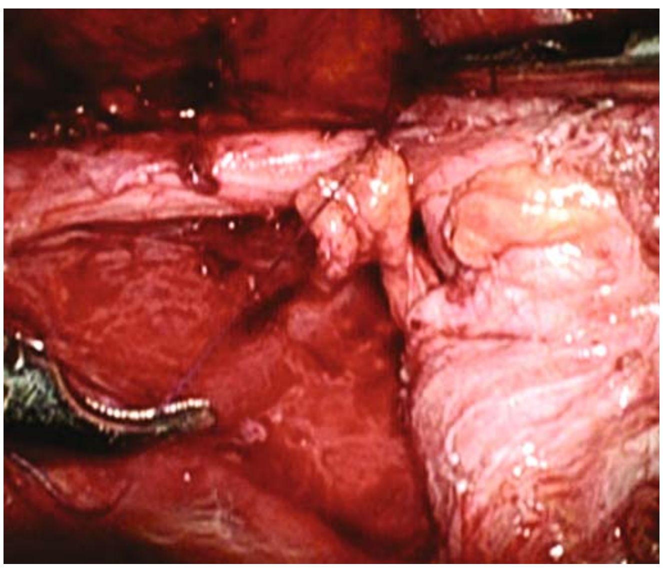


FIG. 7.45. Completing the medial layer suture

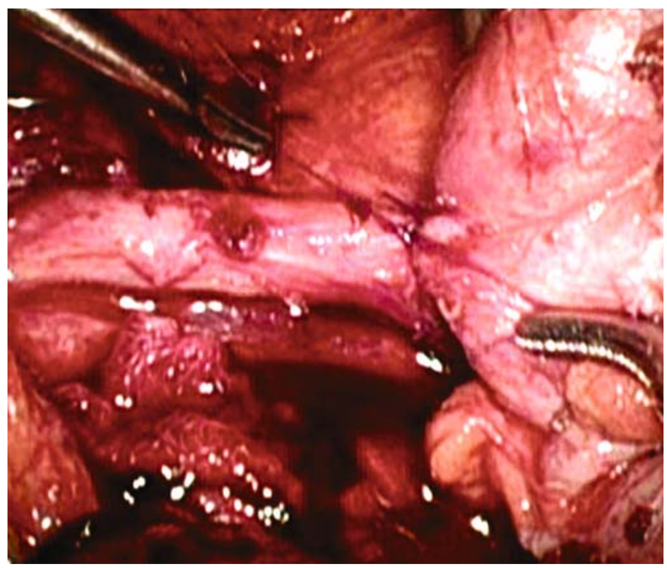


FIG. 7.46. View after completion of the suturing

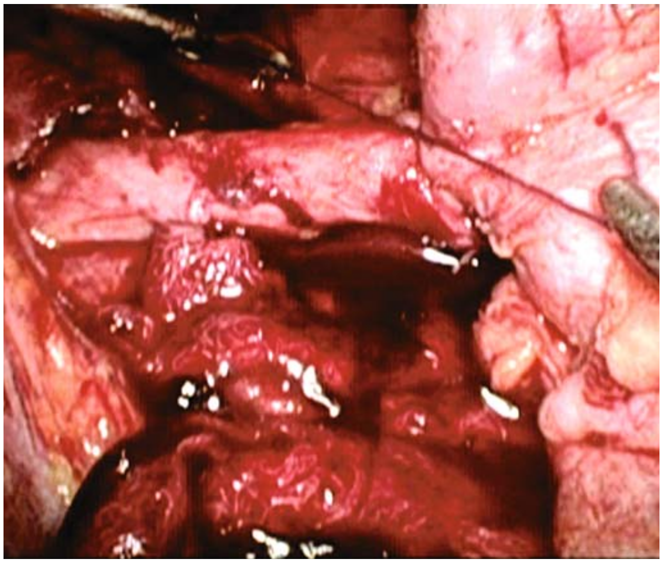


FIG. 7.47. Perirenal fat is tacked onto the suture line

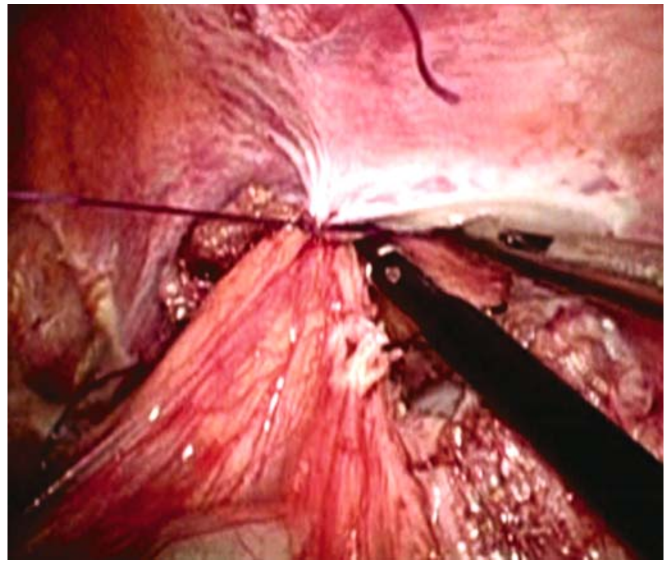


FIG. 7.48. Reperitonealization

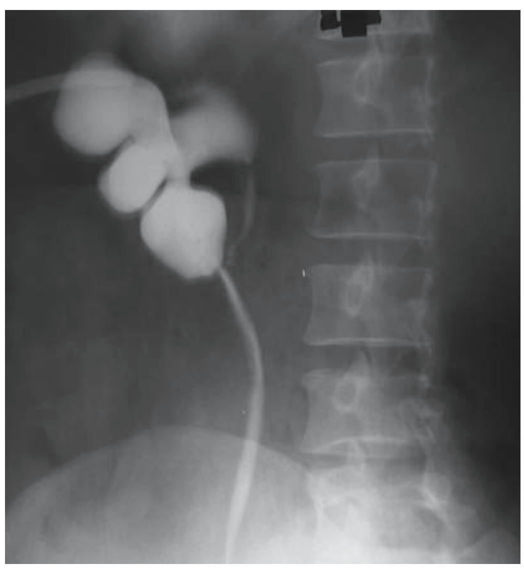


FIG. 7.49. Postoperative nephrostogram shows the stent in situ and contrast draining alongside it

Special Situation: Ureteropelvic Junction Obstruction in the Intrarenal Pelvis with Multiple Secondary Calculi

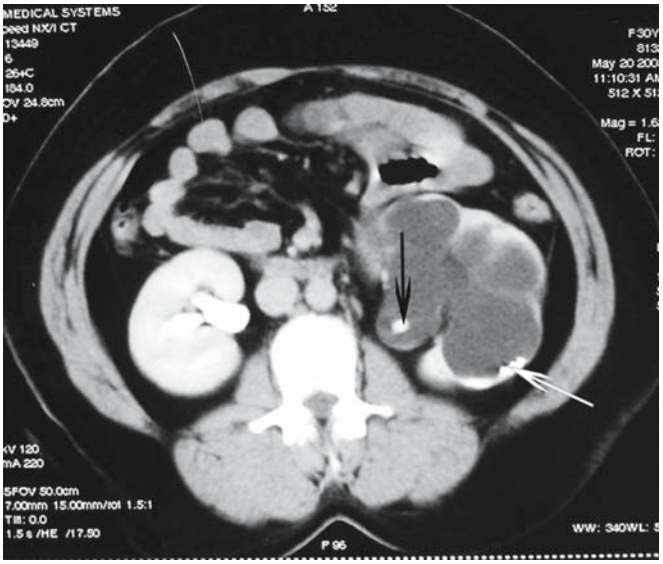


FIG. 7.50. A CT scan shows a left UPJ obstruction in a kidney with an intrarenal pelvis and multiple secondary calculi (arrow)

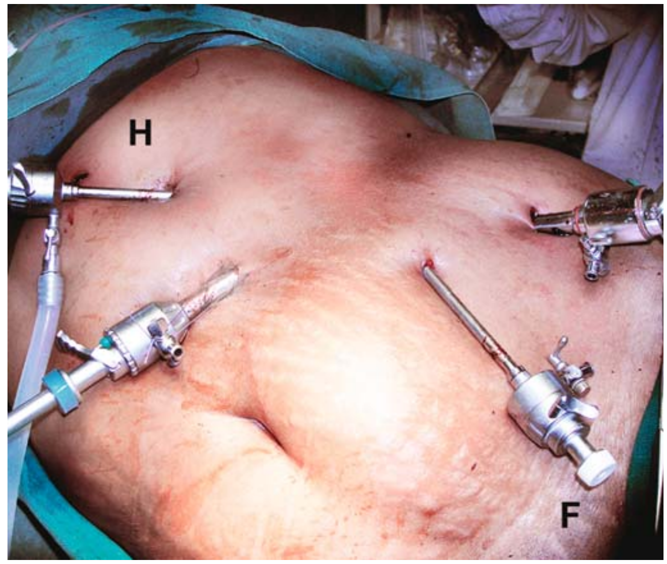


FIG. 7.51. External view of the port positions for a ureterocalicostomy

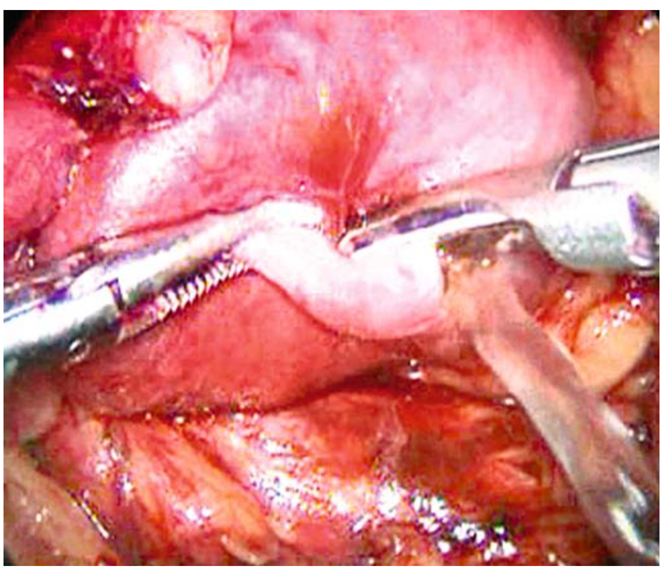


FIG. 7.52. Lower polar calicotomy using an ultracision about 1 cm long

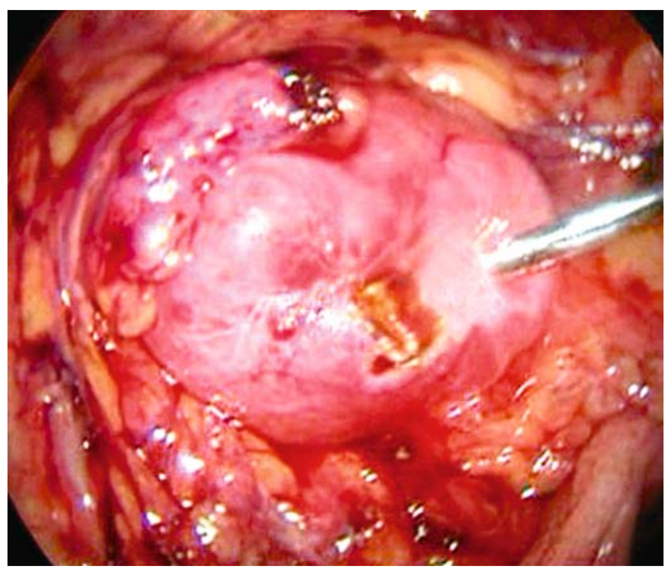


FIG. 7.53. A ureteroscope is introduced through the flank port and then through the calicotomy to pick up secondary calculi

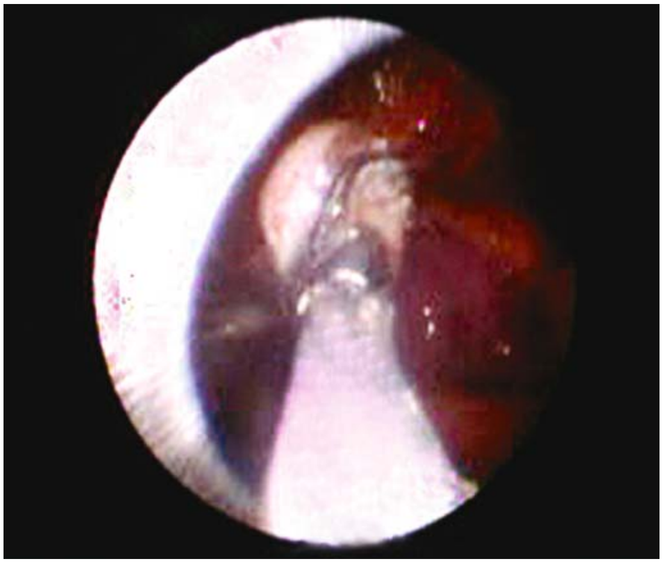


Fig. 7.54. Secondary stones being basketed out using a ureteroscope

Fig. 7.55. Use of the flexinephroscope to pick up calculi from other calices

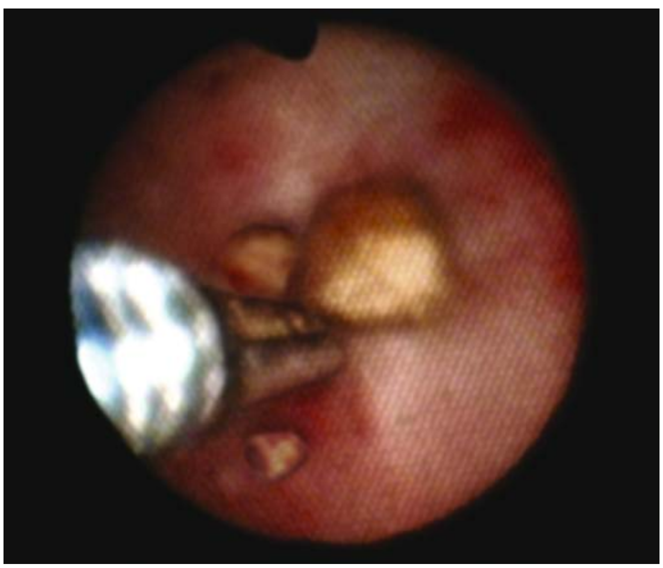


Fig. 7.56. Multiple secondary calculi as seen through flexinephroscope

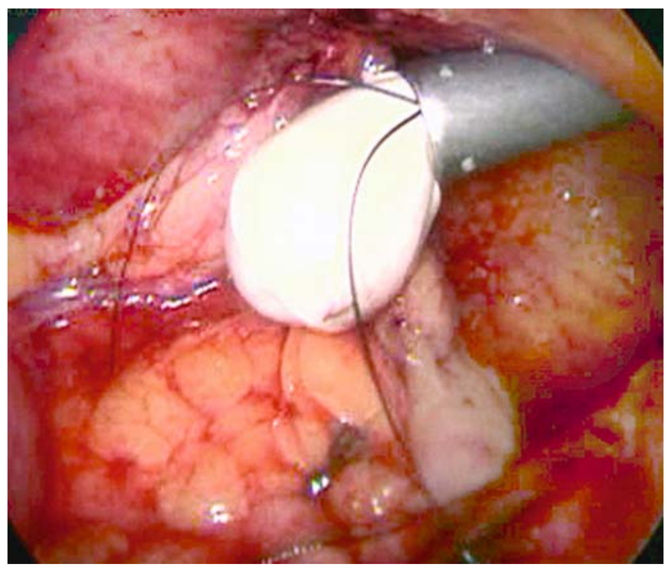


Fig. 7.57. The picked-up stones being collected in a finger stall of a large glove and taken out through a 10-mm port

FIG. 7.58. External view of the dissector picking up the guidewire, over which a nephrostomy catheter can be advanced

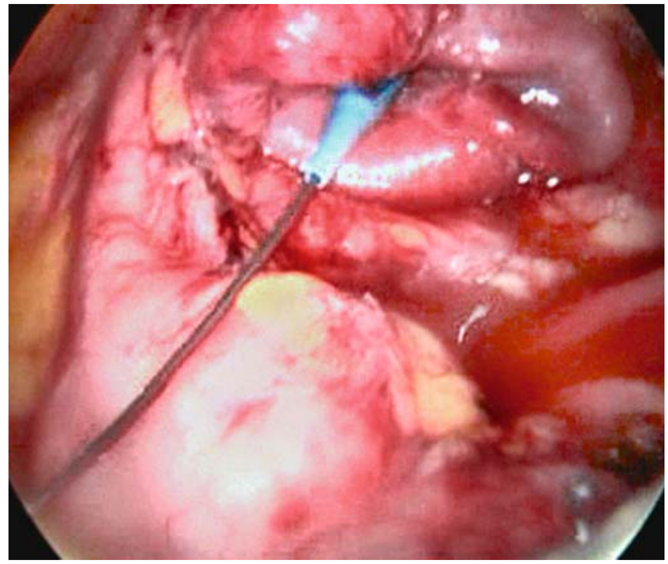


FIG. 7.59. A nephrostomy catheter being advanced over the guidewire

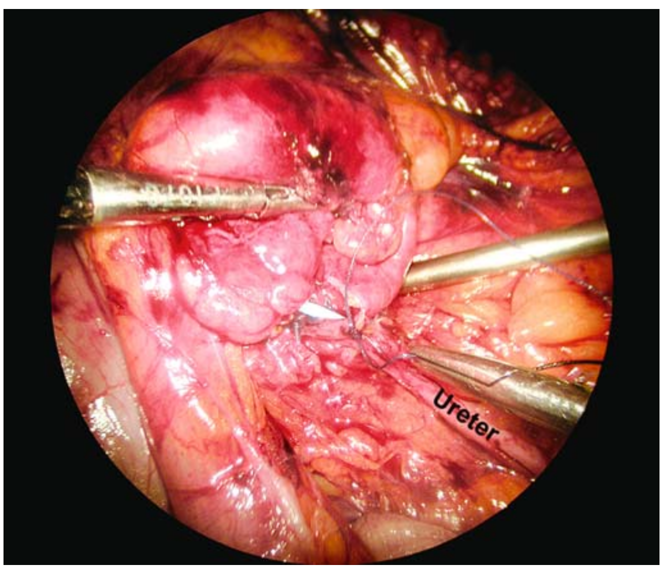


FIG. 7.60. The posterior layer of the ureterocalicostomy suturing is completed

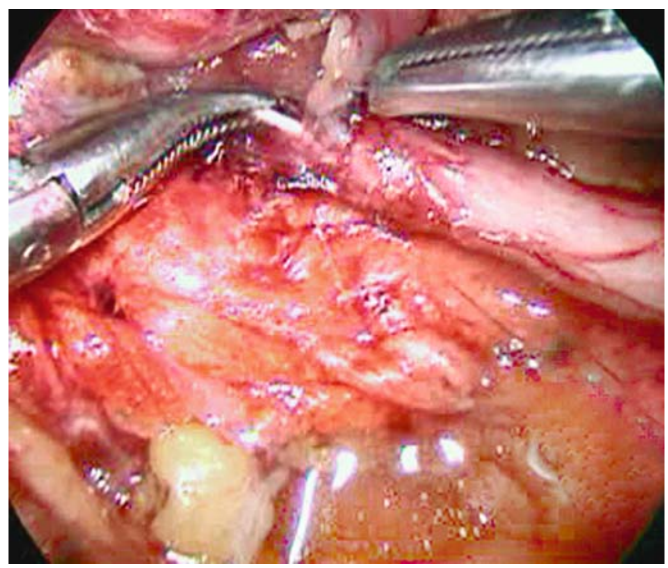
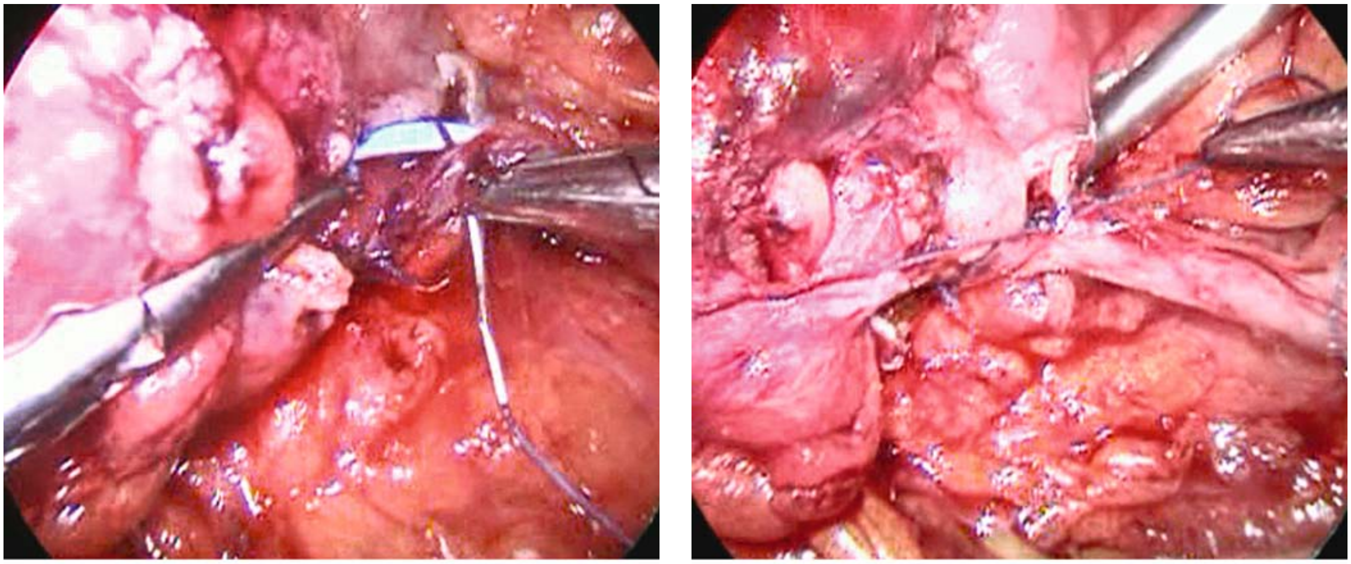


FIG. 7.61. After closing the posterior layer the preplaced guidewire is pushed up into the pelvis



A B

FIG. 7.62. A few more interrupted sutures in progress; sometimes a backhand suture may be easier

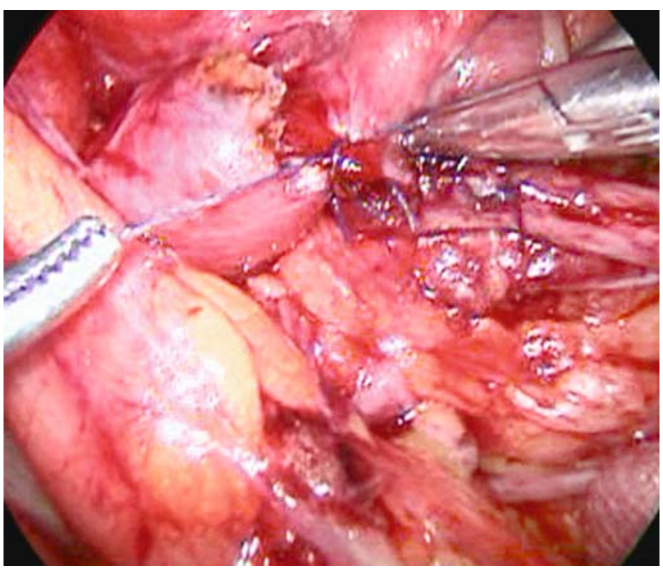


FIG. 7.63. The remaining calicotomy wound being closed

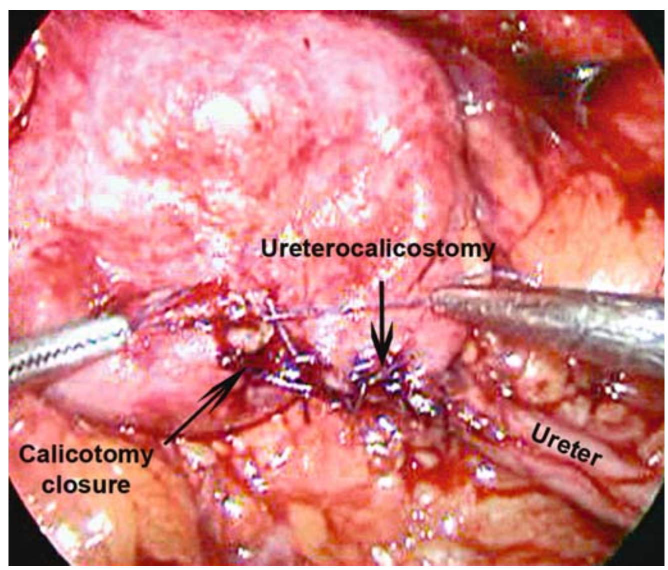


FIG. 7.64. View of the completed ureterocalicostomy

References

1. Hawthorne NJ, Zineke H, Kelalis PP (1976) Ureterocalicostomy: an alternative to nephrectomy. J Urol 115:583–586.
2. Ramalingam M, Senthil K, Selvarajan K, Pai MG (2005) Laparoscopic ureterocalicostomy—our experience in 3 patients. J Endourol 19:A268(abstr).
3. Ross JH, Streem SB, Novick AC, Kay R, Montie J (1990) Ureterocalicostomy for reconstruction of complicated pelviureter junction obstruction. Br J Urol 65:322–325.

8
Laparoscopic Heminephrectomy for Duplex System

M. Ramalingam and K. Selvarajan

Indications

In a double collecting system usually the upper moiety is obstructed. It requires intervention when evaluation reveals a nonfunctioning moiety [1,2]. If there is a separate vessel supplying that moiety, an intervention such as a heminephrectomy is technically easier.

Surgical Technique

Patient position can be between 45 and 70 degrees lateral for a transperitoneal approach.

The surgeon has to have access from the renal area down to the pelvic cavity to excise the ureter. A telescope port at the paraumbilical area and at least three more secondary ports (subcostal, subumbilical, and epigastric or flank) are placed to have good access. After colonic mobilization, the renal vessel or the segmental branch supplying the defective moiety is clipped or ligated. Subsequently the dilated defective moiety with a thin parenchyma is delineated and marked with diathermy. Then using ultracision or electrocautery, the dilated segment can be excised and traced down along its ureteric segment. Additional ports may be needed to excise the lower part of the ureter. As far as possible monopolar cautery is to be avoided. The dilated ureter is ligated at the juxtahiatal level. Subsequently it is divided, and the whole moiety can be removed through a small muscle-splitting incision in the subcostal region or iliac fossa. A tube drain is left in place for 5 days.

Laparoscopic heminephrectomy is a safe, feasible option for a nonfunctioning moiety in duplex kidneys.

Heminephrectomy in Incomplete Duplex System with Nonfunctioning Lower Moiety

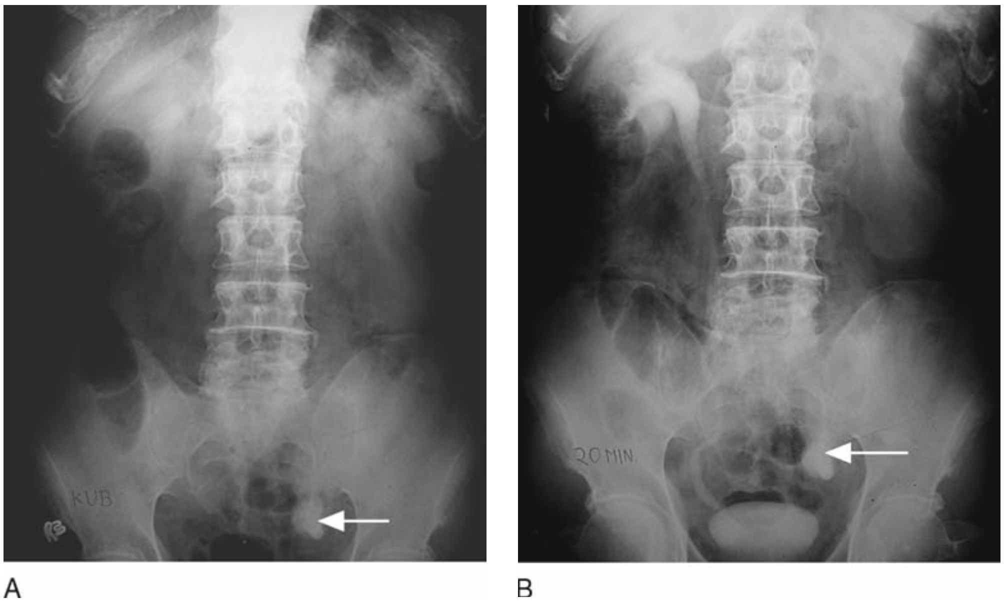


FIG. 8.1. Plain x-ray and intravenous urogram (IVU) shows a large radiopaque shadow below the left sacroiliac joint and poorly functioning lower moiety (note that the upper calyx is seen faintly)

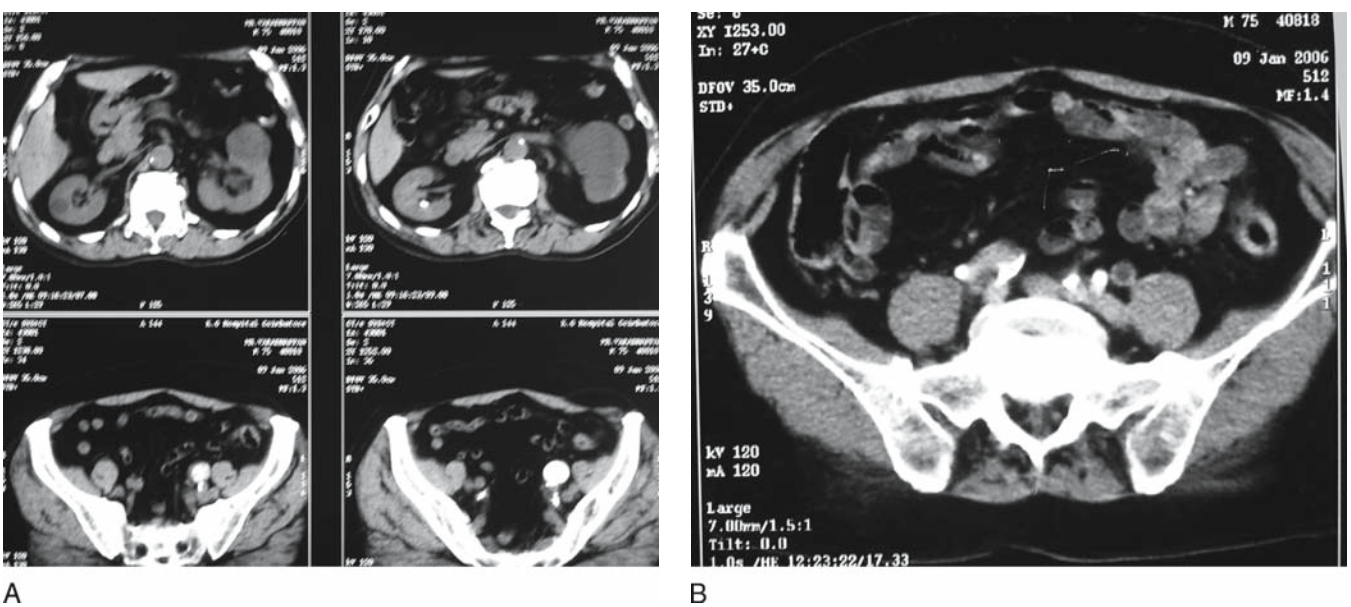


FIG. 8.2. Sequential computed tomography (CT) urogram shows a functioning upper moiety and thinned-out cortex of the lower moiety with a large stone (arrow) in the obstructed lower moiety ureter below the pelvic brim level

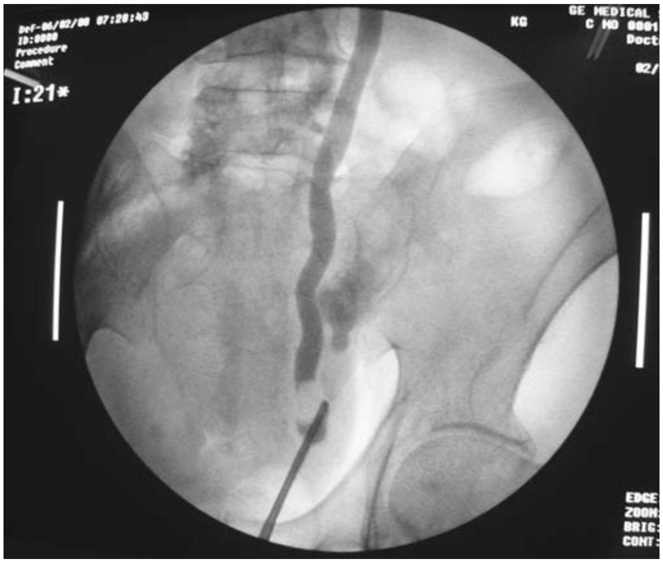


FIG. 8.3. A retrograde pyelogram (RGP) shows a nearly completely obstructed lower moiety

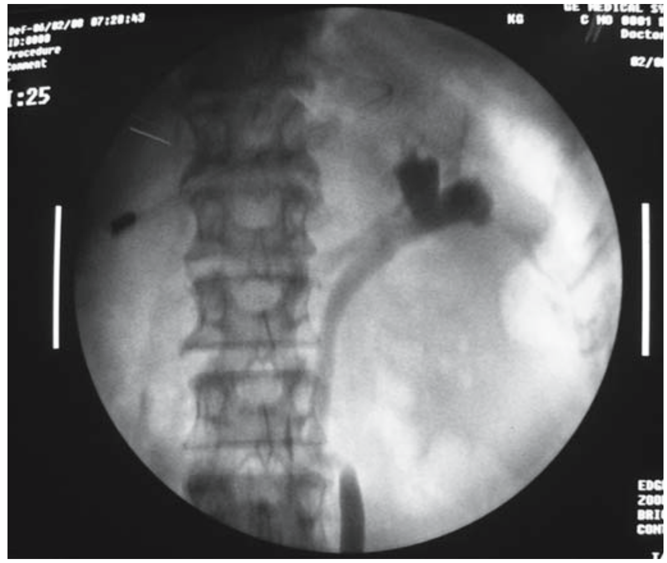


FIG. 8.4. An RGP delineating the upper moiety

FIG. 8.5. A ureteroscopic view of the Y-junction shows a guidewire in the upper moiety ureter and a bulge caused by a lower moiety calculus

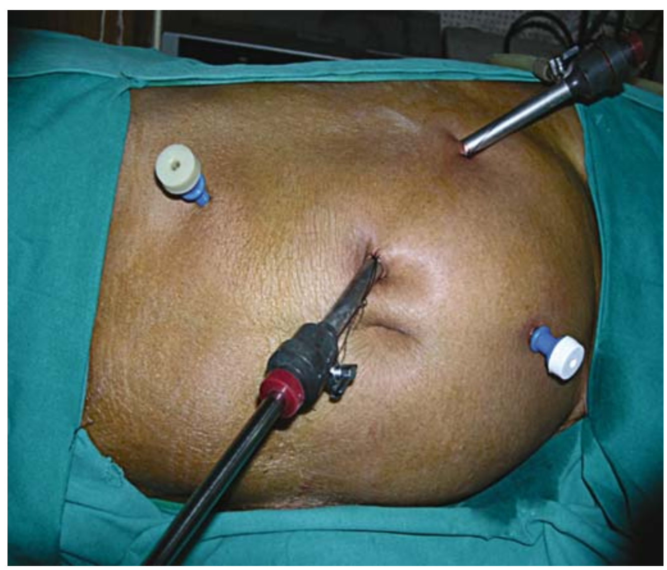


FIG. 8.6. Patient position (70 degrees lateral) and the port positions; the ports are wide apart to provide access to the kidney and the whole ureter

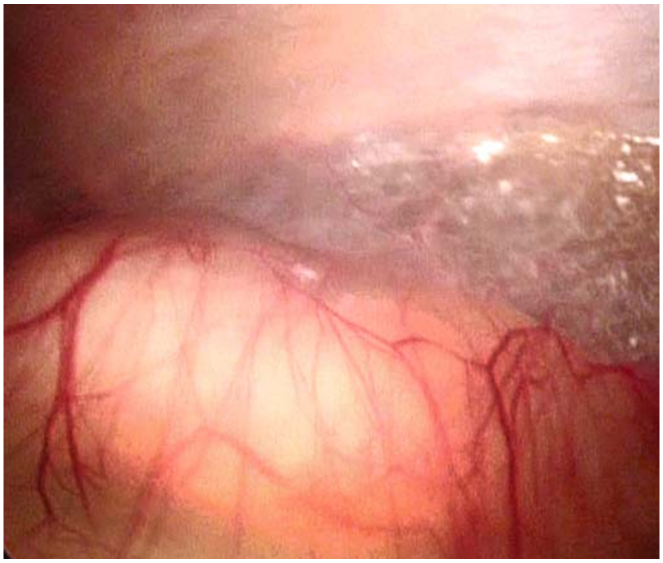


FIG. 8.7. Initial laparoscopic view shows the renal bulge

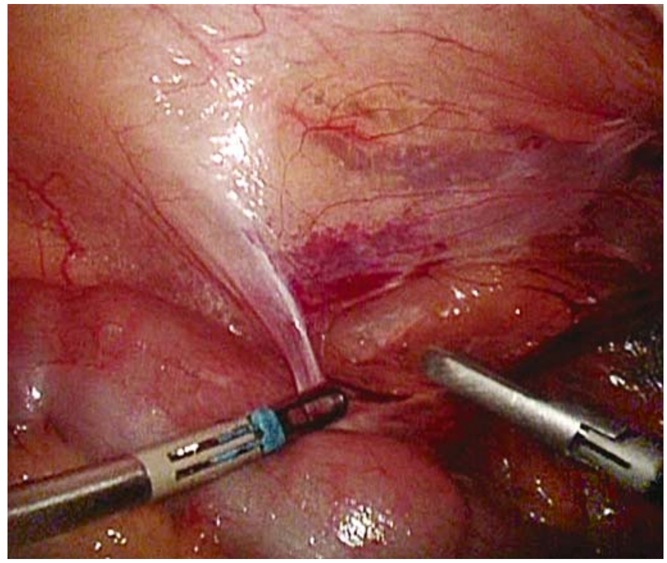


FIG. 8.8. Colonic mobilization at the pelvic brim level to identify the ureters

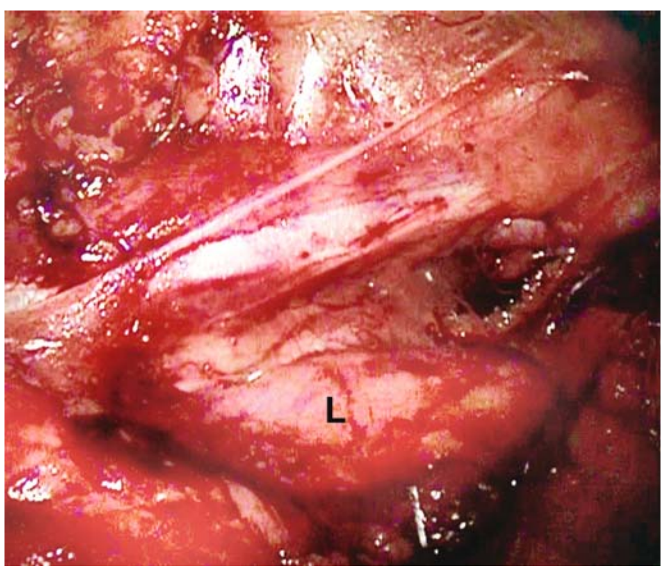
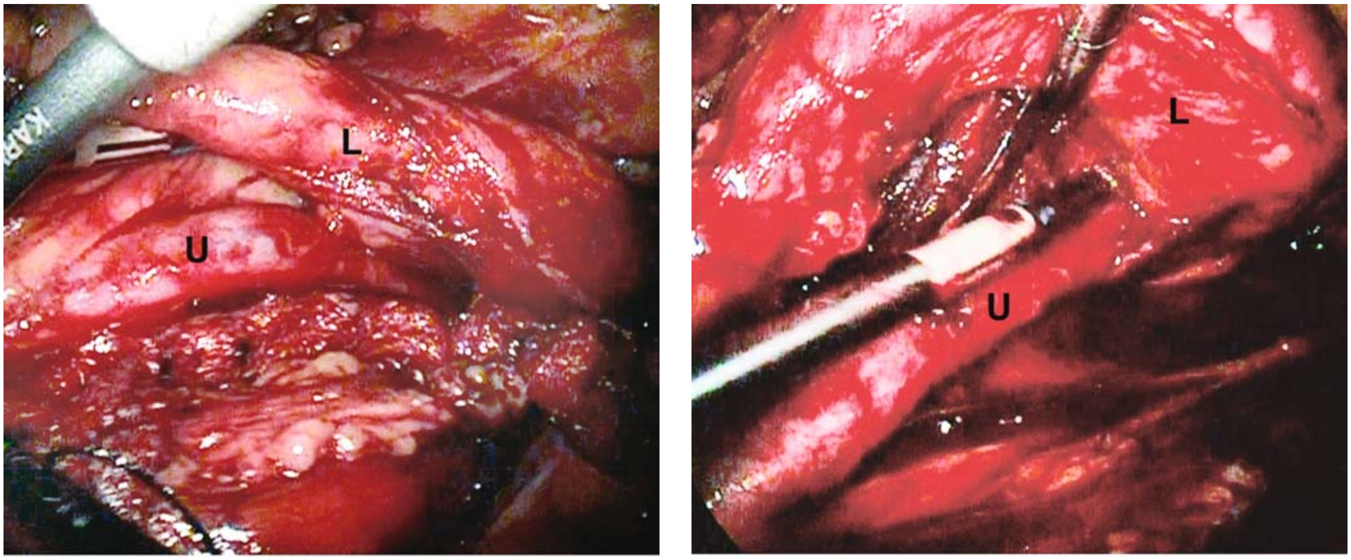
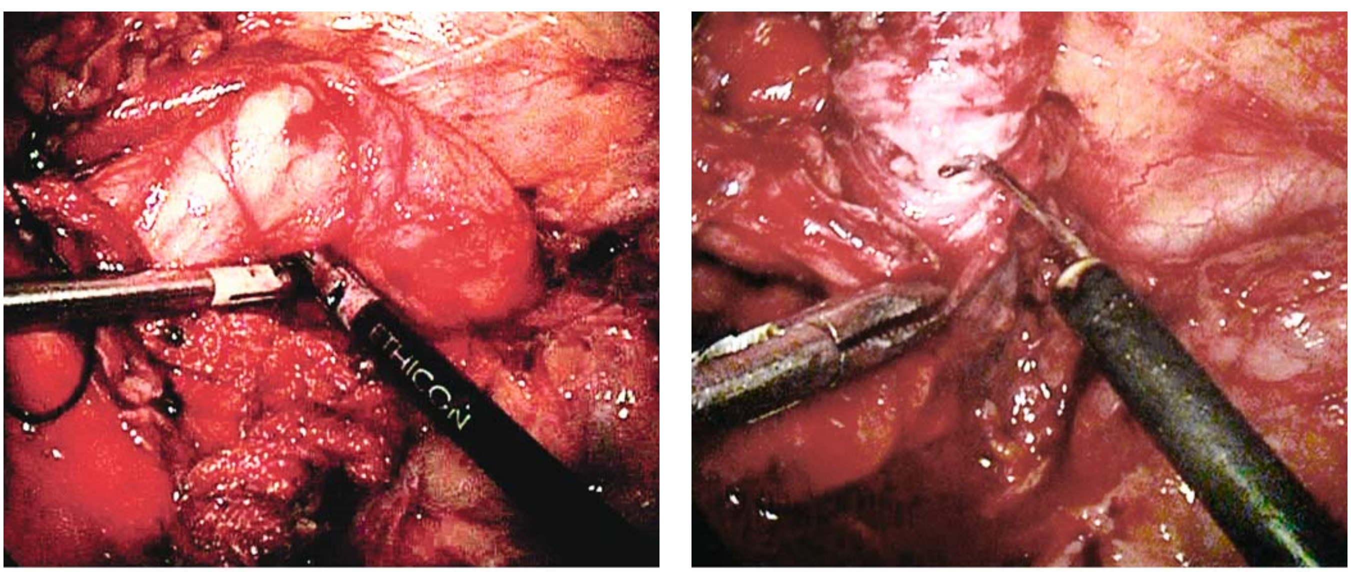


FIG. 8.9. Mobilization of the sigmoid colon exposes the dilated lower moiety ureter (lodging the stone) (L, lower moiety ureter)



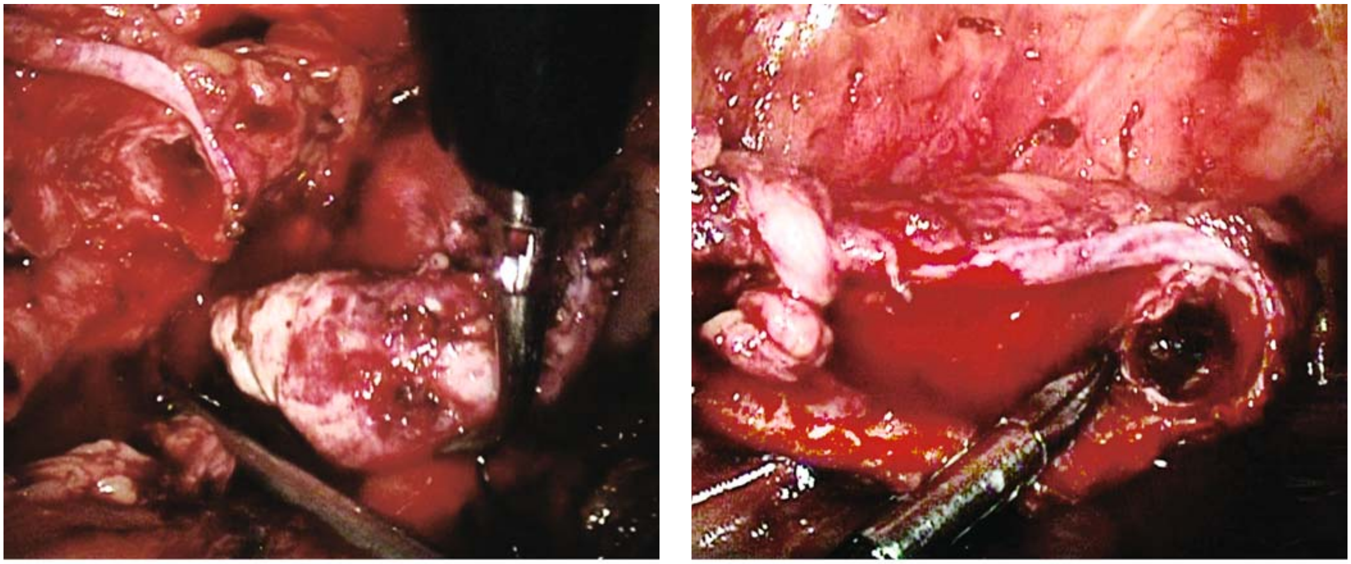
A B

FIG. 8.10. Mobilization of the Y-junction of ureters in progress (U, upper moiety ureter; L, lower moiety ureter)



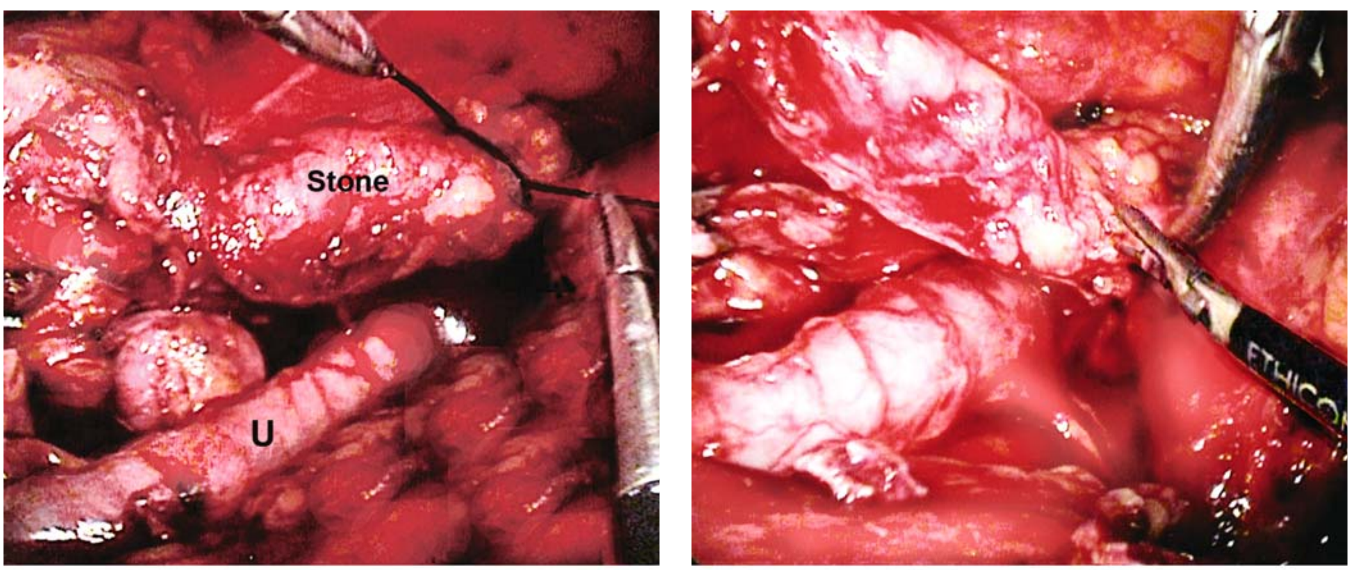
A B

FIG. 8.11. A stone in the dilated ureter is appreciated and a ureterotomy with hook diathermy is performed (note that the mucosa is adherent to the stone)



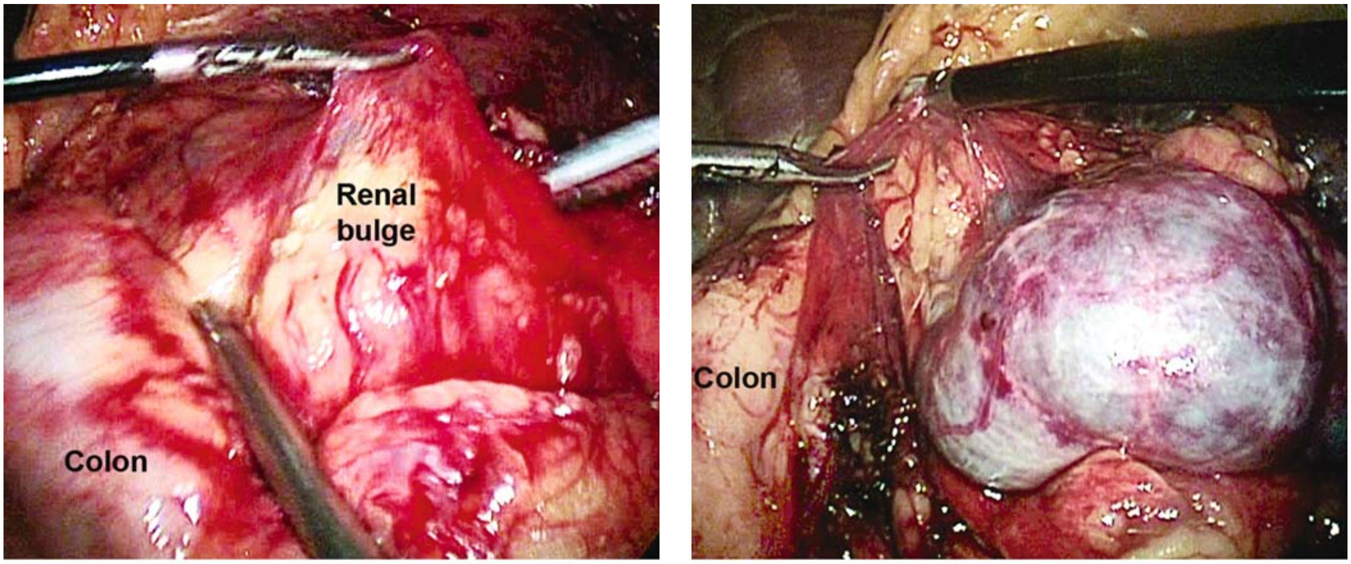
A B

FIG. 8.12. The stone is maneuvered out; note the obstructed segment of the lower moiety is better seen



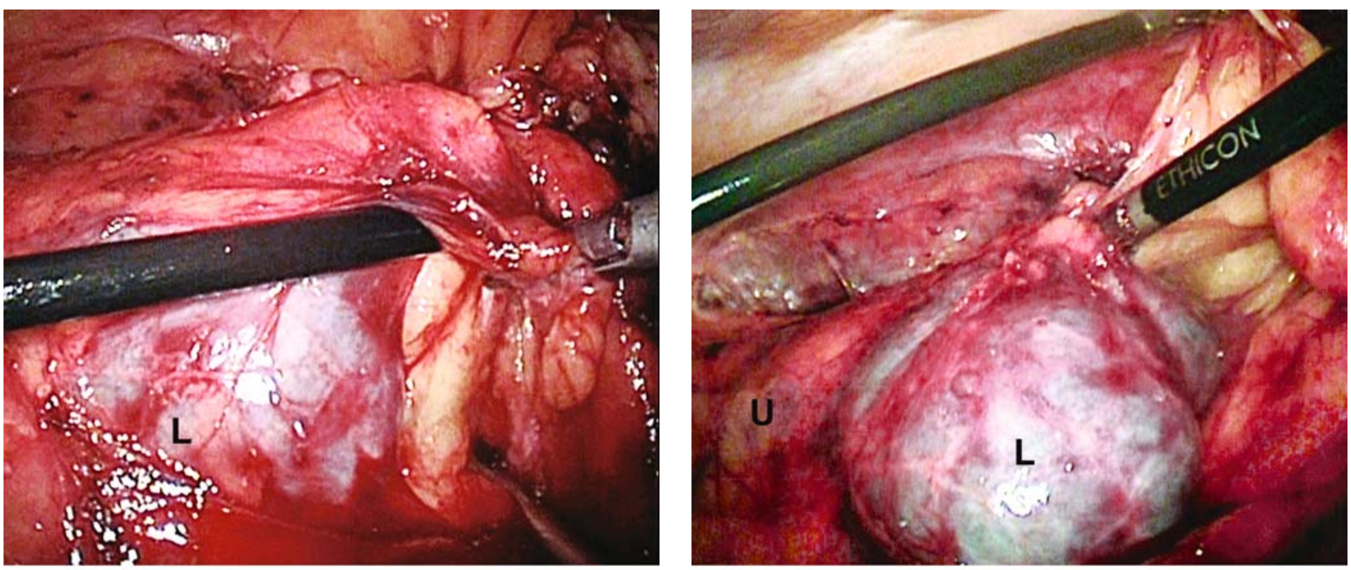
A B

FIG. 8.13. Ligation and division of the lower moiety ureter



A B

FIG. 8.14. Subsequently, colonic mobilization is carried out (to look for renal hilar vessels)



A B

FIG. 8.15. Clearing away the perirenal fat over the kidney to delineate the junction of both moieties (U, upper moiety; L, lower moiety)

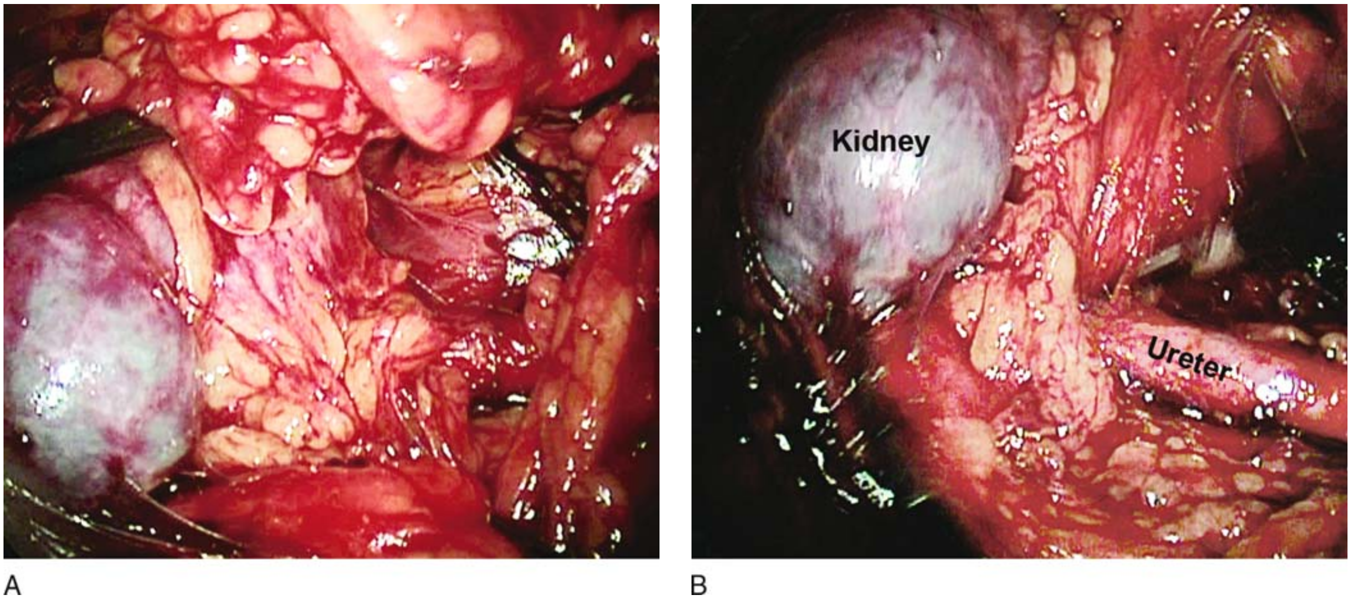


FIG. 8.16. Mobilization of the posterior aspect of the kidney is also essential in order to provide a good view of the line of division

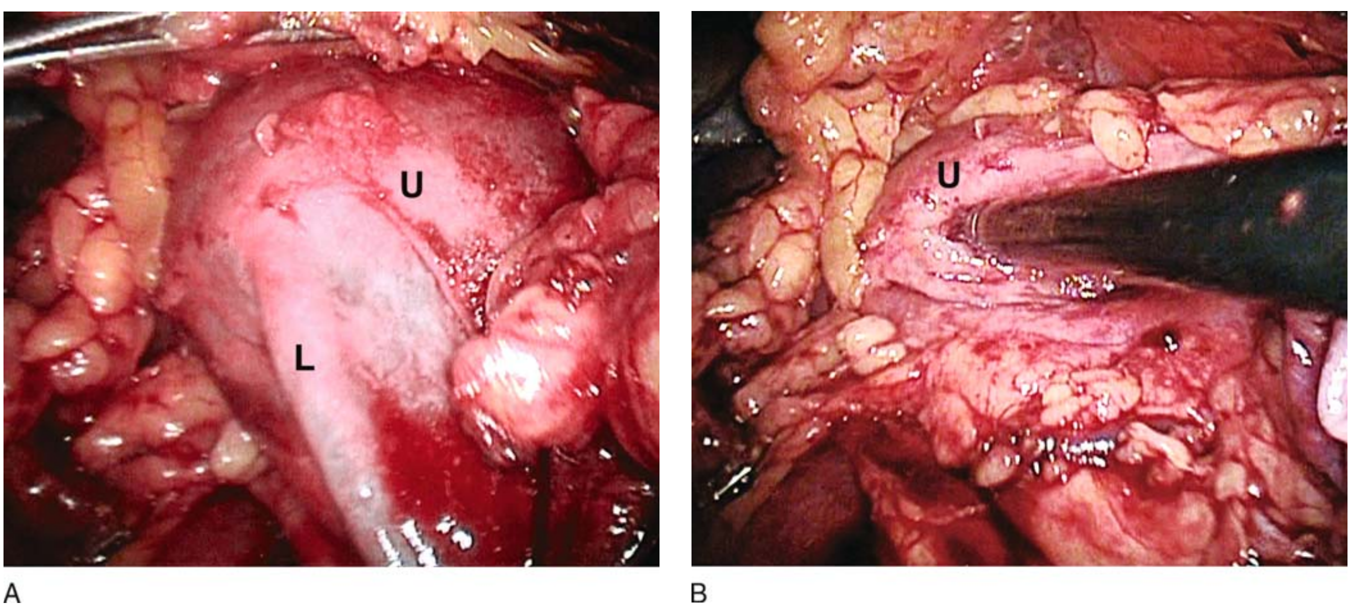


FIG. 8.17. Normal-looking upper moiety (U) and thinned-out parenchyma of the lower moiety (L) coming into view

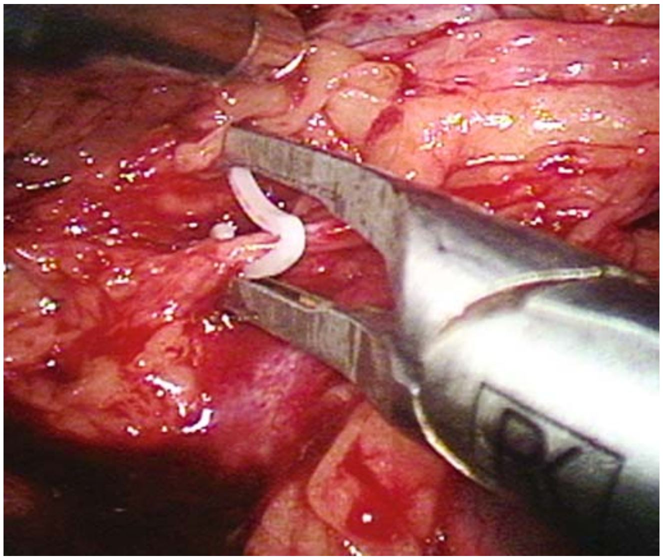


FIG. 8.18. Hem-o-Lok clip applied over renal artery supplying the lower moiety

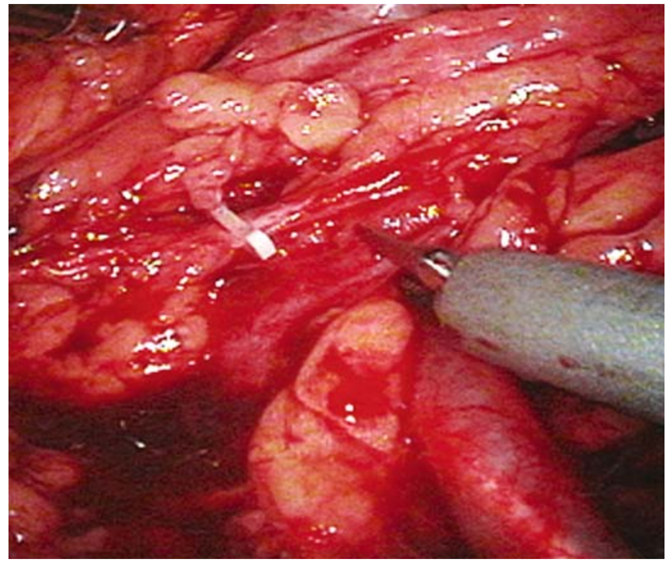


FIG. 8.19. Clipping the vein draining the lower moiety

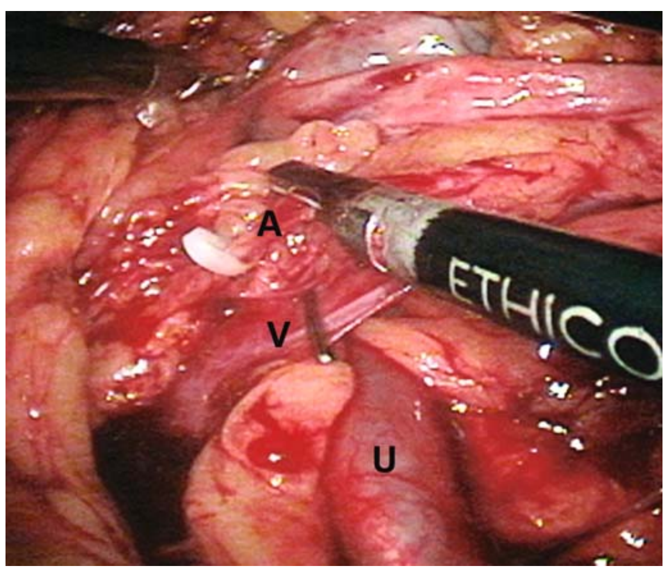


FIG. 8.20. Artery being divided using ultracision (A, artery; V, vein; U, ureter)

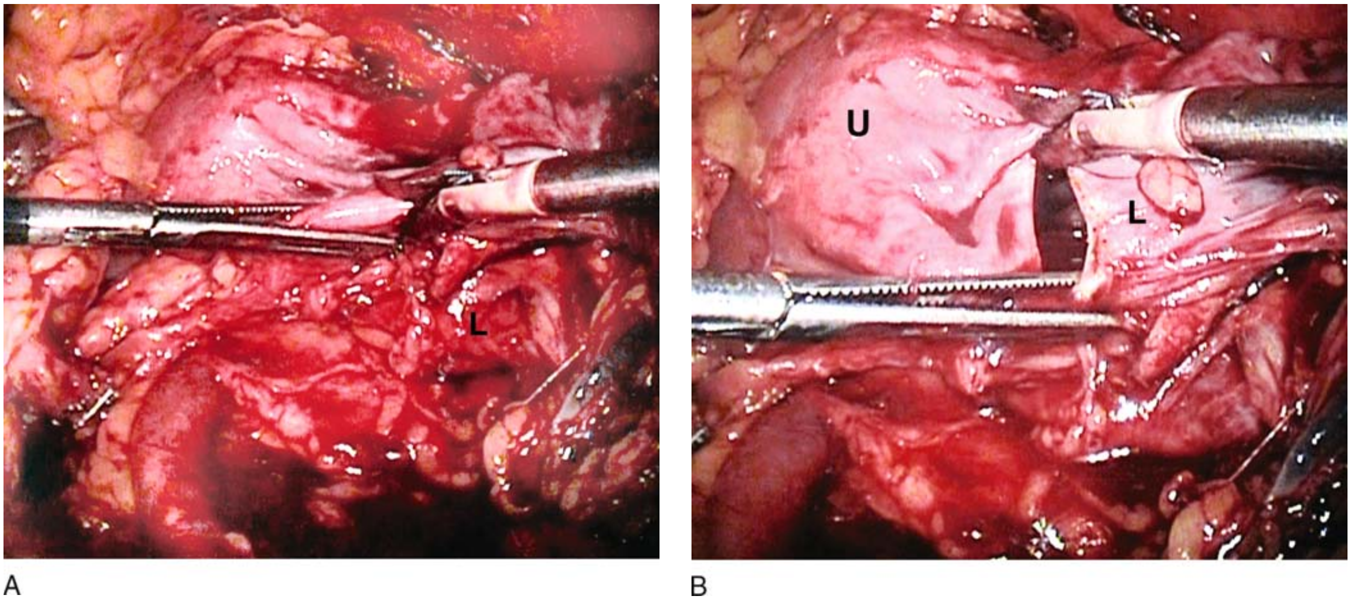


Fig. 8.21. Division of lower moiety parenchyma using bipolar scissors or ultracision (U, upper moiety; L, lower moiety)

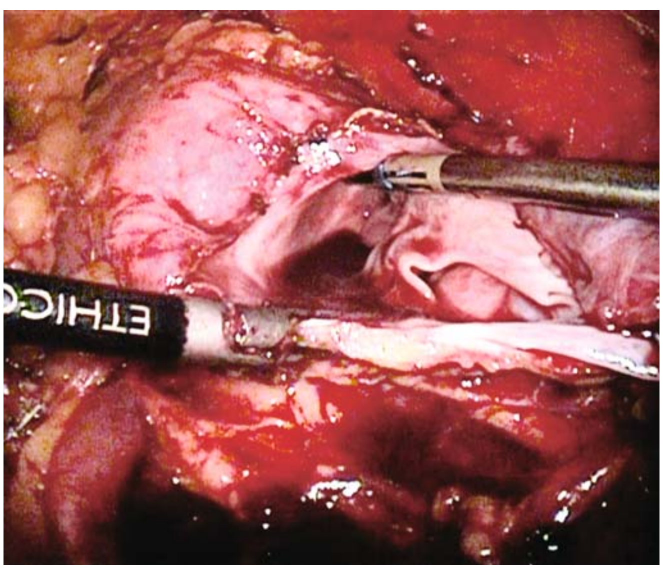


Fig. 8.22. Division of the lower moiety in progress

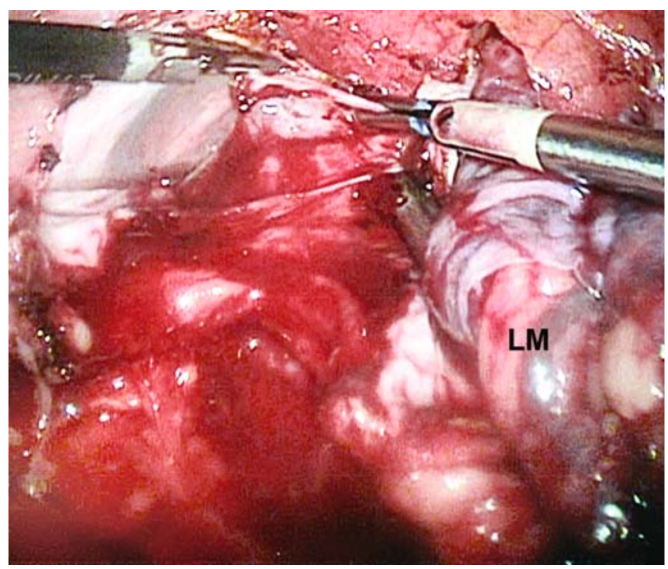
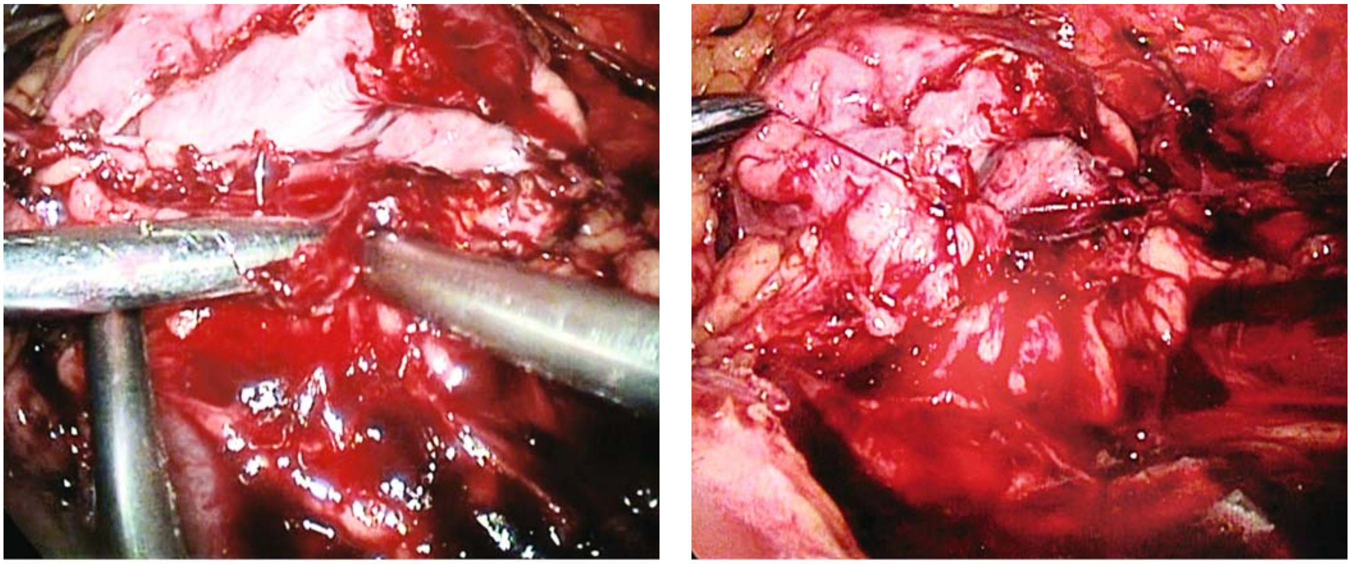
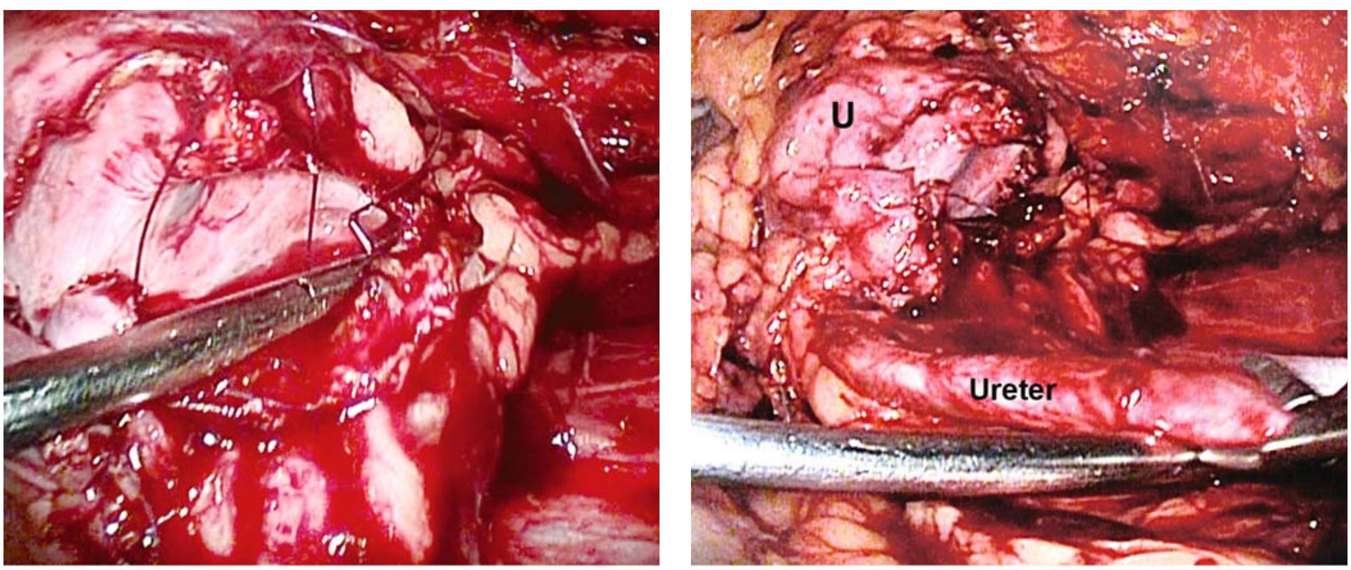


Fig. 8.23. View of the nearly completed division of the lower moiety (LM, divided lower moiety)



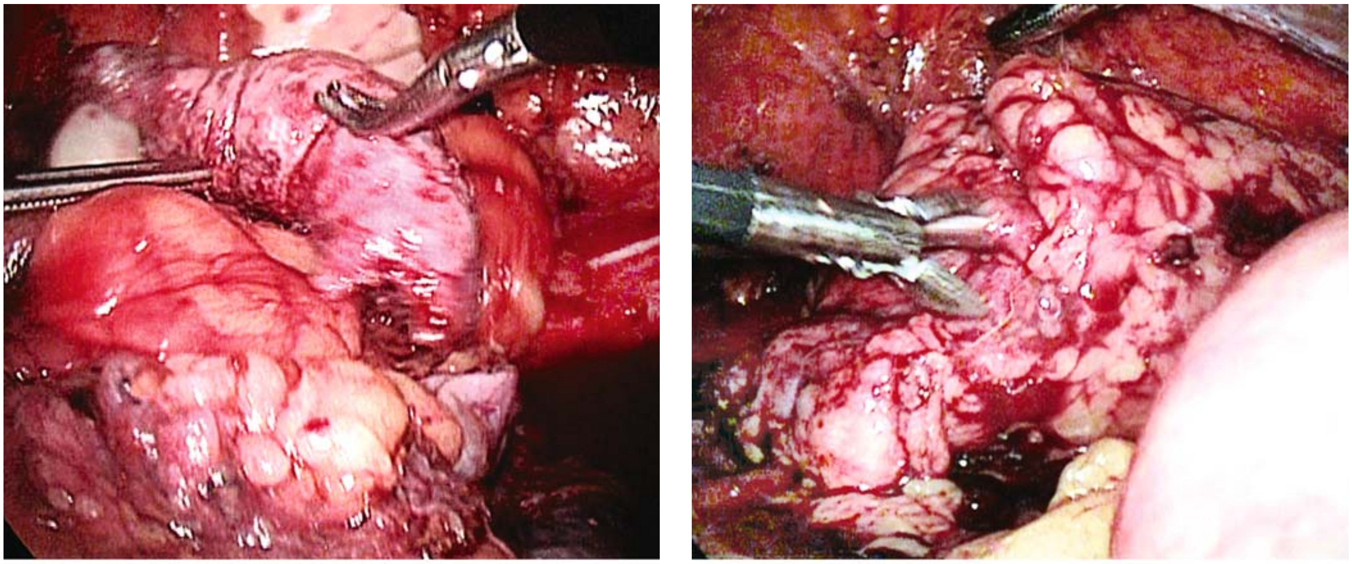
A B

FIG. 8.24. Any bleeding from the cut parenchymal edge can be oversewn using 3-0 Vicryl sutures



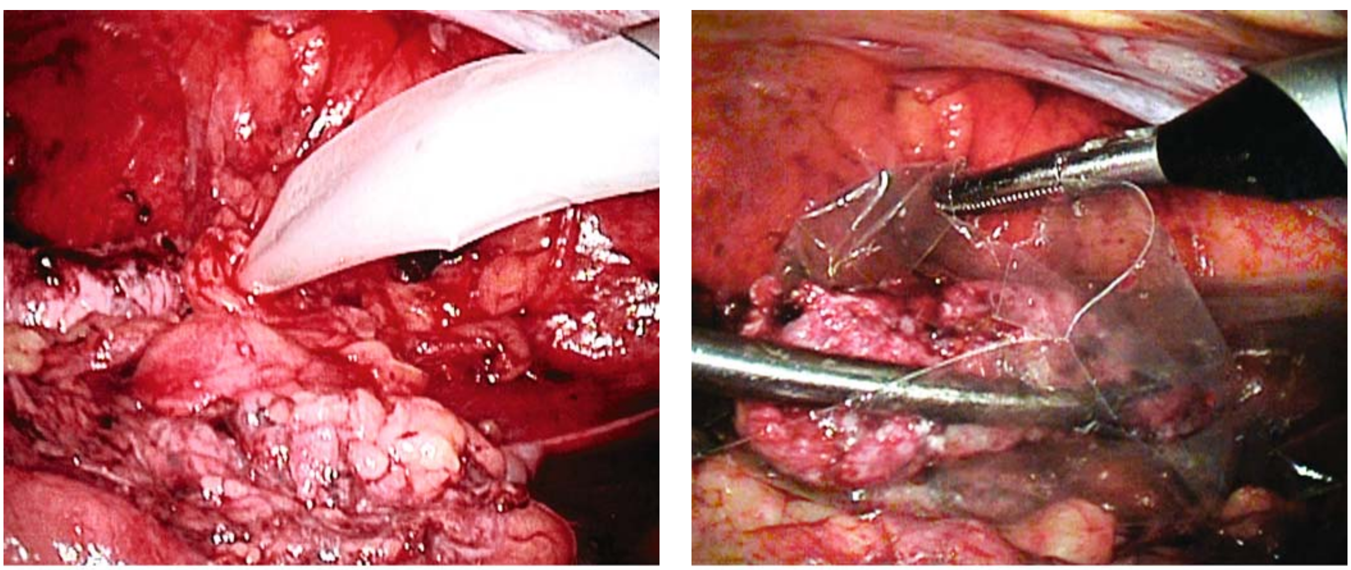
A B

FIG. 8.25. Fair hemostasis is secured (U, upper moiety)



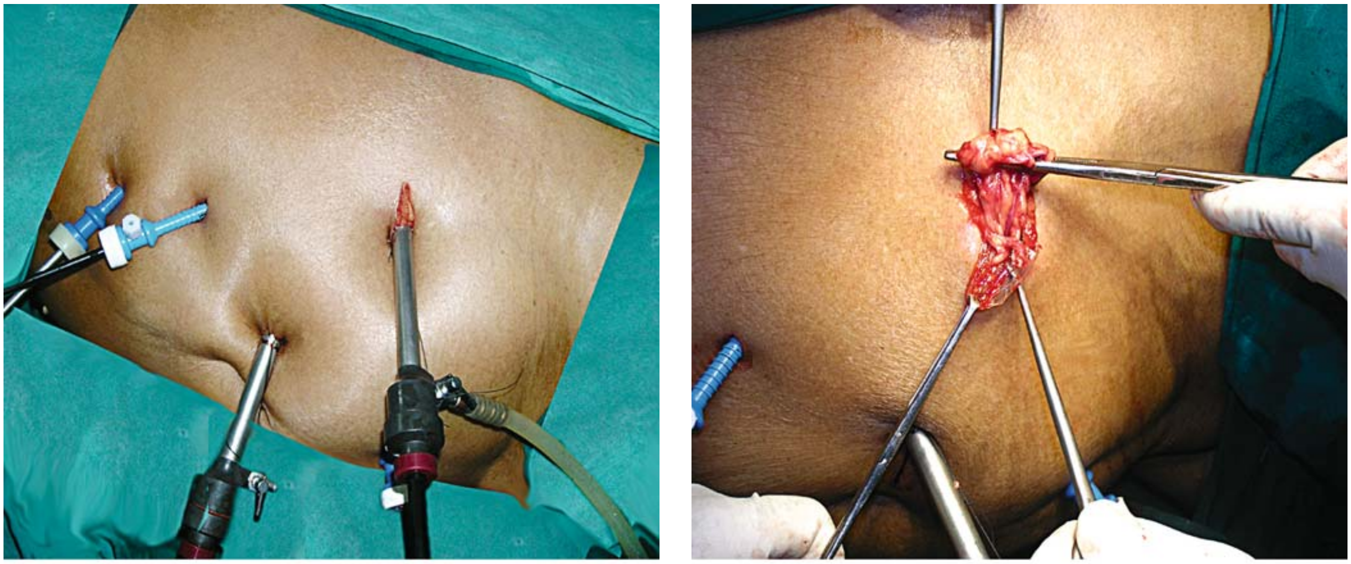
A B

FIG. 8.26. Final few attachments of heminephrectomy specimen being released



A B

FIG. 8.27. A simple plastic bag is inserted and the specimen and stone are entrapped



A B

FIG. 8.28. Incision at the lower lateral port site is extended for about 3 cm to retrieve the specimen

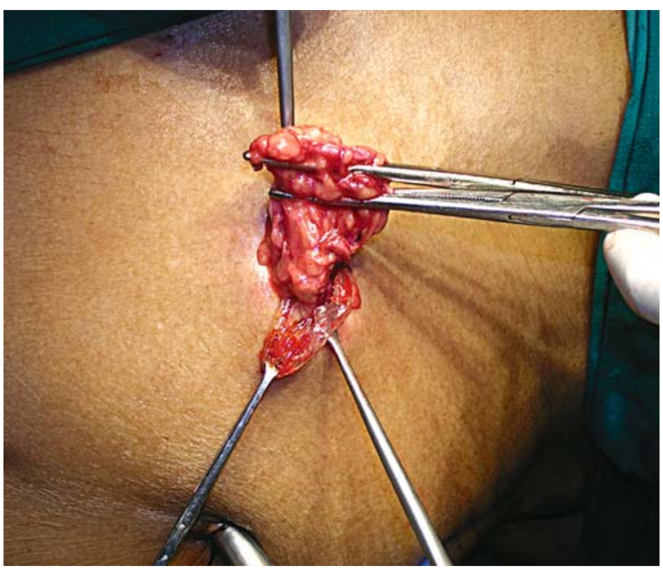


FIG. 8.29. Entrapped specimen is maneuvered out from the plastic bag

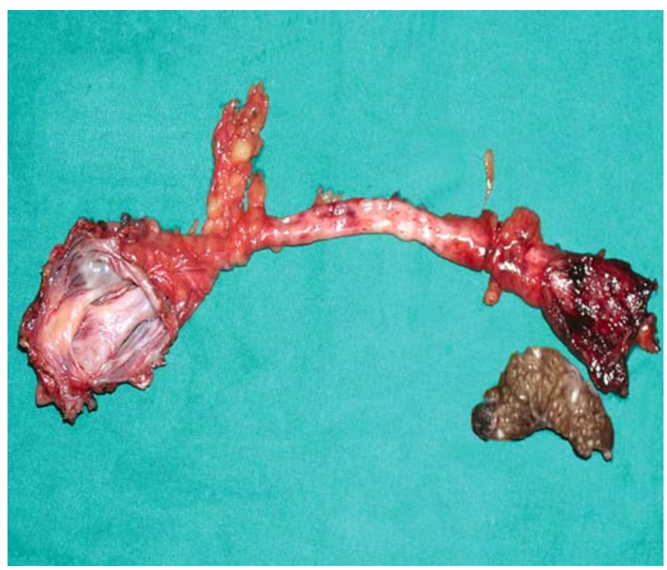


FIG. 8.30. Heminephrectomy specimen and calculus

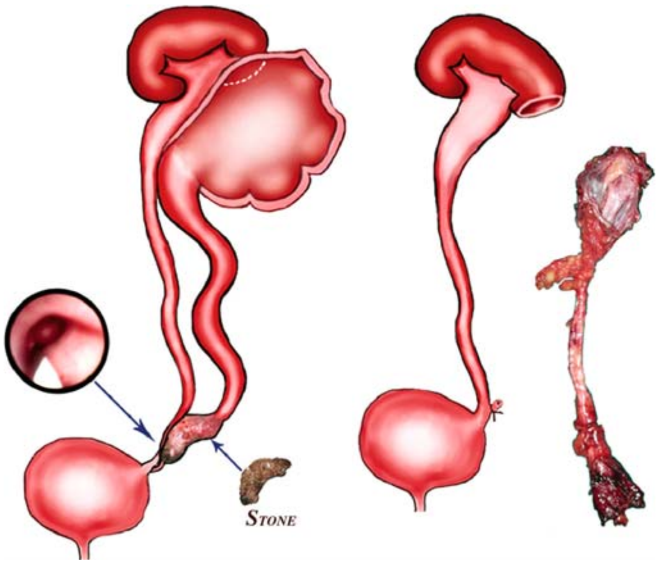


Fig. 8.31. Diagrammatic representation of the duplex system with the procedure completed

Fig. 8.32. Postoperative ultrasonogram revealing residual upper moiety

Heminephrectomy in Complete Duplex System with Nonfunctioning Upper Moiety

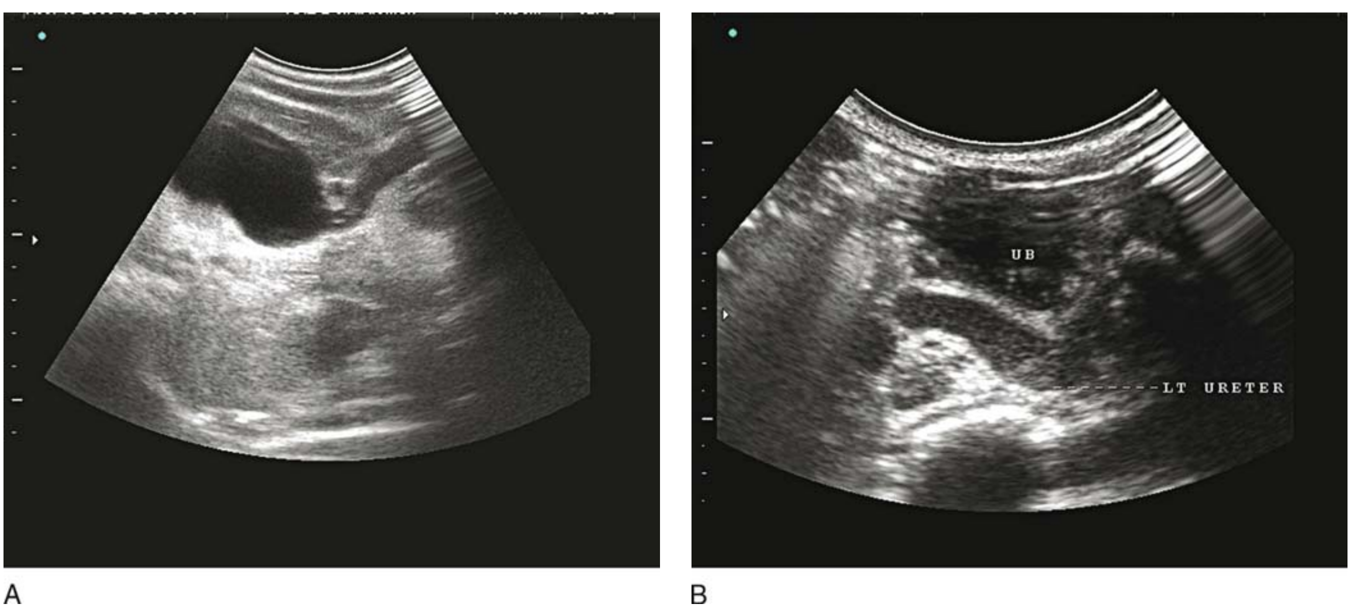


Fig. 8.33. An ultrasound scan shows a dilated upper moiety and its dilated ureter up to the urinary bladder (UB)

FIG. 8.34. Ultrasound scan revealing dilated pelvicaliceal system of the upper moiety of the duplex system

FIG. 8.35. A CT scan shows thin parenchyma of the upper moiety

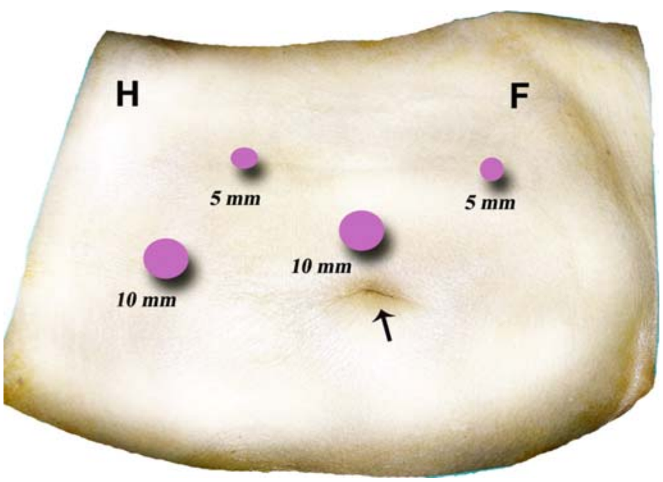


FIG. 8.36. External view of the port positions (H, head end; F, foot end)

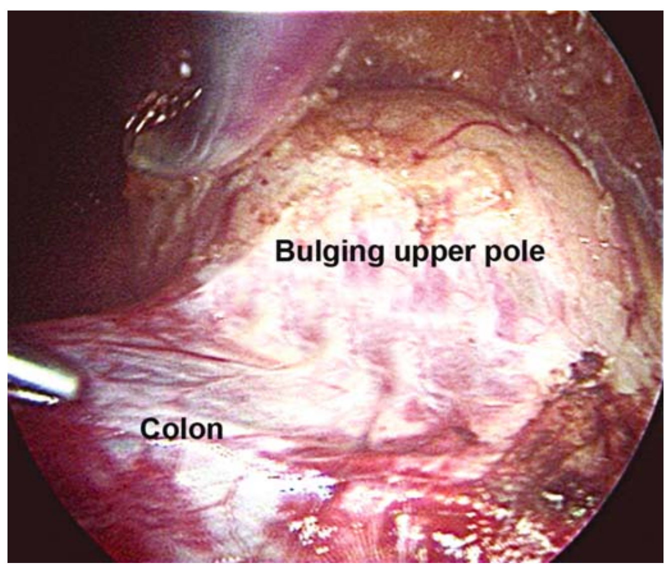


FIG. 8.37. The upper pole is seen prominently; the cleavage between it and the colon makes the dissection easier

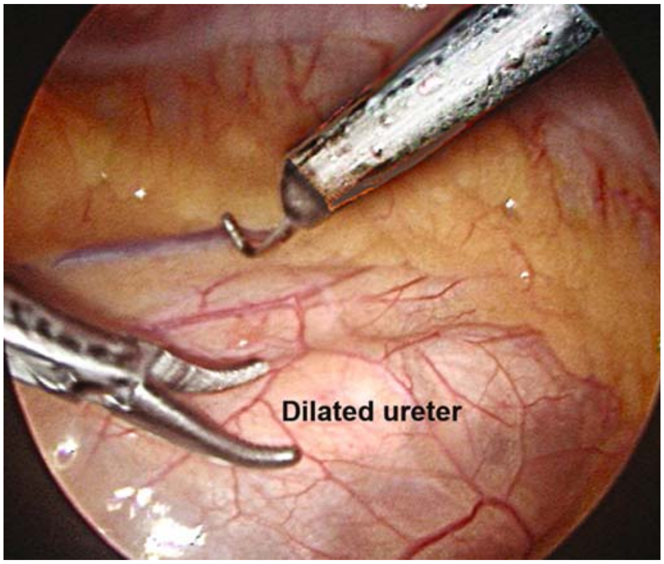


FIG. 8.38. A dilated ureter seen through the mesocolon

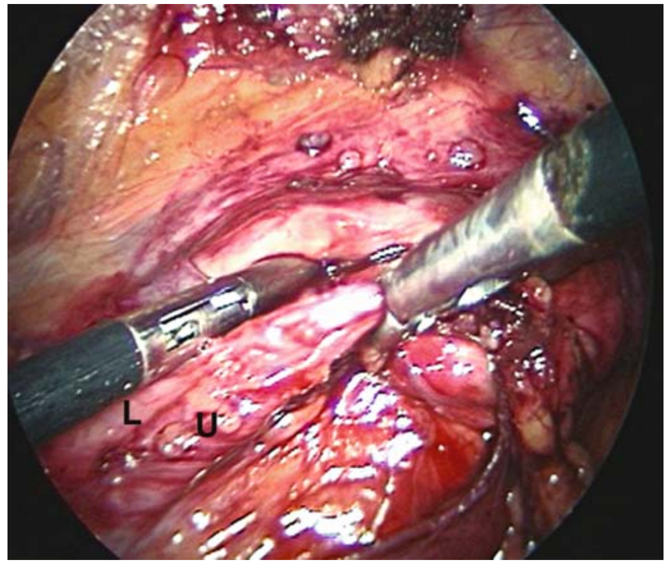


FIG. 8.39. Both ureters being mobilized (L, lower moiety ureter; U, upper moiety ureter)

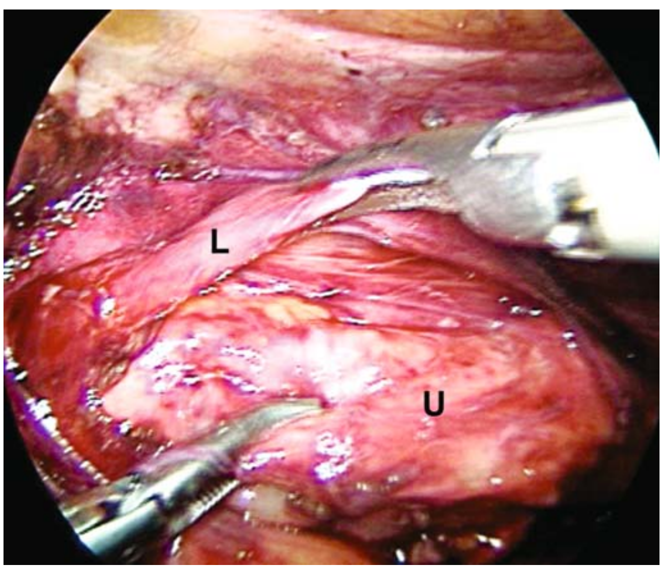


FIG. 8.40. The dilated upper moiety ureter is mobilized

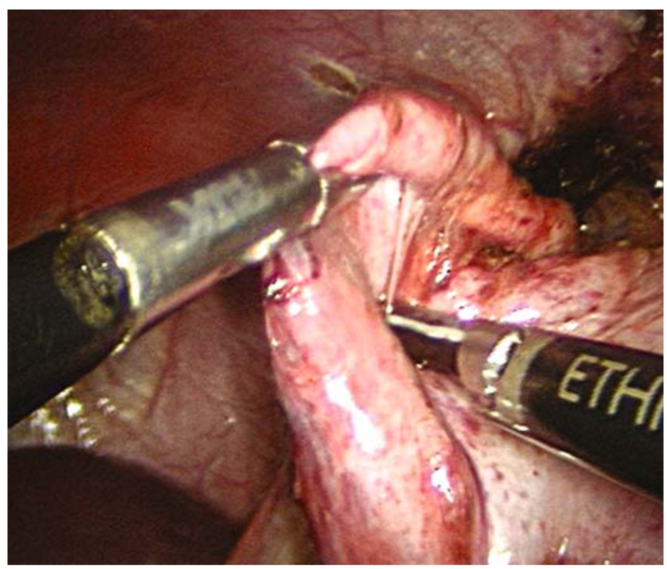


FIG. 8.41. Delineation between the upper and lower moieties defined by the flabby cortex of the upper moiety

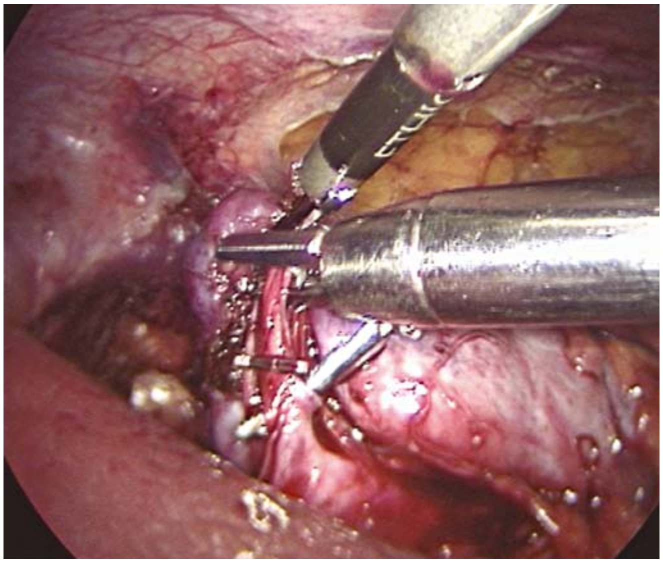


FIG. 8.42. Isolation of the upper pole artery

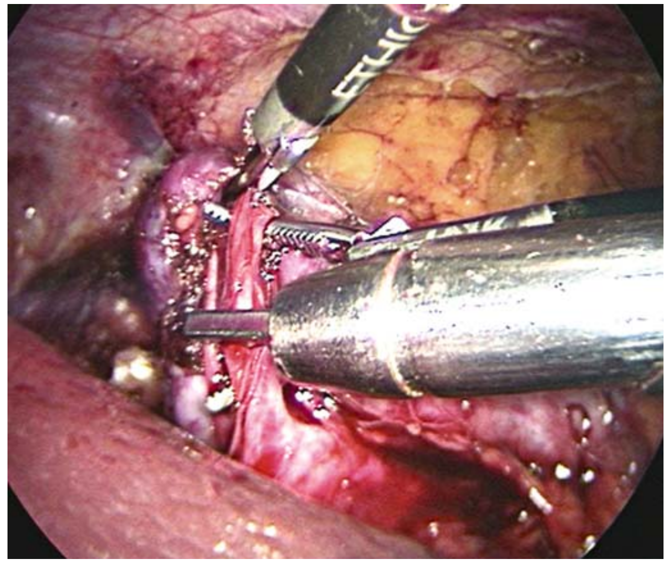


FIG. 8.43. Clipping of the upper pole artery done after applying an endo-bulldog clamp to establish the line of demarcation

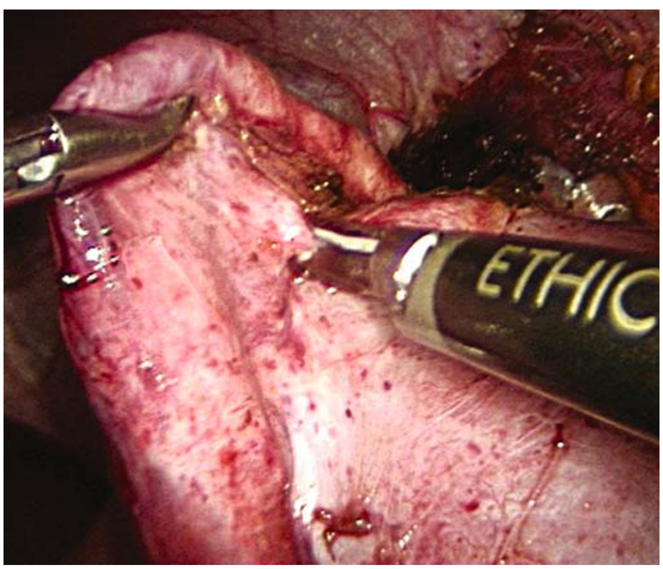


FIG. 8.44. Marking the line of division with ultracision

FIG. 8.45. Subsequently, division of the upper moiety is carried out

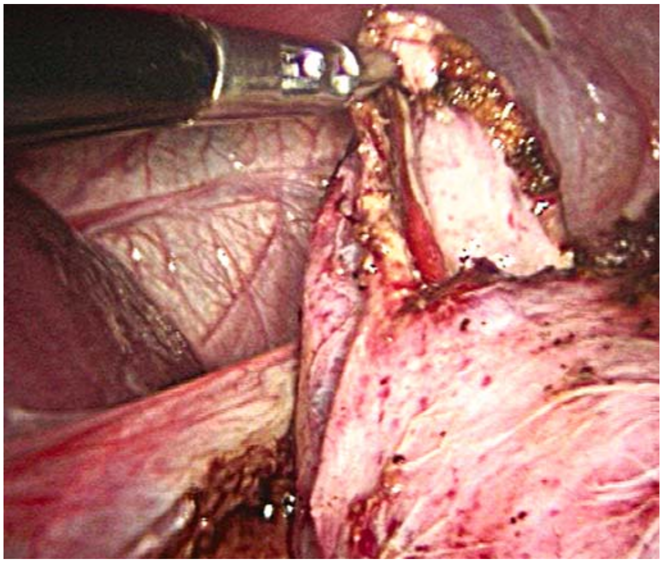


FIG. 8.46. Further excision of the upper moiety is continued

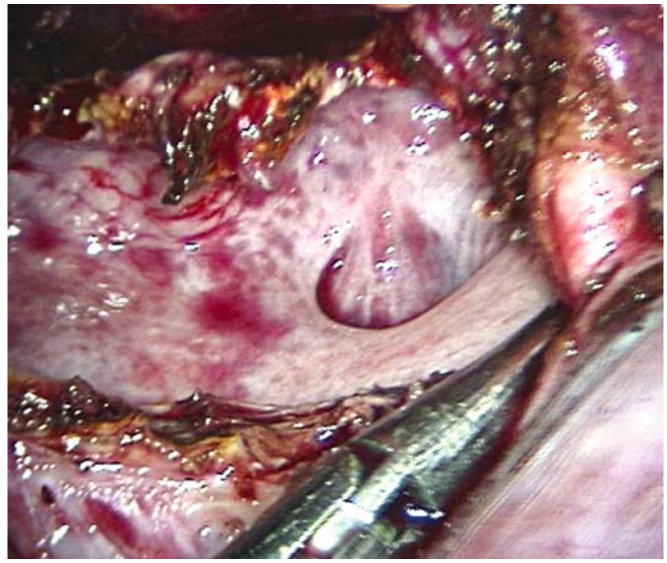


FIG. 8.47. The calyx of the upper moiety is inspected for inflammation, growth, or calculi

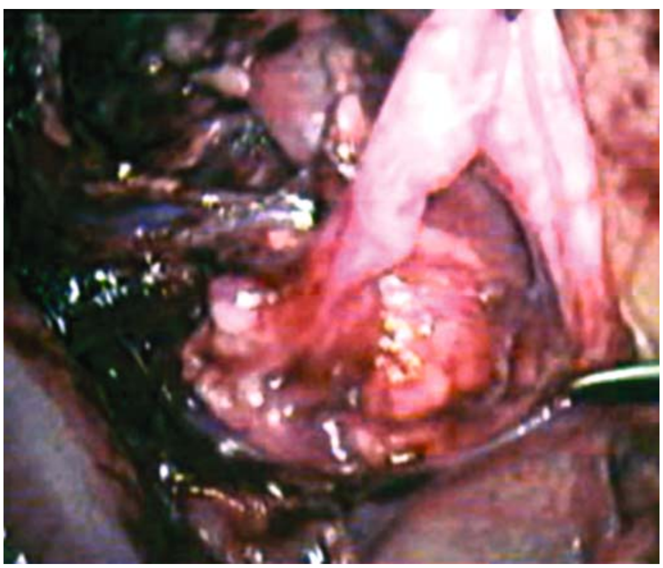


FIG. 8.48. Mobilization of the upper moiety ureter is continued toward the bladder

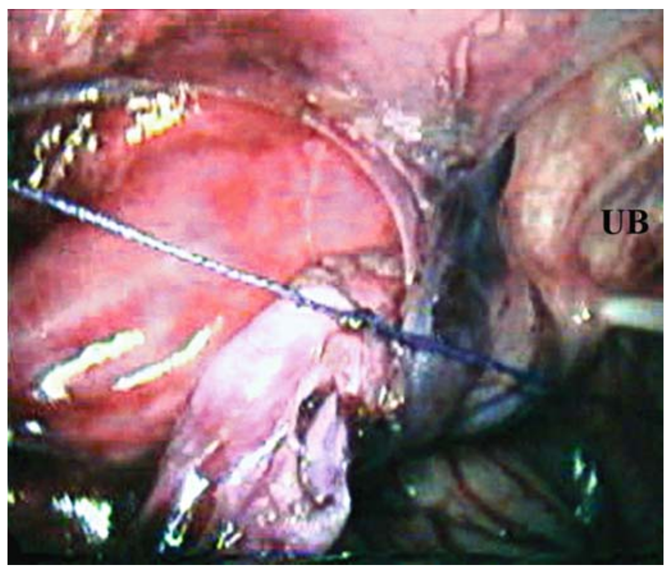


FIG. 8.49. Upper moiety ureter is ligated at the juxtahiatal level (UB, urinary bladder)

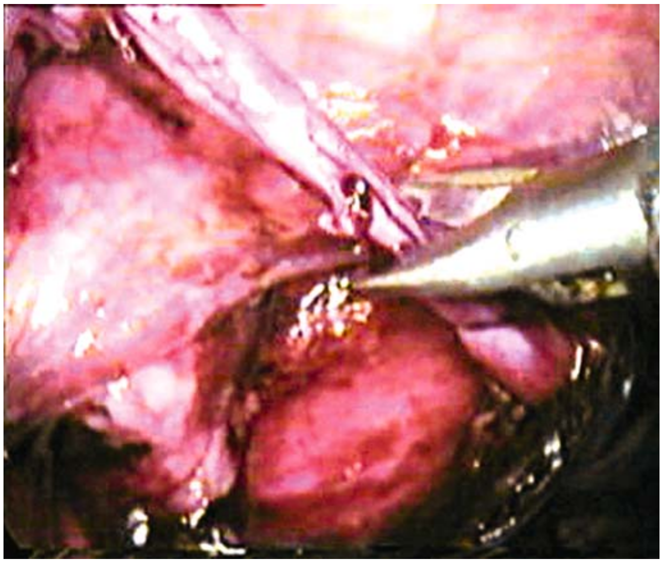


FIG. 8.50. The upper moiety ureter is divided just above the ligature

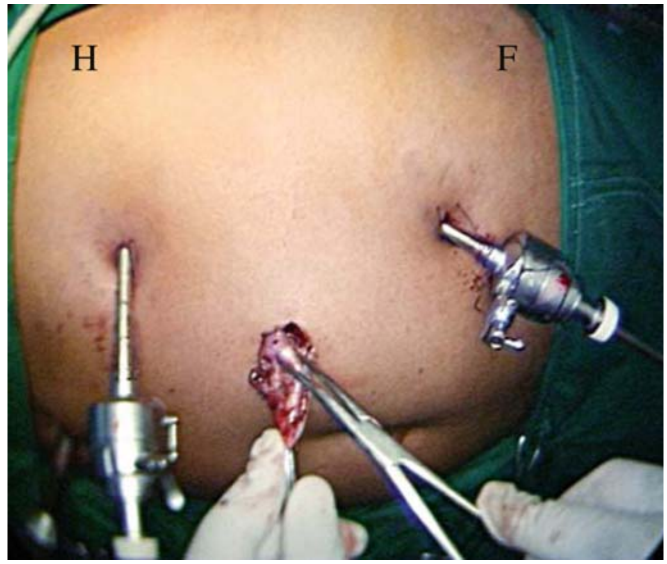


FIG. 8.51. The specimen is retrieved through the camera port (while cross-checking with a 5-mm telescope through one of the accessory ports)

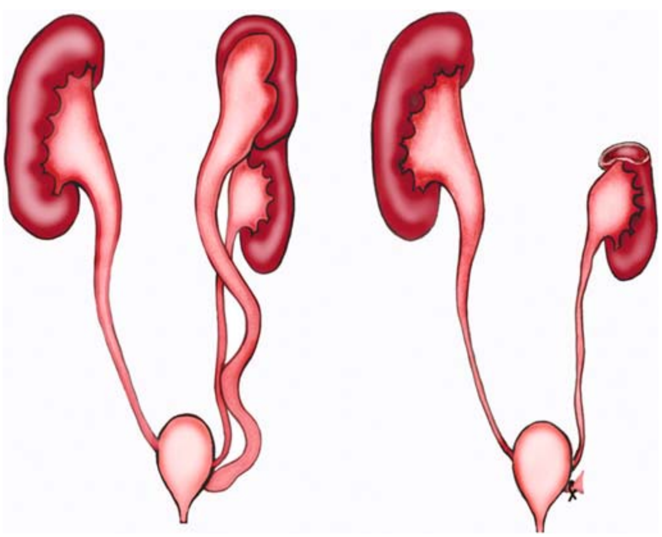


FIG. 8.52. Diagrammatic representation

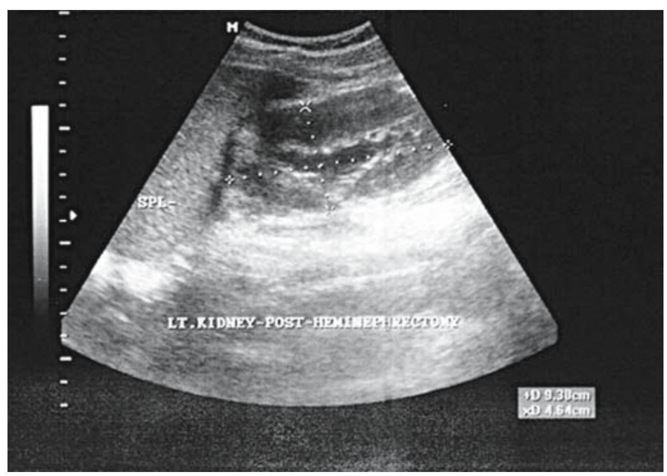


FIG. 8.53. Postoperative ultrasound scan on day 5; no perirenal collection

References

1. Janetscheck G, Seibold J, Radmayr C, et al (1997) Laparoscopic heminephrectomy in Pediatric patients. J Urol 158:1928–1930.
2. Mor Y, Goldwasser B, Ben-Chaim J, et al (1994) Upper pole heminephrectomy for duplex system in children: a modified technical approach. Br J Urol 73:584.

9 Laparoscopic Management of Renal Cystic Disease

K. Senthil and M. Ramalingam

Bosniak Type I and Type II Renal Cysts

Bosniak type I and type II renal cysts with pain or compression on the collecting system need intervention.

Contraindication to Marsupialization of Renal Cyst

Bosniak Type III and Type IV renal cysts need partial nephrectomy if small and peripheral, and radical nephrectomy if large and close to the hilum.

Surgical Technique (Marsupialization)

Renal cystic disease can be approached transperitoneally or retroperitoneally depending on the location of the lesion [1–4]. Frankly infected cyst is better approached retroperitoneally to avoid contamination of the peritoneal cavity. A preoperative computed tomography (CT) angiogram is done for better orientation.

The transperitoneal approach is simple. With the patient in the 70-degree lateral tilt and using four ports, the position of the renal bulge is assessed. The colon is mobilized adequately to expose the cyst up to its attachment with the parenchyma. In cases of a parapelvic cyst, the kidney needs to be mobilized up to the hilum with a blunt dissector, taking care to avoid injury to the stretched-out hilar vessels.

The cyst fluid is aspirated and sent to the cytopathology lab. The cyst wall is excised up to the base with electrocautery. The rest of the cyst wall is irrigated thoroughly and the interior inspected for any abnormality. A tongue of omentum or perirenal fat is mobilized and transfixed to the excised margin of cyst.

Bosniak Type III and IV Renal Cyst (Complex Cyst)

As type III cysts can be associated with malignancy, partial nephrectomy is the ideal option. Small type IV renal cysts (<4 cm) may also be managed by partial nephrectomy. As type IV cysts are cystic malignancies, large cysts need radical nephrectomy. A preliminary retrograde catheter is useful. The approach can be transperitoneal or retroperitoneal. The whole kidney has to be mobilized.

After exposing the renal vessels, an endo-bulldog clamp or Satinsky clamp is applied. If a separate branch is seen supplying the lesion, we attempt to clip it. Subsequently, the line of demarcation appears over the renal parenchyma a few millimeters away from the lesion. This is marked with an L-hook dissector.

A review of the CT angiogram at this stage will guide the line of division deep down. Ultracision may be used for division of the parenchyma with better hemostasis. Methylene blue irrigation through a preplaced ureteric catheter will delineate the amputated calices. This aids in transfixing the calyx. Subsequently the renal parenchymal edges can be approximated with absorbable sutures. The sutured line can be supported with a Surgicel bolster. It is preferable to seal the raw area with omentum and leave a tube drain. At the end, the ureteric catheter can be exchanged for a double pigtail stent.

Retroperitoneal Approach for an Infected Renal Cyst

Infected cysts can be approached retroperitoneally to avoid peritoneal contamination. Cysts located on the posterior or lateral aspect of the kidney can be easily approached by this technique. A drain is a must when dealing with infected cysts.

Renal Cyst: Laparoscopic Marsupialization

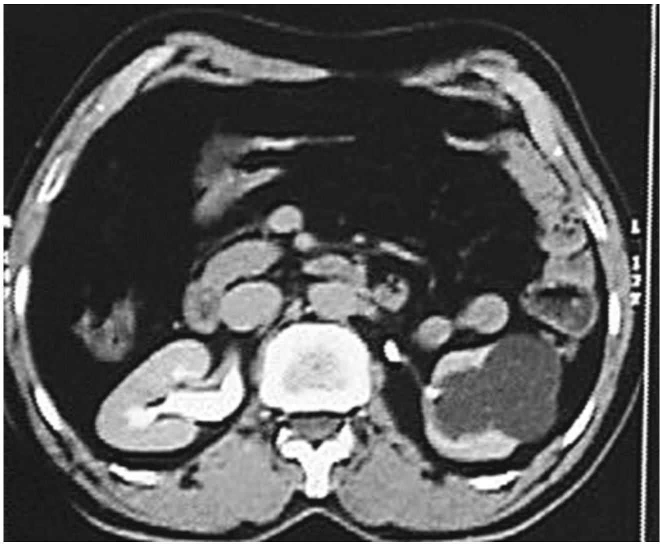


FIG. 9.1. A CT scan shows a left renal cyst distorting the collecting system

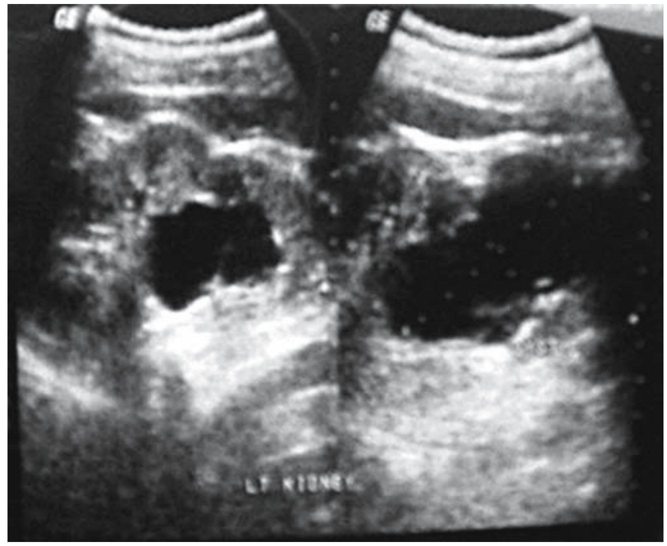


FIG. 9.2. An ultrasound scan shows a left renal cyst distorting the collecting system

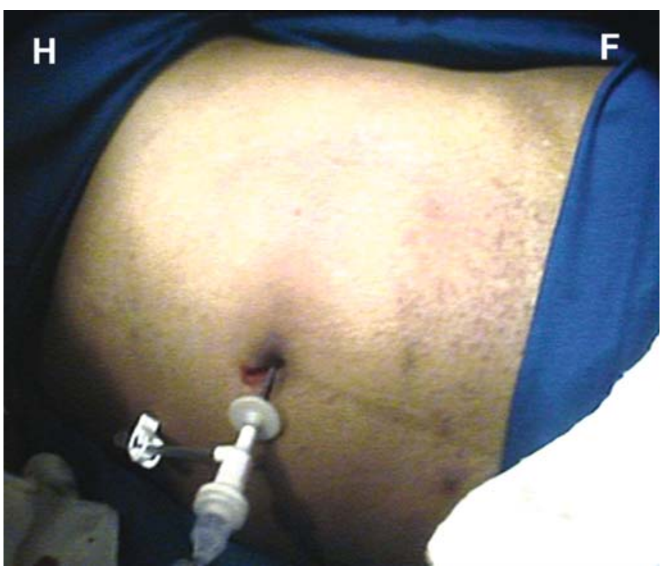


FIG. 9.3. The flank position for the transperitoneal approach (H, head end; F, foot end)

FIG. 9.4. The initial view shows a bulge in the left paracolic area

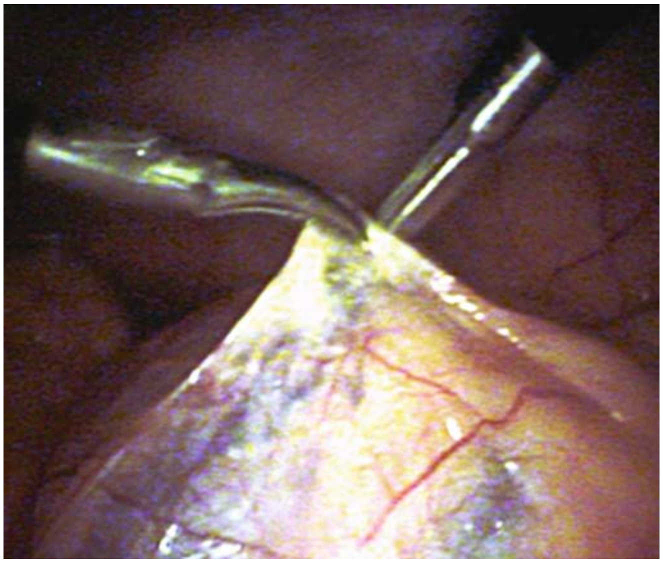


Fig. 9.5. An incision in the peritoneum over the cyst and mobilization of the colon

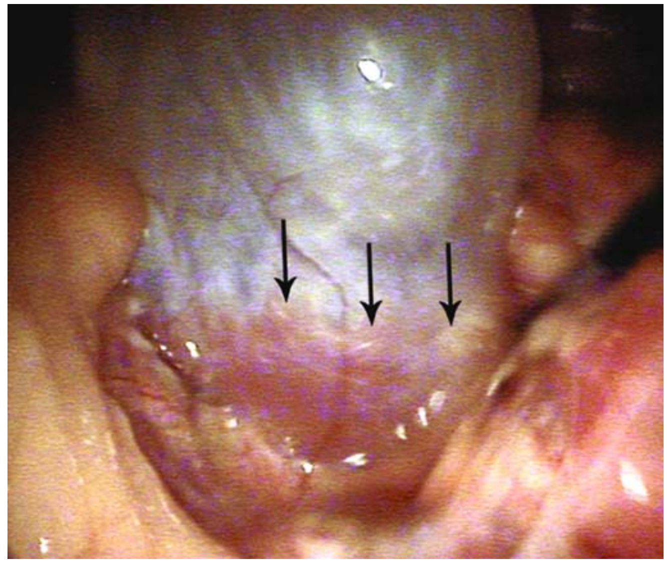


Fig. 9.6. The dissection is continued on the cyst wall until the flattened parenchymal edge (arrows) is seen

Fig. 9.7. The cyst being mobilized up to the parenchyma after decompression

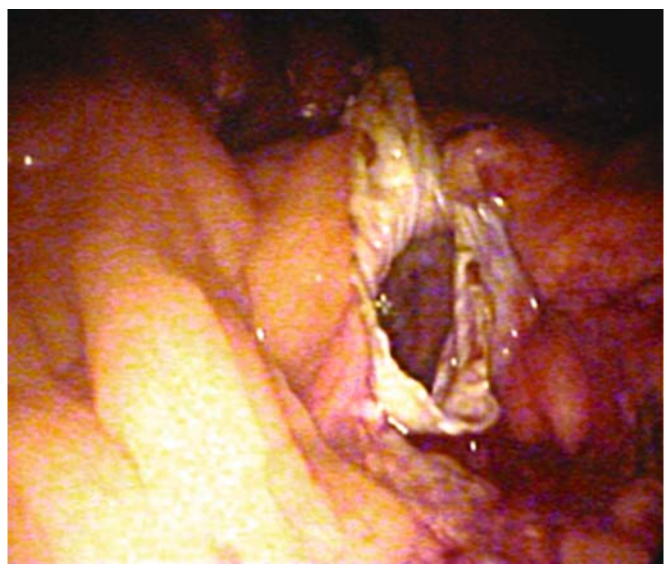


Fig. 9.8. Cyst wall excision in progress

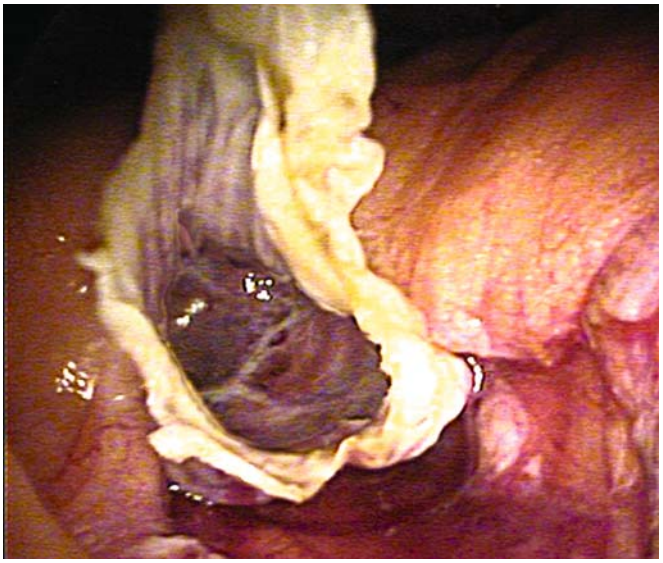


FIG. 9.9. Inspection of the inner aspect of the cyst wall to rule out growth

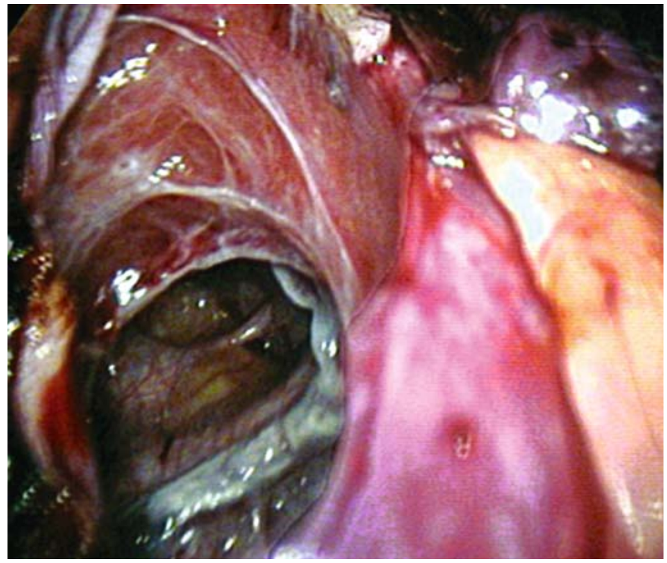


FIG. 9.10. A close-up view of a septate cyst

FIG. 9.11. Omental transfixation to the margin of the cyst

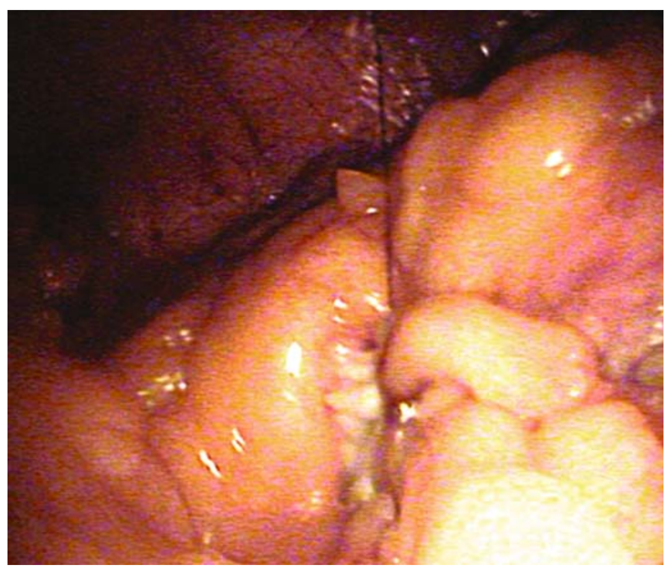


FIG. 9.12. Omentum covering the left kidney

Laparoscopic Management of a Complex Cyst

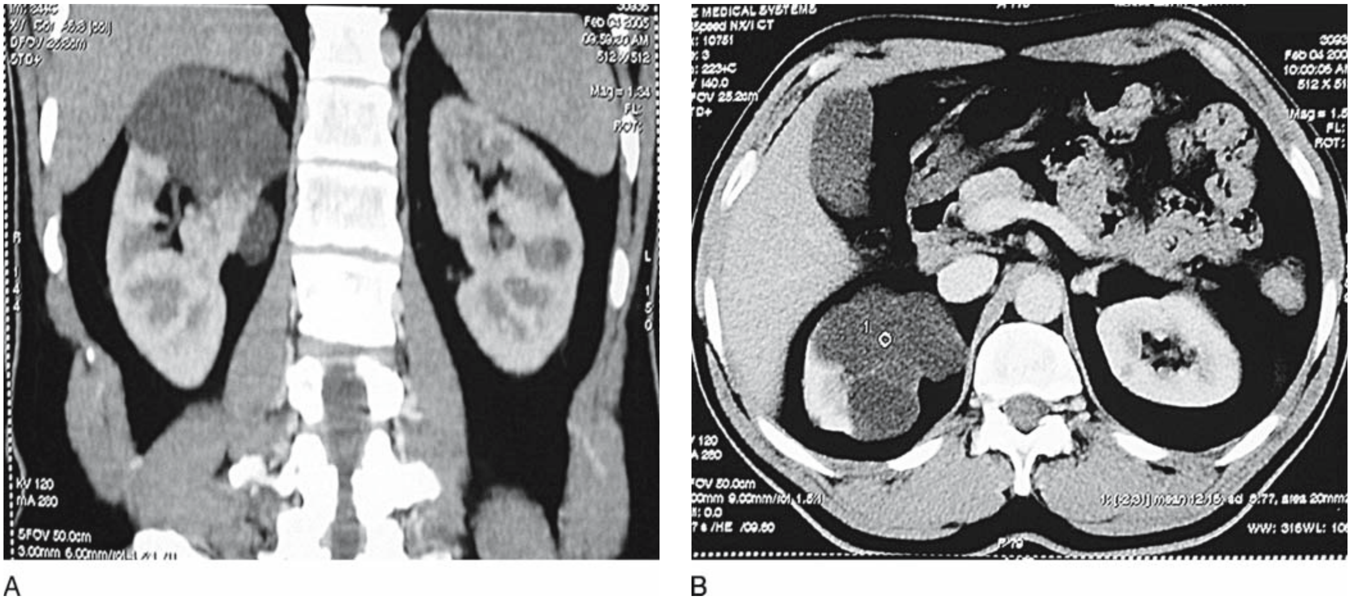


Fig. 9.13. A CT scan of the right kidney shows a multiseptate cyst in its upper pole

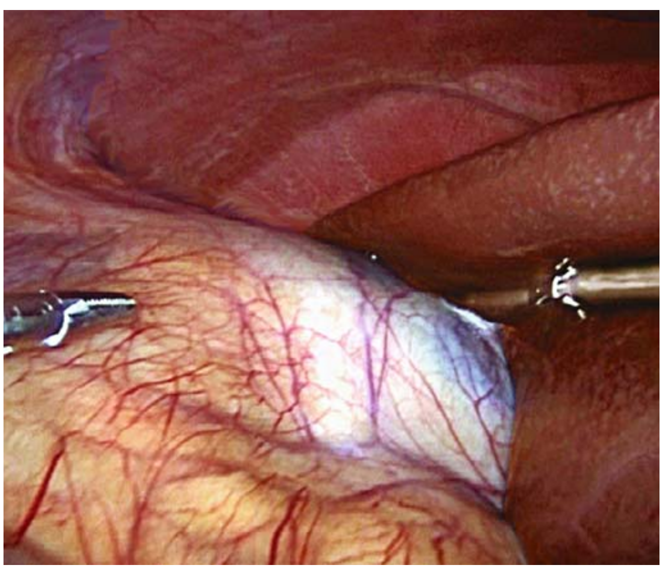


Fig. 9.14. Laparoscopic view shows bulge in the upper pole of the right kidney

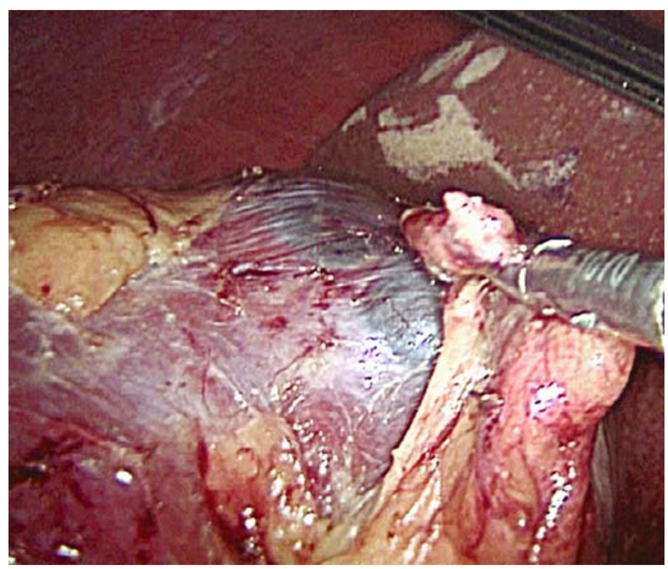


Fig. 9.15. Colonic mobilization exposes a cystic upper pole; note that the liver has to be retracted

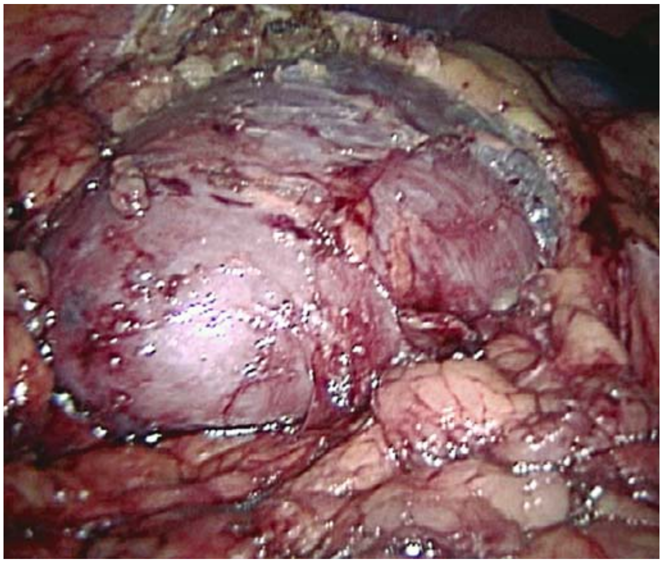


Fig. 9.16. Mobilized right kidney shows a normal lower half

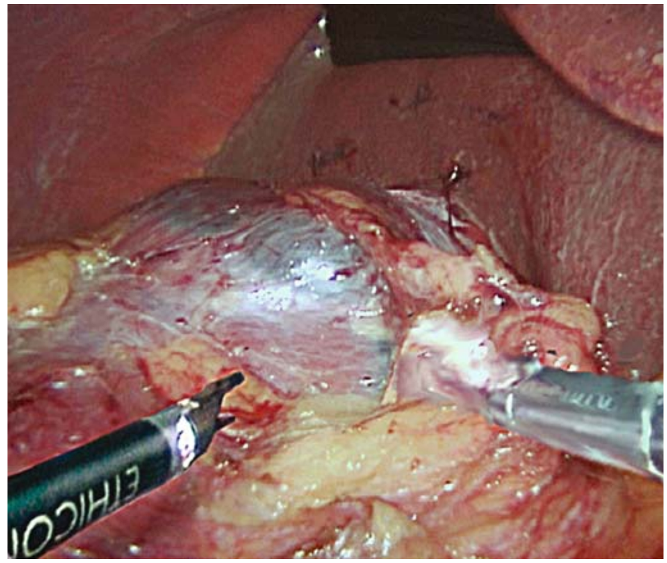


Fig. 9.17. A close-up view of the right kidney shows demarcation between a cystic upper pole and a normal lower segment

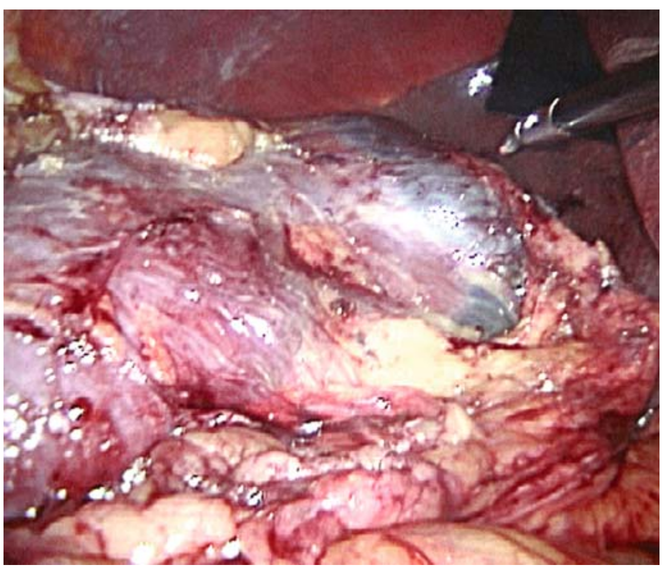


Fig. 9.18. Using ultracision, the proposed line of division is marked

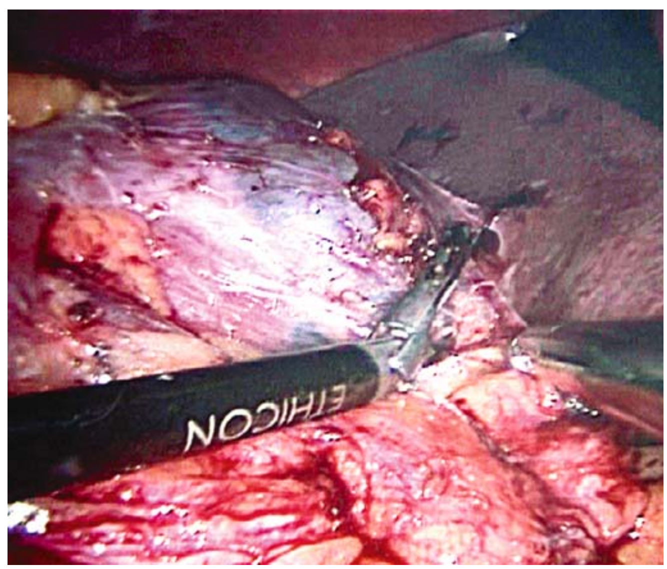


Fig. 9.19. Dividing the peritoneal attachment between the kidney and the liver with an ultrasonic device

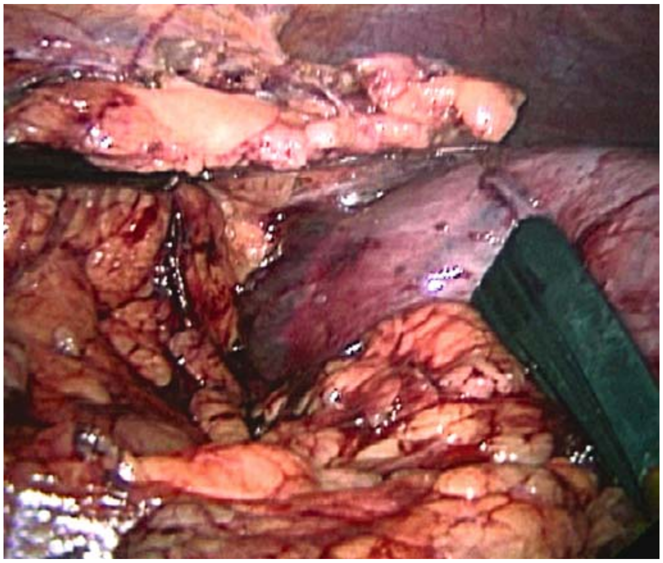


FIG. 9.20. Flipping the kidney after further mobilization to inspect the posterior surface

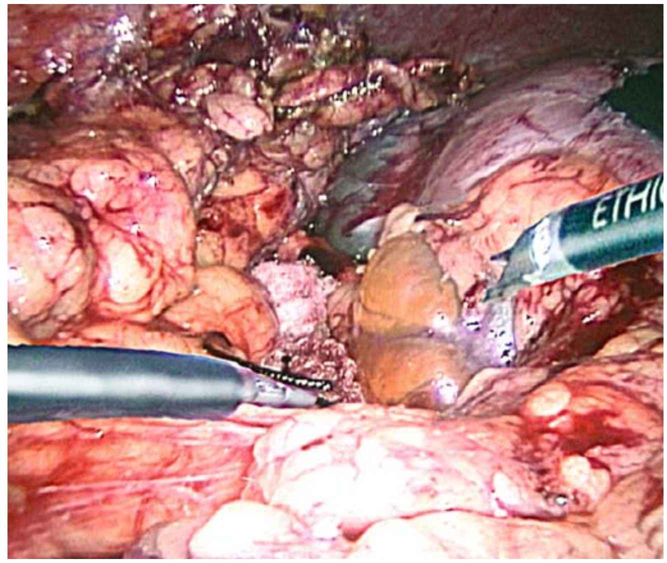
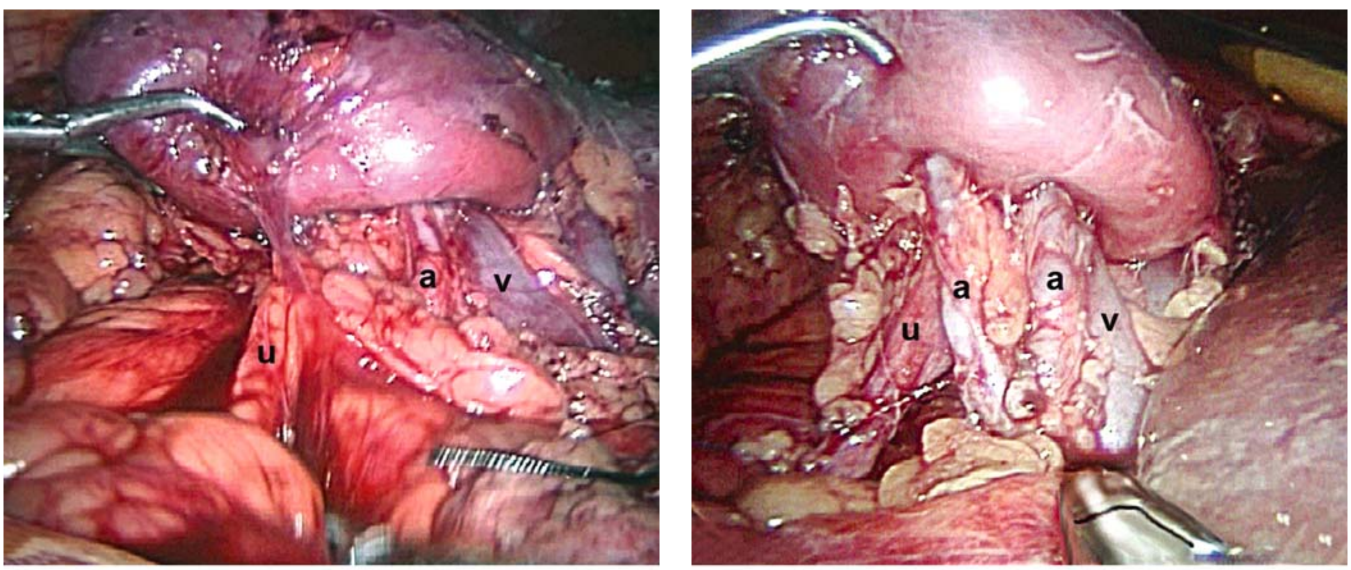


FIG. 9.21. Marking the line of division on the posterior aspect



A B

FIG. 9.22. Further mobilization delineating the renal vessels and ureter (u, ureter; v, vein; a, artery)

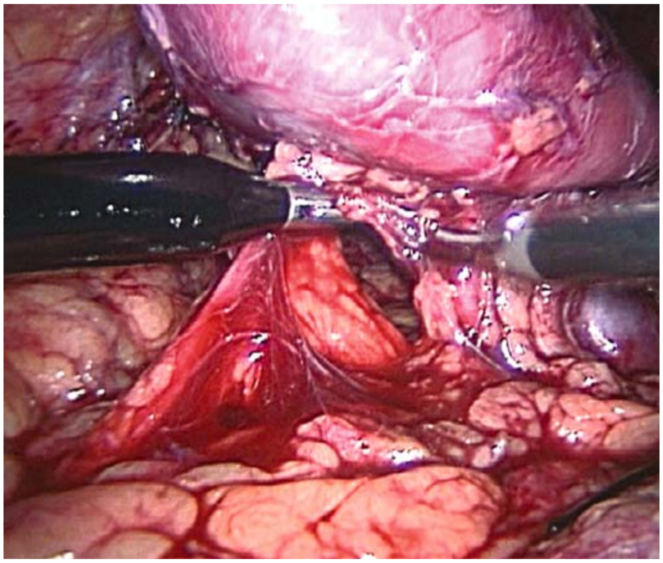


FIG. 9.23. Hilar dissection to study branching pattern of the vessels in preparation for a partial nephrectomy

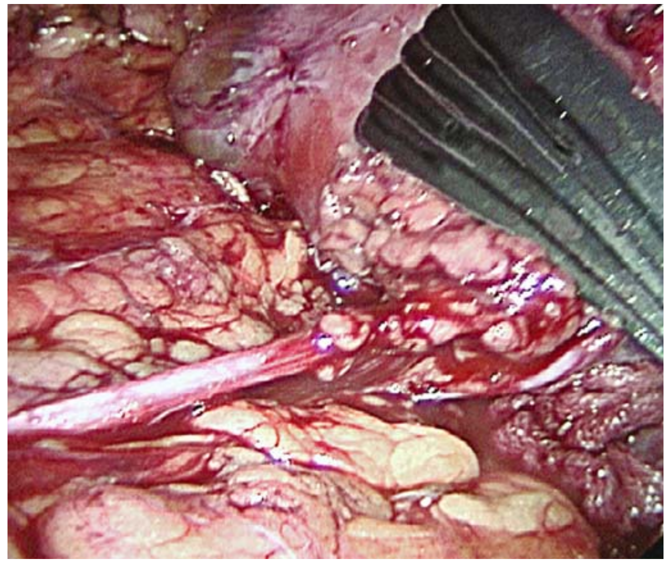


FIG. 9.24. Mobilizing the pelvis to prevent injury during transection of the left kidney

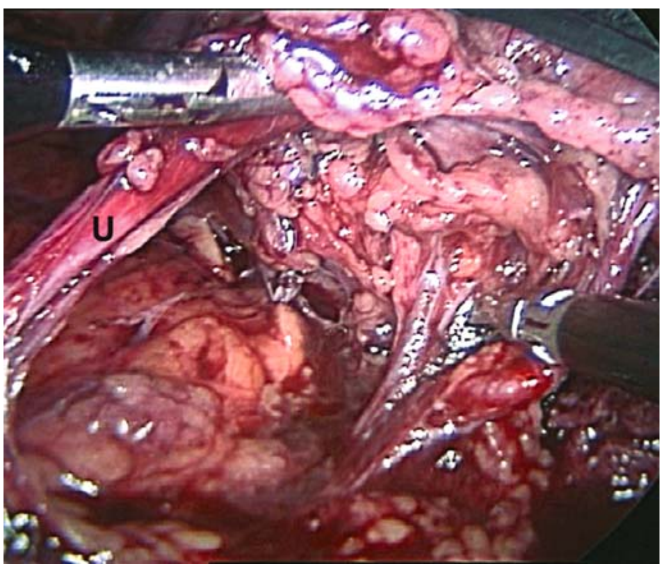


FIG. 9.25. Isolating the vessels supplying the upper pole

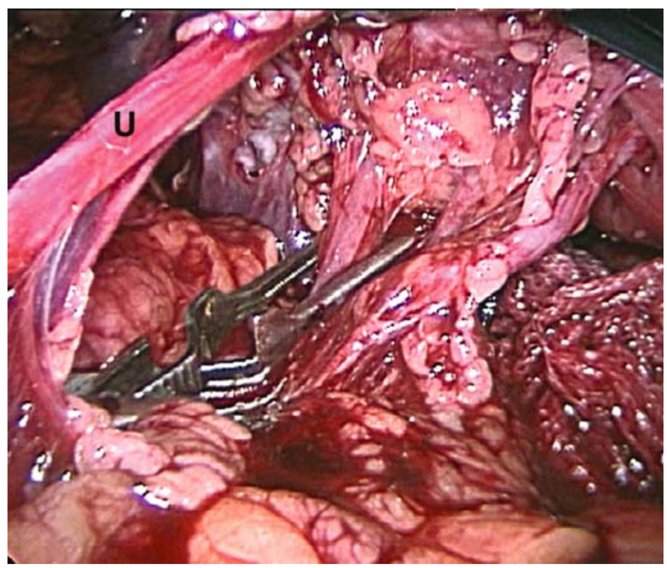


FIG. 9.26. Applying an endo-bulldog clamp to the upper pole artery (U, ureter)

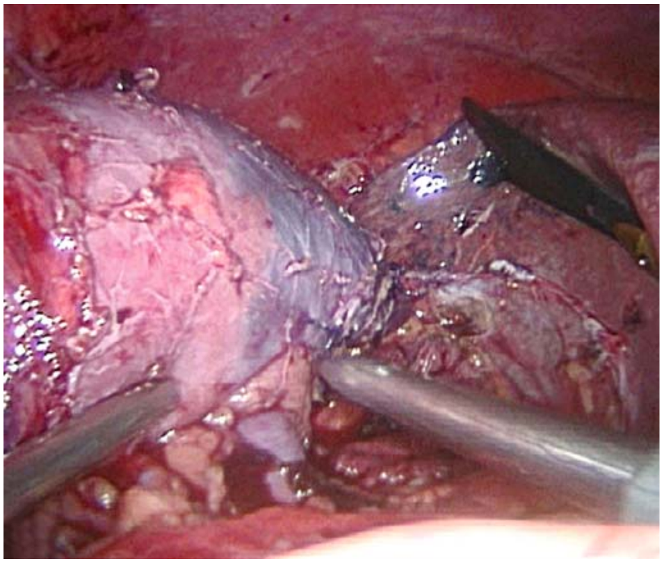


FIG. 9.27. The line of demarcation, which helps in division of the parenchyma

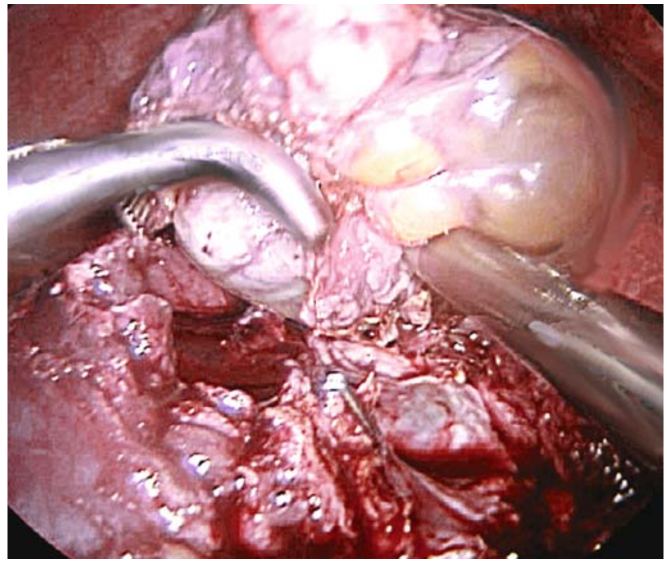


FIG. 9.28. Division of the parenchyma with ultracision

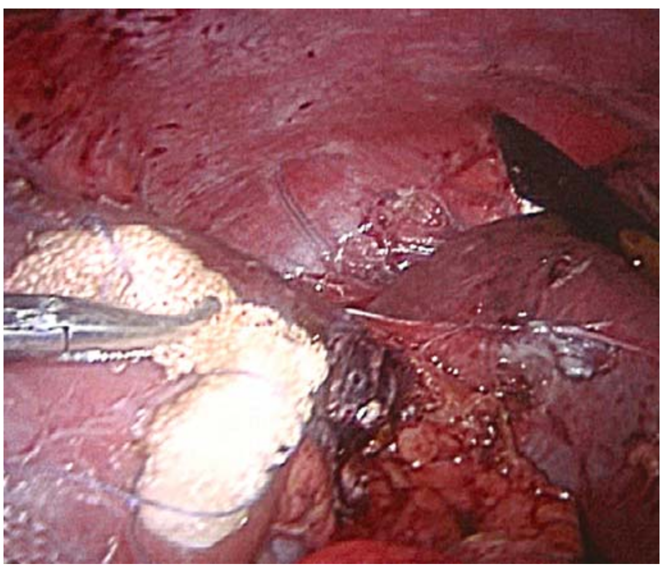


FIG. 9.29. A Gelfoam bolster aids hemostasis

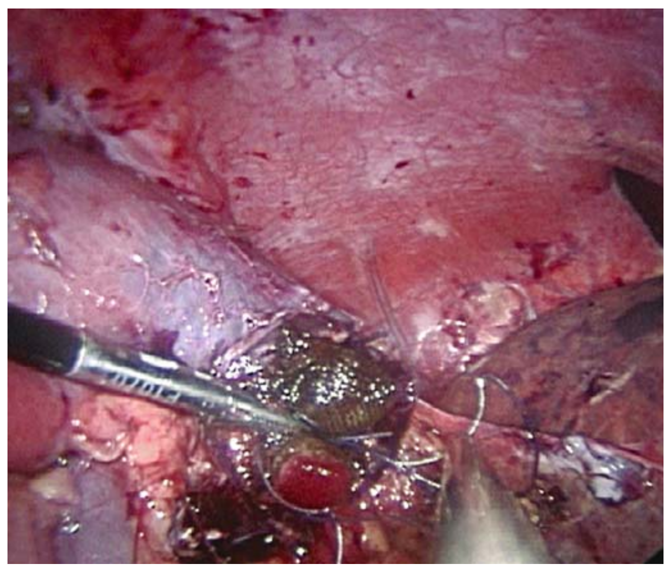
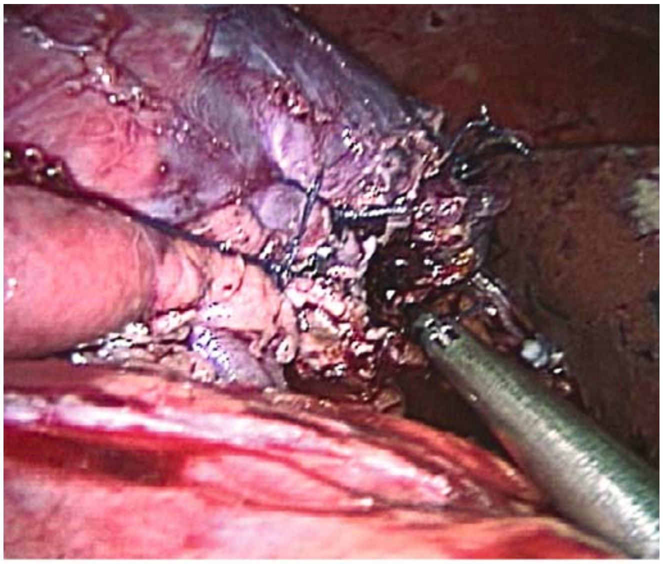
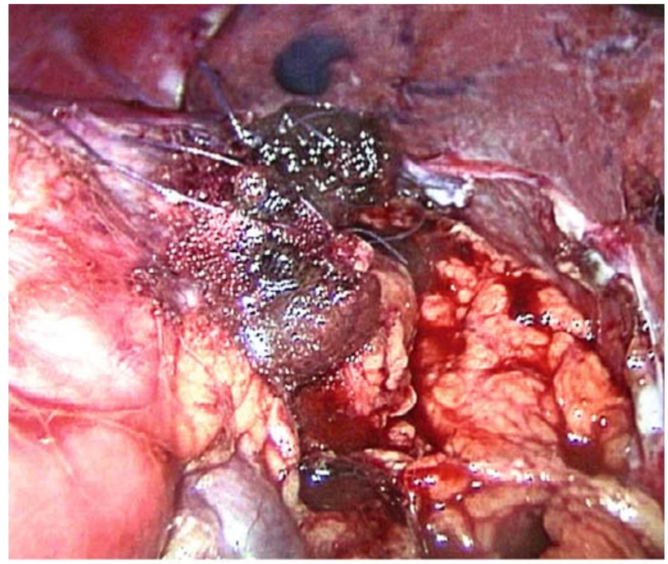


FIG. 9.30. Cut ends of the renal parenchyma being closed with 1-0 Vicryl over a Gelfoam bolster



A



B

FIG. 9.31. Fair hemostasis after releasing the bulldog clamps

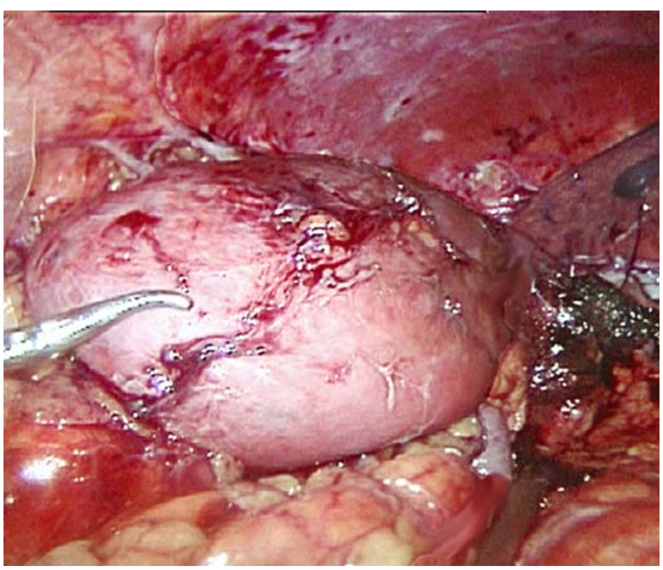


FIG. 9.32. Normally perfused lower segment

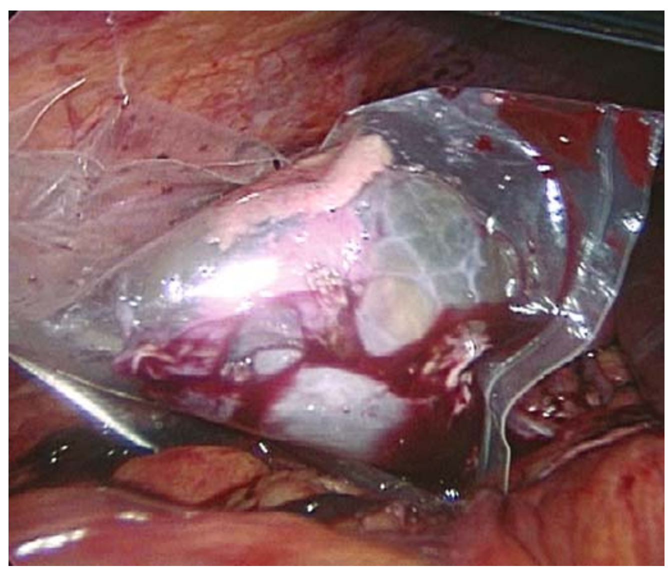


FIG. 9.33. Specimen entrapped in a plastic bag

FIG. 9.34. Retrieved multiseptate cyst

FIG. 9.35. A CT scan 3 months postoperatively revealing no residual cyst

Retroperitoneal Approach for an Infected Renal Cyst

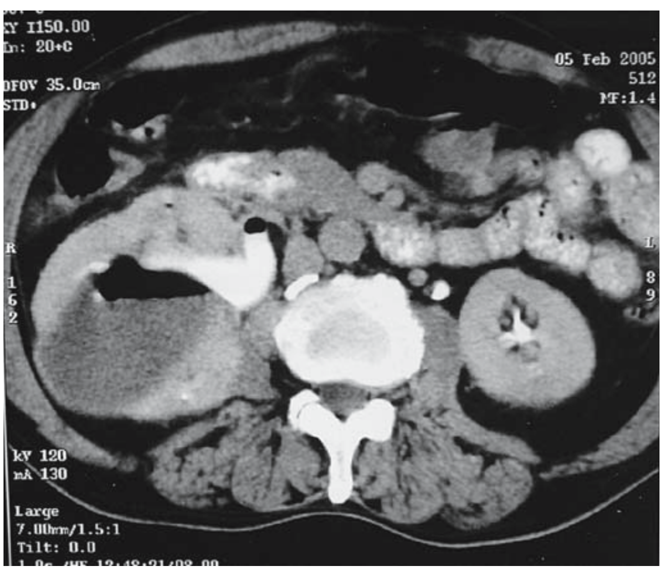


FIG. 9.36. A CT scan shows an infected renal cyst with fair function of the right kidney

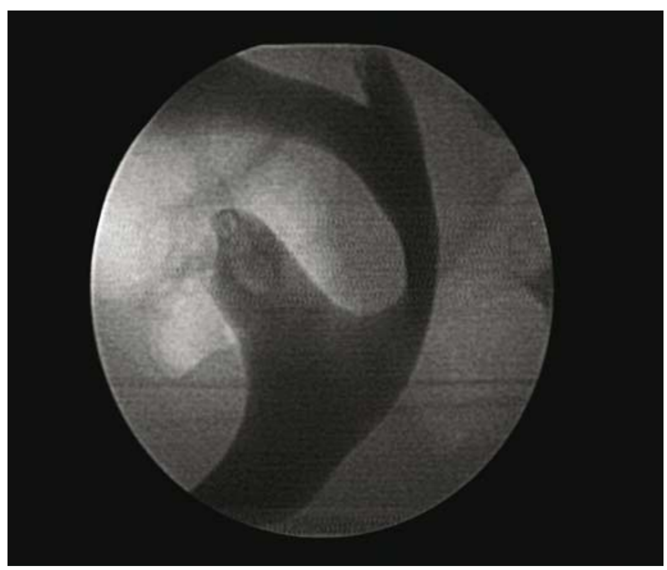


FIG. 9.37. A right retrograde pyelogram (RGP) shows distortion of the collecting system (no communication with the cyst)

FIG. 9.38. Retroperitoneoscopic deroofing of cyst

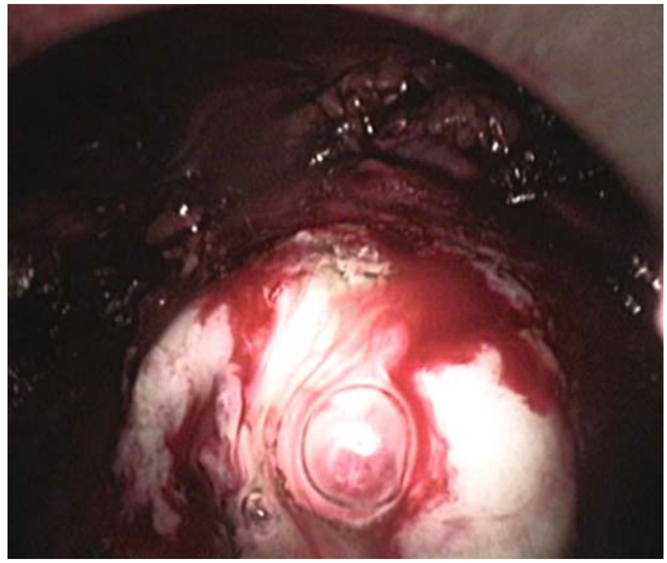


FIG. 9.39. Pus and air drained (infection confined to the retroperitoneum)

FIG. 9.40. Examination inside the cyst revealing thick pus

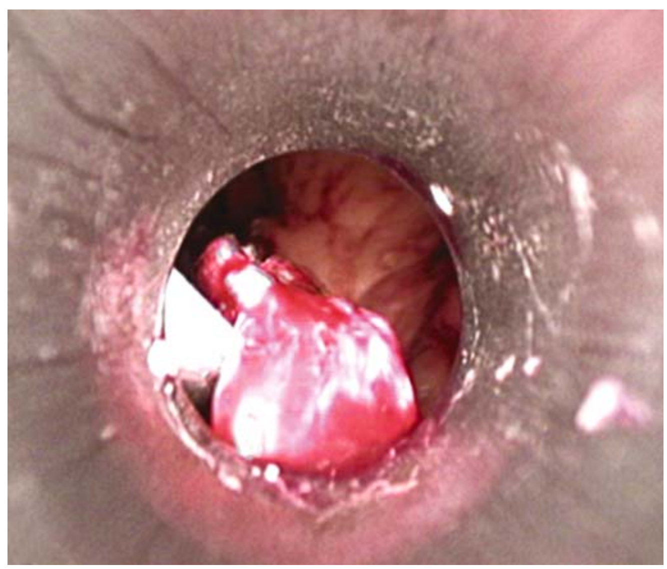


FIG. 9.41. Excision of a button of parenchyma for better drainage

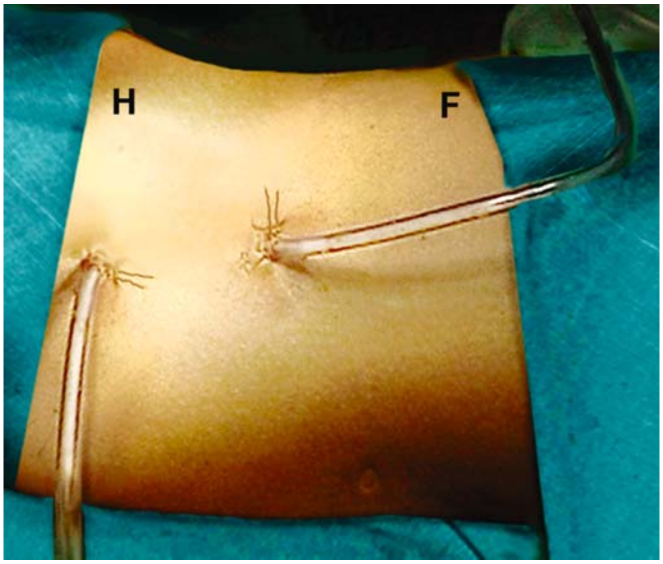


FIG. 9.42. Two drains (one in the cyst cavity and one in the retroperitoneum) are introduced

References

1. Dunn MD, Clayman RV (2000) Laparoscopic management of renal cystic disease. World J Urol 18:272–277.
2. Pearle MS, Traxer O, Cadeddu JA (2000) Renal cystic disease: laparoscopic management. Urol Clin North Am 27:661–673.
3. Roberts WW, Bluebond-Langner R, Boyle KE, et al (2001) Laparoscopic ablation of symptomatic parenchymal and peripelvic renal cyst. Urology 58:165–169.
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10
Laparoscopic Pyelolithotomy

K. Senthil and M. Ramalingam

Generally laparoscopy is appropriate for patients with a renal pelvic stone in an ectopic kidney and for those who need adjunctive procedures such as a pyeloplasty. Laparoscopy does not result in nephron injury and is advantageous in children with large stone burden. Percutaneous nephrolithotomy (PCNL) may require more than one puncture in a similar situation.

A computed tomography (CT) scan is a useful investigation to determine the exact relationship of the stone to the pelvis and calyces.

Technique

Retroperitoneoscopic Pyelolithotomy [1,2]

A preliminary cystoscopy with retrograde pyelogram is performed. A guidewire is placed in the pelvis and a stent may be placed just below the pelvis. Provision of C-arm screening helps locate the position of the calculus intraoperatively.

The patient is then positioned in the true lateral (90-degree kidney) position and strapped to the table. A 10-mm incision is made just below the tip of the twelfth rib. A hemostat is inserted and the muscles are separated. The glistening lumbodorsal fascia can be seen, and it is pierced with the hemostat and dilated. Stay sutures with 1-0 Vicryl are taken through the muscle layers. A retroperitoneal balloon, either a commercially available one in various forms or a custom-made one using the middle finger of a size 8 glove tied over a stiff catheter, is used. The balloon is placed in the retroperitoneal space more cranially, as the pelvis has to be approached. About 400 mL of saline is filled in the balloon and left in place for about 5 minutes.

A balloon-tipped trocar is inserted and fixed in place with Vicryl sutures, which were taken earlier. Two 5-mm trocars for hand instruments are inserted along the anterior axillary line an inch above the iliac crest and below the costal margin. An additional 10-mm port for retraction or suction may be inserted posterior to the telescope port. As in any retroperitoneoscopy the first step is to identify the anatomic landmarks (i.e., the psoas muscle). The ureter is sought in the groove medial to the psoas and identified by its characteristic peristalsis and arborization of the vessels. The ureter is then carefully traced up to the pelvis, taking care not to injure any lower polar vessels. Inflammatory fat may be a hindrance to the dissection.

The pelvis is carefully mobilized. C-arm imaging may be useful at this juncture to determine the exact site of the incision (pyelotomy). One of the instruments may be held at the presumed site of the stone and all other instruments are moved away prior to screening. Pyelotomy is performed using an endoknife or curved scissors. The stone is maneuvered out using a right-angled dissector and the preplaced double-J stent is advanced over the guidewire. The pyelotomy is then closed with interrupted 3-0 or 4-0 Vicryl sutures. The Vicryl stay sutures are used to close the muscle layers of the telescope port. A tube drain is left in place through the lower port. The patient can be usually discharged by the fifth postoperative day after the drain tube is removed. The ureteric stent may be left in situ for about 2 weeks.

Transperitoneal Pyelolithotomy

The preliminary steps are same as in the retroperitoneal approach. The patient is placed in the 70-degree kidney position and trocars are inserted as in a laparoscopic pyeloplasty. The colon is mobilized, and the ureter is traced up to the pelvis. Once the pelvis is dissected and the position of the stone is identified, the steps are the same as in the retroperitoneoscopic pyelolithotomy. A drain is placed in the retroperitoneal space near the site of pyelotomy.

Special Situations

- In cases where a stent was not preplaced, a guidewire with a stent is passed through a Veress needle placed cranially such that it is directed toward the pyelotomy and ureter.
- A ureteroscope through the cranially placed port also may be used to insert the stent.
- In the intrarenal pelvis, dissection is continued into the pelvis by lifting the posterior lip and then through the pyelotomy; a flexible cystoscope/nephroscope may be used.
- A flexible cystoscope/nephroscope may be used to retrieve calculi that migrate from the pelvis to the calyces.
- Imaging can be used to verify the completeness of stone clearance.

Retroperitoneoscopic Pyelolithotomy

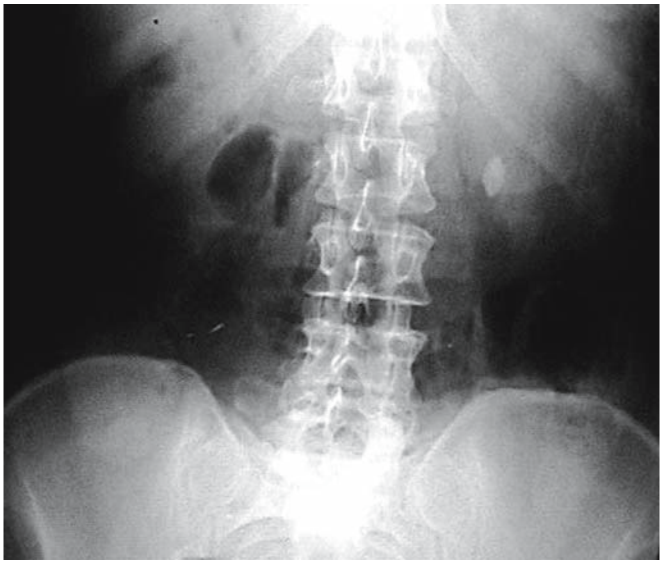

Fig. 10.1. A plain x-ray of the kidney and urinary bladder (KUB) shows a large radiopaque shadow in the left renal area

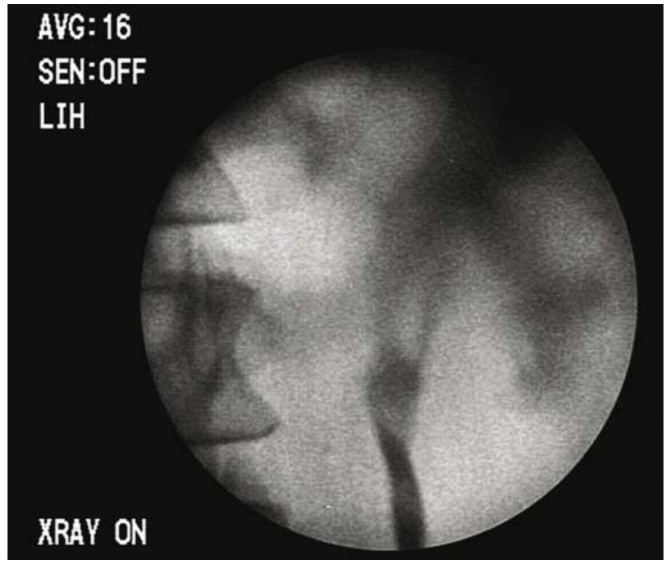

Fig. 10.2. A retrograde pyelogram (RGP) reveals a filling defect in the left renal pelvis suggestive of a pelvic stone

Fig. 10.3. Initial view of a retroperitoneoscopy; blunt dissection through the loose areolar tissue area is done to look for landmarks such as the psoas, ureter, or lower pole of kidney

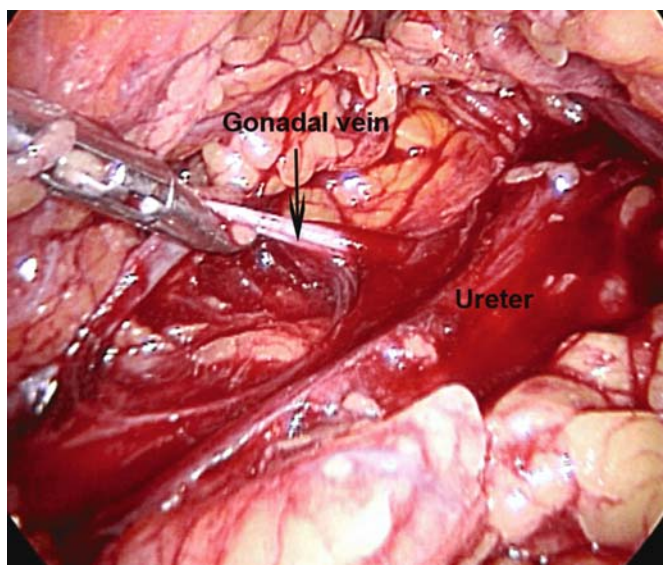

Fig. 10.4. Further dissection reveals one or both linear structures (gonadal vein or ureter or both)

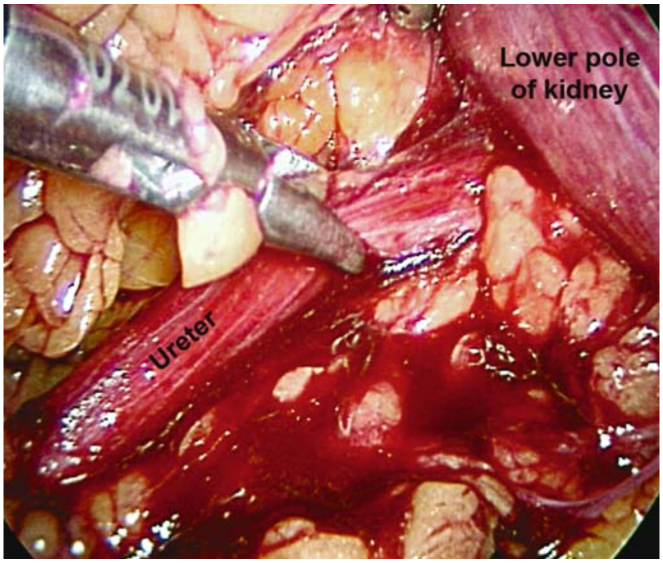

FIG. 10.5. Once the ureter is identified, the stone may be felt with the help of the dissector

FIG. 10.6. An intraoperative screening with the C-arm image intensifier helps in performing the pyelotomy, when the stone is not felt

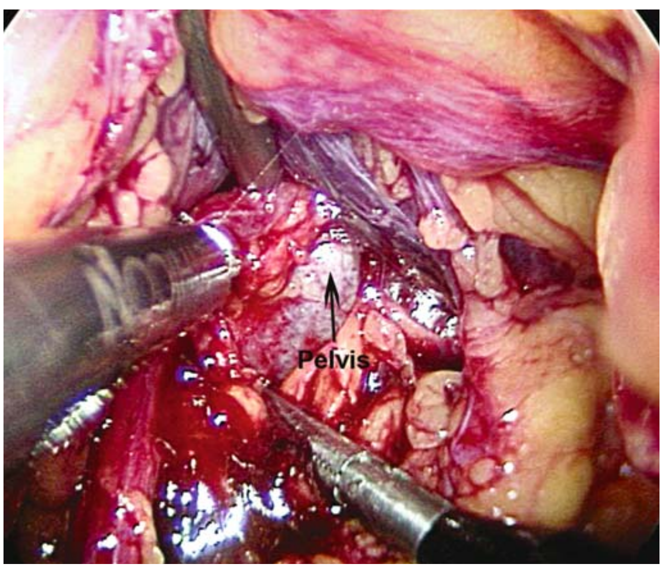

FIG. 10.7. Sometimes the pannus may have to be dissected off to visualize the pelvis

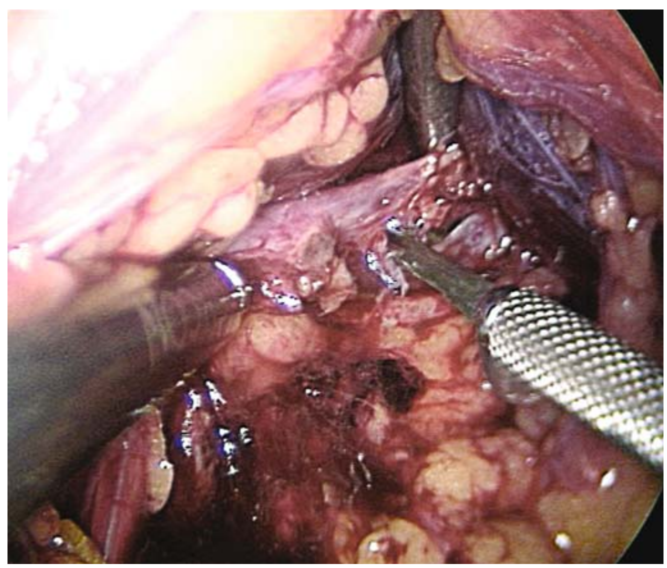

FIG. 10.8. Incision of the pelvis with an endoknife to expose the stone

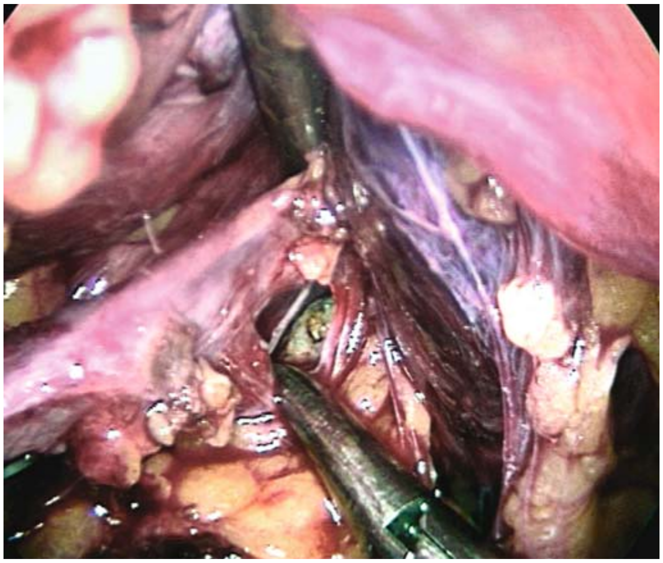

Fig. 10.9. The stone being maneuvered out using a right-angle dissector

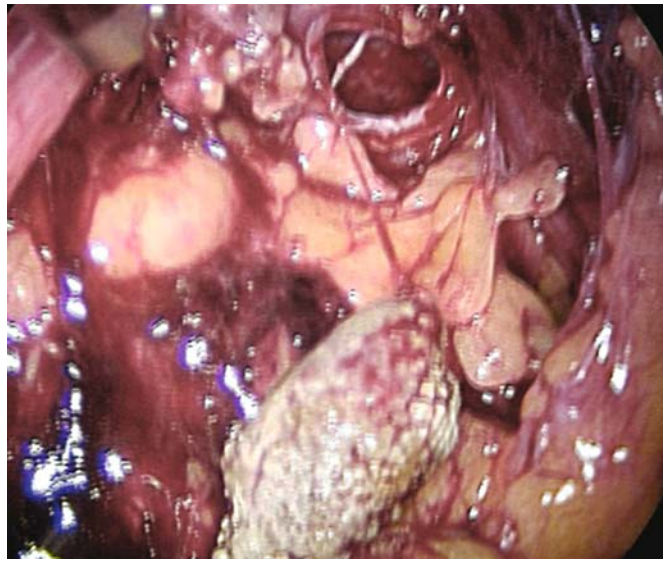

Fig. 10.10. A stone lodged over the psoas to be picked up later

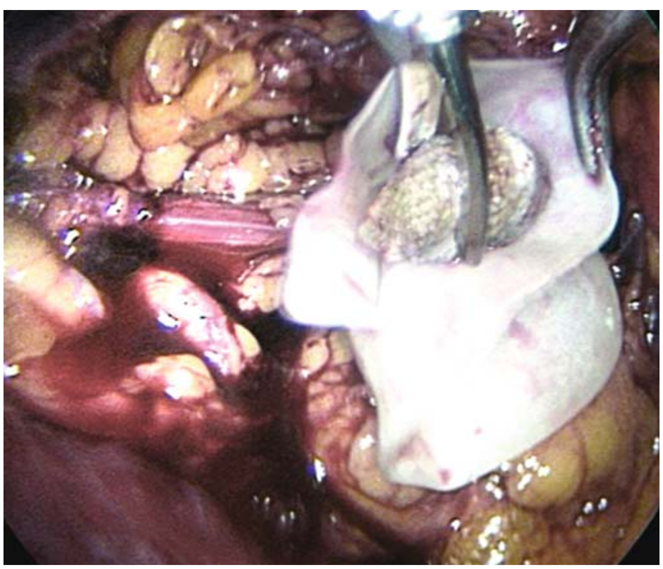

Fig. 10.11. A stone bagged in a fingerstall of a glove (can also be retrieved using a Babcock forceps)

Fig. 10.12. An antegrade stent passed through the sheath of a Veress needle as seen from the front

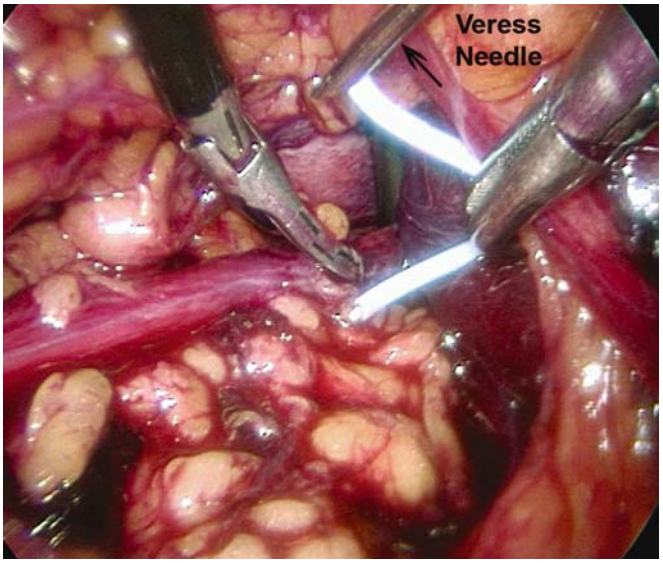

Fig. 10.13. An endo-view of antegrade stent passage through a Veress needle, to be guided down the ureter

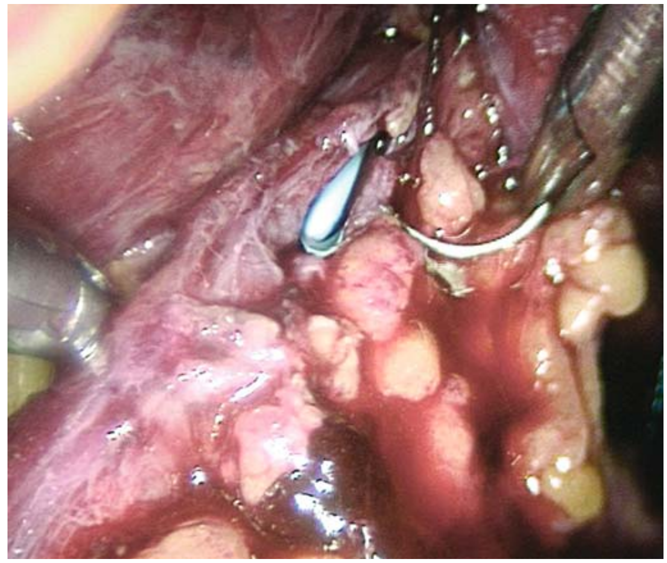

Fig. 10.14. Pyelotomy closure with 4-0 interrupted Vicryl suture

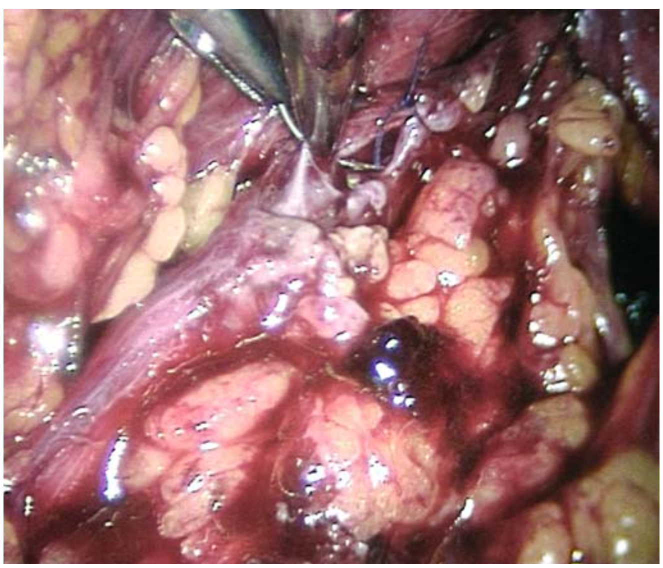

Fig. 10.15. Sometime suturing has to be done using a backhand suture

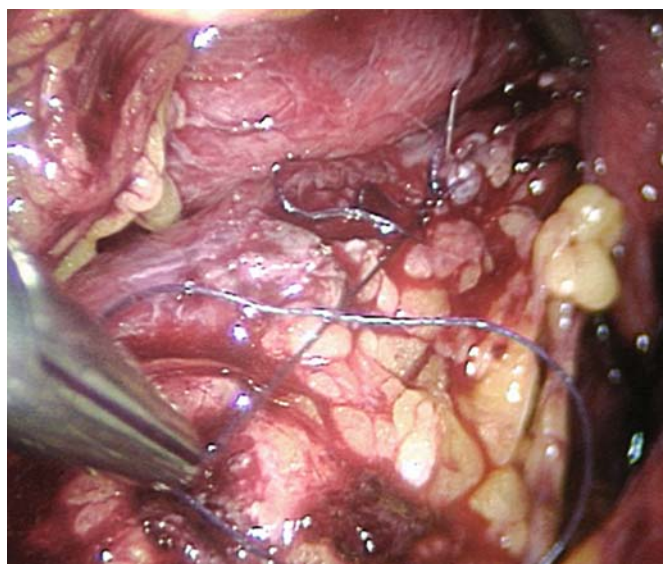

Fig. 10.16. The pyelotomy closure is nearly completed

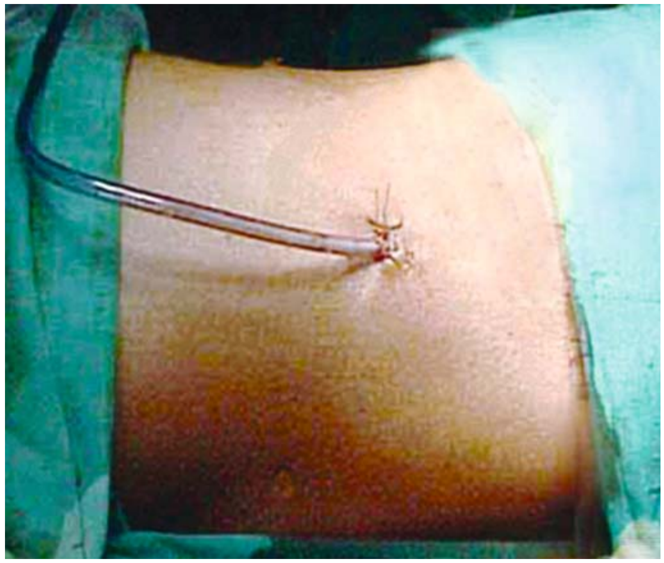

Fig. 10.17. A tube drain is inserted through the primary port

Transperitoneal Pyelolithotomy

Fig. 10.18. A plain KUB x-ray shows a large radiopaque shadow

Fig. 10.19. An intravenous urogram (IVU) shows an extrarenal pelvis lodging a large stone

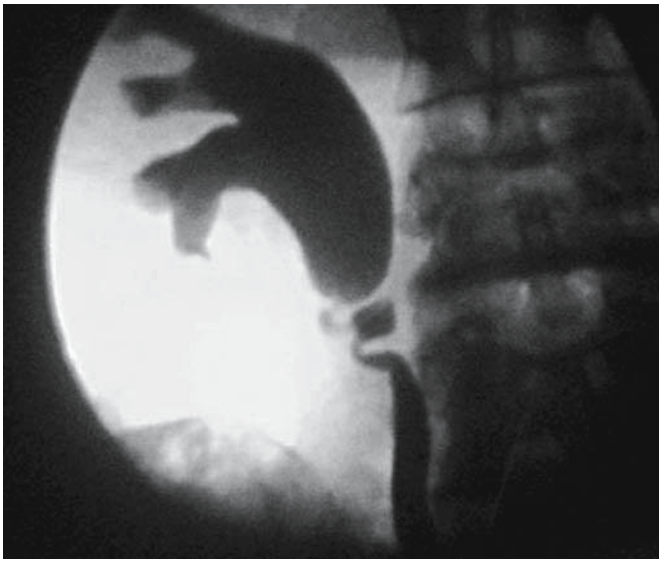

Fig. 10.20. A right RGP shows an extrarenal pelvis with doubtful ureteropelvic junction (UPJ) narrowing, which may need pyeloplasty and hence laparoscopy was preferred over a PCNL

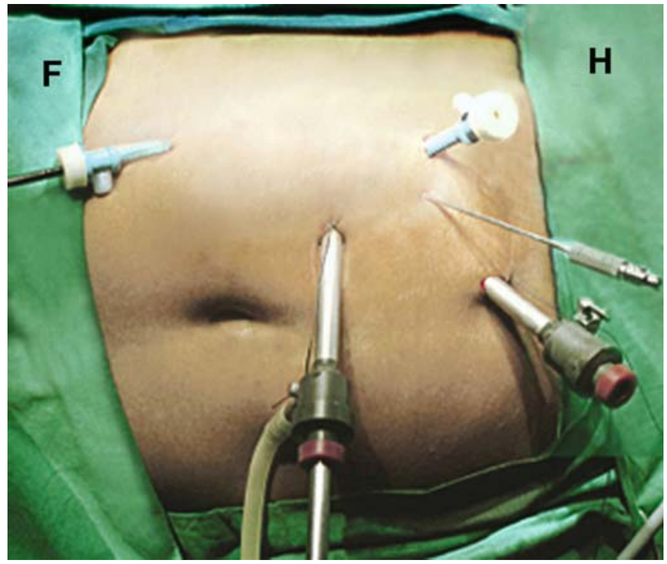

Fig. 10.21. The port position for a right transperitoneal pyelolithotomy; note a Veress needle in the subcostal area is used for initial insufflation

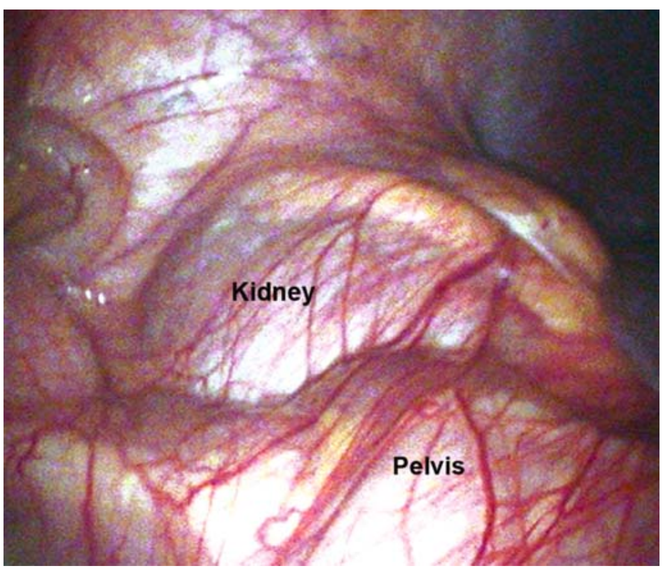

Fig. 10.22. The transperitoneal view of the kidney and pelvis

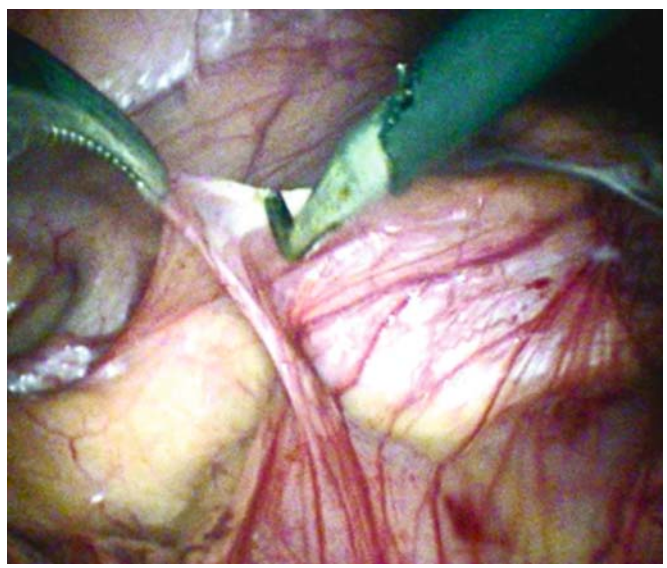

Fig. 10.23. Colonic mobilization starting at the hepatic flexure with hook diathermy

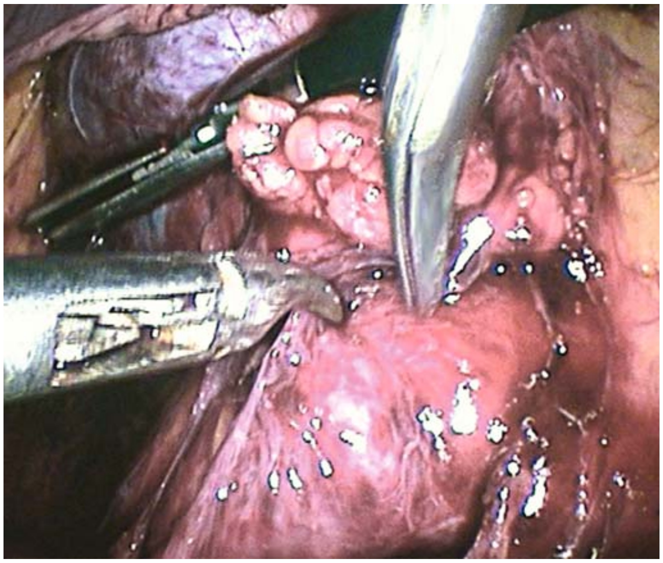

Fig. 10.24. Further colonic mobilization exposes the pelvis; a stone is felt through the pelvis

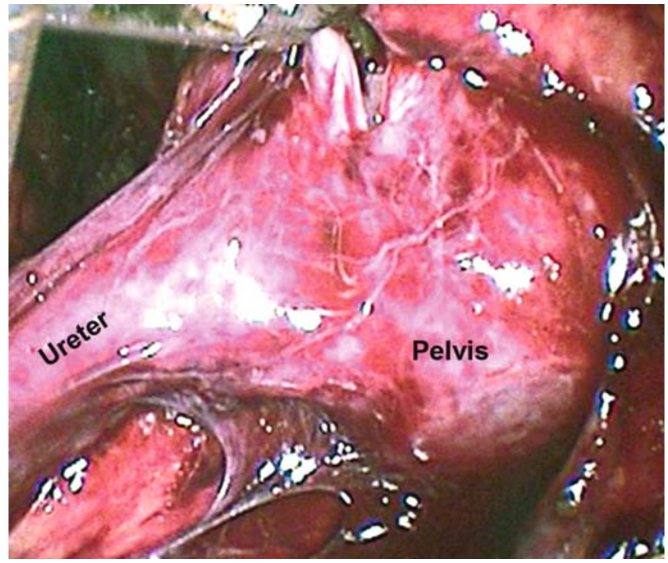

Fig. 10.25. The pelvis and ureter coming into view (no UPJ narrowing noted)

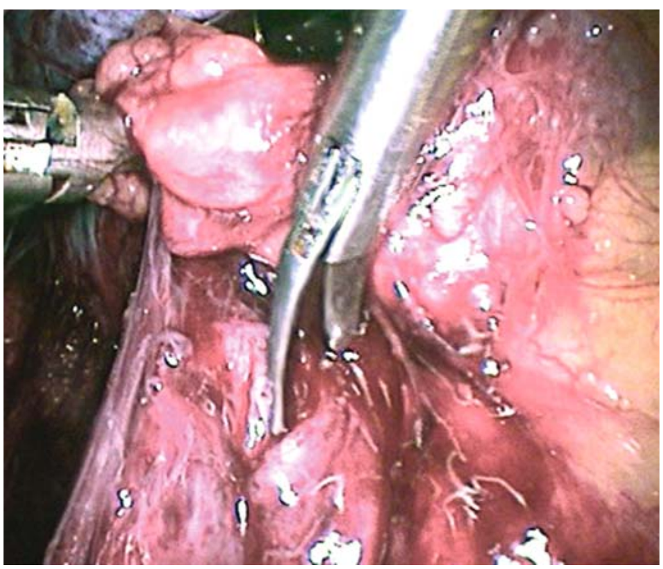

Fig. 10.26. A pyelotomy with cold scissors (or endoknife) is done to expose the stone

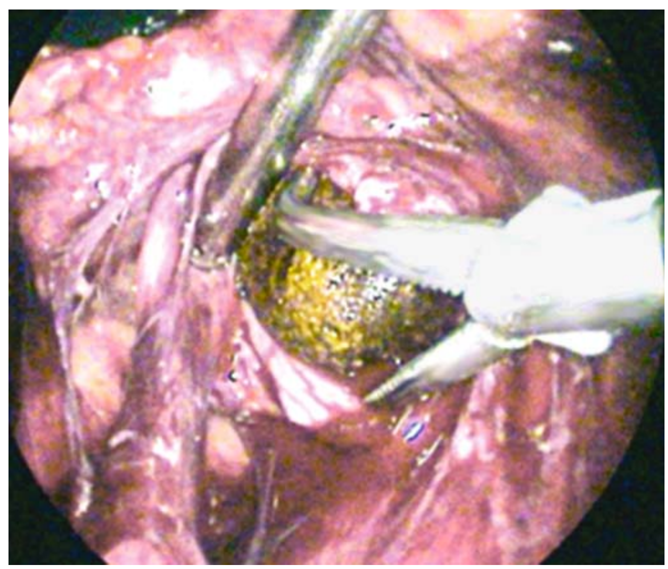

Fig. 10.27. Stone retrieval is attempted; if there is difficulty in delivering it, it is better to extend the pyelotomy

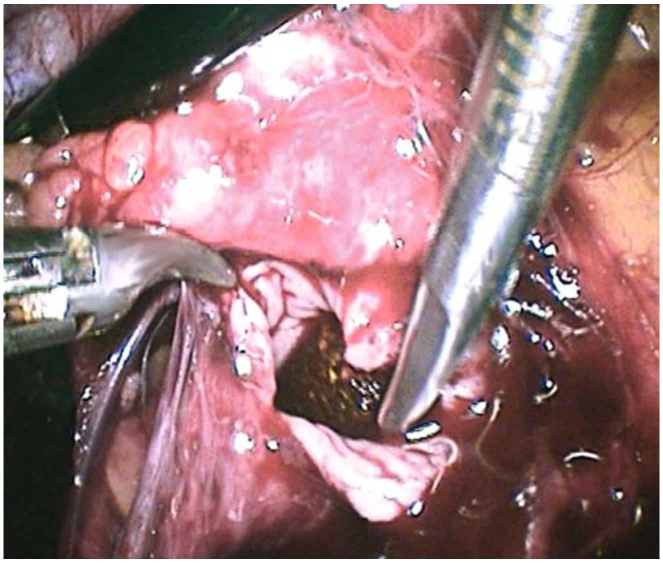

FIG. 10.28. If linear pyelotomy is insufficient, a Y-shaped flap of the pelvis can be made

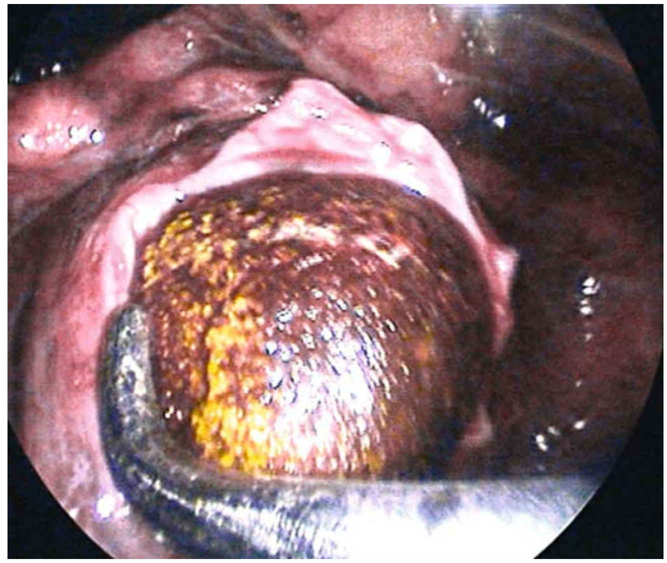

FIG. 10.29. Stone extraction with a right-angle dissector (a Babcock forceps can also be used)

FIG. 10.30. A guidewire is advanced for easy stent placement

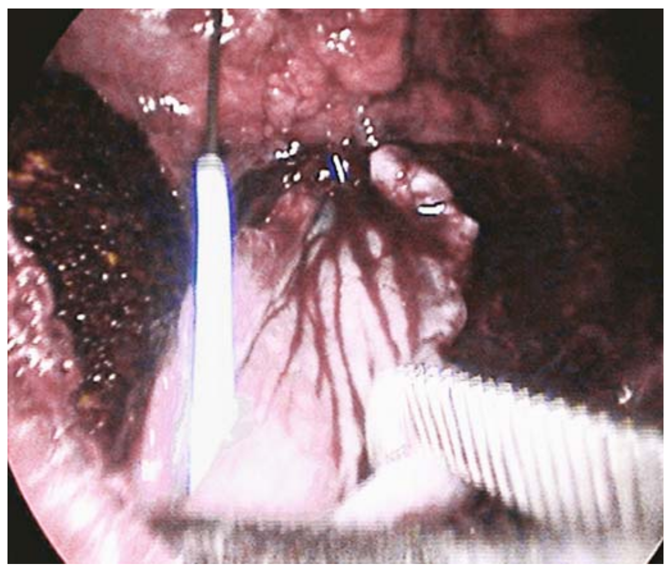

FIG. 10.31. A preplaced stent is advanced

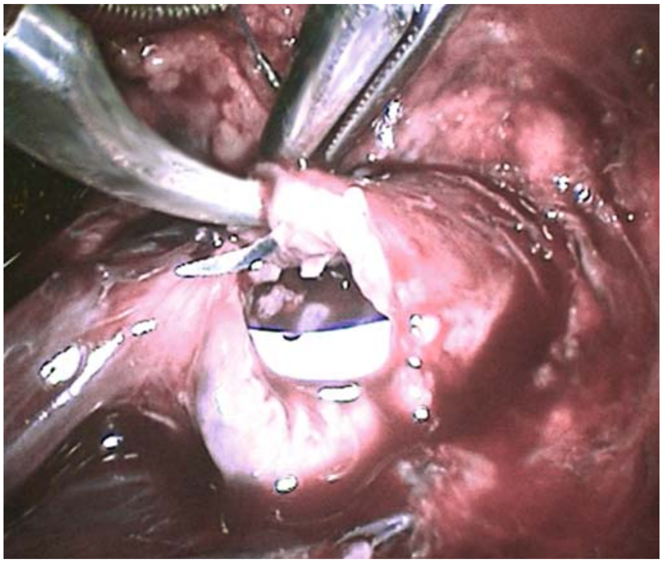

Fig. 10.32. Pyelotomy closure can be done with 4-0 interrupted Vicryl suture

Fig. 10.33. Stone extracted using a Babcock forceps by enlarging the 10-mm port

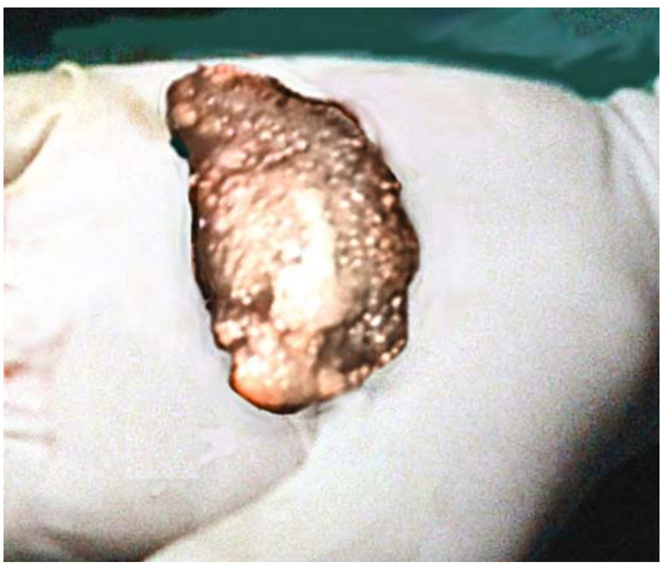

Fig. 10.34. The stone is retrieved intact

Fig. 10.35. A tube drain is inserted through the flank

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2. Ramalingam M, Senthil K, Selvarajan K, Pai MG (2004) Laparoscopic pyelolithotomy in children. J Endourol 18:A228(abstr).

11 Laparoscopic Partial Nephrectomy

Howard M.H. Lau and Bill Papadopoulos

Indications

Absolute indications include renal tumor in a solitary functioning kidney or when non-nephron sparing surgery will induce renal failure. Relative indications include renal tumor less than 4 cm (T1a) or other renal abnormality such as renal cyst, abnormal duplex kidney or calyceal diverticulum. Recent reports suggest an equivalent survival outcome in patients with localized T1a renal cell carcinoma (RCC) treated by open partial nephrectomy as in those treated by radical nephrectomies [2, 7, 13, 15]. Similar oncologic outcomes are likely to be achieved by laparoscopic partial nephrectomy (LPN). The surgical principles of vascular control, clean resection margin, and minimal tumor handling are the same as in open surgery [3]. Due to technical difficulties with cooling and suturing of the renal substance, laparoscopic partial nephrectomy should be considered only when the operator has gained considerable laparoscopic experience.

Technical Considerations

Preoperative Imaging

Computed tomography (CT) angiogram is the preferred method to image the renal vasculature. Renal angiogram may also be used; however, the renal vein is not well visualized. Before operation the resection site should be defined based on both the coronal and reconstructed scan images.

Clamping of Vessels

Following colon, splenic or liver mobilization, the renal vessels are dissected to allow the application of the clamp. A small amount of peri-arterial tissue may act as a “cushion” for the clamp and reduce the risk of injury to the artery. A laparoscopic Satinsky clamp is used to clamp the renal artery or arteries. Other clamps such as bulldog clamps or vessel loops can be used. In cases with small exophytic tumors, vascular clamping may not be necessary. Clamping of the artery and vein together can be considered, especially in centrally located tumors or in cases where the artery is adherent to the vein. When clamping both the artery and vein, it is important to ensure all arterial branches are controlled as venous obstruction with continual arterial inflow will lead to increase bleeding which in turn compromises vision, thus the main technical advantage of laparoscopic surgery.

Tumor Position and Localization

Exophytic tumors without hilar involvement are more suitable than are centrally located tumors for LPN. Non-exophytic tumors can be located by the use of a laparoscopic ultrasound probe, but the surgical margins are still difficult to identify. The perinephric fat is left intact until a sufficient amount of the kidney is freed. A window is made in Gerota's fascia, away from the tumour to avoid unexpected tumour spillage. The tumour base is isolated with the overlying perinephric fat left intact, to ensure adequate clearance. Clear vision of the resection margin without any thermo artefact helps guard against incomplete tumor resection.

Hemostasis

Cold scissors are used to remove the tumour. The line of resection is premarked with diathermy. The parenchymal defect is closed in two layers using a 2-0 chromic suture with an MH needle (Johnson & Johnson). The ultrasonic dissector can also be used. Bipolar diathermy or an argon beam coagulator may be used for hemostasis. Hemostatic agents such as Surgicel (Johnson & Johnson) and Floseal (Baxter Hayward, CA, USA) may be used for additional hemostasis.

Urine Leakage

For centrally located or deep tumours, a 5-French open-ended ureteric catheter is inserted into the ureter and attached to methylene blue (one ampule in 1 L normal saline). Gravity infusion of this is used to identify the integrity of the calyceal system and thus facilitate its repair. For superficial lesions this step can be omitted.

Nephron Protection (Ischemic Time, Cooling)

If clamp time is kept under 40 minutes, renal damage should be minimal and reversible [11]. Cooling has been described but is technically difficult by laparoscopy [4, 9, 12].

TABLE 11.1. Summary of oncologic outcome of laparoscopic partial nephrectomy (LPN) in published reports

Reference	Year	Size in cm (range)	*n*	RCC	Follow-up (months)	Recurrence
Rassweiler 17	2000	2.3 (1.1–5.0)	53	37	24	0%
Jeschke 10	2001	2 (1.0–5.0)	51	38	–	0%
Gill 3	2002	3 (1.4–7)	50	34	7.2	0%
Allaf 1	2004	2.4 (1.0–4)	48	48	37.7	4.2%

TABLE 11.2. Summary of surgical outcome of LPN

Reference	Year	No. of pts	Size in cm (range)	Hilar control	Hemostasis	Blood loss (mL)	Operative time (min)	Complication rate
Janetschek 8	2000	25	1.9	No	Bipolar, argon, glue	287	162	12%
Harmon 6	2000	15	2.3	No	Argon, bolster	368	168	0
Guillonneau 5	2003	28	2 25.2	No, 12; yes, 16	Ultrasonic, bipolar, suture	708 270	179 121	10%
Link 14	2005	223	2.6 (1–10)	Yes, 75%	Argon, glue, suture	385	186	10%
Ramani 16	2005	200	2.9	Yes	Suture	247	180	33%

Complications

Intraoperative complications include bleeding, bowel injury, injury to surrounding organs, and conversion to an open procedure. Early postoperative complications include urine leak/urinoma, prolonged ileus, transient renal impairment, pneumonia/atelectasis, and cardiovascular complications. Late postoperative complications include wound infection, delayed nephrectomy, urine leak, hematuria, hematoma, wound dehiscence, incisional hernia, and pulmonary embolism.

A Case of Right Interpolar Renal Tumor

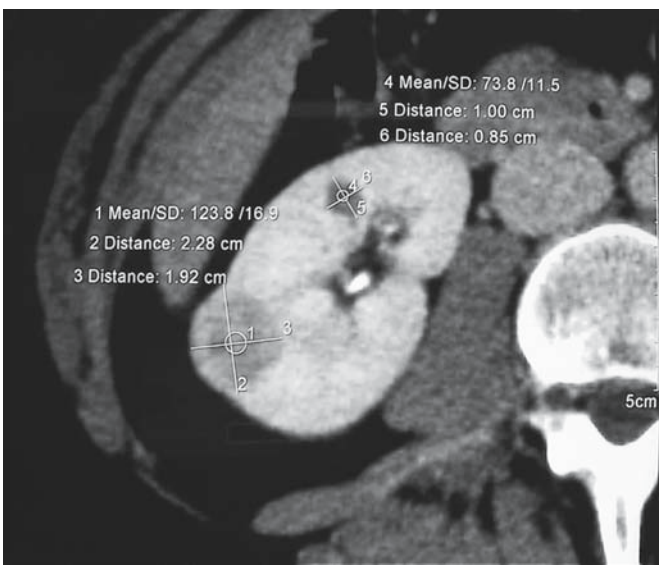

FIG. 11.1. A 2.5-cm interpolar renal tumor with a small cyst in a 50-year-old woman

FIG. 11.2. Methylene blue in normal saline connected to a retrograde ureteric catheter will identify leakage from the collecting system

Fig. 11.3. Some of the vascular clamps available for laparoscopic partial nephrectomy (LPN): curved Satinsky clamp, straight Satinsky clamp, and detachable clamp and its applicator

Fig. 11.4. Patient in the lateral position with attention paid to the pressure points; calf compression, preoperative bowel preparation, and early postoperative clear fluid are used routinely

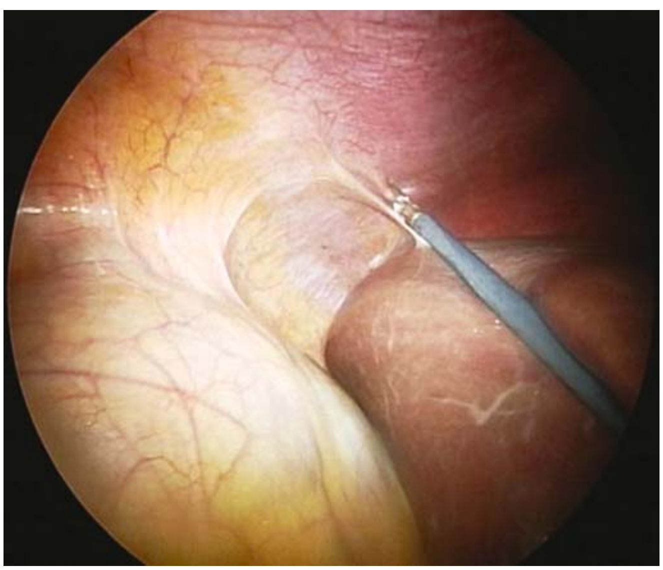

Fig. 11.5. Initial pneumoperitoneum is achieved with an open dissection Hasson technique; a 5-mm lockable forceps is used as a liver retractor, inserted via an infra-xiphi-sternal port and secured onto the under surface of the diaphragm (see Fig. 11.13)

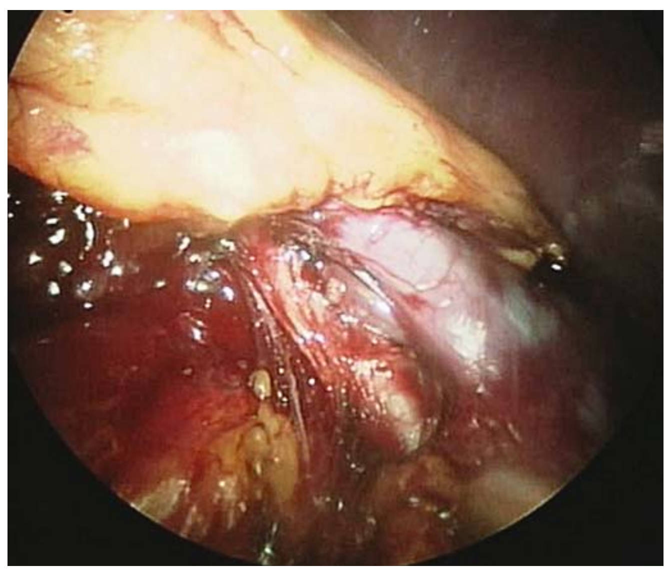

Fig. 11.6. After mobilization of the right colon and duodenum, the renal artery and vein are isolated

Fig. 11.7. Mild bleeding may be encountered while separating the artery from vein, as in this case; a 2-inch ribbon gauge was inserted to tamponade the bleeding while the tumor is exposed

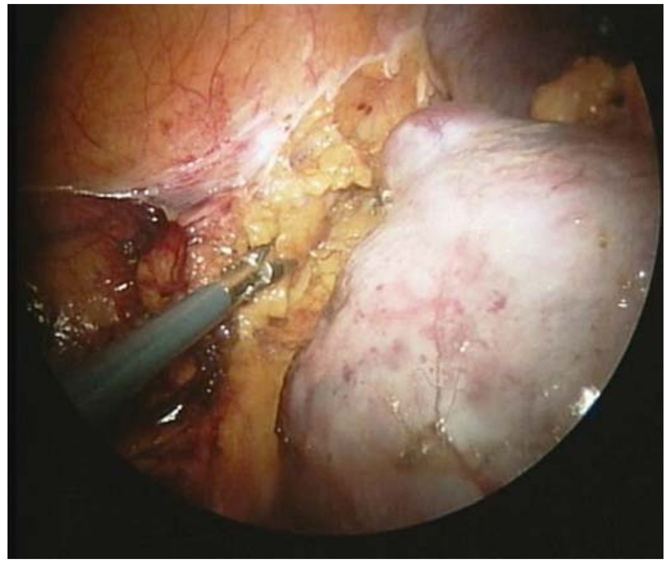

Fig. 11.8. The interpolar mass is exposed by freeing the perinephric fat from the kidney

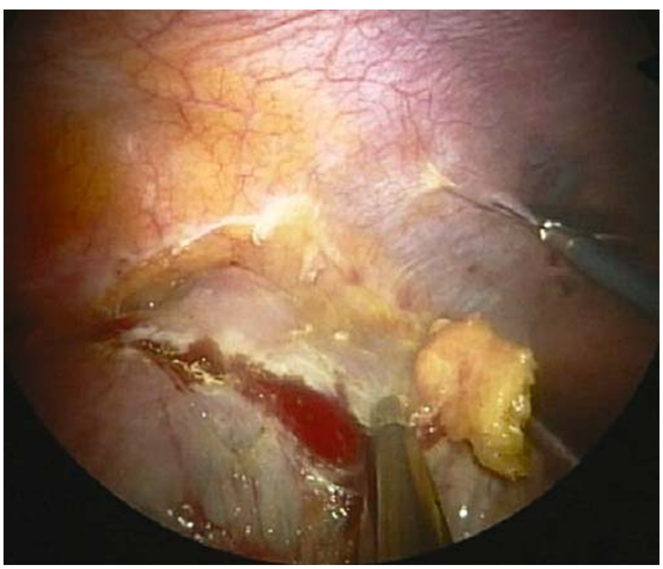

Fig. 11.9. The excision margin is marked by diathermy, allowing a generous margin to ensure complete resection

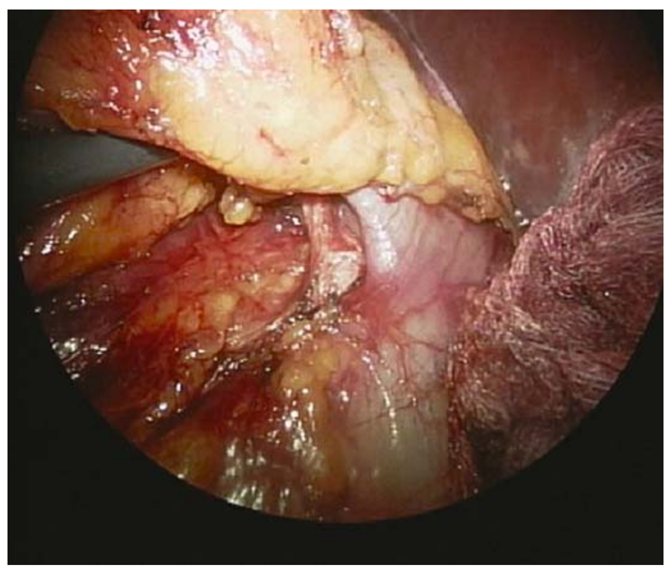

Fig. 11.10. Bleeding between the renal artery and vein is stopped

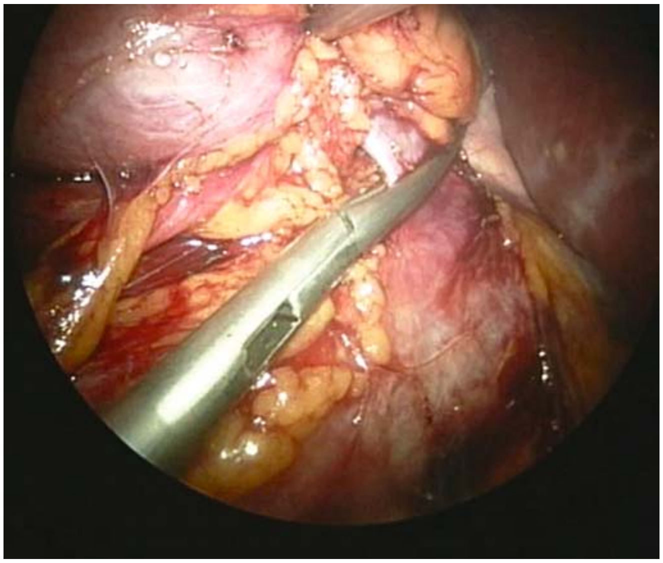

Fig. 11.11. Clamping of the artery and vein together to avoid further bleeding; it is important to ensure that all arteries are included, otherwise bleeding during the rest of the LPN can be massive due to venous outflow obstruction

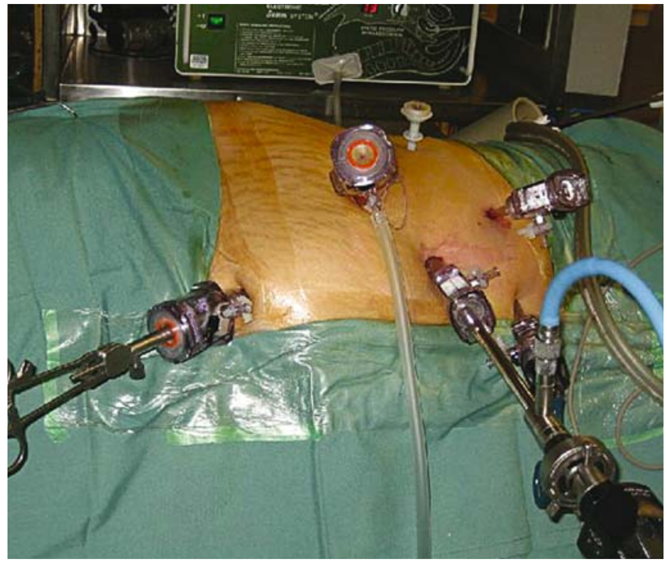

Fig. 11.12. External view of the ports; note the position of the vascular clamp port, which should be at a distance from the other working ports to allow unrestricted movement

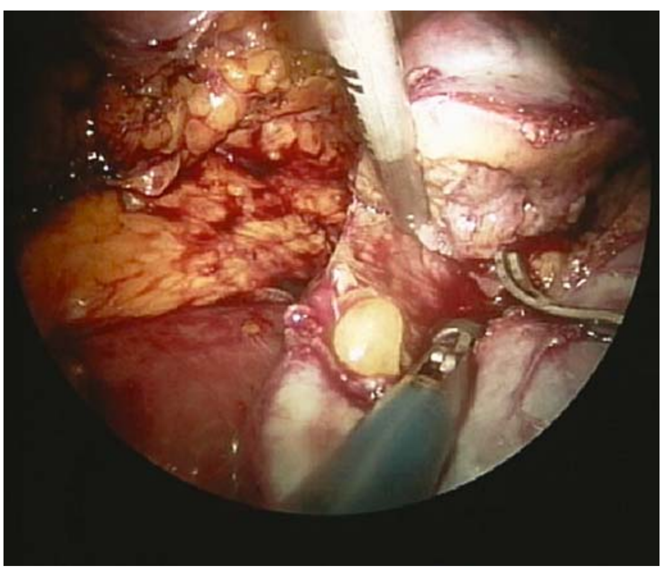

Fig. 11.13. The tumor is excised using cold scissors; dissecting with cold scissors improves the speed of the resection and reduces the thermal effect on tissue and hence provides better identification of the resection margin

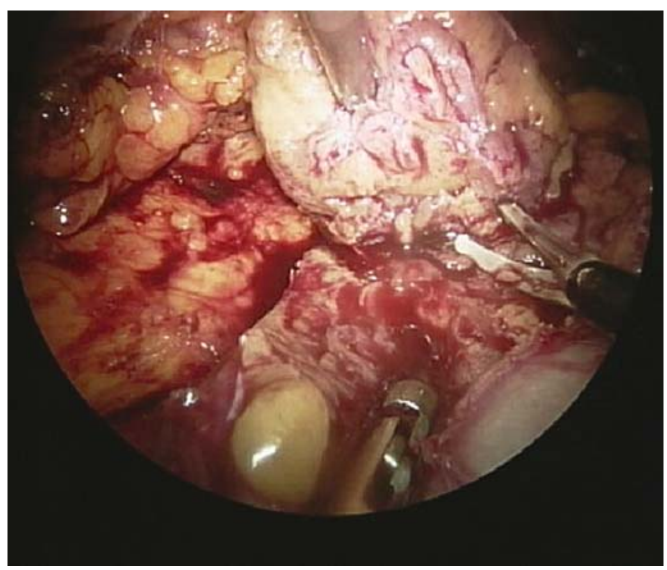

Fig. 11.14. The excision is almost complete

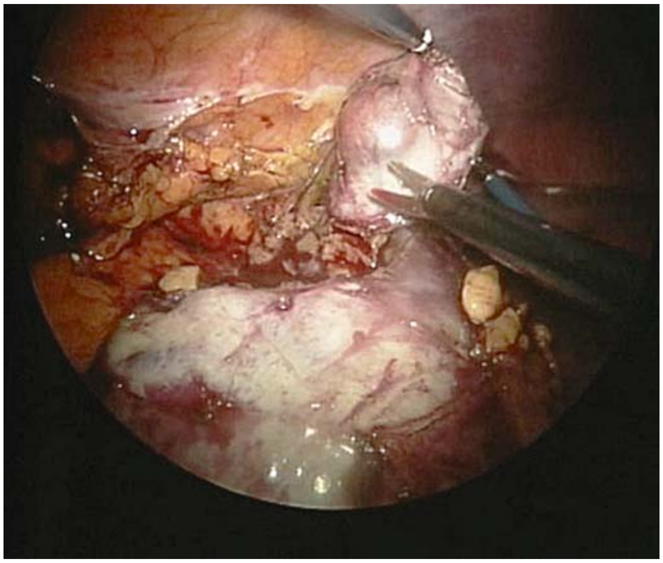

Fig. 11.15. The tumor is completely detached

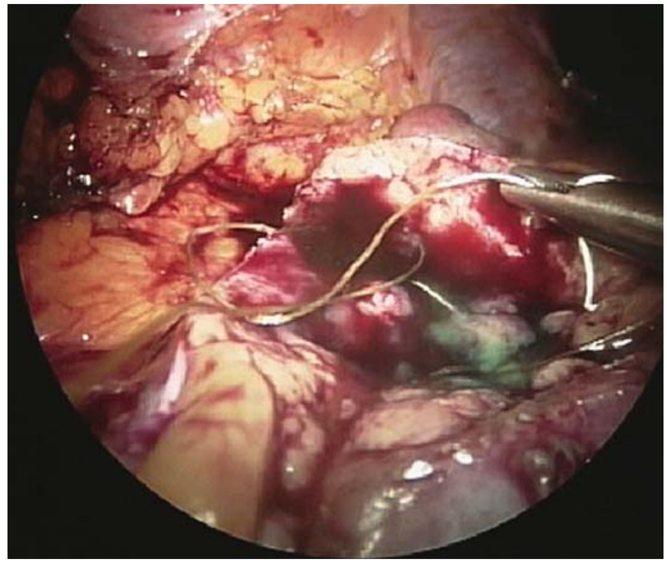

Fig. 11.16. Closure of the collecting system with leakage highlighted by methylene blue

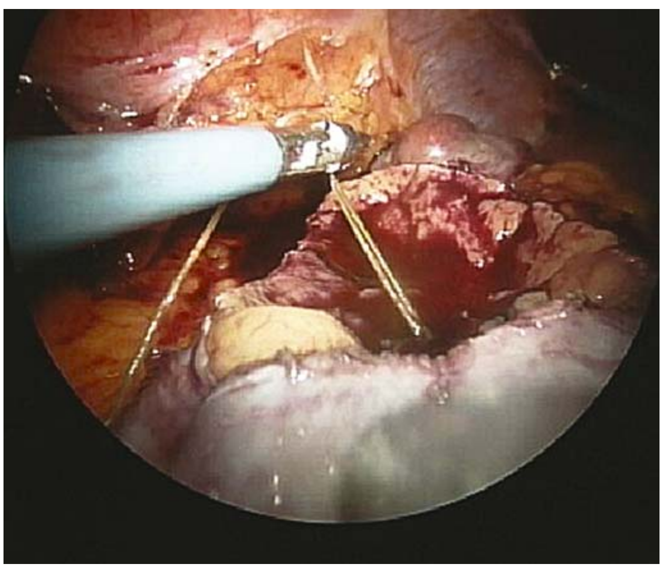

Fig. 11.17. Closure of the inner layer completed

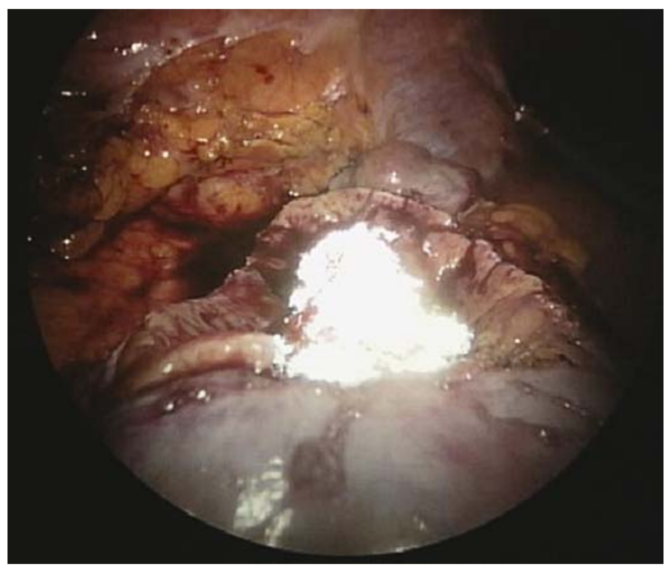

Fig. 11.18. Hemostatic agents can be used to enhance hemostasis between the two layers; Avitene (Bard) is used here

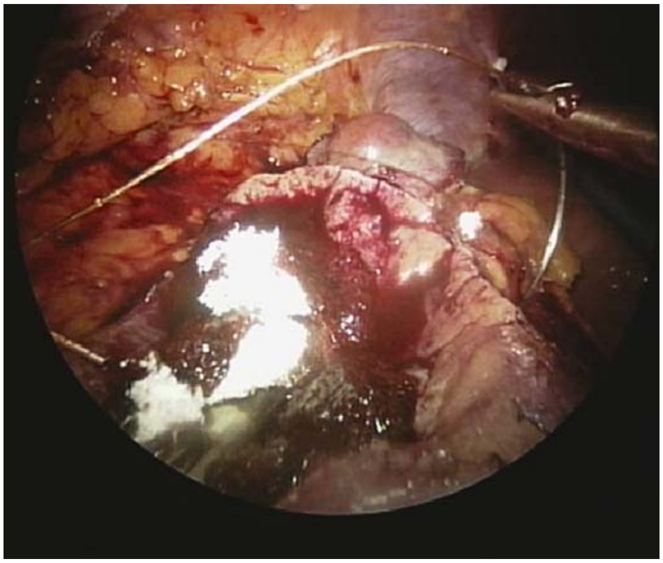

Fig. 11.19. Outer layer of the continuous suture

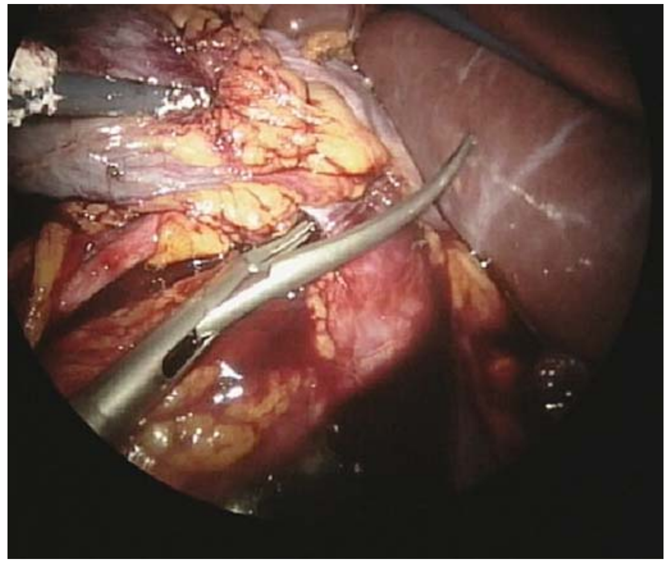

Fig. 11.20. The vascular clamp released

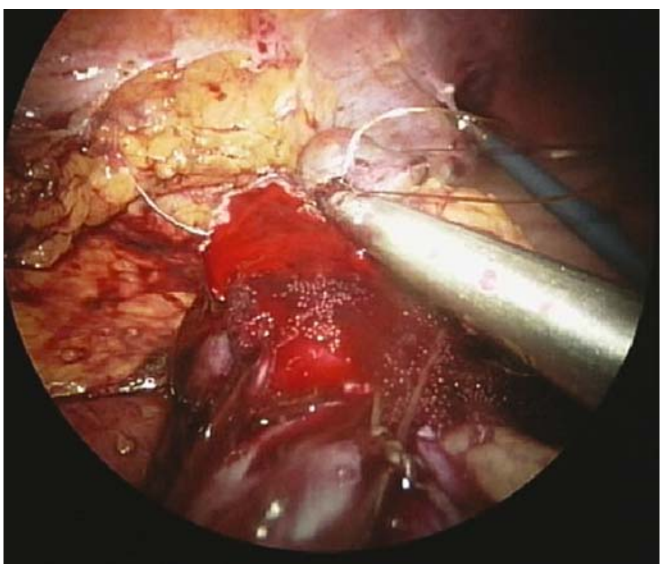

Fig. 11.21. Bleeding at one corner is oversewn

Fig. 11.22. Hemostasis is achieved before closure; a piece of Surgicel (Johnson & Johnson) was applied to the renal incision

FIG. 11.23. The tumor is bagged in an EndoPouch bag (Johnson & Johnson)

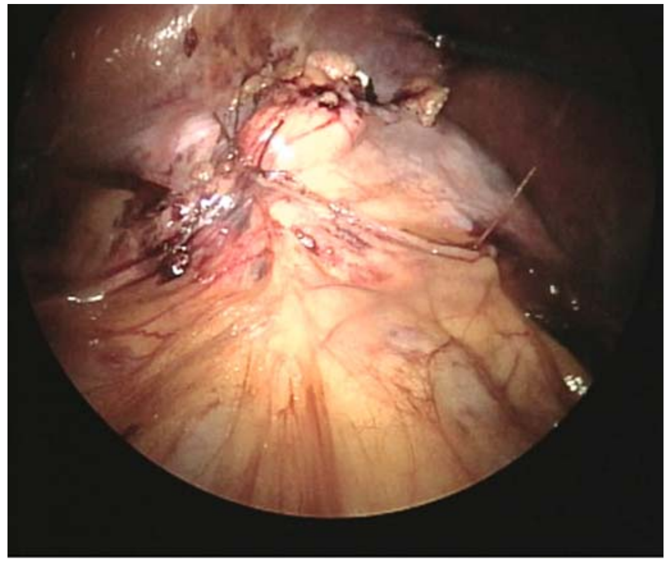

FIG. 11.24. The retroperitoneum is reconstructed before drain insertion (19-French Blake)

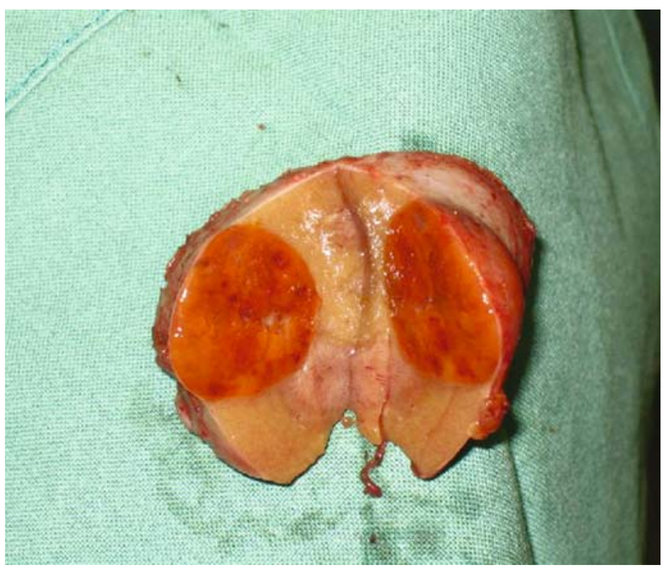

FIG. 11.25. The specimen shows a wide surgical margin

A Case of Left Lower Pole Tumor

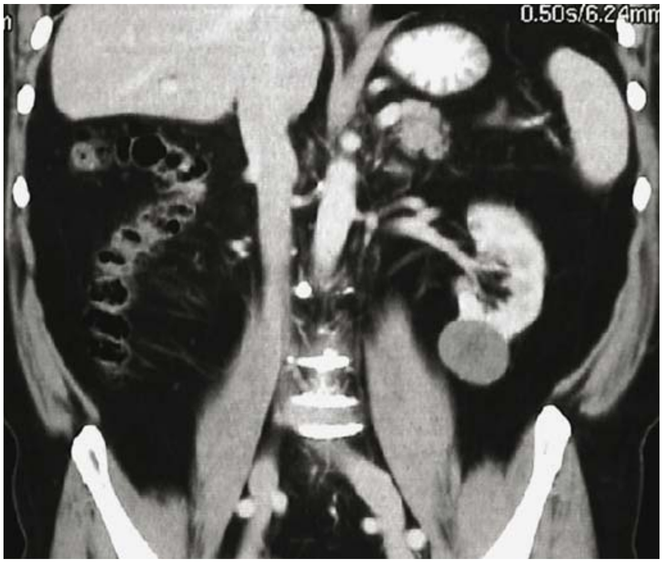

FIG. 11.26. Lower pole renal tumor (4 cm) in a 72-year-old obese man

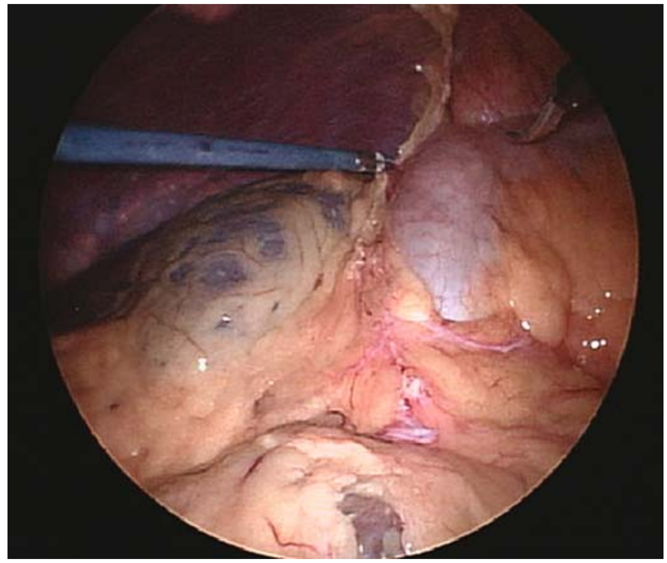

FIG. 11.27. For a left transperitoneal procedure, the splenic flexure and the spleen should be mobilized together; this maneuver is likely to reduce the risk of splenic injury.

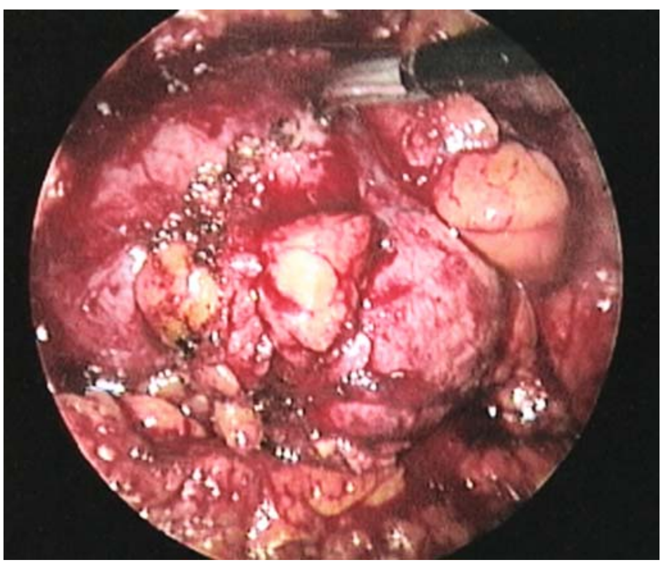

FIG. 11.28. The lower pole tumor is exposed by lifting the perinephric fat; the resection margin is premarked with diathermy

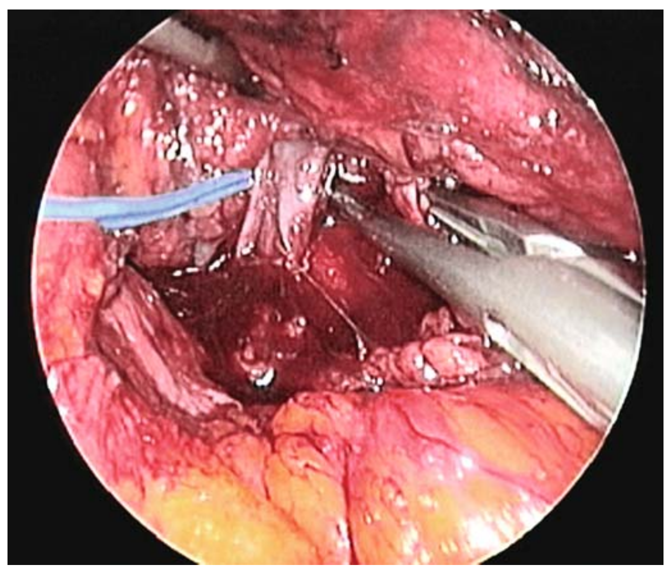

FIG. 11.29. Two renal arteries are found and both clamped with a single vascular clamp

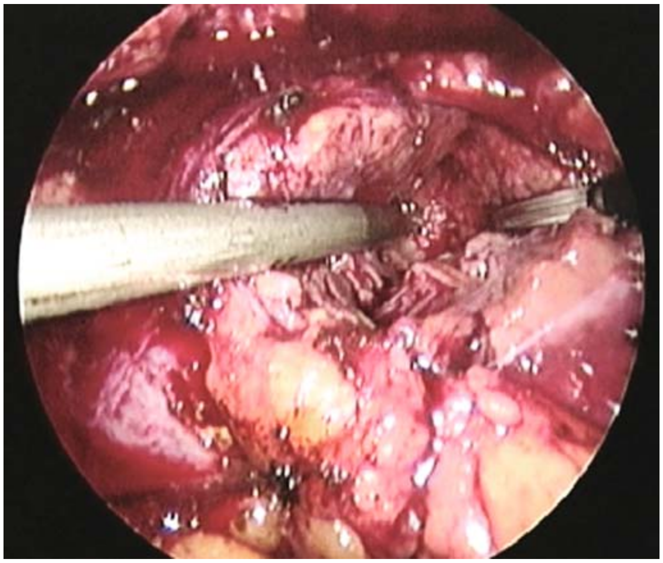

Fig. 11.30. The resection margin is inspected as the partial nephrectomy proceeds

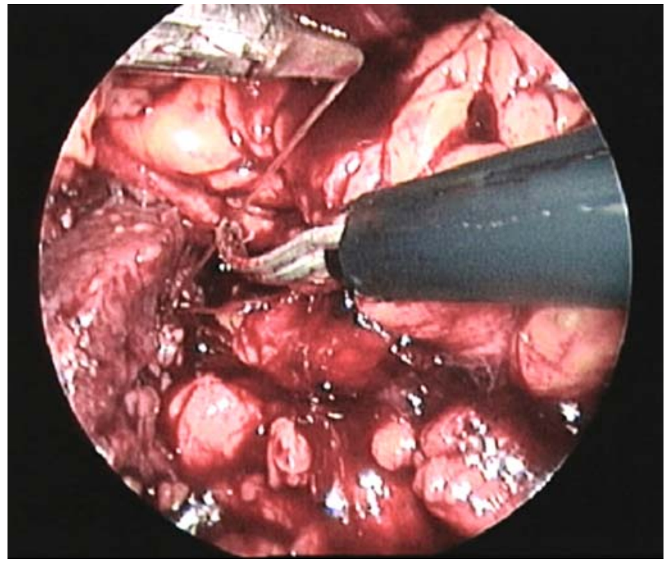

Fig. 11.31. The collecting system is closed and the sinus fat oversewn

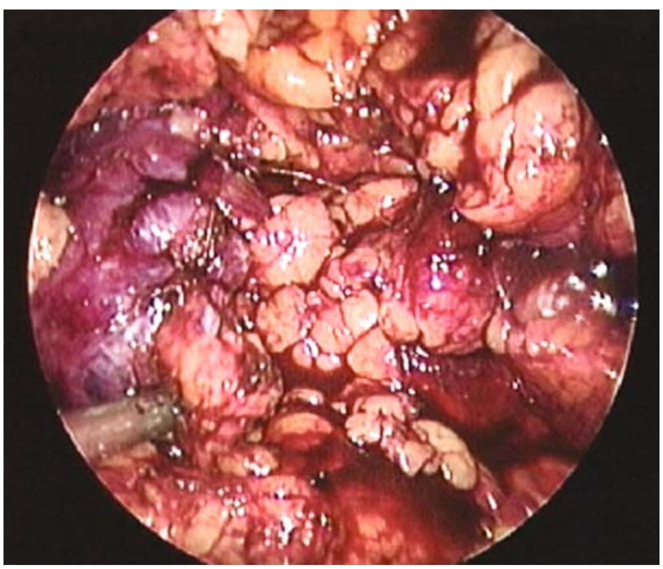

Fig. 11.32. The kidney is repaired with good hemostasis after release of the clamp

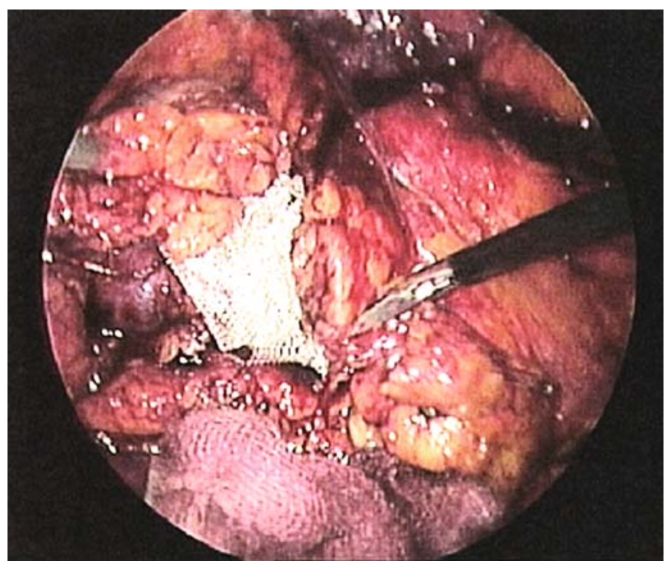

Fig. 11.33. Surgicel (Johnson & Johnson) is applied over the renal incision

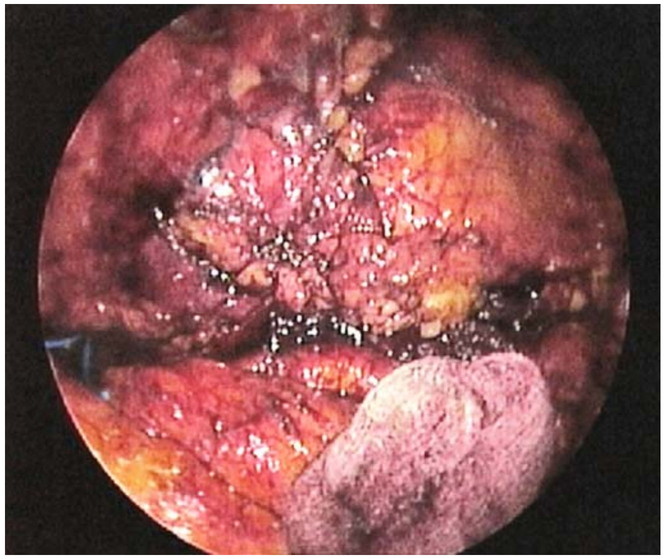

Fig. 11.34. Perinephric fat is closed

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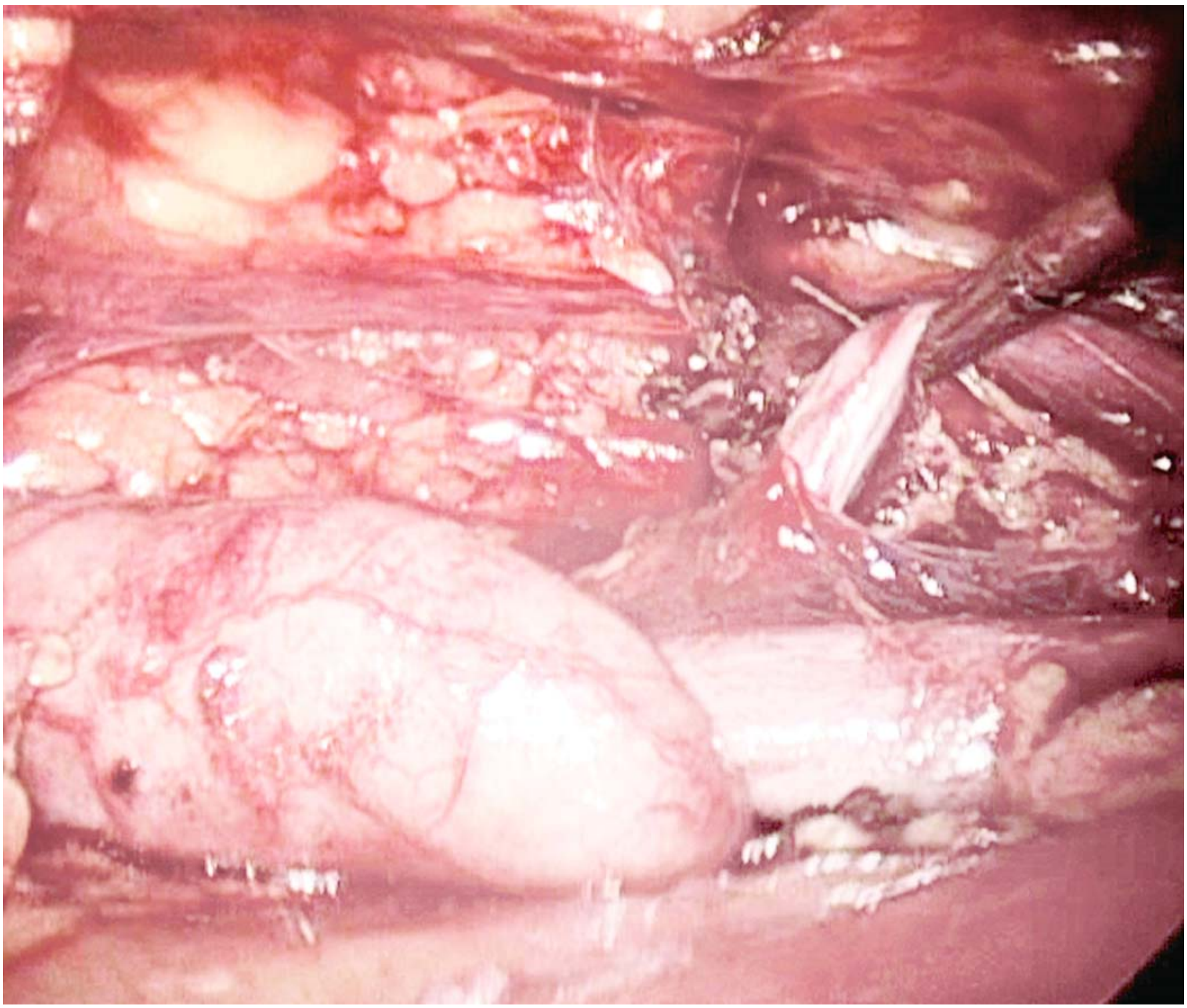
Section III
Ureteral Reconstructive Procedures



12
Laparoscopic Ureteroureterostomy

M. Ramalingam, K. Selvarajan, K. Senthil, and M.G. Pai

Laparoscopic Ureteroureterostomy in Retrocaval Ureter

Indications

Conventional management of a retrocaval ureter is by open repair. This uncommon anomaly is usually asymptomatic, and surgery is indicated only when the patient is symptomatic or develops back-pressure changes of the kidney. An intravenous urogram (IVU) or preferably computed tomography (CT) scan delineates the features of a retrocaval ureter. There are sporadic reports of single cases being repaired laparoscopically [1–8].

Surgical Technique

A retrocaval ureter can be approached transperitoneally or retroperitoneally.

Transperitoneal Approach

A retrograde pyelogram is done before laparoscopy to rule out distal ureteral problems and to confirm the hooking of the ureter. A soft guidewire may be placed with a double-J stent that is advanced to just below the obstruction under image-intensifier control. The distal end of an open-ended ureteral catheter is placed behind the stent to serve as a stent pusher. Access to the stent and guidewire should be kept sterile.

The patient is placed in the right lateral position with a 70-degree tilt. Pneumoperitoneum is created. Four ports (a supraumbilical 10-mm port for the telescope, a 5-mm port in the right subcostal region, a 5-mm port in the right iliac fossa, and a 5-mm port on the right flank for suction/irrigation) are needed. The right colon is mobilized adequately to expose the ureter and inferior vena cava (IVC). The ureter is isolated from the IVC adequately and transected where it starts to wind around the inferior vena cava (after pulling the preplaced guidewire distally). The circumcaval segment of the ureter is then transposed anteriorly. The stenotic ureter may be excised and the ends spatulated. Ureteroureterostomy suture starts in the posterior layer with interrupted 4-0 Vicryl. Now the stent can be advanced cephalad. Subsequently the anterior layer of suturing is completed. Omental wrapping or tacking is optional. A 14-French tube drain is placed through the flank port.

Retroperitoneal Approach

A retrocaval ureter is usually approached transperitoneally. However, a retroperitoneal approach is appropriate as both the IVC and the ureter are retroperitoneal organs. It has definite advantage of retroperitoneoscopy.

Transperitoneal Ureteroureterostomy

Preureteral Vena Cava (Retrocaval Ureter)

Fig. 12.1. A retrograde pyelogram (RGP) shows smooth upper ureteric narrowing and sinuous course suggestive of retrocaval ureter

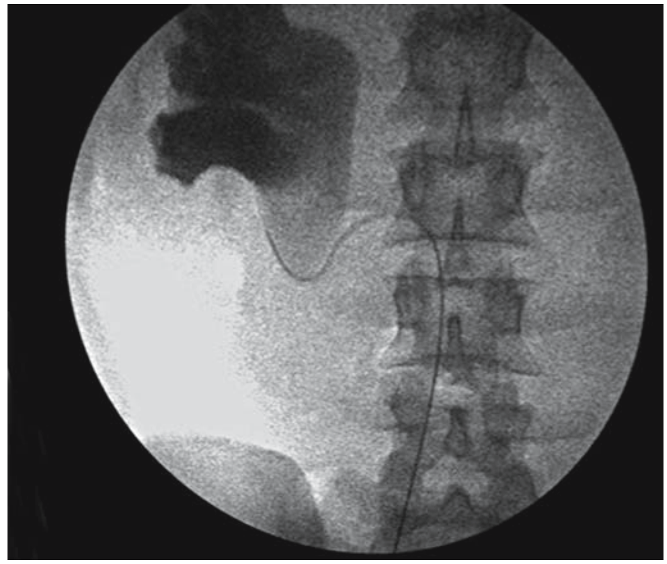


Fig. 12.2. Preplacement of the guidewire

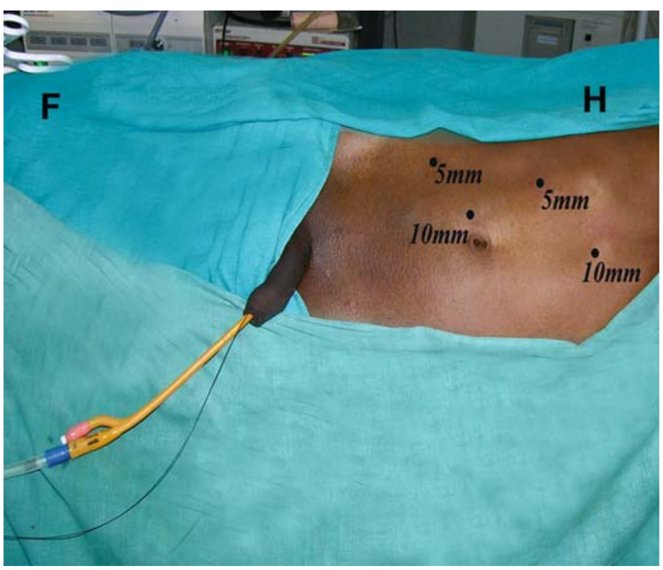


Fig. 12.3. The preplaced guidewire is kept sterile and accessible to facilitate easy stenting intraoperatively (H, head end; F, foot end)

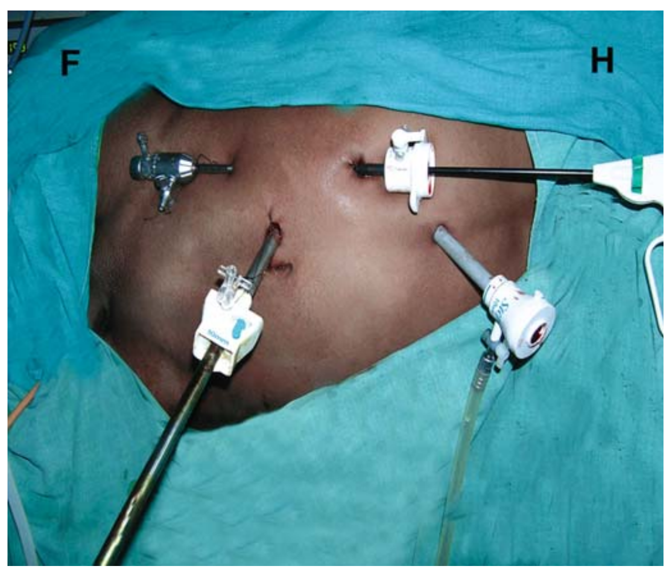


Fig. 12.4. External view of the port positions

FIG. 12.5. Initial laparoscopic view of the right paracolic area

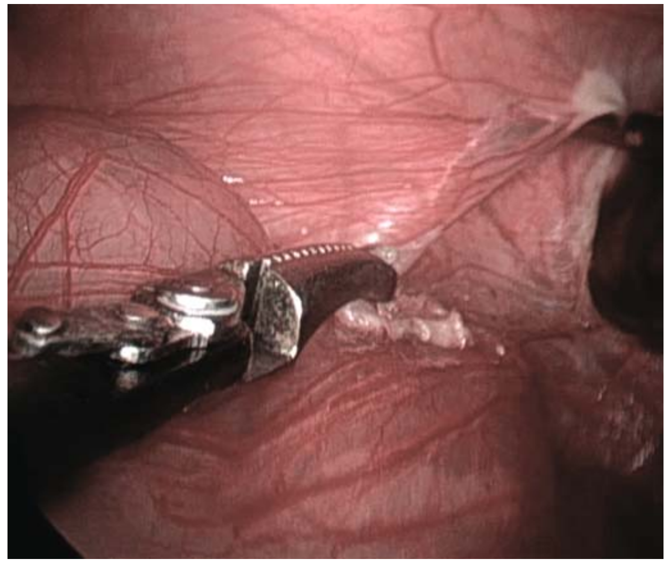


FIG. 12.6. Colonic mobilization in progress

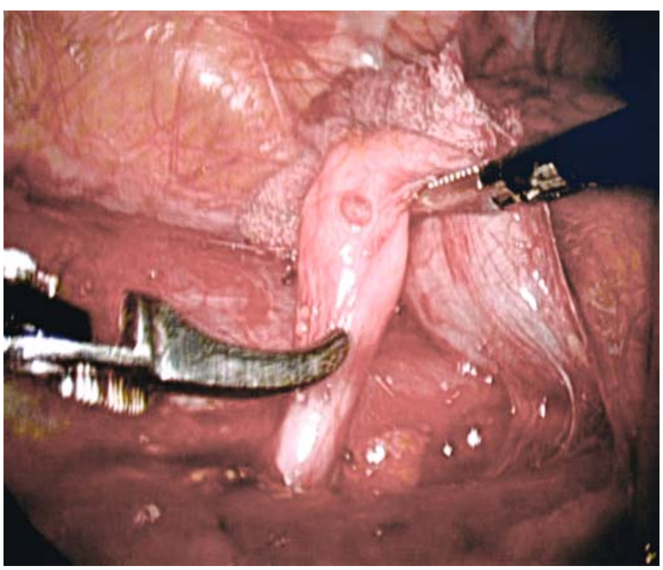


FIG. 12.7. Mobilization of the proximally dilated ureter

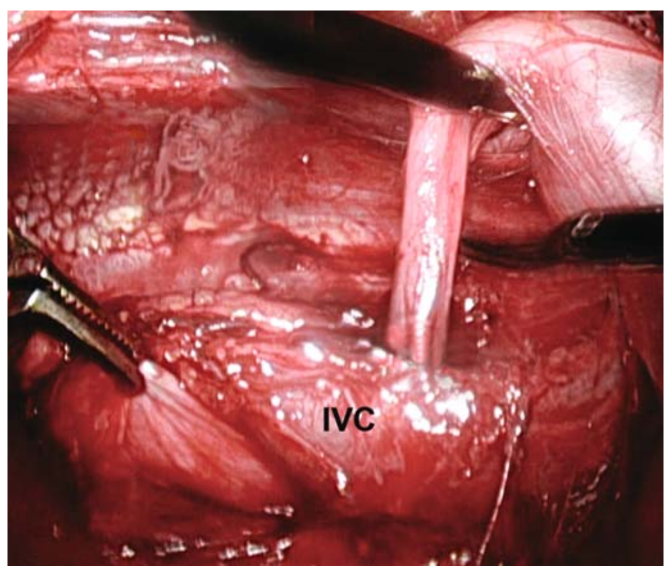


FIG. 12.8. Mobilization of the retrocaval segment of ureter (IVC, inferior vena cava)

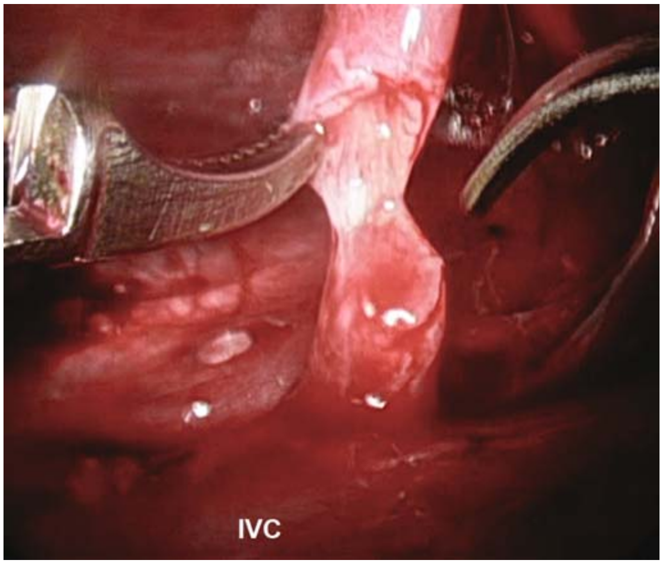


Fig. 12.9. Division of the ureter lateral to the inferior vena cava (IVC)

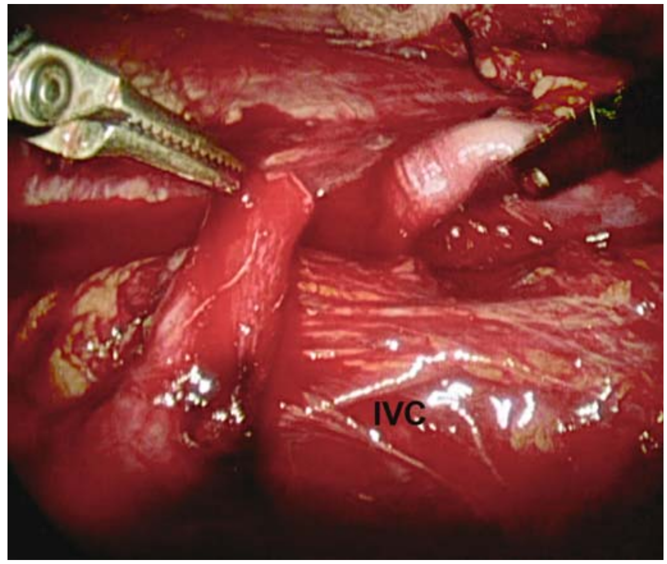


Fig. 12.10. Transposition of the retrocaval segment of the ureter in front of the IVC

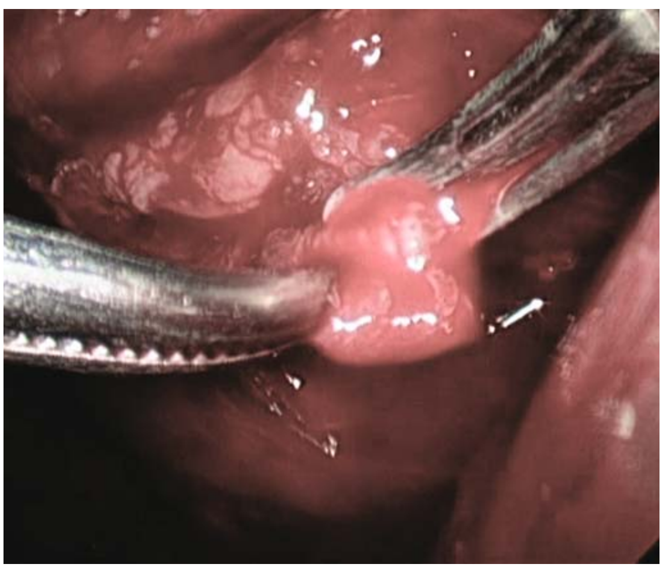


Fig. 12.11. Spatulation of the distal segment of the ureter

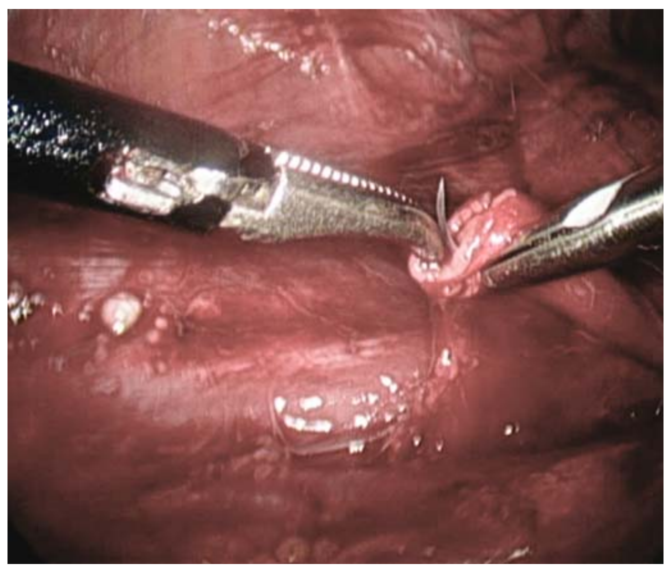


Fig. 12.12. Initial suture with 5-0 Vicryl (outside-in) taken through the proximal segment of ureter in preparation for a ureteroureteral anastomosis

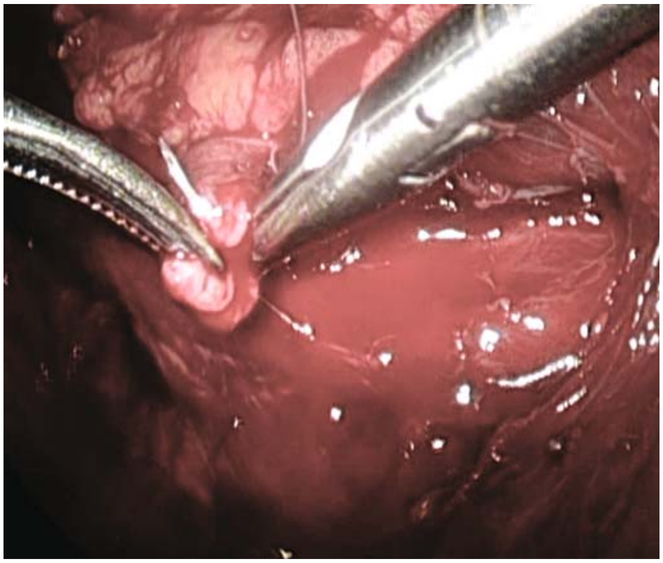


FIG. 12.13. A corresponding suture is taken inside-out through the spatulated distal ureter

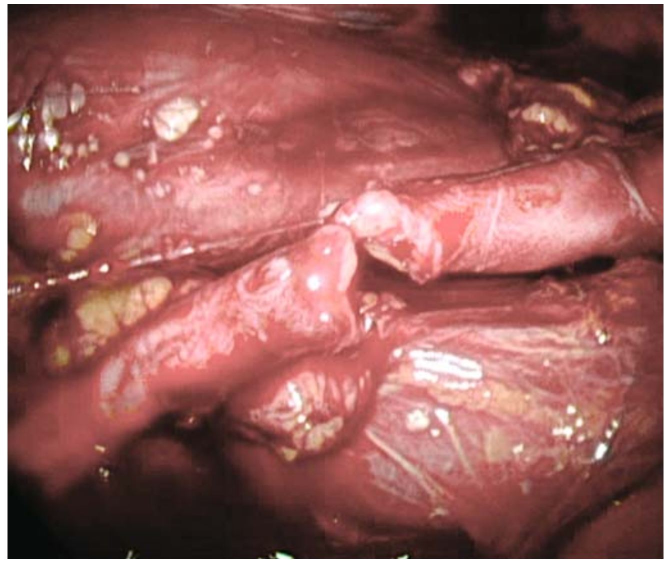


FIG. 12.14. Tension-free approximation of ureteric ends

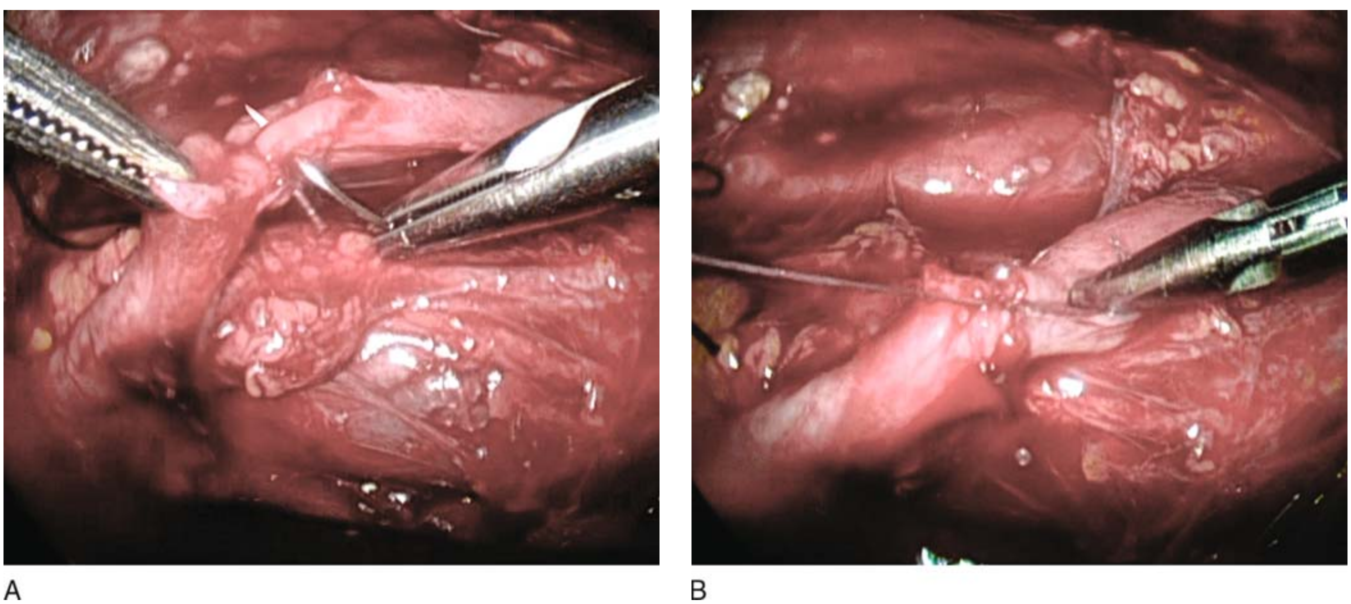


FIG. 12.15. Subsequent interrupted sutures of the posterior layer

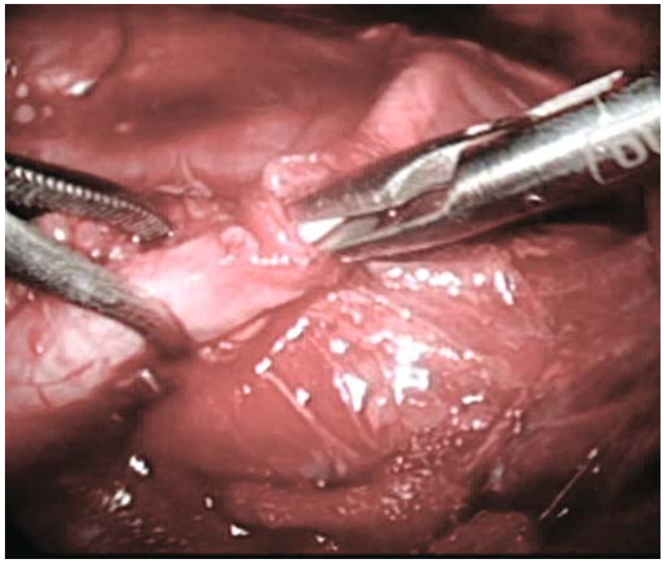
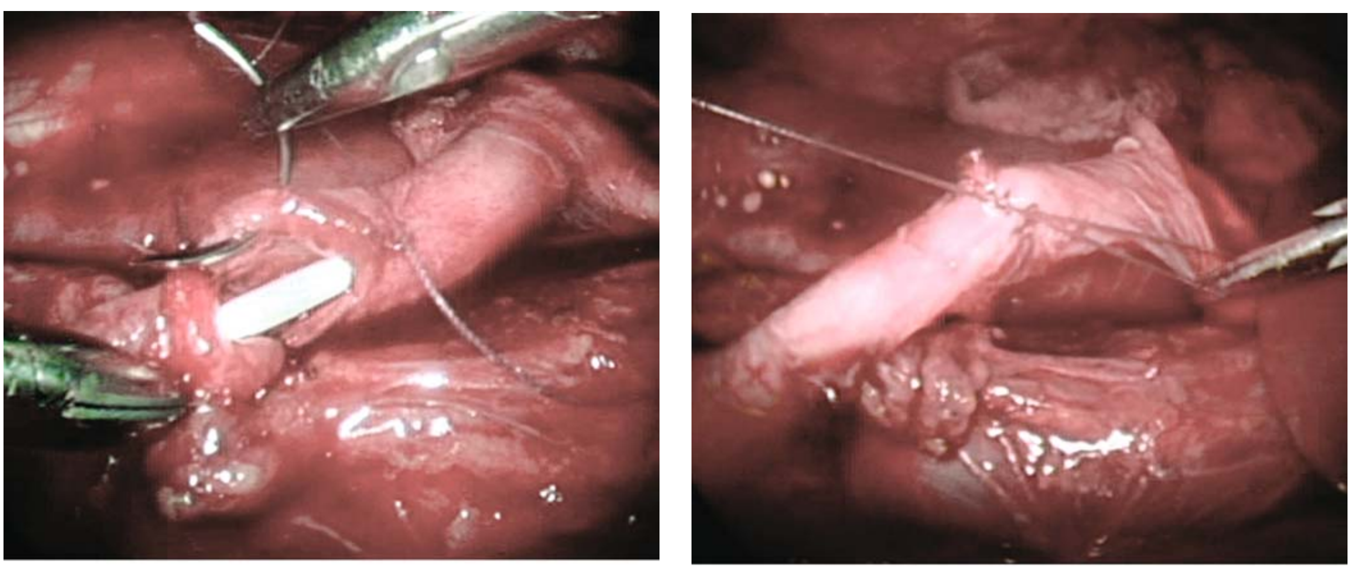


FIG. 12.16. Subsequently the stent is advanced over the preplaced guidewire



A B

FIG. 12.17. Anterior layer suturing is in progress

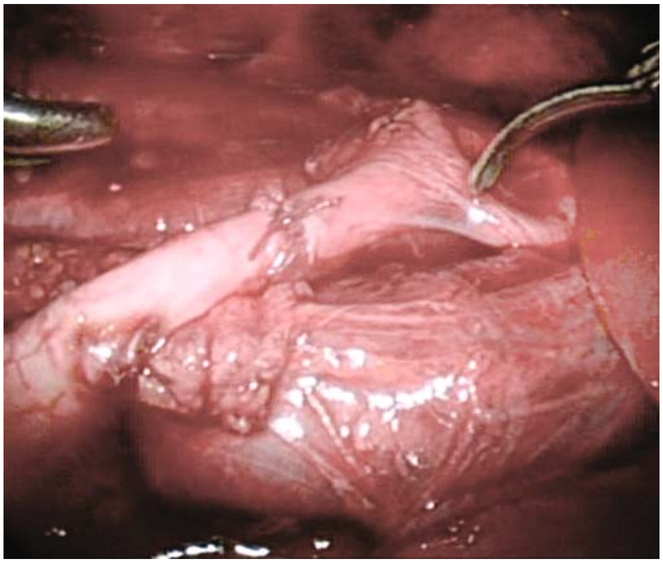


FIG. 12.18. The view after completing the ureteroureterostomy

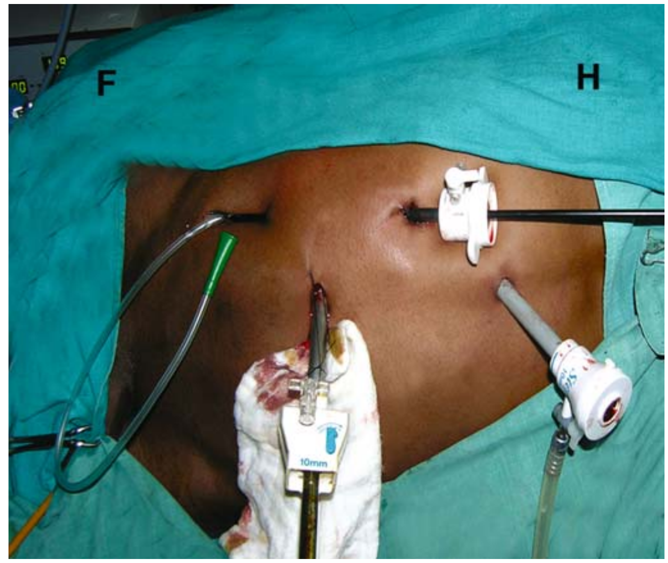


FIG. 12.19. A tube drain inserted from the lower lateral port

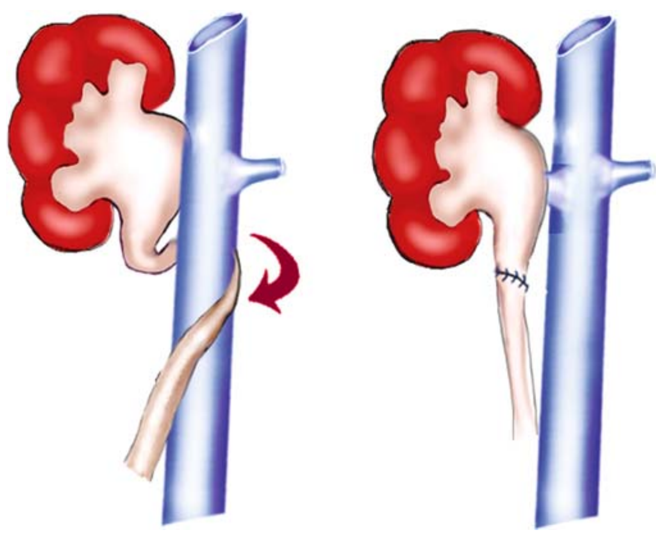


FIG. 12.20. Diagrammatic representation of the procedure executed

Retrocaval Ureter Retroperitoneoscopic Ureteroureterostomy

Fig. 12.21. An intravenous urogram (IVU) shows the seahorse sign suggestive of a retrocaval ureter

Fig. 12.22. An RGP shows smooth upper ureteric narrowing and a sinuous course suggestive of a retrocaval ureter

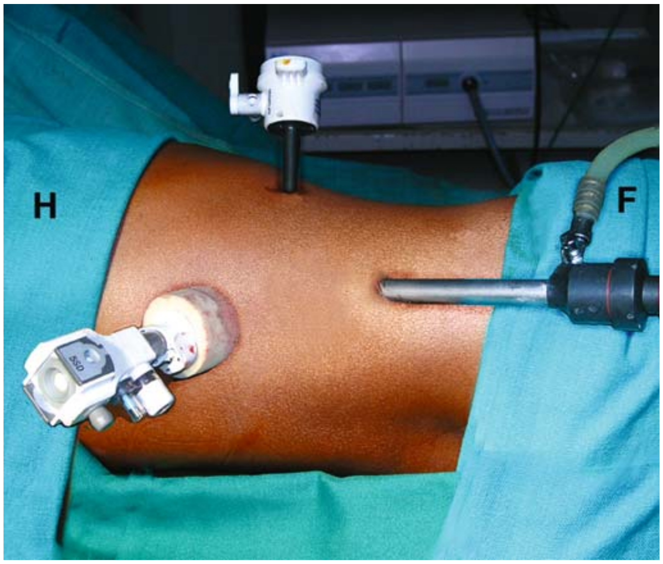


Fig. 12.23. External view of the port positions—bird's-eye view

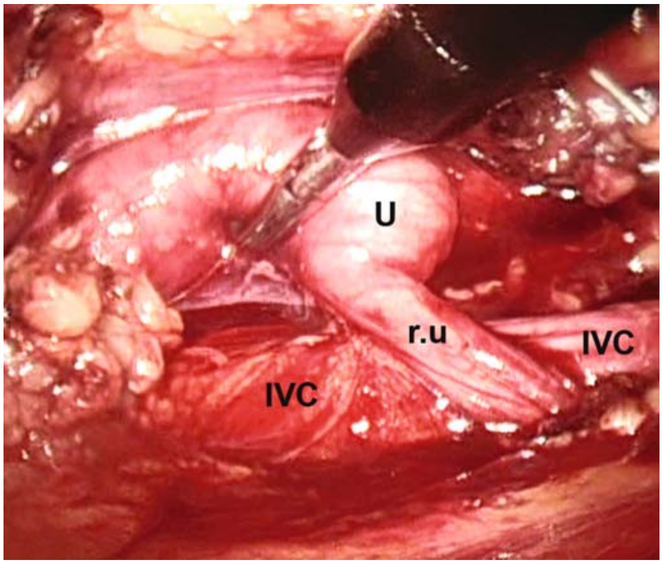


Fig. 12.24. Retroperitoneoscopic view of a dilated upper ureter hooking IVC (U, dilated ureter; r.u, retrocaval segment of ureter)

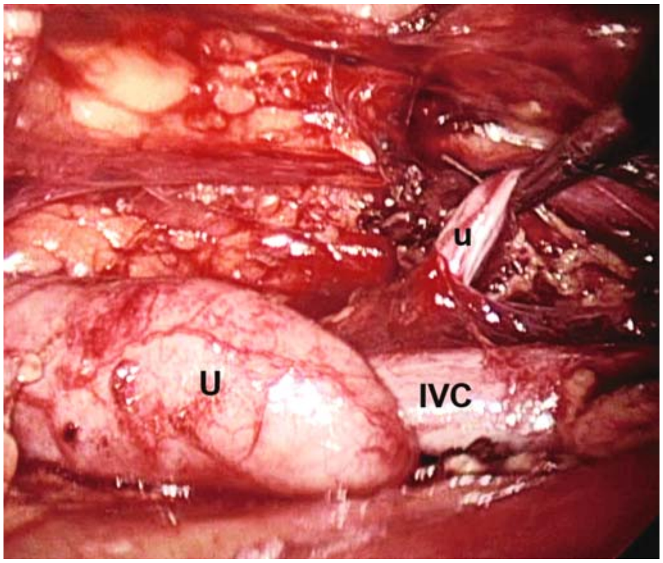


FIG. 12.25. Dissection on the medial aspect shows a normal-caliber ureter (U, dilated ureter; u, normal-caliber ureter)

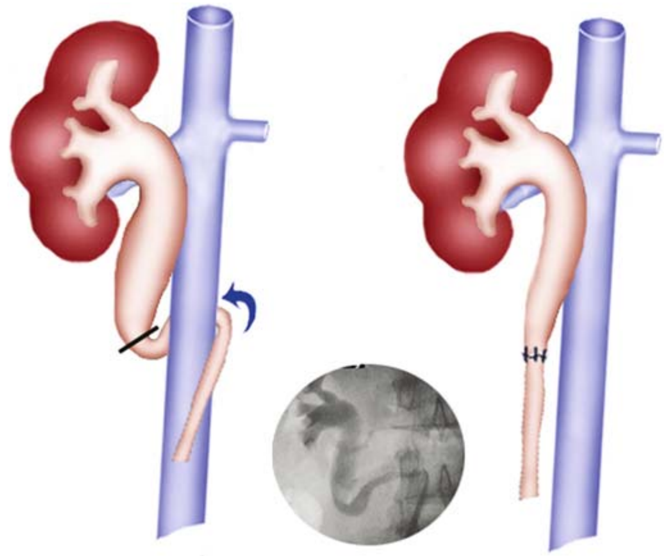


FIG. 12.26. Diagrammatic representation of the planned ureteroureterostomy

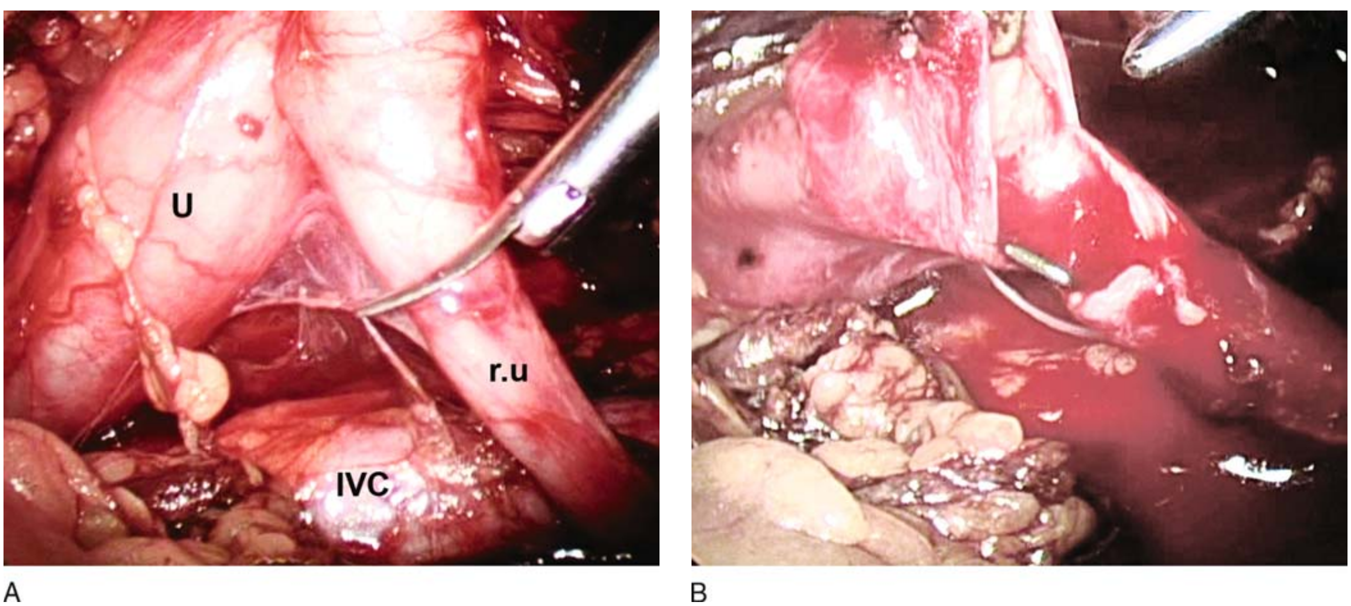


FIG. 12.27. Division of ureter on the transition zone (U, dilated ureter; r.u, retrocaval segment of ureter)

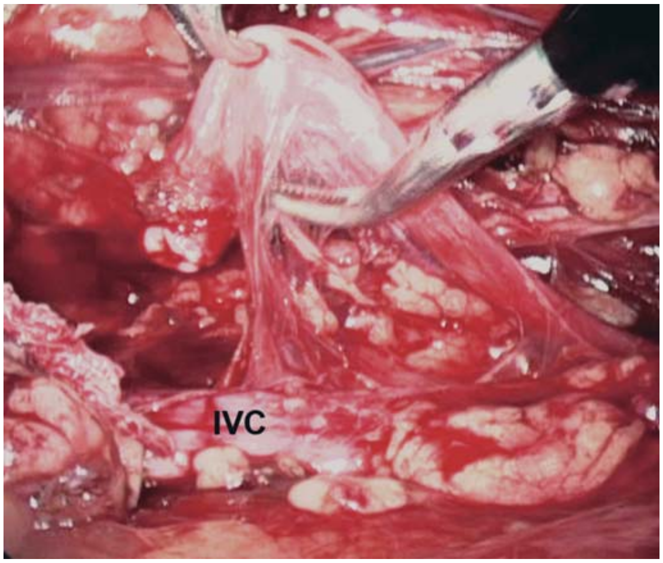


Fig. 12.28. Transposition of retrocaval segment by pulling medially (as it appears to be of normal caliber, it doesn't need excision)

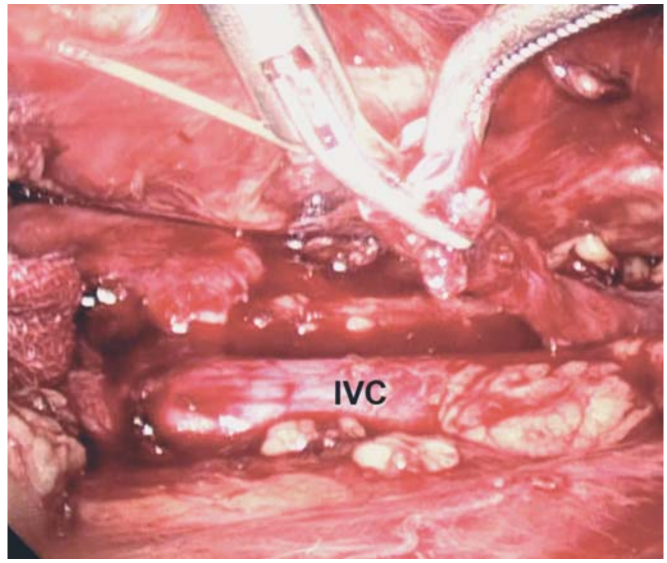


Fig. 12.29. Lateral spatulation of the retrocaval segment of the ureter (preplaced guidewire comes into view)

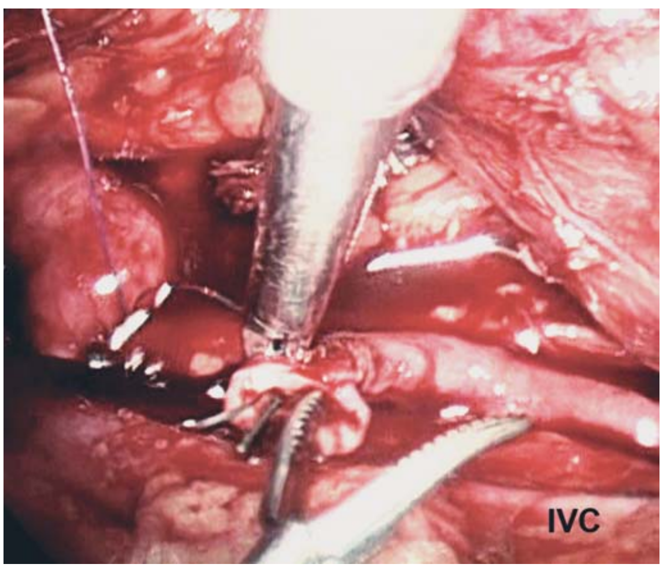


Fig. 12.30. Initial 4-0 Vicryl suture taken outside-in through the non-spatulated end of the ureter

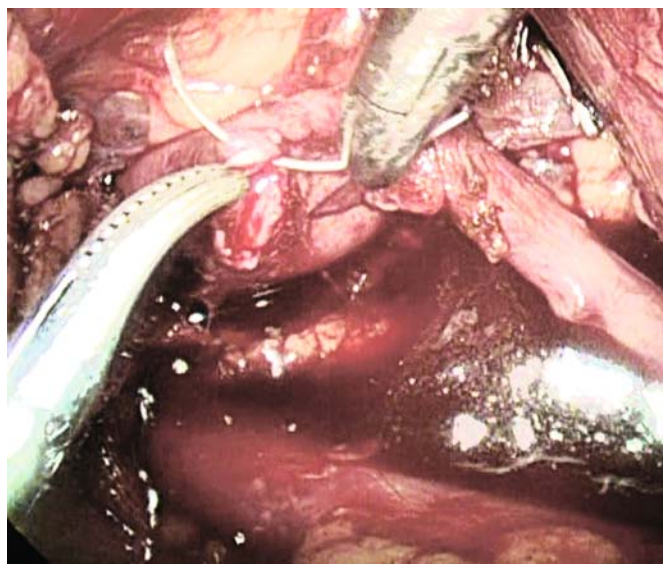
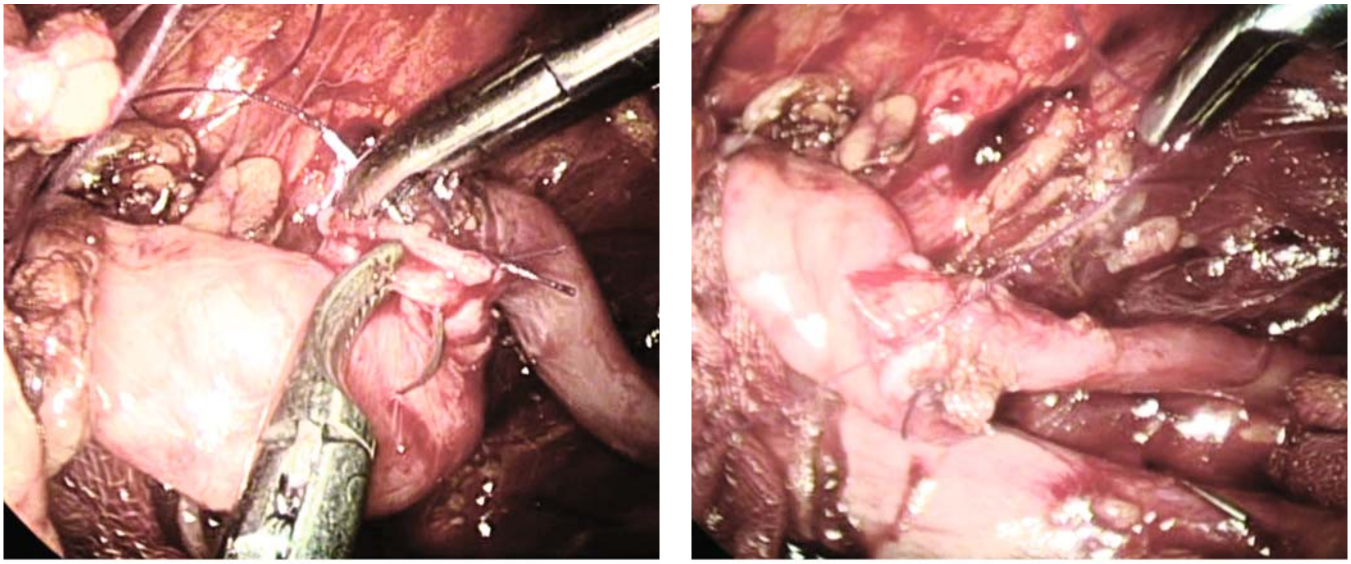


Fig. 12.31. Corresponding suture taken inside-out through the medial aspect of the dilated ureter



A B

Fig. 12.32. Subsequent interrupted 4-0 Vicryl suture

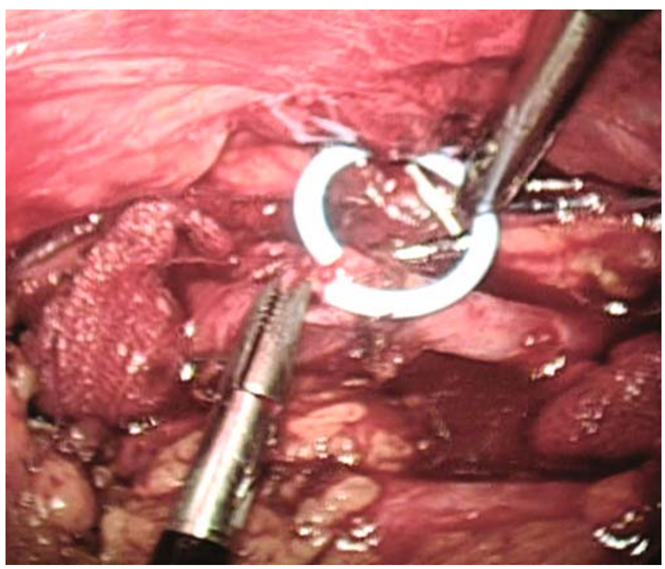


Fig. 12.33. After few interrupted sutures, the stent is advanced retrograde

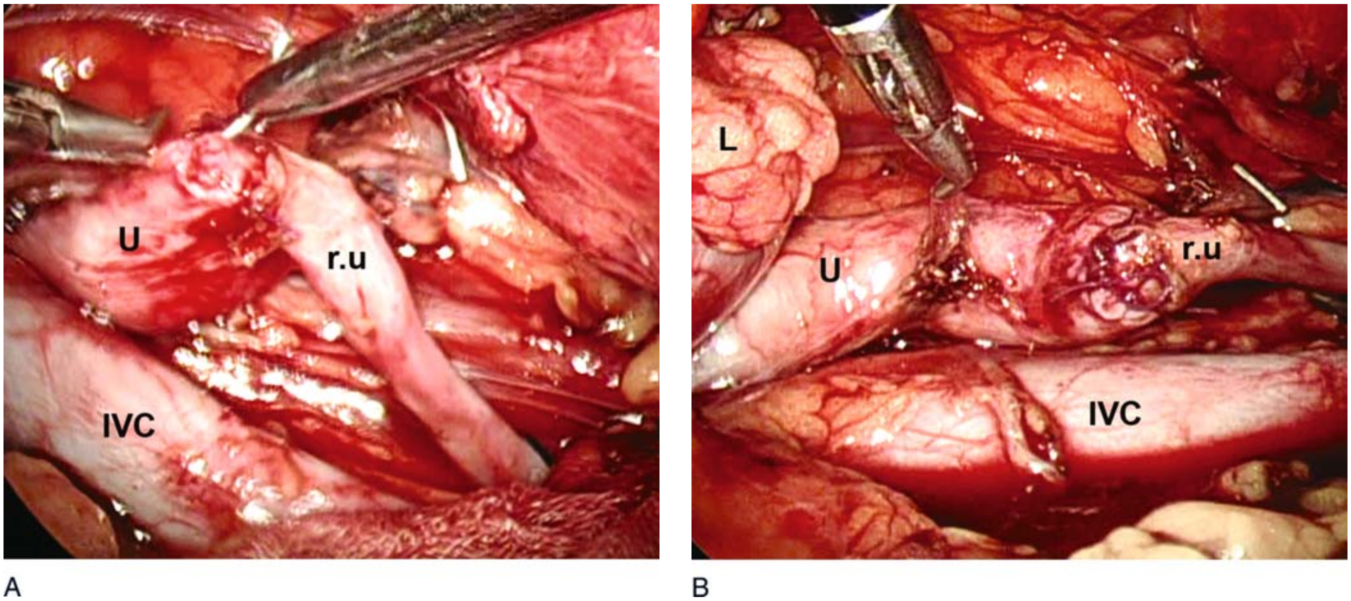


FIG. 12.34. With a few more interrupted sutures (anterior layer), the ureteroureterostomy is completed (L, lower pole kidney; U, dilated ureter; r.u, retrocaval segment of ureter)

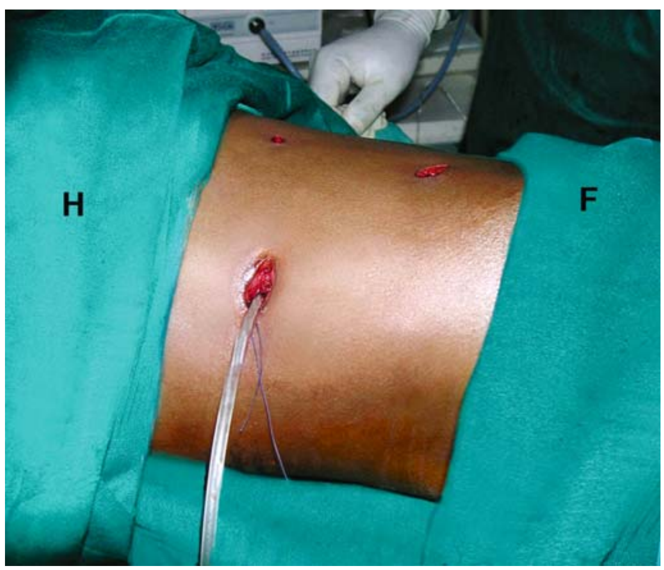


FIG. 12.35. A tube drain introduced through the primary port

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Laparoscopic Ureteroureterostomy in Ureteral Stricture Transperitoneal Approach

Shailesh A. Shah and Amit K. Devra

There are very few reports on ureteric stricture management by the laparoscopic approach. According to Gill et al [10], who broadly classified laparoscopic reconstructive urology, ureteroureterostomy still falls under an evolving procedure group. We report one such case of iatrogenic mid ureteral stricture managed by laparoscopic ureteroureterostomy.

Indications

Short ureteric stricture due to tuberculosis, post-URS, or open ureterolithotomy.

Surgical Technique

Preoperative IVU and RGP will reveal the extent of strictured segment. The stricture can be approached transperitoneally or retroperitoneally.

Transperitoneal Approach

With the patient under general anesthesia and placed in the lateral decubitus position with a 75-degree tilt, the ureter is approached transperitoneally. At the supraumbilical site a small incision is made, and a Veress needle is inserted into the peritoneal cavity for insufflation. A 10-mm port is inserted at the subumbilical area for the telescope. Under laparoscopic vision two working ports (5-mm suprapubic and 10-mm flank) are inserted. The ports are kept well away from any previous scar of ureterolithotomy. The right lateral peritoneal fold is identified and incised. After colonic mobilization and sharp dissection, the cecum and ascending colon are reflected medially. In the retroperitoneal space, the dilated proximal ureter is identified and dissected. The ureter is gently held with a grasping forceps and further dissected in the pelvis. The ureter is traced up to the site of the stricture. Sometimes the ureter may be adherent to the underlying vessel. If the strictured segment is densely adherent to the underlying artery with significant scarring, we can choose not to excise. With sharp and blunt dissection the lower ureter can be identified and is dissected sufficiently. A proximal mildly dilated ureter is transected just above the strictured segment and the lower ureter is transected below the diseased segment of the ureter. The lower end of the ureter is spatulated. The anastomosis is performed using 4-0 polyglactin suture on a 20-mm round body needle. First an apical suture is taken intracorporeally. A double-J stent is placed with the help of a ureteroscope (9.5 French). Four posterior followed by three anterior interrupted intracorporeal sutures are taken to complete the anastomosis. After ensuring hemostasis, a Penrose drain is kept adjacent to the anastomosis. The pneumoperitoneum is desufflated and the port sites are closed.

The urethral catheter is removed on the third postoperative day followed by drain removal in the evening of the same day. The patient is discharged on the fourth postoperative day. The double-J stent is removed after 3 weeks.

Results

The operating time was around 250 minutes. The blood loss [Au5] was insignificant. Postoperative analgesic requirement was minimal. The hospital stay was 4 days. A postoperative intravenous urogram revealed good function and drainage.

Discussion

Many of the ureteral strictures are today managed by endourologic techniques, including balloon dilatation and endoureterotomy. Patients with complete obliteration of the ureter, as in our case, requires surgical excision and repair.

Iatrogenic ureteral strictures are commonly reported after gynecologic surgeries. Tulikangas et al reported four cases of laparoscopic ureteral repair in patients with pelvic ureter injury following laparoscopic gynecologic surgery. The result was good except in one patient, in whom a stricture developed at the anastomotic site and this was managed conservatively. Nezhat et al [11] described end-to-end laparoscopic uretero-ureterostomy in a patient with ureteral obstruction secondary to endometriosis. Among nine patients, one patient developed mild anastomotic stenosis managed conservatively with balloon dilatation, and one patient developed recurrent endometriosis at the anastomotic site. Similarly, Bhandarkar et al [9] has reported one case of laparoscopic resection and uretero-ureterostomy for congenital midureteral stricture with a successful outcome.

In our patient, stricture was in the midureter, caused by open ureterolithotomy. With the transabdominal approach, laparoscopic ureteroureterostomy was done over a double-J stent.

Ureteroureterostomy in a Ureteric Stricture

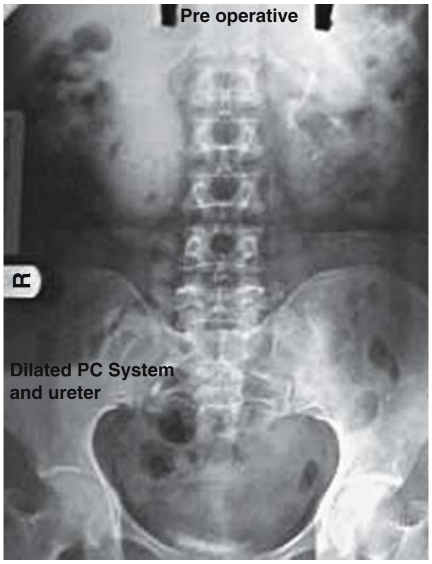

FIG. 12.36. Preoperative IVU shows dilated PC system and a hydroureter

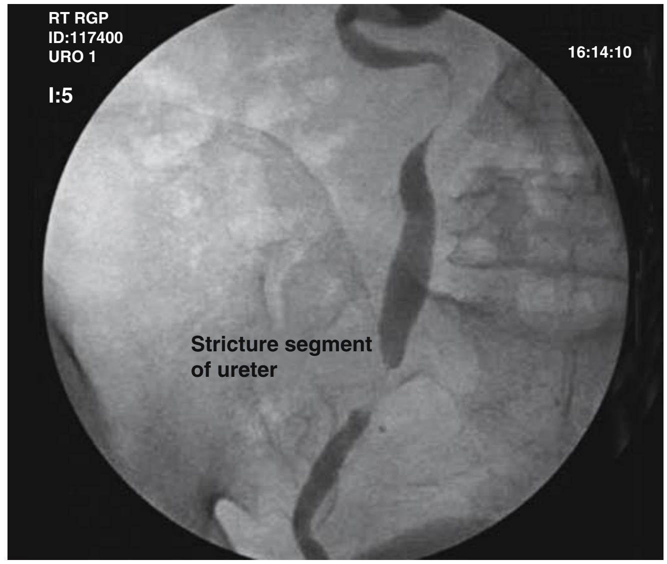

FIG. 12.37. An RGP shows a midureteric stricture

FIG. 12.38. Nephrostogram revealing a stricture at the midureter

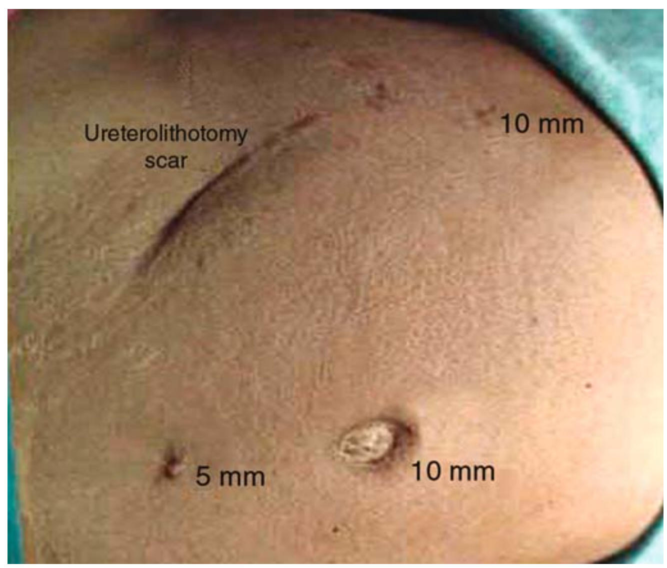

FIG. 12.39. Port marks and scar of previous surgery (ureterolithotomy)

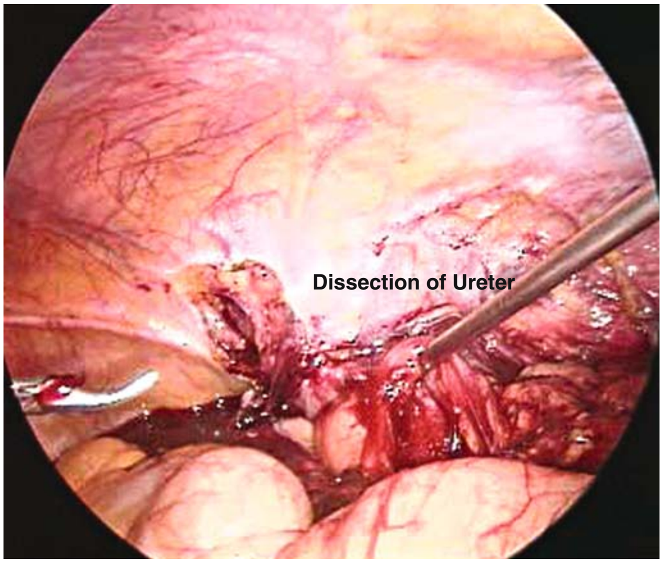

FIG. 12.40. Dissection of the ureter at the level of the pelvic brim

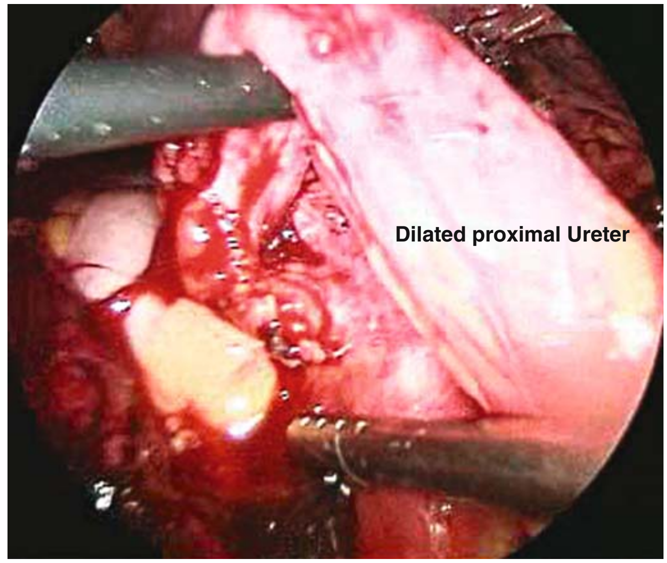

FIG. 12.41. The dilated proximal ureter is dissected up to the stricture

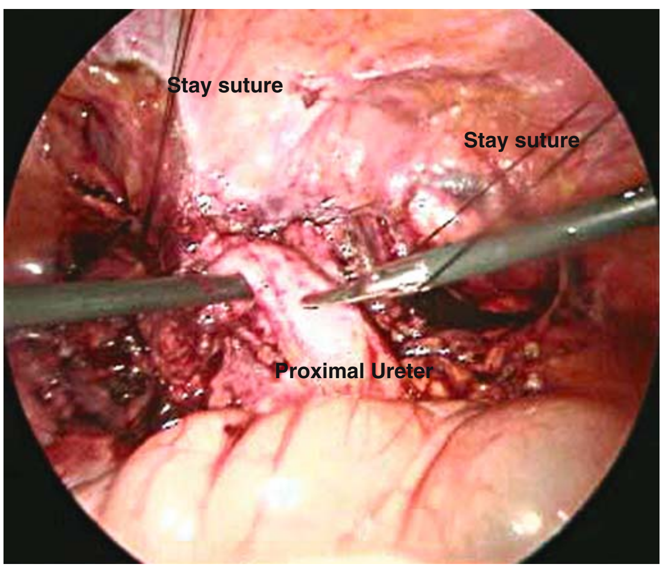

FIG. 12.42. A stay suture over the ureter

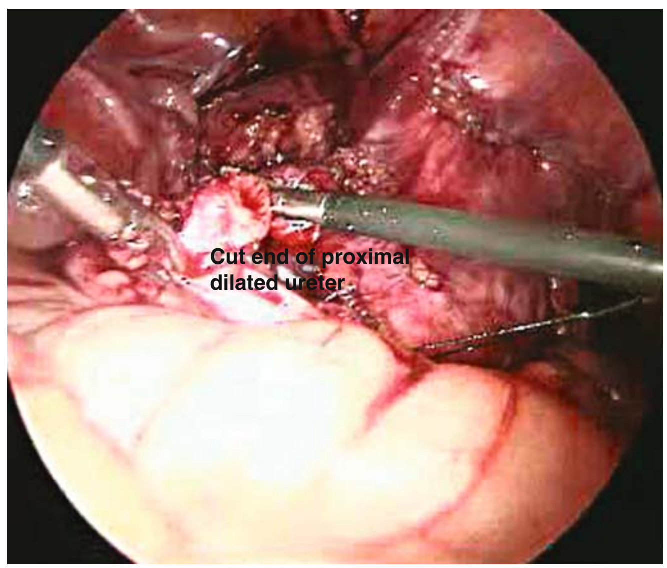

FIG. 12.43. The cut end of the proximal dilated ureter

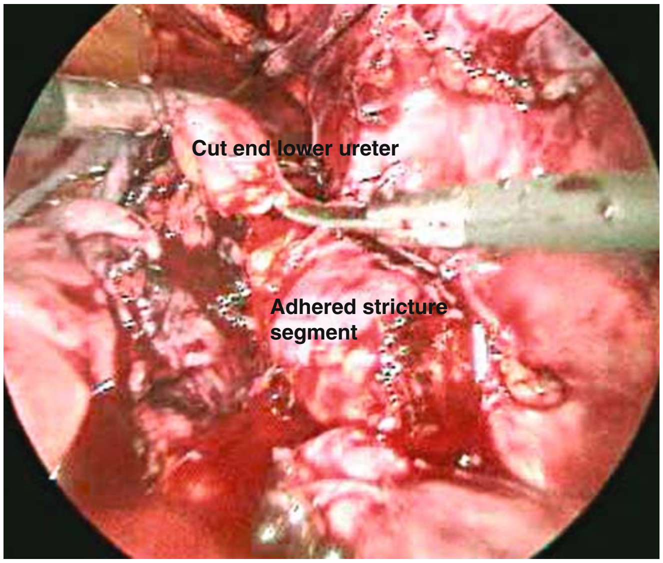

FIG. 12.44. Division of the ureter just below the strictured segment

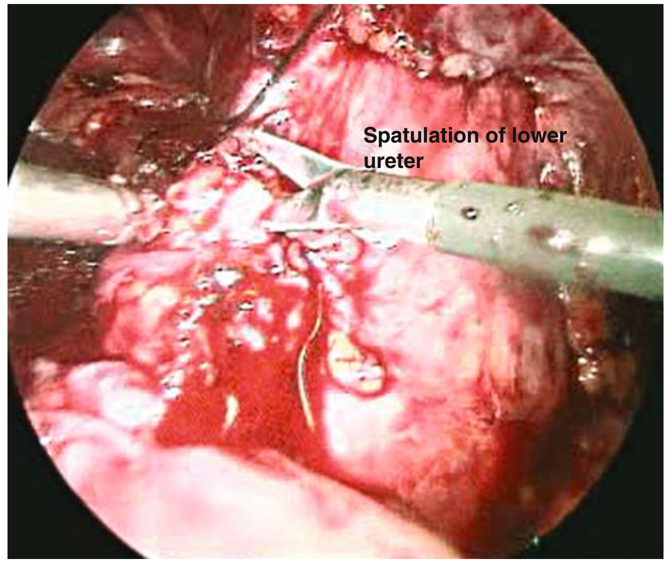

FIG. 12.45. Spatulation of the lower ureter

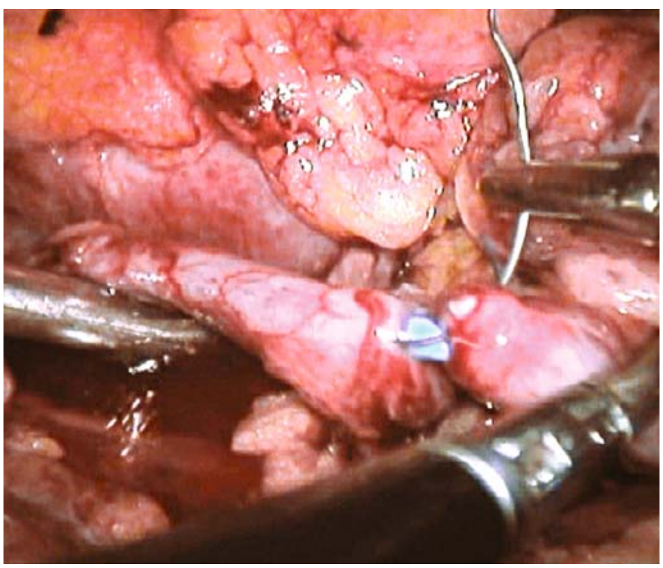

FIG. 12.46. Initial suture with 4-0 polyglactin passing outside-in through the proximal cut end of the ureter

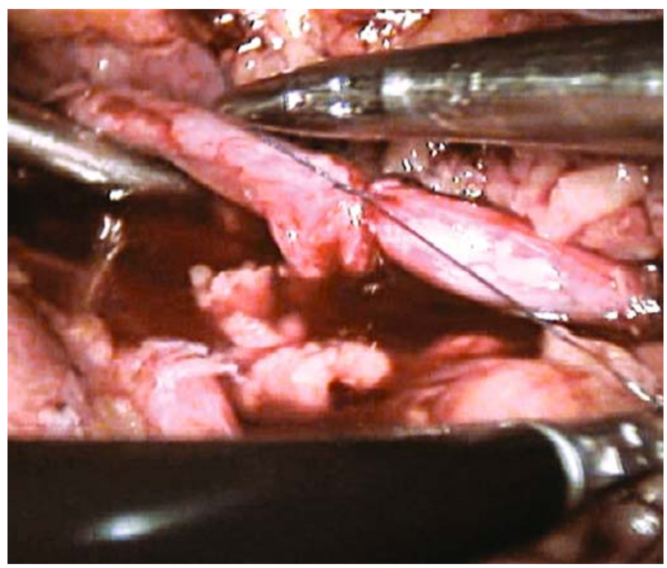

FIG. 12.47. Tension-free approximation

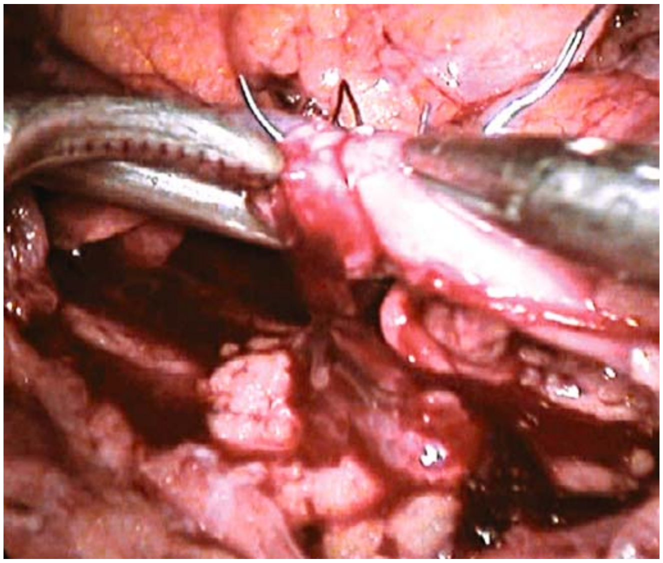

FIG. 12.48. Subsequent interrupted sutures

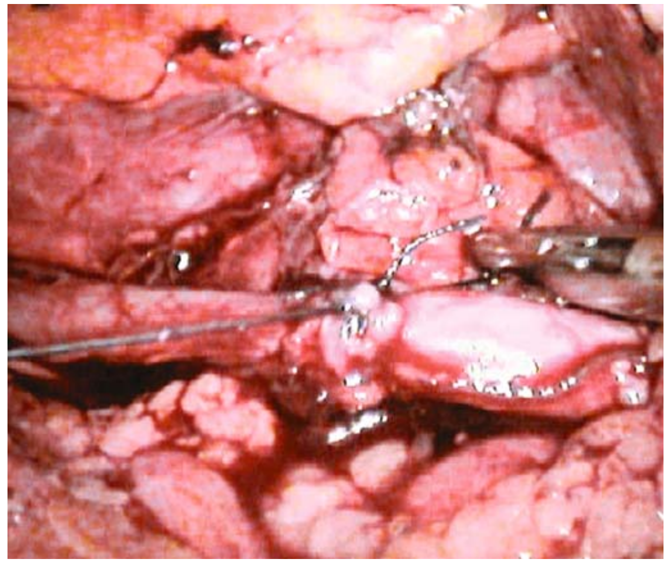

FIG. 12.49. Final view of the ureteroureterostomy

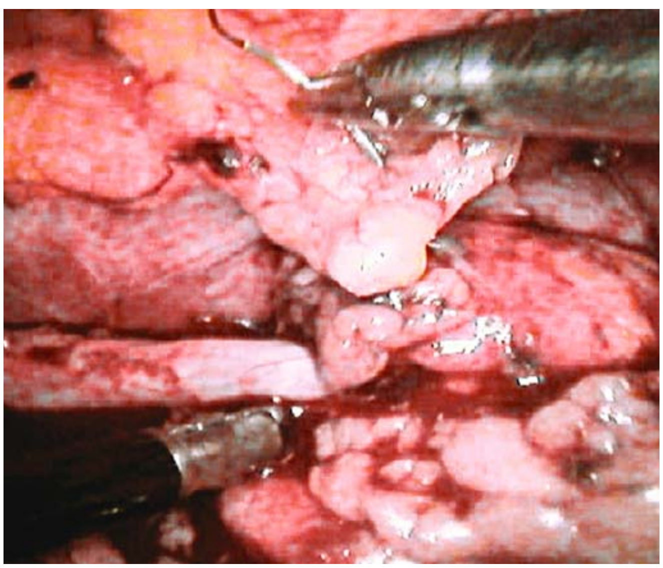

FIG. 12.50. Covering the sutural line with perirenal fat

FIG. 12.51. Postoperative IVU shows improved drainage

Stricture Ureter Retroperitoneoscopic Ureteroureterostomy for Benign Stricture

R. Jayaraman and P.B. Sivaraman

The retroperitoneoscopic approach for benign ureteral stricture is preferable as the peritoneum is not violated. The retroperitoneoscopic ureteroureterostomy is illustrated in the following figures.

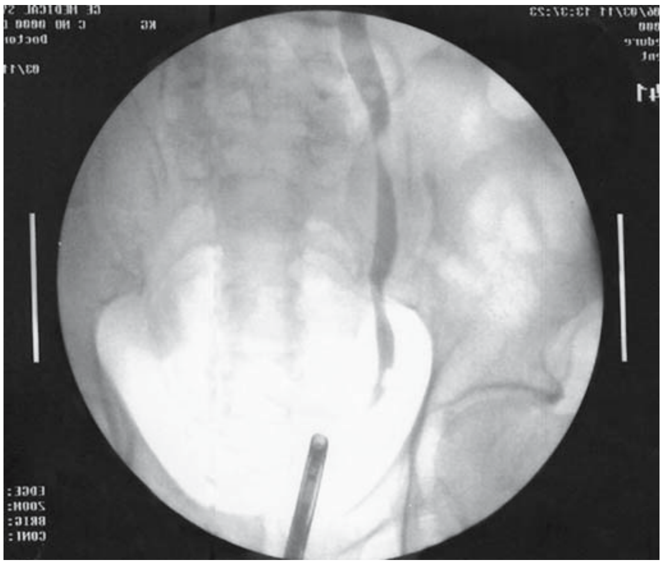

Fig. 12.52. An RGP shows the left upper ureteric stricture

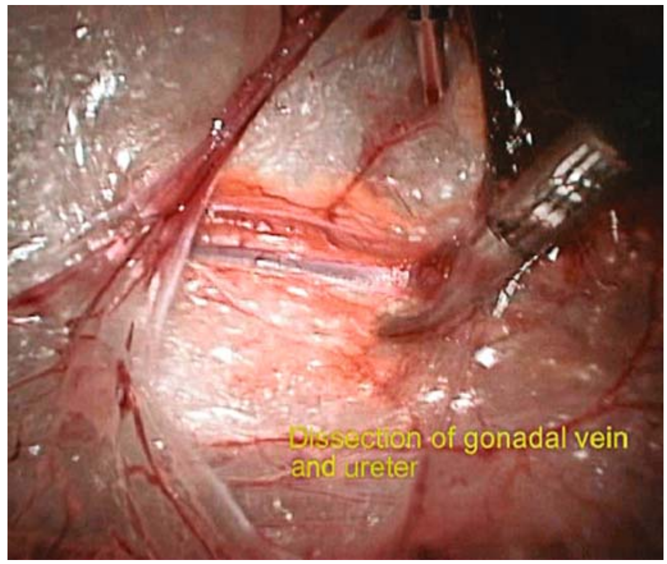

Fig. 12.53. Initial retroperitoneoscopic view reveals loose areolar tissue and probably gonadal vessels across; one has to use a blunt dissector below to look for the psoas muscle and the ureter

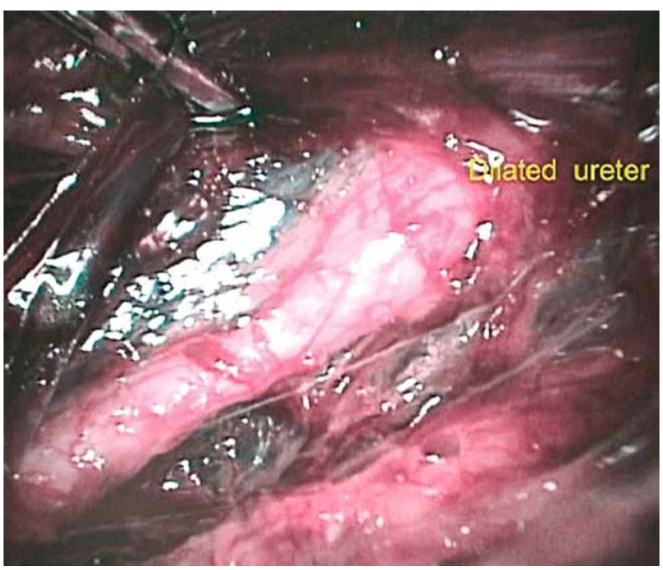

Fig. 12.54. Further blunt dissection exposes the proximal, dilated ureter and the psoas below

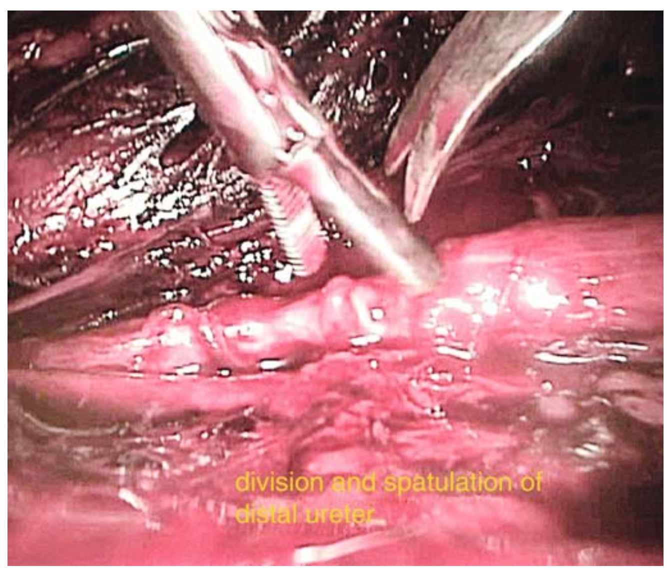

Fig. 12.55. The ureter is mobilized on either side of the strictured segment

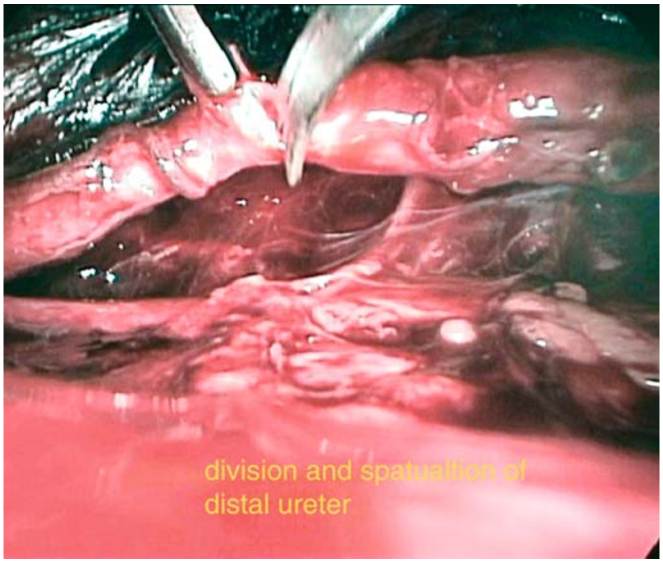

FIG. 12.56. The ureter is divided partially a little above the stricture

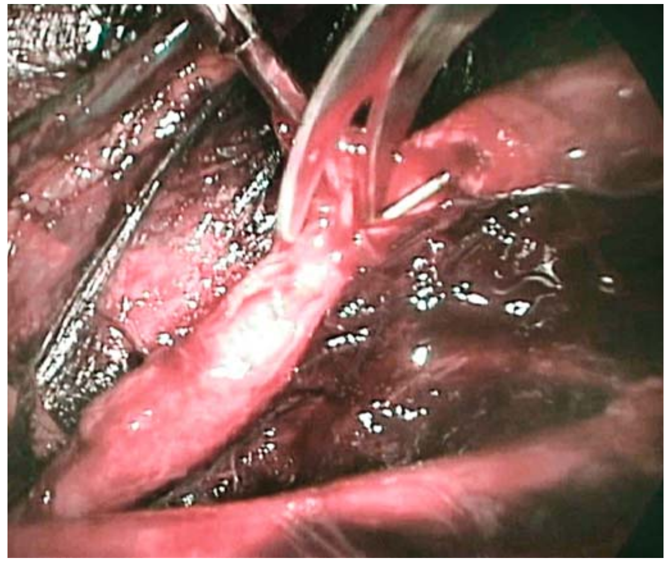

FIG. 12.57. Spatulation through the strictured segment is carried out in a caudal direction, which exposes the preplaced guidewire

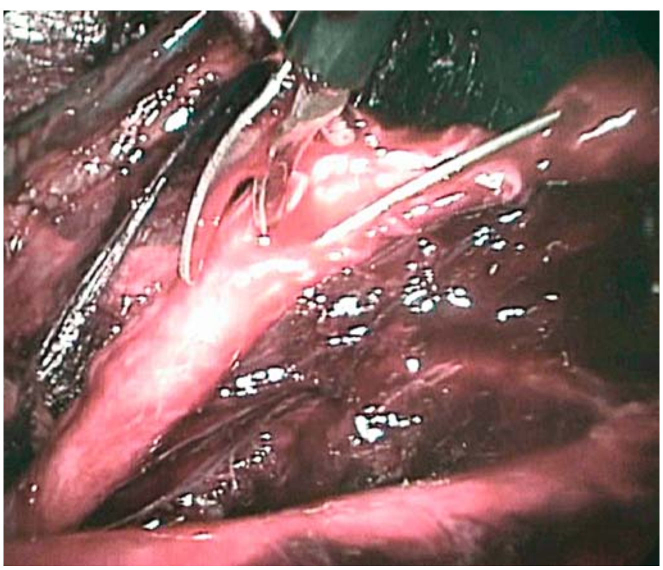

FIG. 12.58. Spatulation is carried down until a normal-caliber supple area is seen

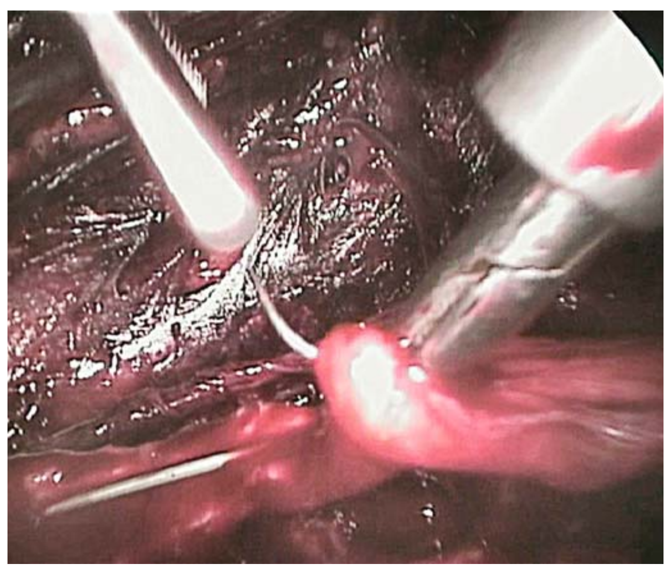

FIG. 12.59. An initial 4-0 Vicryl suture is taken outside-in through the proximal cut end of the ureter (note that the stricture is not yet excised to avoid recession and also to provide better orientation)

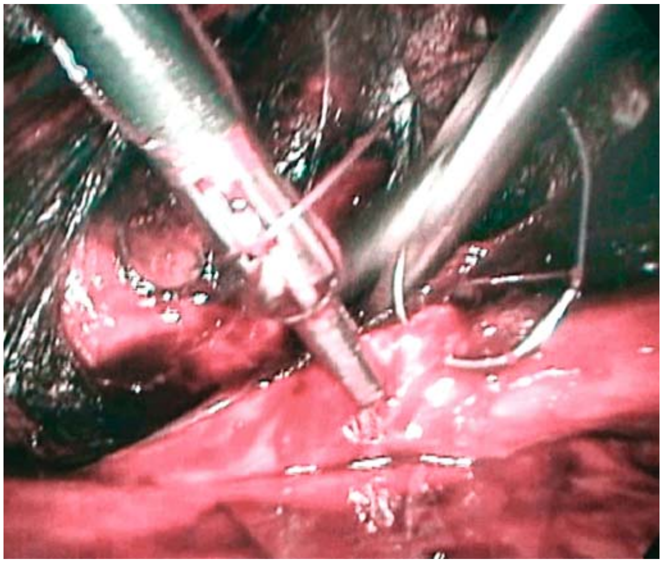

FIG. 12.60. End-to-end ureteroureterostomy is done with interrupted 4-0 Vicryl suture

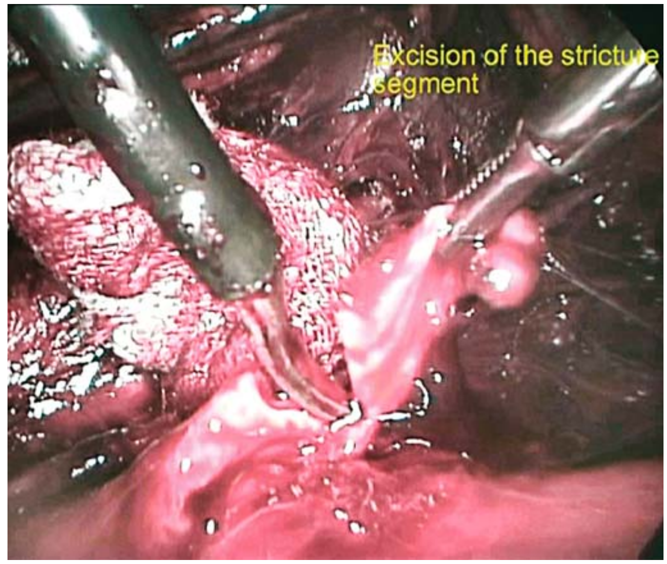

FIG. 12.61. Excision of the strictured ureter

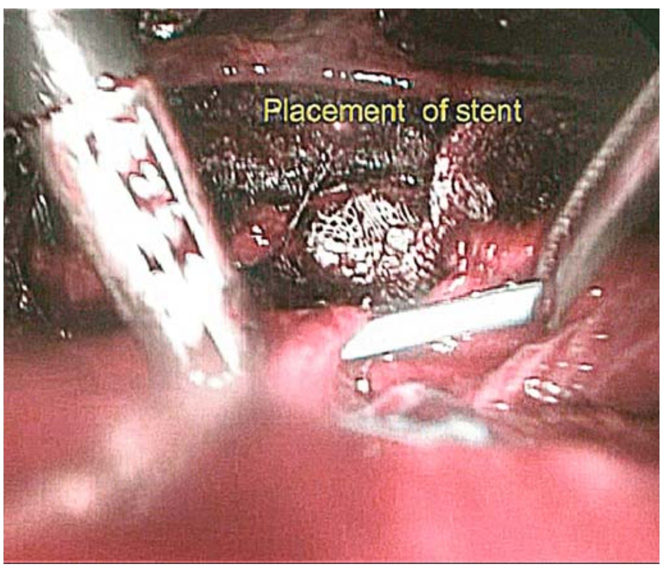

FIG. 12.62. After one or two sutures, a stent can be advanced over a preplaced guidewire

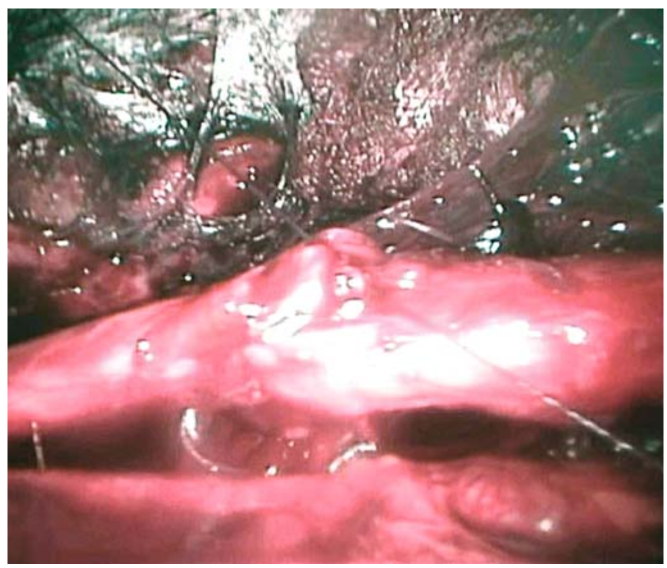

FIG. 12.63. Six interrupted sutures are inserted to achieve a water-tight anastomosis

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13
Laparoscopic Ureteric Reimplantation

M. Ramalingam, K. Selvarajan, and K. Senthil

Ureteric reimplantation in open surgery is a fairly straightforward procedure and can be done extravesically or transvesically. Laparoscopically ureteric reimplantation using a transvesical approach can be challenging because the space is limited and the risk of the ports slipping out is high. It also involves a high level of skill in suturing precisely [1–3]. In extravesical reimplantation, suturing the bladder mucosa to the ureter and creating a submucosal tunnel may require dexterity and patience.

Indications

- Congenital vesicoureteric reflux (VUR) that requires intervention
- Primary obstructive megaureter (POM)
- Ureterocele with back pressure changes
- Lower ureteric stricture
- Lower ureteric injuries
- Ureterovaginal fistula

Surgical Techniques

Transvesical Ureteric Reimplantation: Cohen's Technique

In VUR transvesical ureteric reimplantation is suitable if the ureter is not grossly dilated. The difficulties encountered are as follows:

1. Fixing the bladder wall
2. Preventing gas leak after mobilizing the ureter (as the hiatus will be open to extravesical space)
3. Suturing within the bladder

The patient is placed in the lithotomy position and a preliminary cystoscopy is performed to visualize the bladder neck and trigone and to introduce a 5-French (F) infant feeding tube into the ureter on the side to be reimplanted. The bladder is filled optimally for subsequent placement of a camera port at the umbilical level. A 10-mm incision is made at the subumbilical level, the linea alba is incised, and a stay suture is taken through the dome of the bladder with 3-0 Vicryl. This facilitates easy introduction of a camera port under cystoscopic guidance, and prevents subsequent slippage of the port. Now the cystoscope is removed and an optimum-size Foley catheter is introduced and clamped (to prevent gas leak). Pneumovesical insufflation is started, and the secondary ports are planned according to the capacity of the bladder and inserted. The ports are fixed to the abdominal wall, to prevent slippage of trocars. A 5F infant feeding tube of suitable length can also be dropped into the bladder through the 10-mm port. The infant feeding tube is introduced into the ureter and transfixed with a 4-0 suture. The bladder mucosa over the ureteric orifice is circumcised with hook diathermy or cold scissors.

The ureter is held along with the stay suture with one of the hand instruments, and gentle traction is applied toward the opposite direction to facilitate mobilization using blunt and sharp dissection. The muscular or vascular attachments of the ureter are divided with hook diathermy. The optimum length of the ureter is mobilized, depending on the caliber of the ureter. The mobilized ureter must be tension free. Subsequently a submucosal tunnel is created by making a small buttonhole in the bladder mucosa cephalad to the opposite ureteric orifice. The ureteral end is trimmed and sutured to the bladder mucosa with 4-0 interrupted Vicryl suture.

Bilateral transvesical reimplantation may be a challenging procedure, as gas leaks at the hiatus. This results in perivesical gas emphysema leading to a collapsing bladder, which makes suturing difficult.

Transperitoneal Approach

Lich Gregoir's Extravesical Tailored Reimplantation (Grossly Dilated Ureter in the Primary Obstructive Megaureter)

Whenever the distal ureter of the primary obstructive megaureter is grossly dilated and tortuous, it needs to be tailored. The redundant segment of ureter is excised, and the distal cut end is tailored (smoothly tapered) using continuous 3-0 or 4-0 Vicryl depending on the width of the ureteral wall. The rest of the technique of reimplantation is similar to what has been described already.

Lich Gregoir's Extravesical Nontailored Reimplantation (in Moderately Dilated Ureter)

The patient is placed in the supine head-low position with a sandbag below the ipsilateral hip. A preliminary cystoscopy is done to inspect the bladder interior and assess the capacity. An indwelling urethral Foley is placed with provision for filling the bladder intraoperatively. The access to the catheter is kept sterile. An umbilical 10-mm port for the telescope and the two working ports are used; one 5-mm port is placed lateral to the rectus and the other 5-mm port is placed in the anterior axillary line, midway between the costal margin and iliac crest. In addition, a suprapubic 5-mm port is inserted for stabilizing the ureter, suturing, and to help introducing the stent.

The lower ureter is adequately mobilized. This may be easier in the POM but difficult in a stricture due to inflammation and scarring. The colon may need to be reflected sometimes. The ureter is dissected adequately just above the pathologic area and transected as distal as possible, taking care to retain as much of the periureteric tissue as possible. A 5F double pigtail stent is passed proximally into the ureter and distally into the bladder. The ureter is anastomosed to the anterolateral wall of the bladder mucosa using 5-0 polyglactin interrupted sutures with Lich Gregoir's extravesical reimplantation technique. The detrusor is buttressed over the ureter to form a submucosal tunnel using 3-0 interrupted sutures. The anterolateral wall of the bladder is sutured to the psoas muscle (psoas hitch). The hitch is done as high as possible using absorbable sutures (1-0 polyglactin). Omental wrapping over the anastomotic site is preferable.

Psoas Hitch

Whenever there is tension in the anastomotic area, it is advisable to suture the bladder wall just above the reimplanted area to the psoas with two or three interrupted 2-0 Vicryl sutures.

Trocar Slippage

In the transvesical approach, slippage of the trocars results in quick perivesical gas emphysema, making reintroduction of trocar extremely difficult.

Vesicoureteric Reflux: Transvesical Reimplantation

FIG. 13.1. A micturating cystourethrography (MCU) shows gross vesicoureteric reflux on the left side

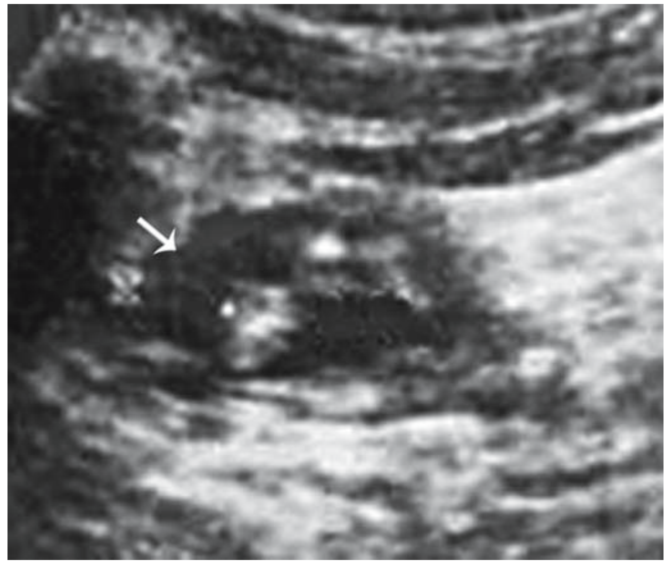


FIG. 13.2. Ultrasound scan shows cortical scar (arrow)

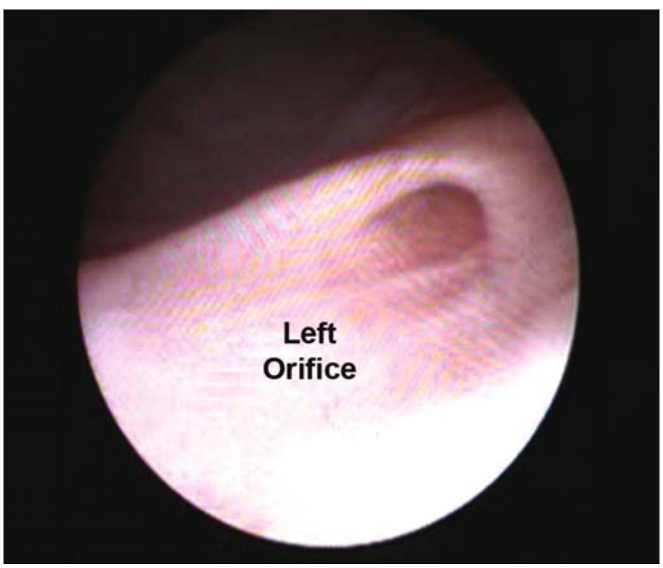


FIG. 13.3. Cystoscopy shows gaping left ureteric orifice

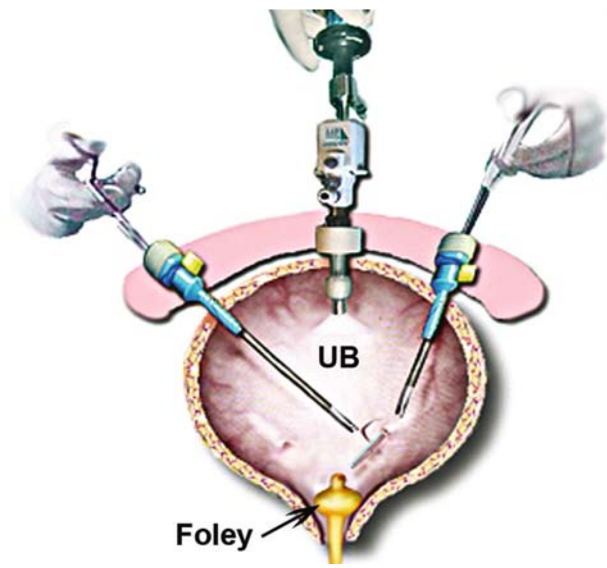


FIG. 13.4. Diagrammatic representation of the port positions (UB, urinary bladder)

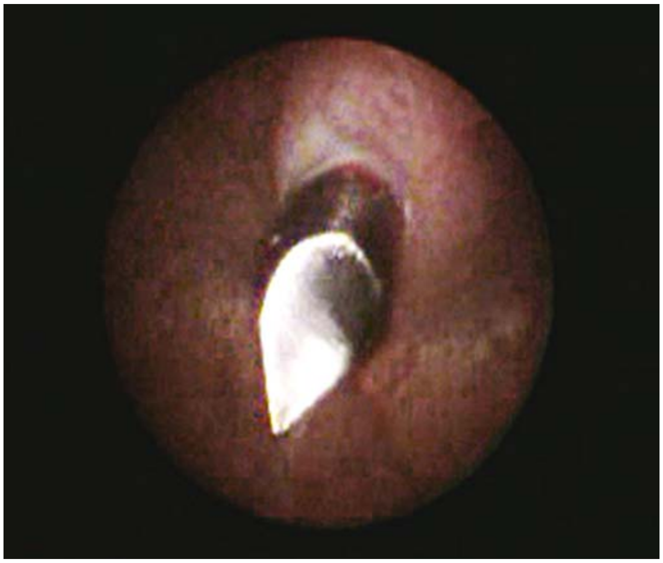


Fig. 13.5. Subumbilical camera port insertion under cystoscopic guidance

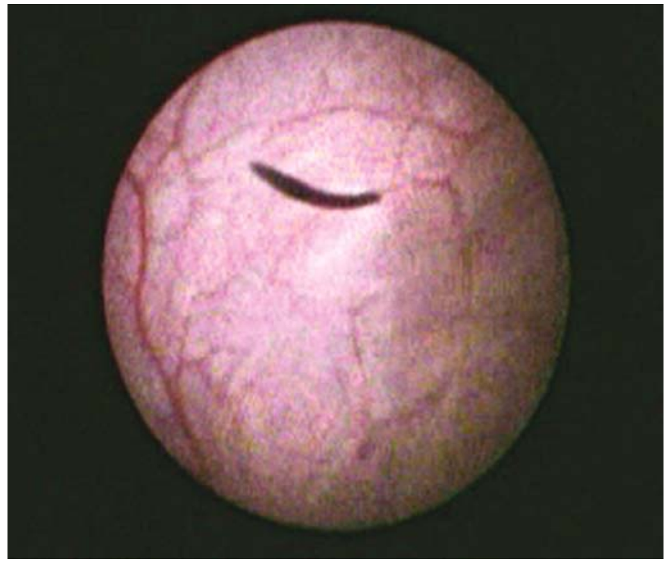


Fig. 13.6. Endoview of the bladder wall stay being taken

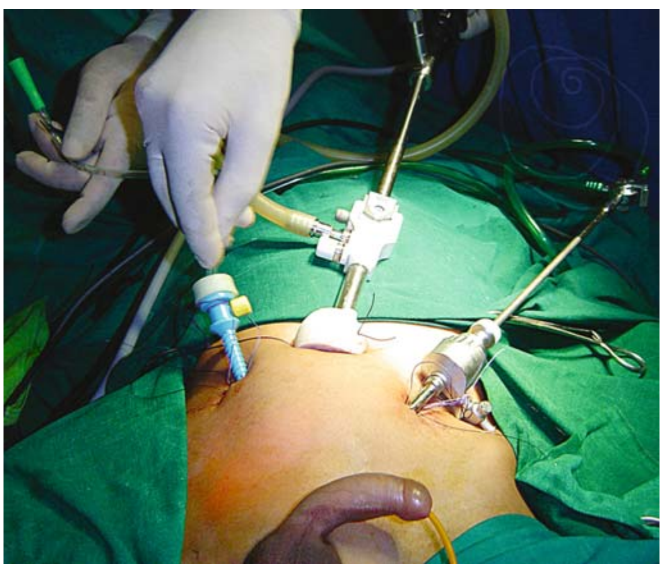


Fig. 13.7. External view of the secondary ports

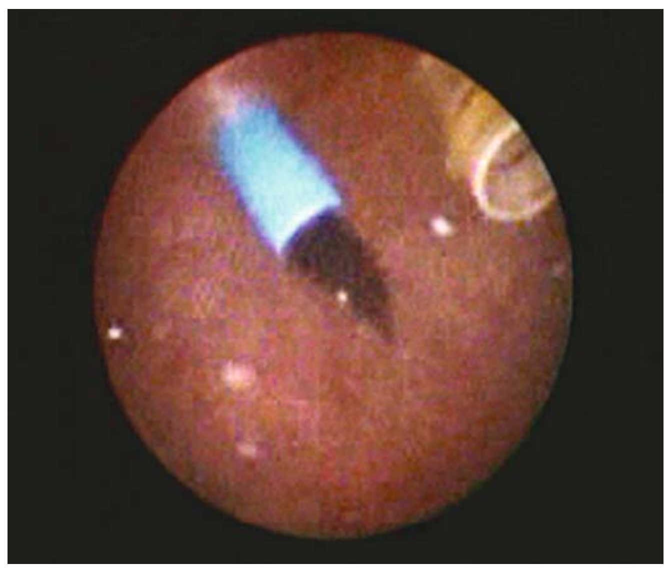


Fig. 13.8. Endoview of the secondary port

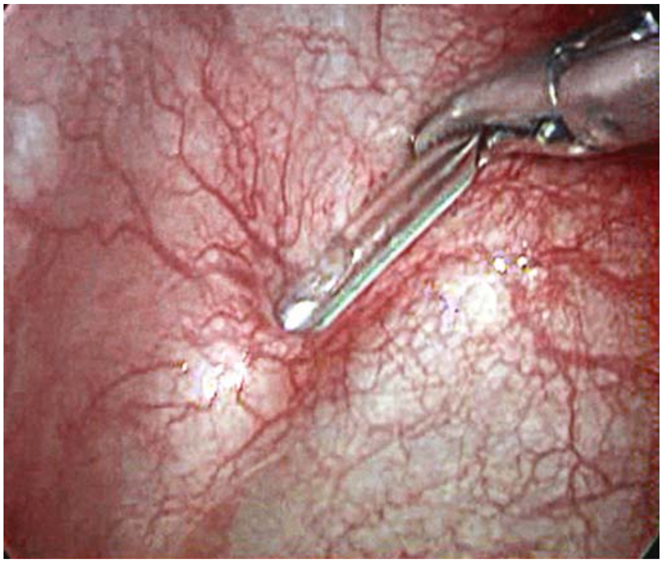


Fig. 13.9. Stenting left ureter (5F feeding tube)

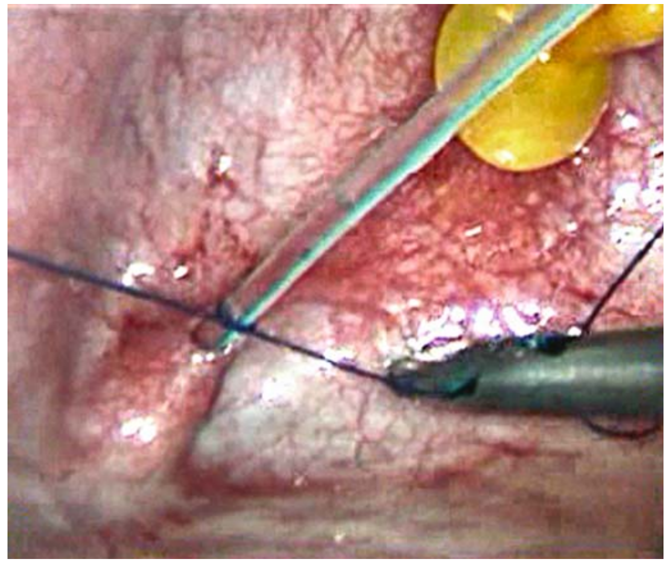


Fig. 13.10. Transfixing the stent to the ureter

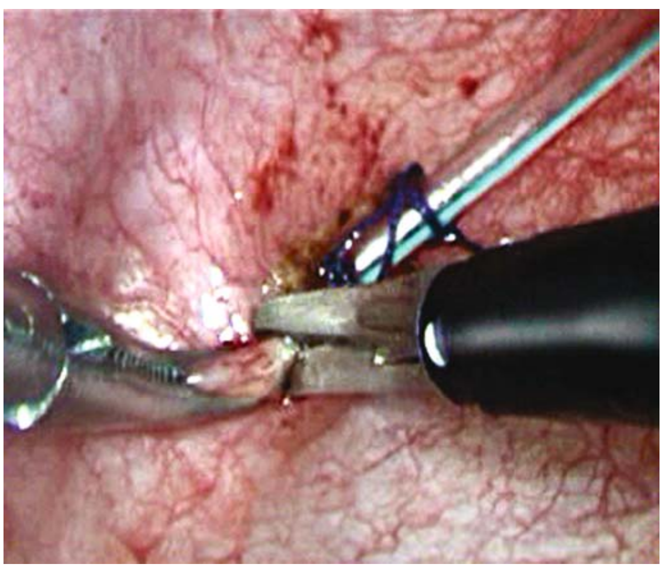


Fig. 13.11. Incising the bladder mucosa around the left ureteric orifice

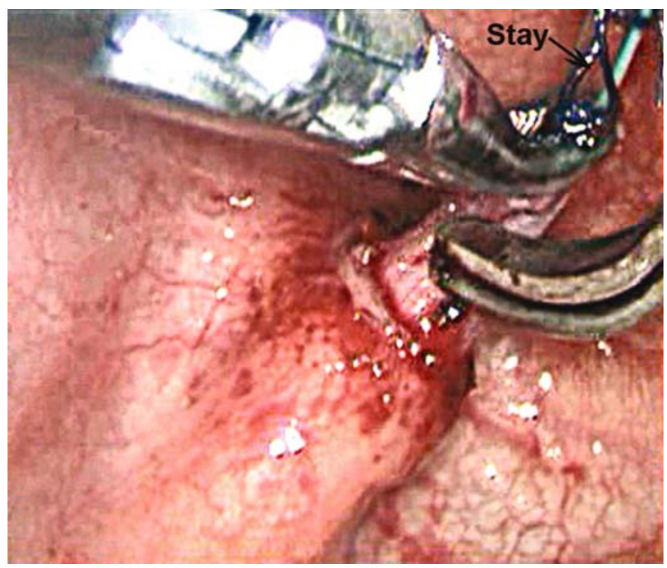


Fig. 13.12. Mobilization of the left ureter; note the countertraction using the ureteric stay

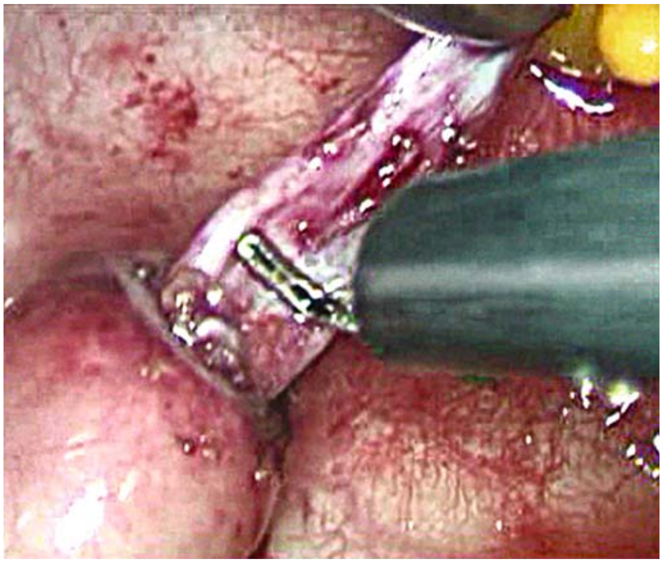


Fig. 13.13. Mobilization in progress

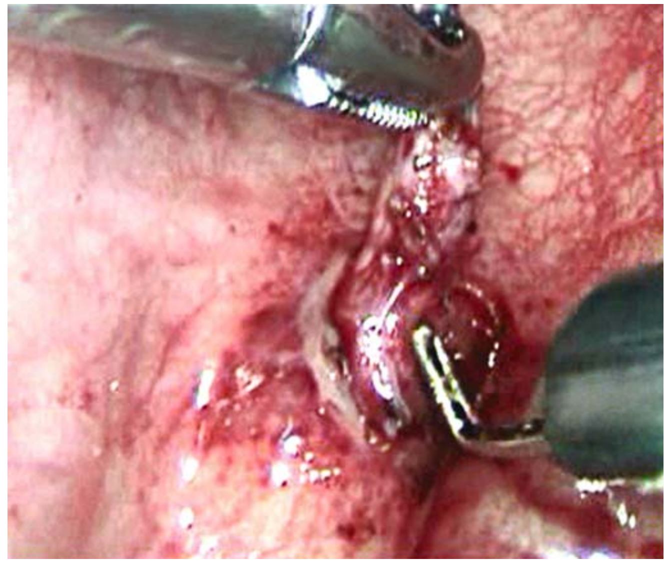


Fig. 13.14. Division of detrusor fibers attached to the distal ureter with hook diathermy

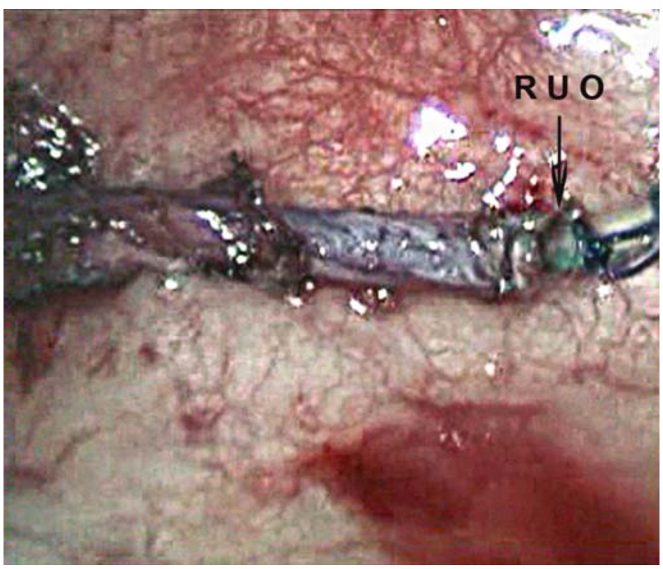


Fig. 13.15. The mobilized ureter lying tension-free close to the right ureteric orifice (RUO)

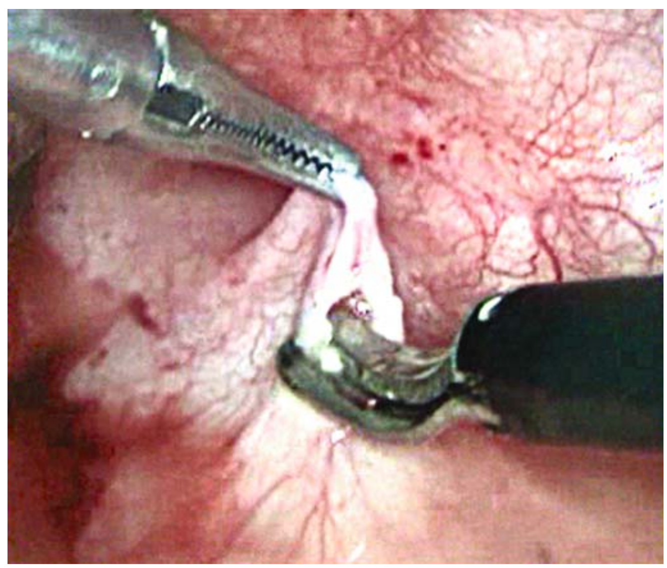


Fig. 13.16. Buttonhole in bladder mucosa about 3 cm from the hiatus and cephalic to the right ureteric orifice

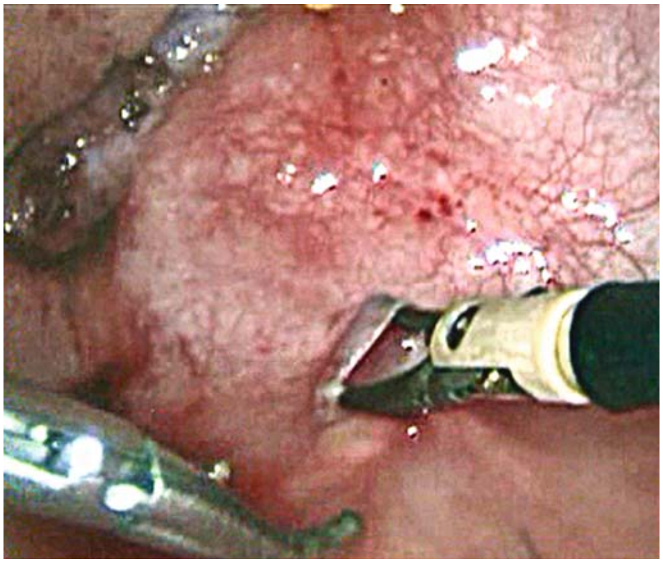


FIG. 13.17. Creation of the submucosal tunnel with a dissector

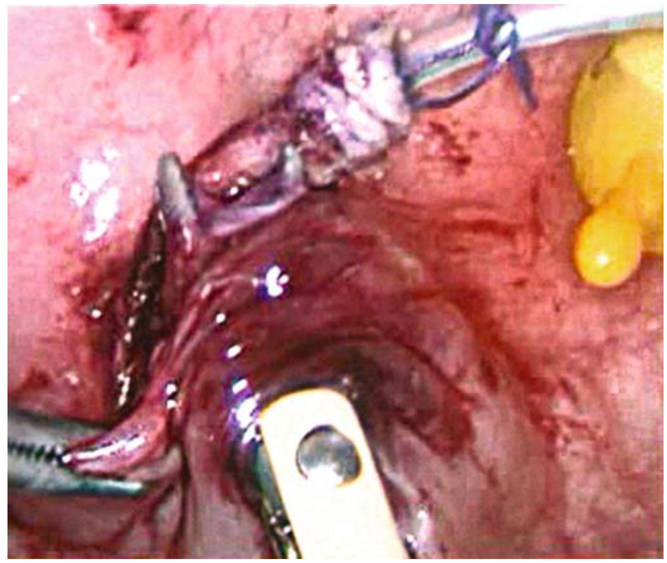


FIG. 13.18. Completion of the submucosal tunneling

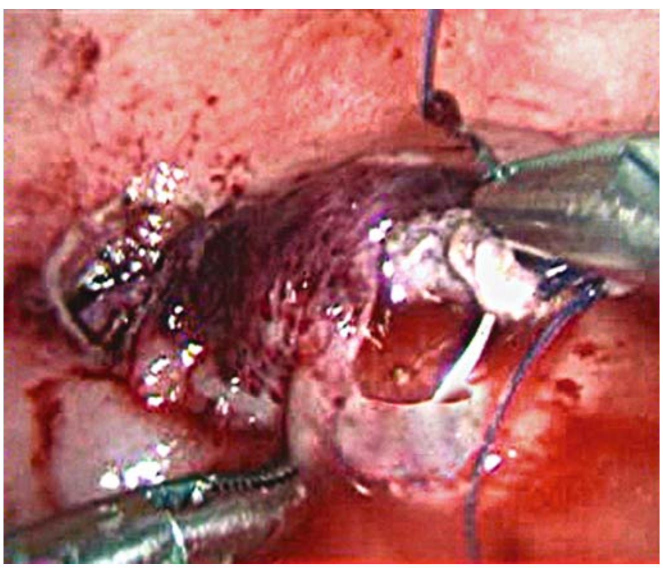


FIG. 13.19. The ureter positioned in the tunnel

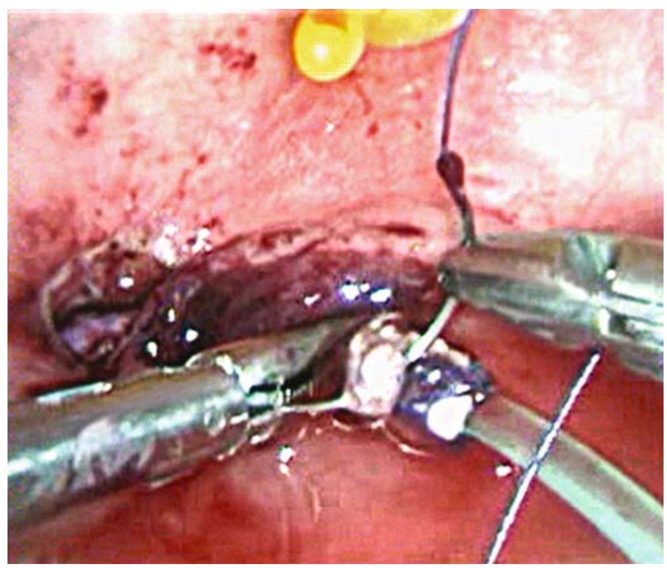


FIG. 13.20. Suturing the ureteric end to the bladder mucosa with interrupted 5-0 Vicryl

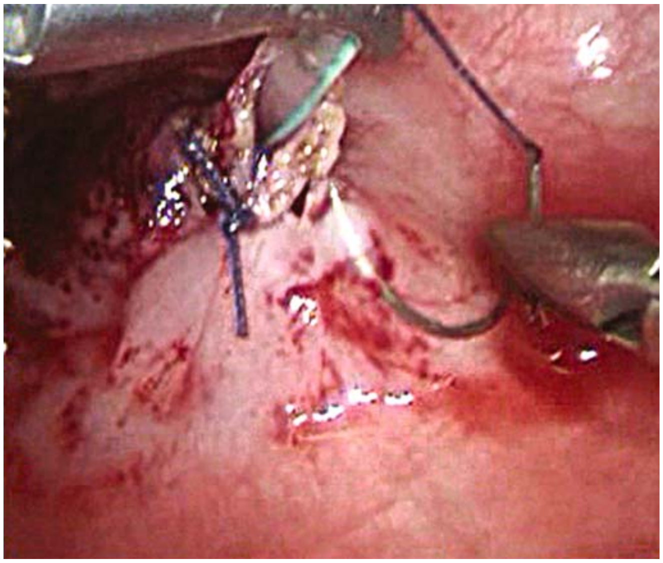


FIG. 13.21. Subsequent suturing in progress

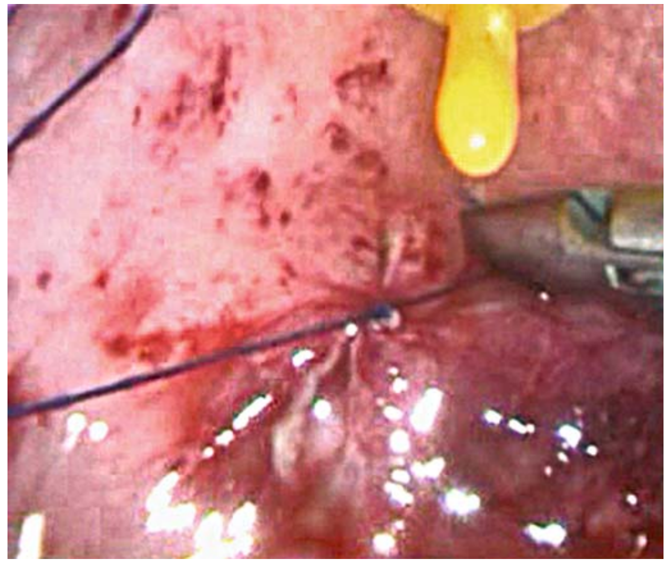


FIG. 13.22. Closure of the hiatus with 3-0 Vicryl suture to prevent extravasation

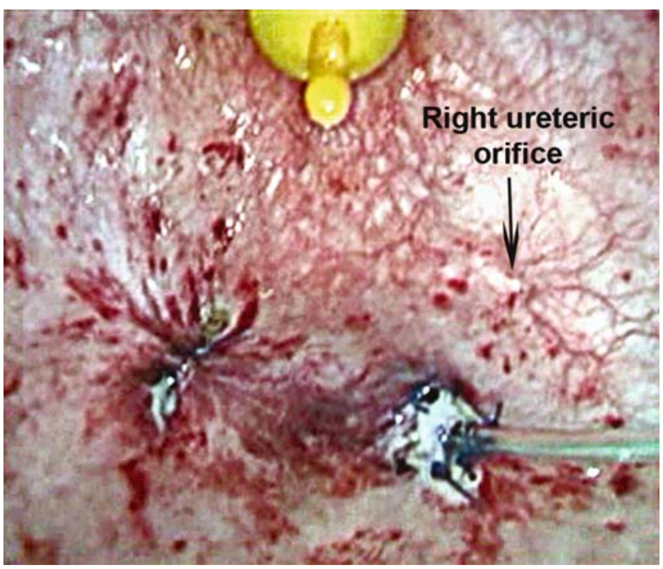


FIG. 13.23. Final view of the reimplanted ureter

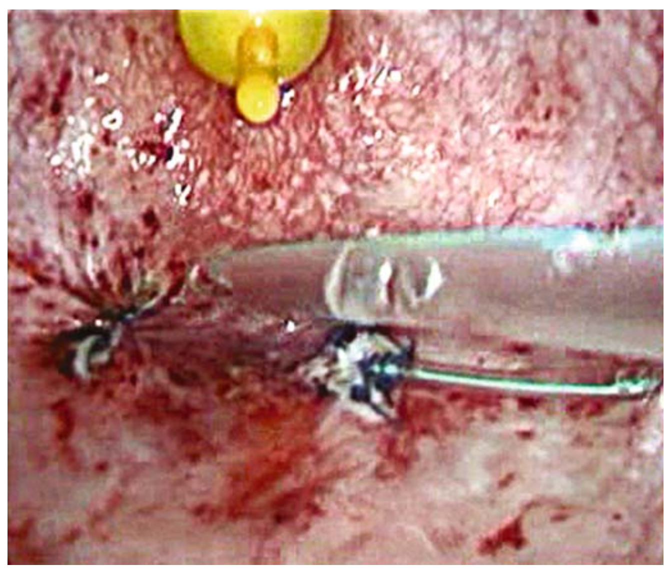


FIG. 13.24. Tube drain (suprapubic cystostomy catheter, [SPC]) insertion through one of the ports

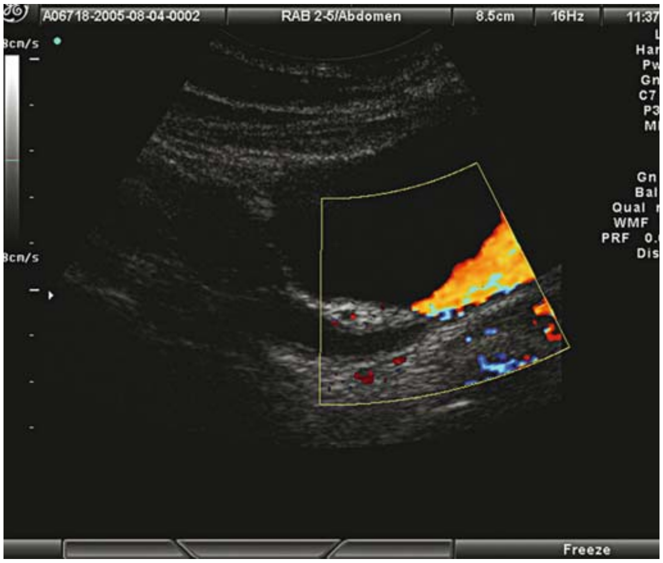


FIG. 13.25. Ultrasound scan done 3 months later shows good efflux from the reimplanted ureter

FIG. 13.26. Postoperative MCU done 3 months later shows no reflux

Laparoscopic Transvesical Reimplant for Ureterocele

FIG. 13.27. Ultrasound scan shows a right ureterocele; a ureteric jet shows the location of the orifice

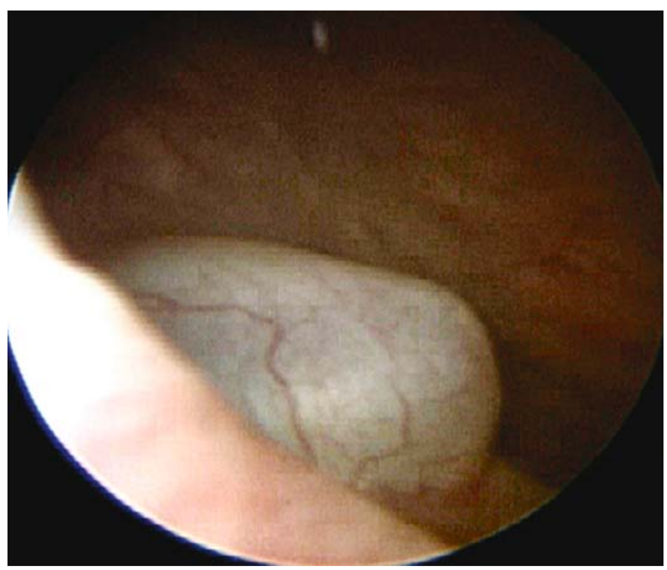


FIG. 13.28. Cystoscopic view of the right ureterocele

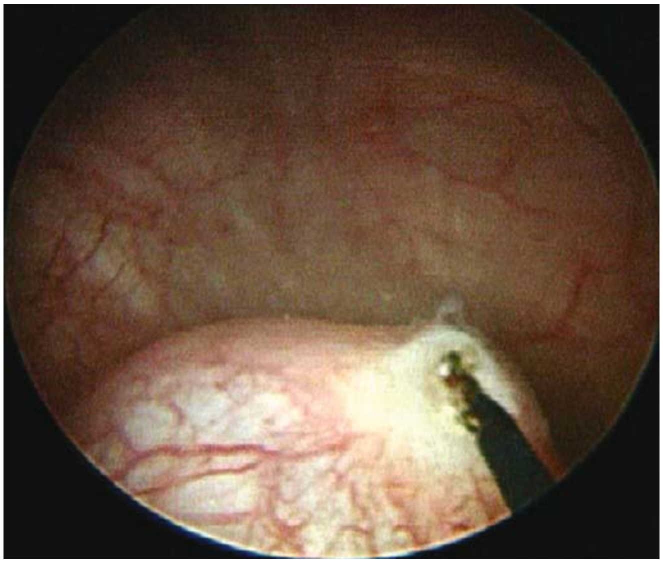


FIG. 13.29. Cystoscopic deroofing of the ureterocele to advance the ureteric stent

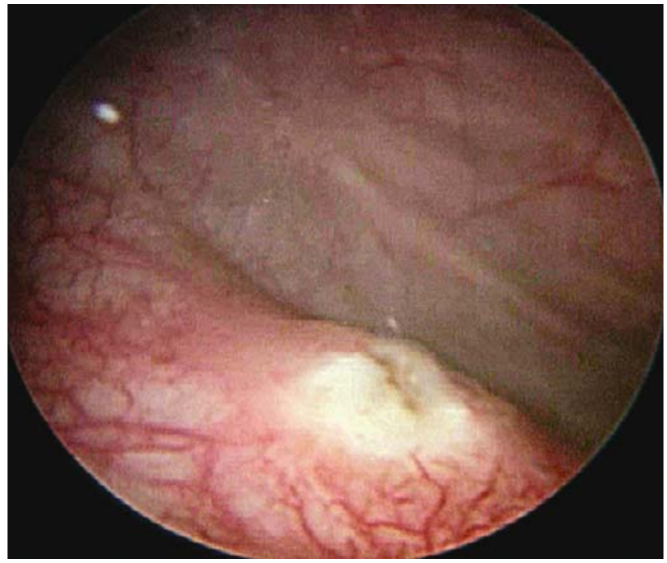


FIG. 13.30. View after deroofing the ureterocele

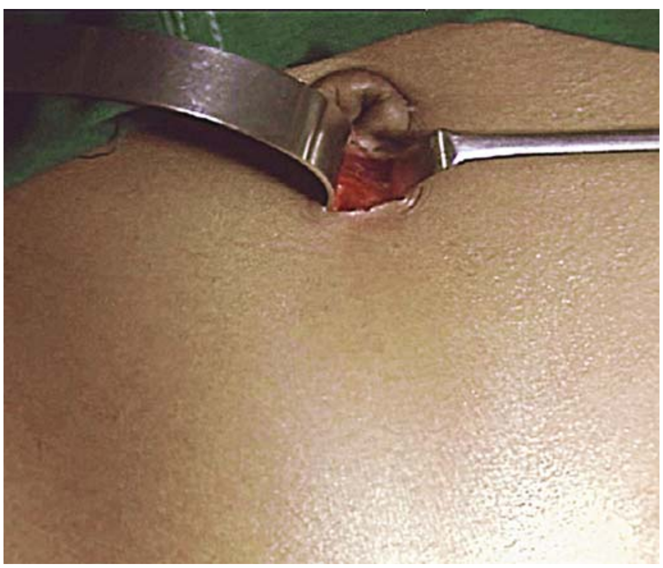


FIG. 13.31. Subumbilical camera port site

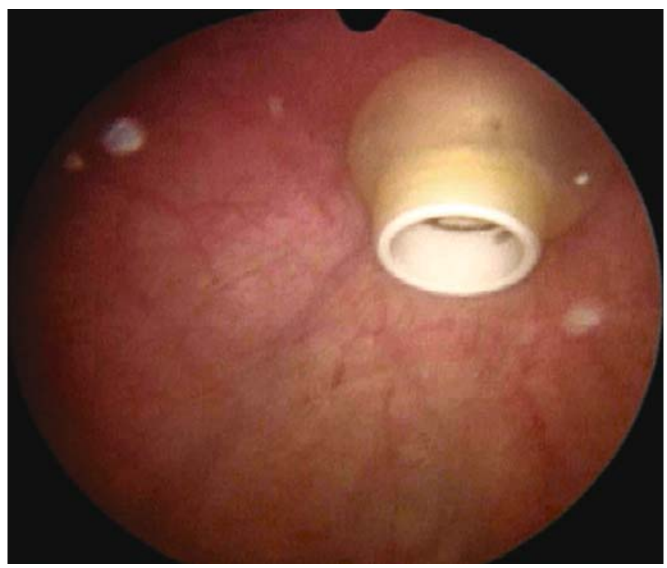


FIG. 13.32. Balloon trocar insertion as the subumbilical camera port

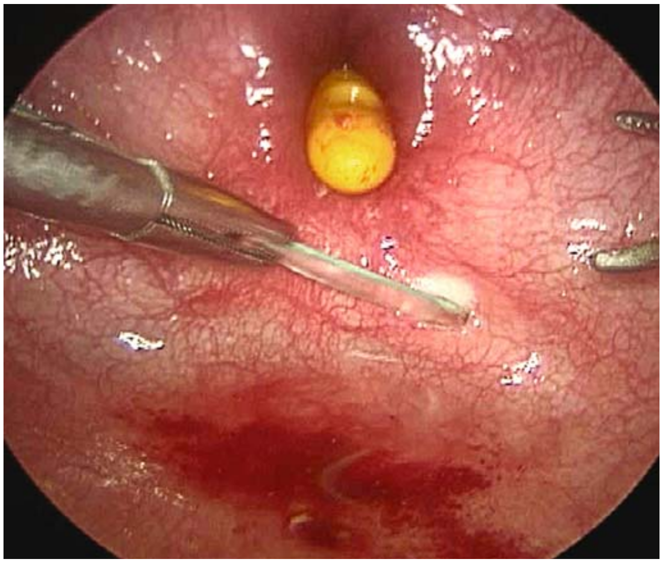


FIG. 13.33. Transvesical laparoscopic view after deroofing; an infant feeding tube is advanced into the ureter

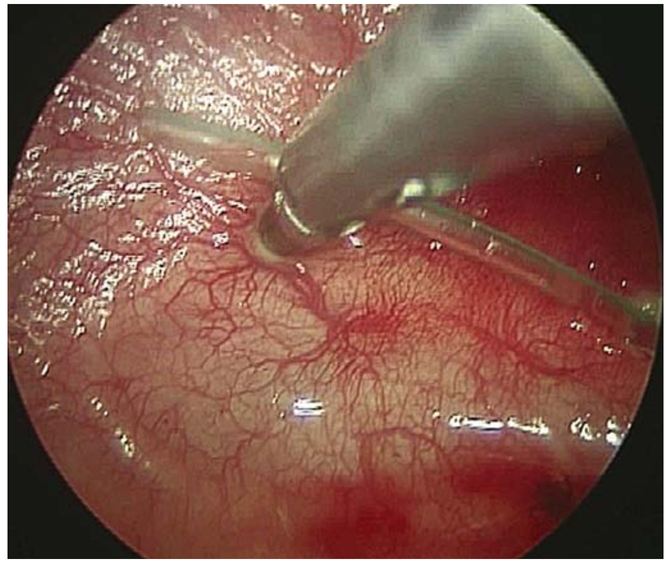


FIG. 13.34. Locating the left ureteric orifice to plan the direction of submucosal tunneling

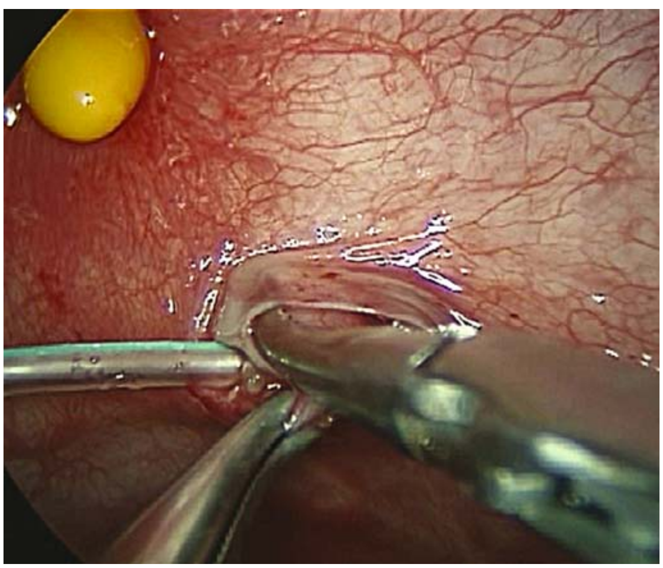


FIG. 13.35. A thin-walled ureterocele is being carefully mobilized (after circumferential incision of bladder mucosa)

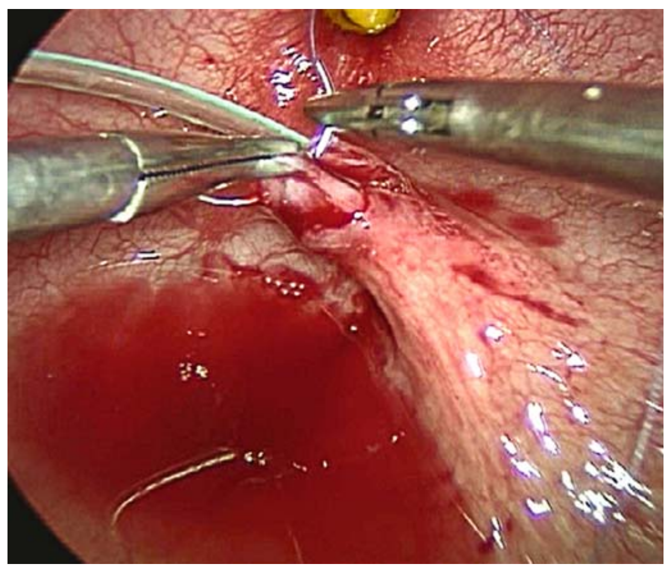


FIG. 13.36. Ureteric stent is being transfixed to the ureterocele

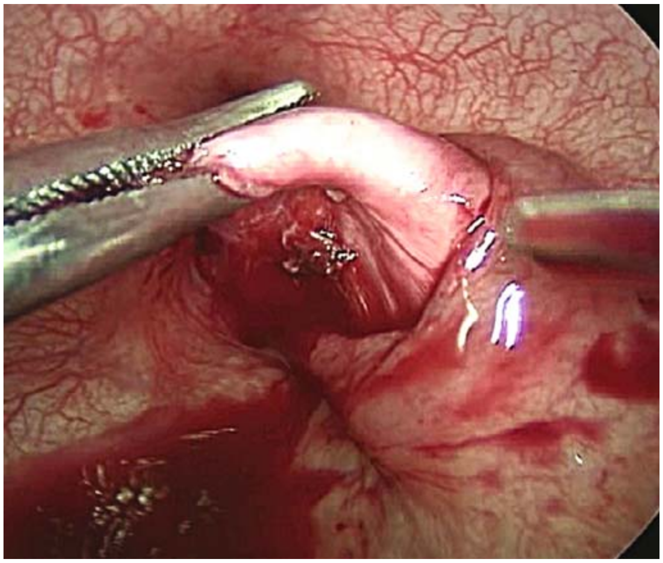


Fig. 13.37. The ureterocele is held with a dissector and dissected all around

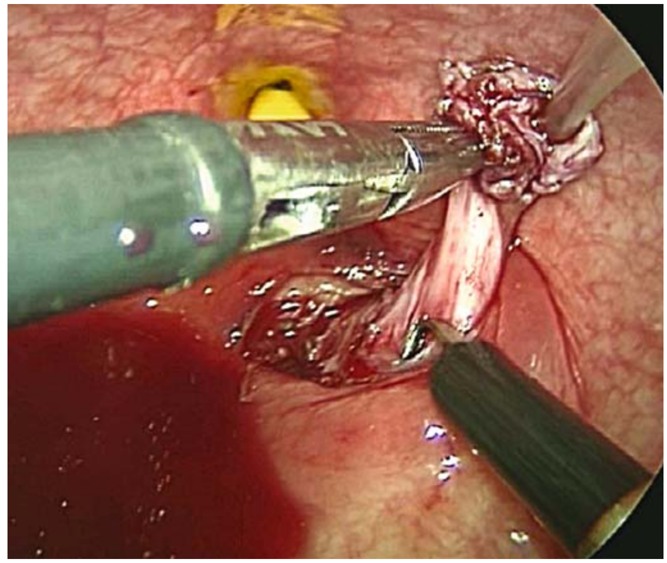


Fig. 13.38. All bladder muscle fiber attachments to the ureter are divided using a hook dissector with electrocautery

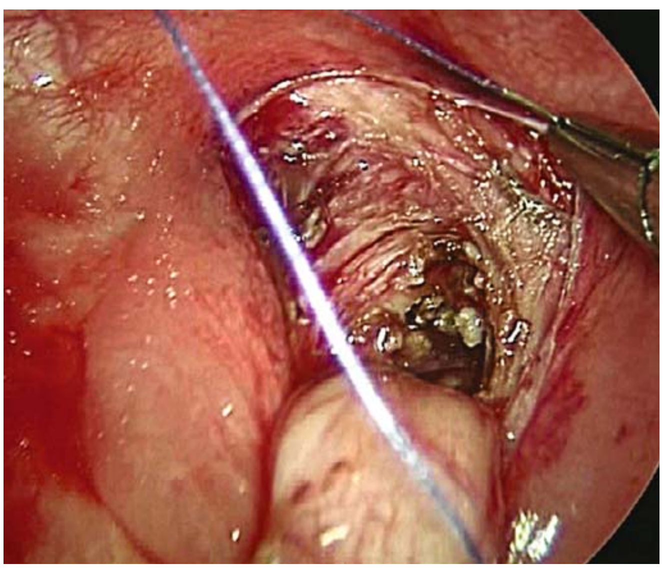


Fig. 13.39. The ureter is mobilized until perivesical fat is seen

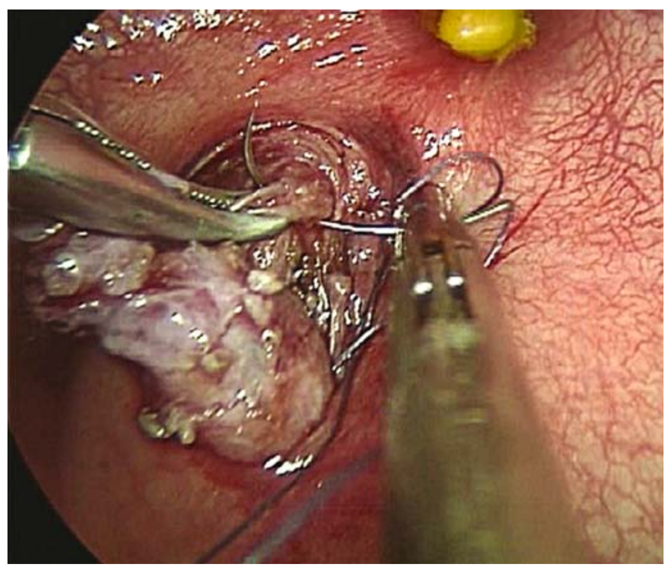


Fig. 13.40. The hiatus has to be narrowed using 2-0 Vicryl suture to prevent air leak

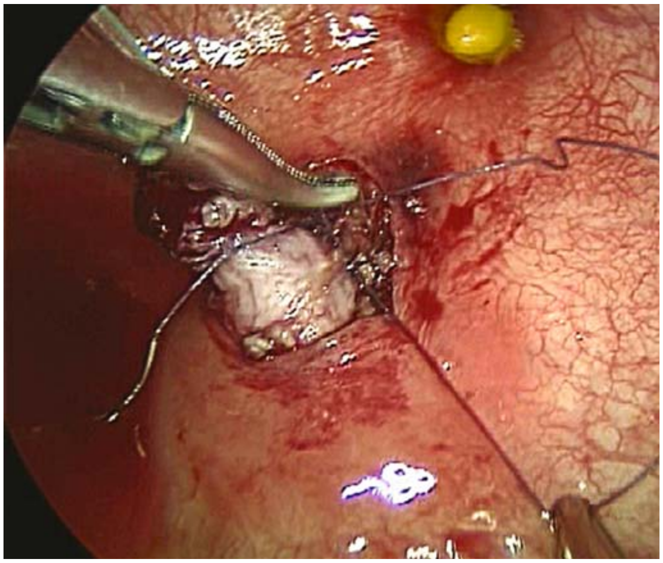


FIG. 13.41. The hiatus narrowed adequately

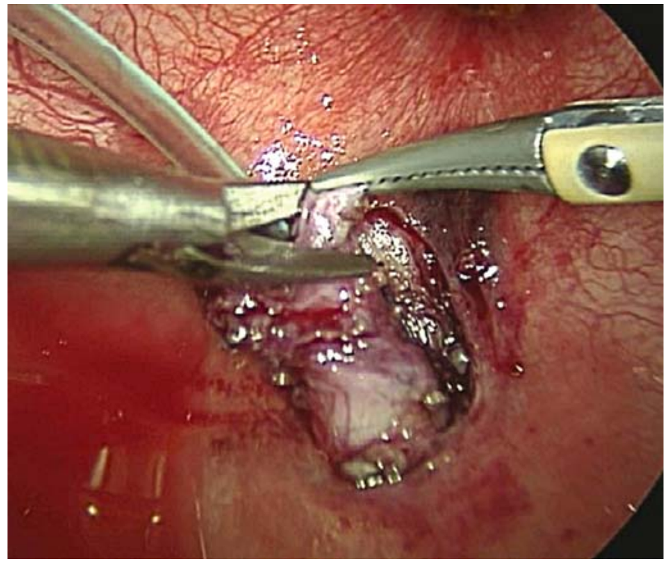


FIG. 13.42. The ureterocele is being excised with scissors

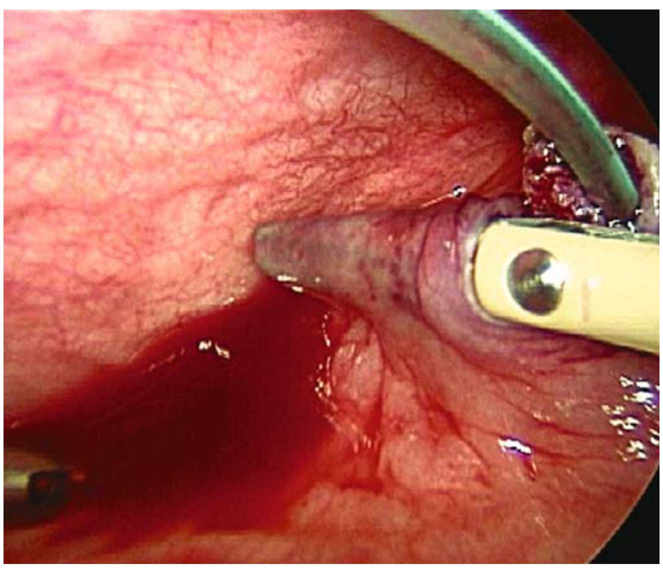


FIG. 13.43. The submucosal tunnel is being created with a dissector

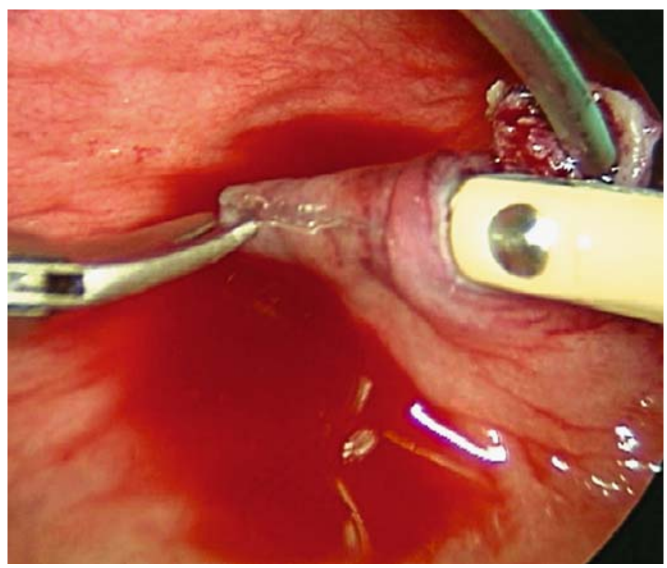


FIG. 13.44. Once an adequate length of submucosal tunnel is achieved, sufficient bladder mucosal incision is made for the neoureteric orifice

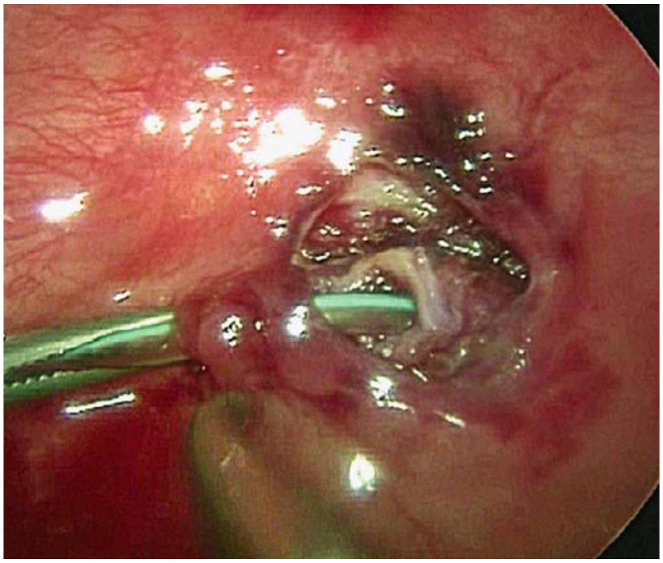


FIG. 13.45. The ureteric stent with the ureter is grasped with a dissector and routed through the submucosal tunnel

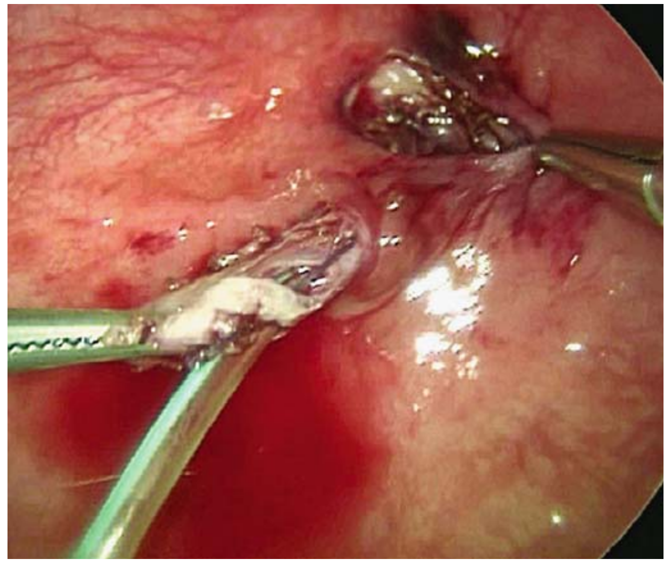


FIG. 13.46. The ureter is seen exiting through the new tunnel

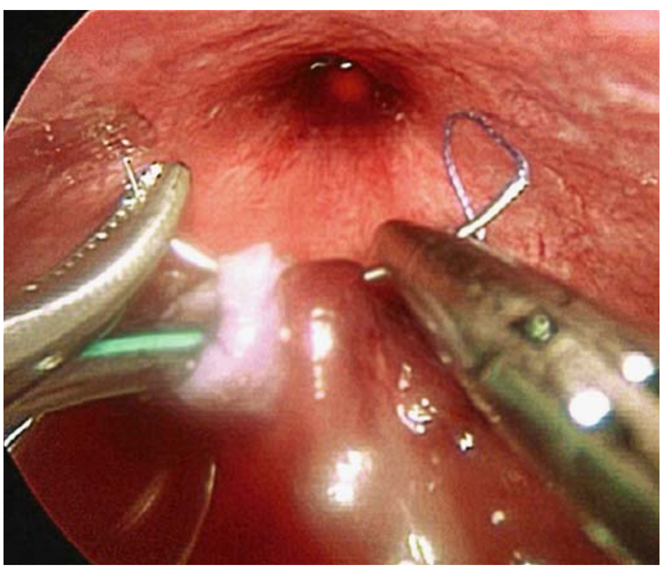


FIG. 13.47. The ureteric end is sutured to the mucosal edge using interrupted 4-0 Vicryl suture

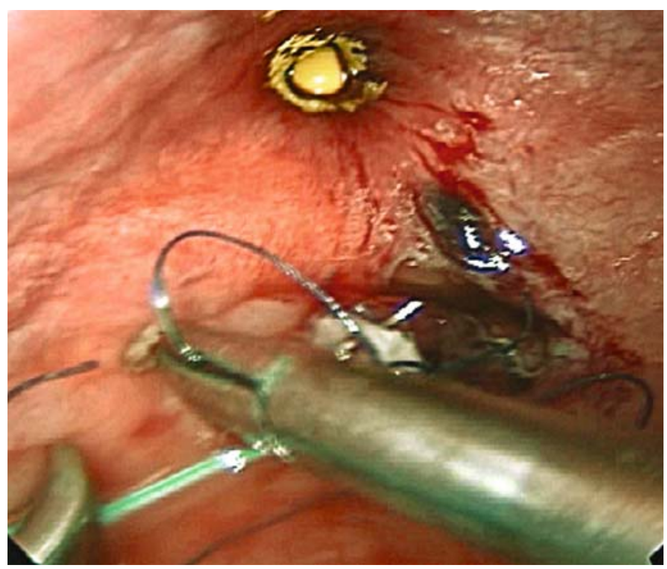


FIG. 13.48. A few more Vicryl sutures are placed to fix the ureter

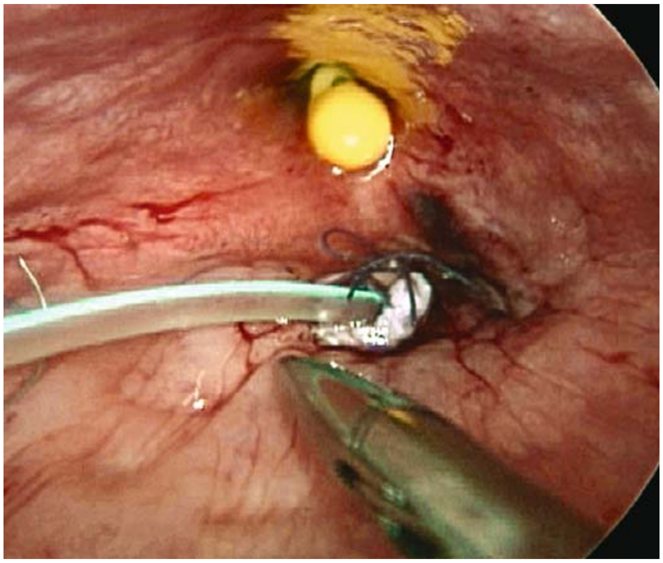


FIG. 13.49. View after reimplantation

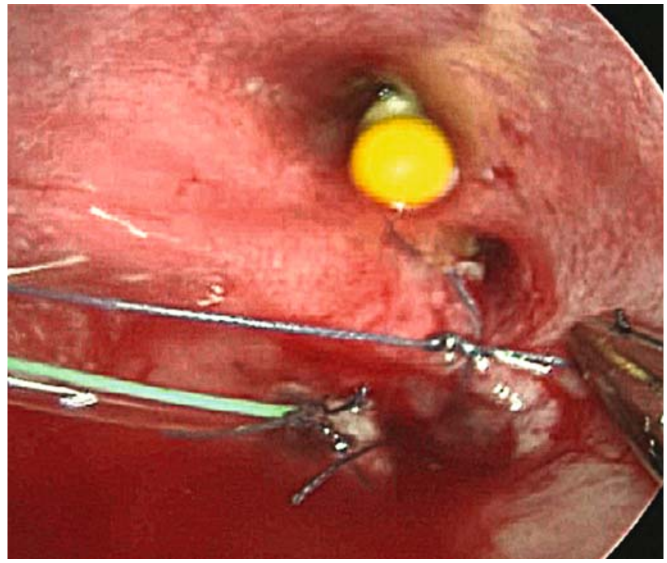


FIG. 13.50. The mucosal defect at the hiatus is closed

Special Situation: Transvesical Ureteric Reimplant

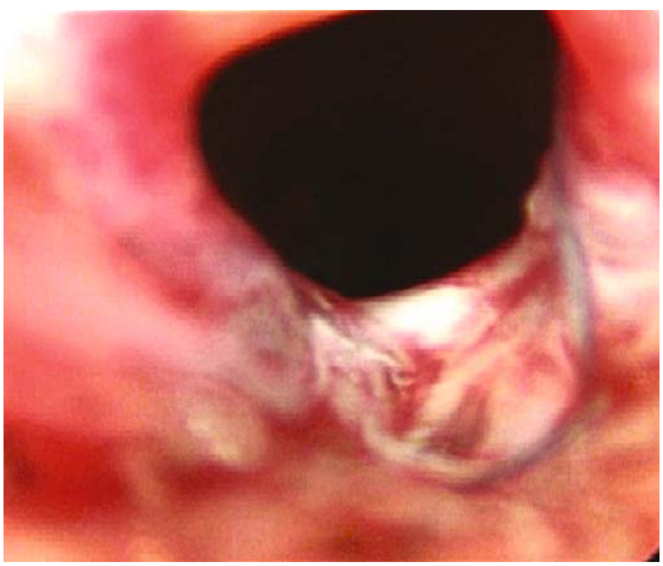


FIG. 13.51. The camera port slipped out of the bladder

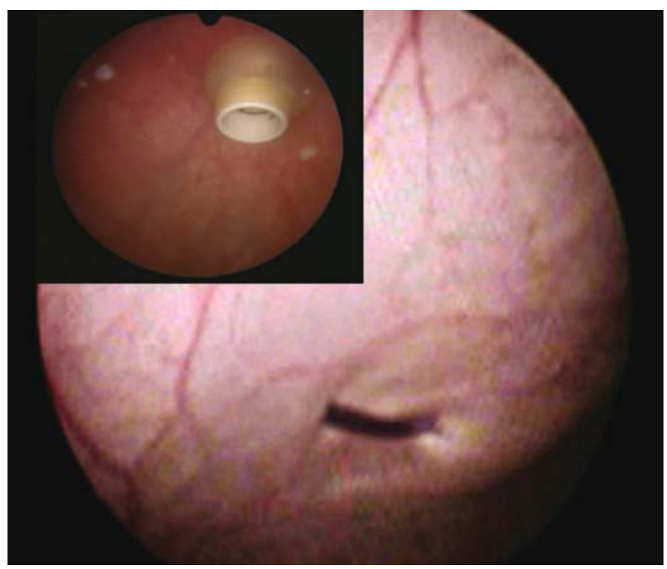
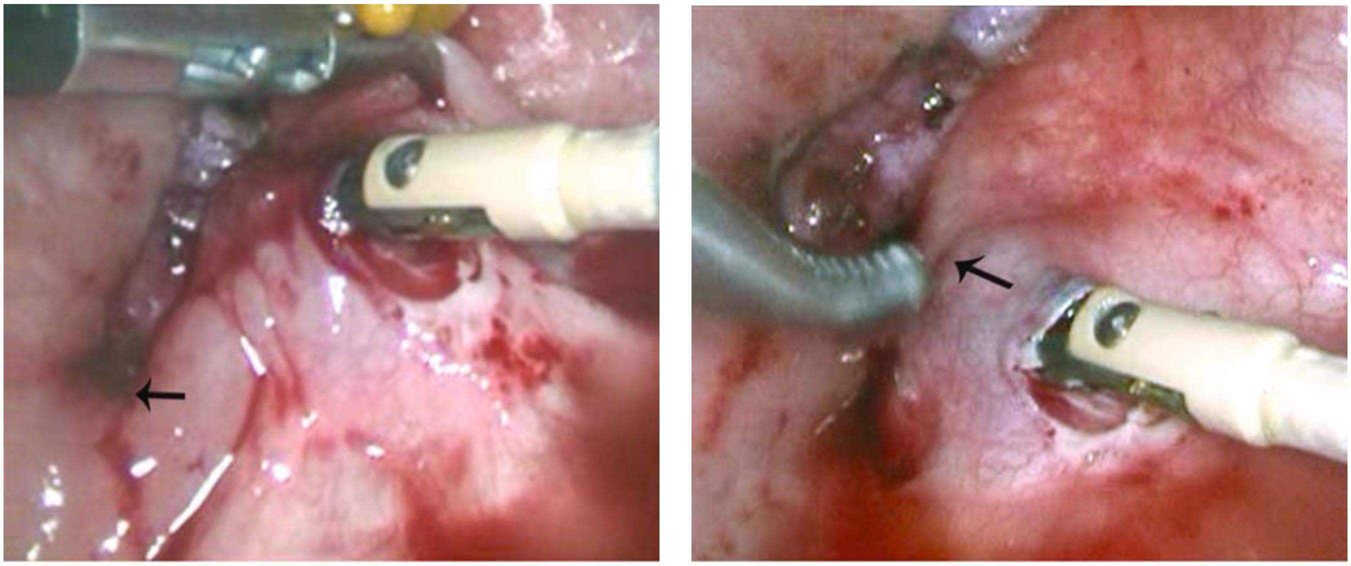


FIG. 13.52. Camera post slippage can be prevented by a stay suture taken through the dome of the bladder or by using a balloon-tip trocar (inset)



A B

Fig. 13.53. When the dissector is not in a desired direction while creating a submucosal tunnel, a roticulating dissector is helpful, as it can be easily rotated and a tunnel can be made in the desired direction

Bladder Collapse Due to Perivesical Emphysema

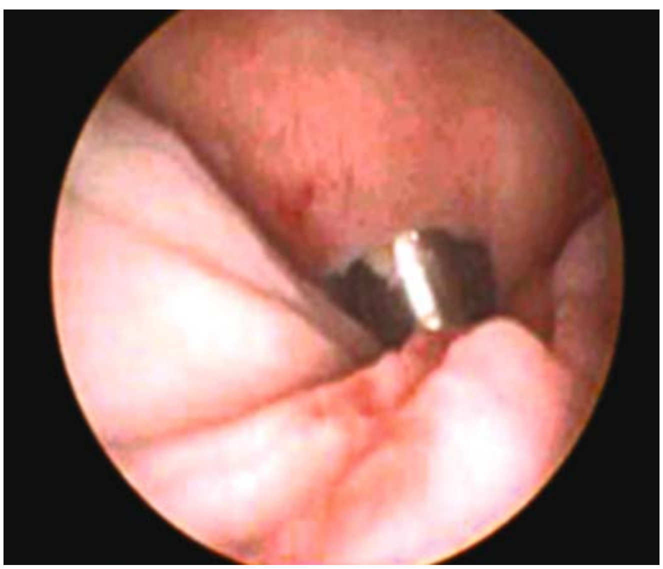


Fig. 13.54. Collapse of the bladder (due to escape of air) may result in slippage of the trocar

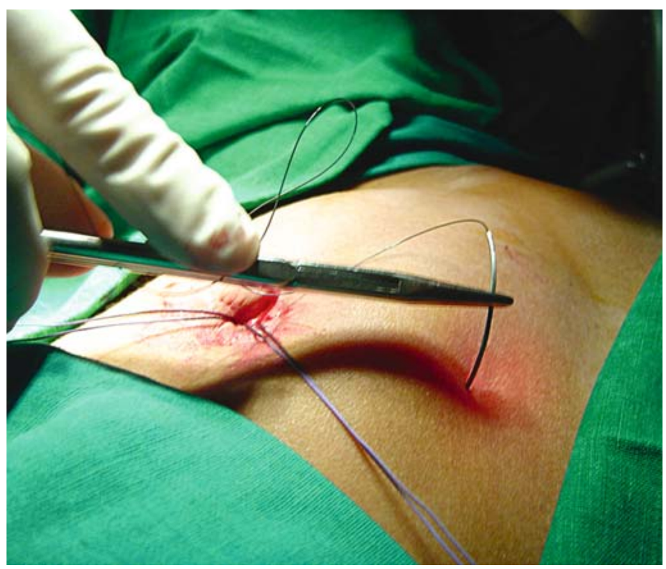


Fig. 13.55. Prevention of collapse of the bladder with a stay (1 Ethilon) taken through the dome and anterolateral wall of the bladder

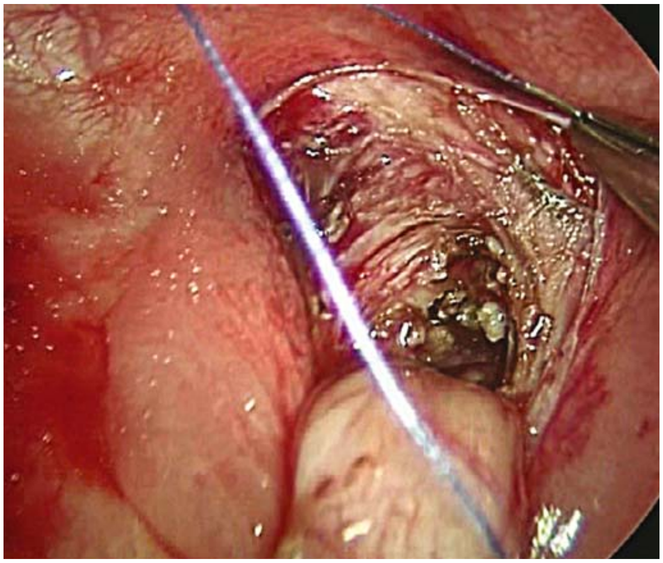


FIG. 13.56. Gas leak through the hiatus (which can result in perivesical emphysema and collapsing of bladder)

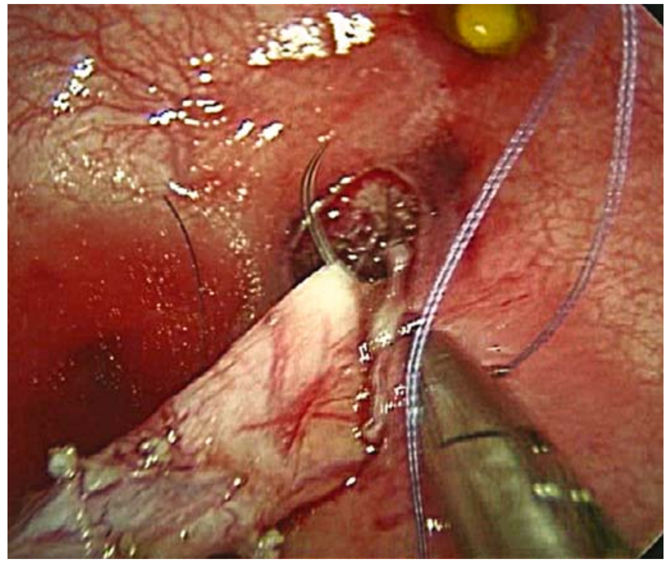


FIG. 13.57. Adequate closure of the hiatus prevents this leak

Accumulation of Blood-Stained Urine in the Operative Area Obscuring Clarity

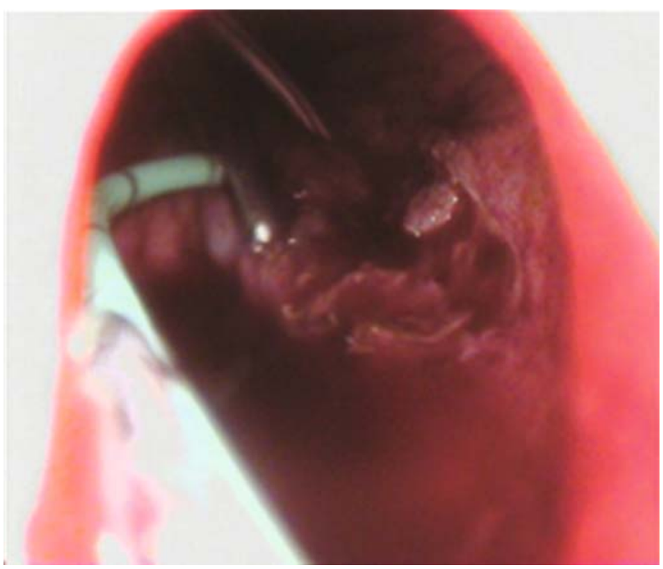


FIG. 13.58. Accumulation of blood-stained urine preventing progress of surgery (as seen by cystoscopy)

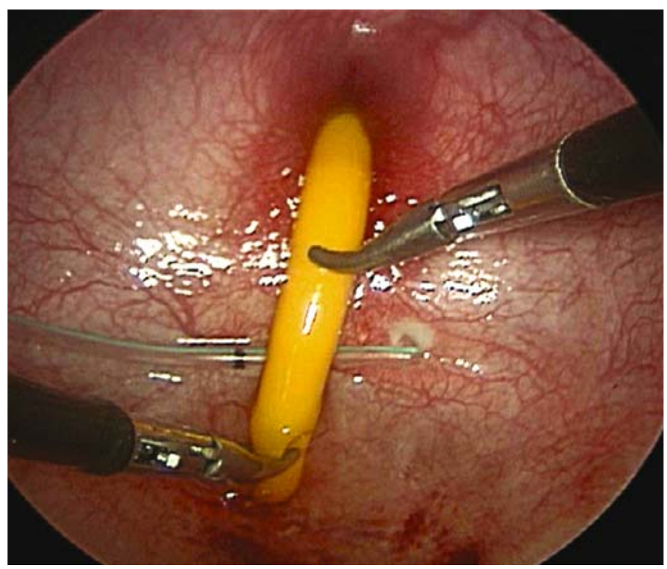


FIG. 13.59. Accumulated urine sucked out through a Foley catheter placed per urethrally

Laparoscopic Ureteric Reimplantation in Primary Obstructive Megaureter

Transperitoneal Lich Gregoir's Technique (Tailored)

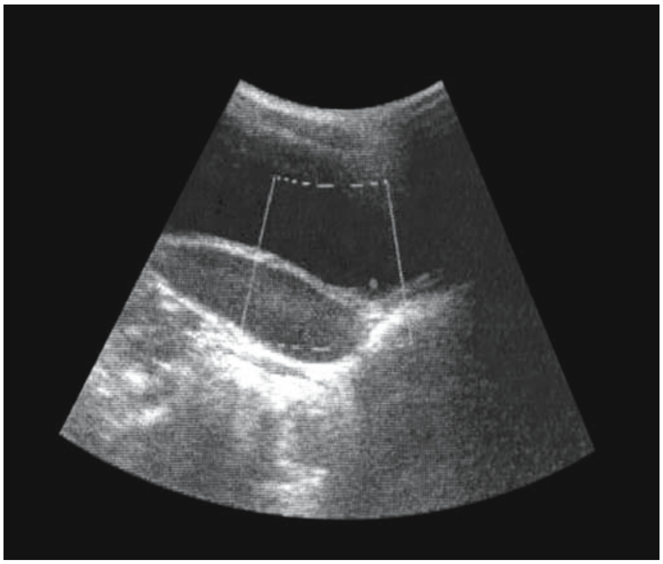


Fig. 13.60. Ultrasound scan shows conical narrowing of the left lower ureter in a 2-year-old child

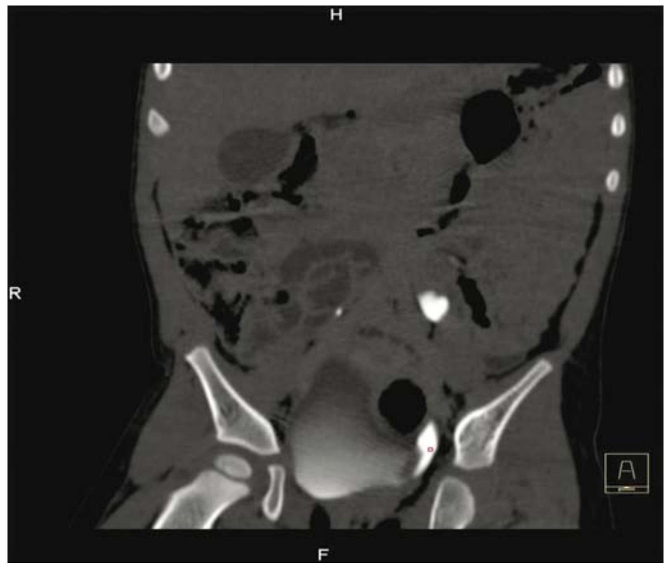


Fig. 13.61. A computed tomography (CT) scan shows an obstruction at the juxtahiatal left ureter

Fig. 13.62. The port positions for ureteric reimplantation

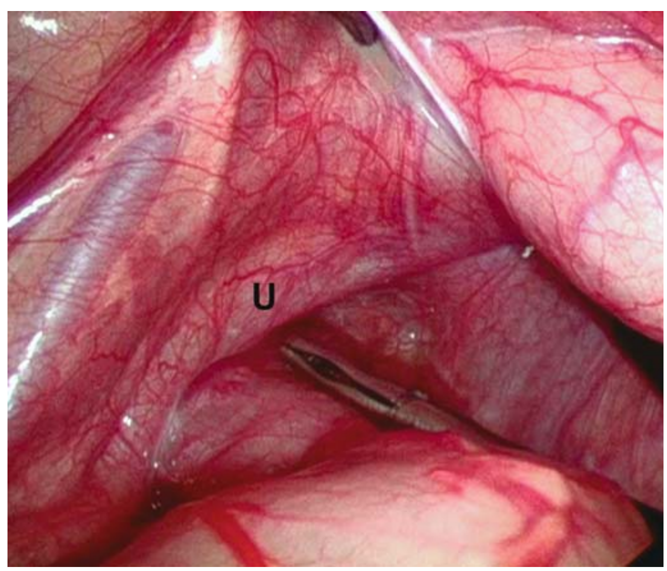


Fig. 13.63. Initial view shows a dilated left lower ureter (U, ureter)

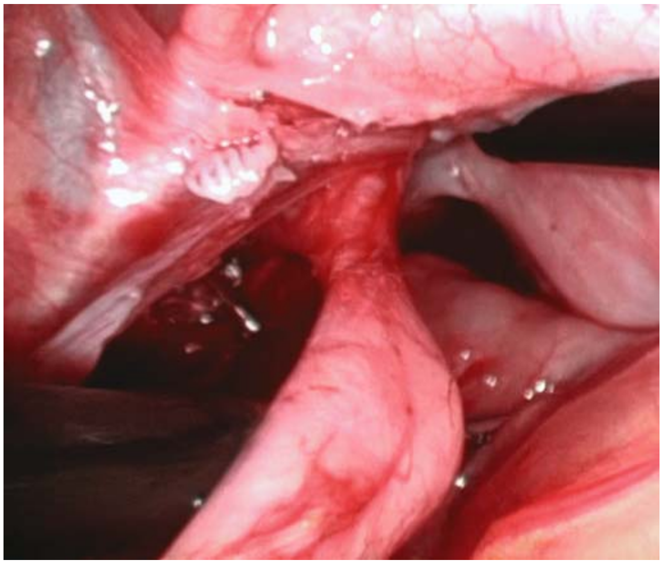


Fig. 13.64. Conical tapering of mobilized lower ureter

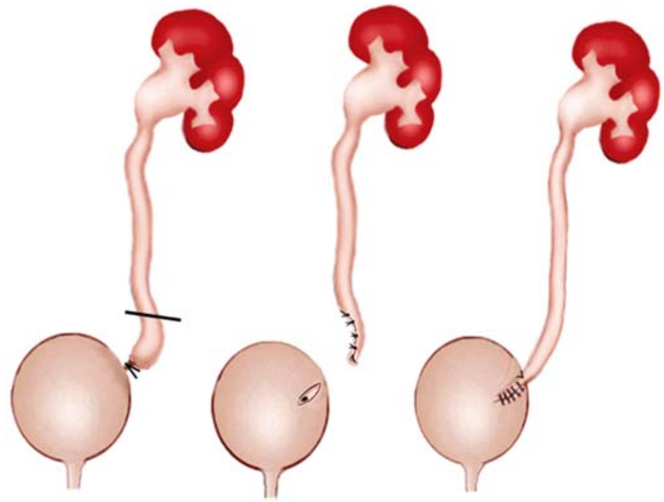


Fig. 13.65. Diagrammatic representation of the planned tailored reimplantation

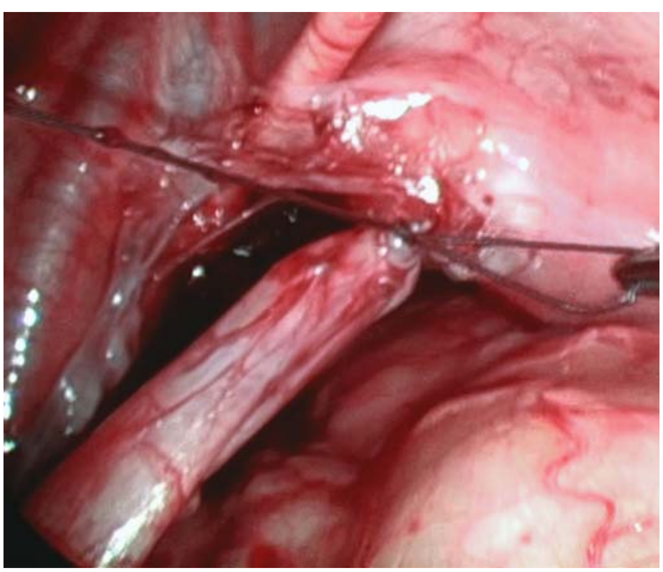


Fig. 13.66. Ligation of the ureter at the level of the hiatus

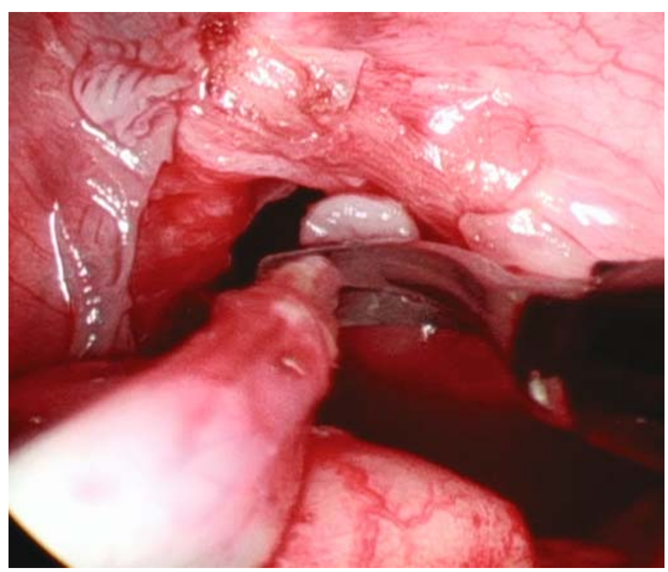


Fig. 13.67. Division of the ureter at the level of the hiatus

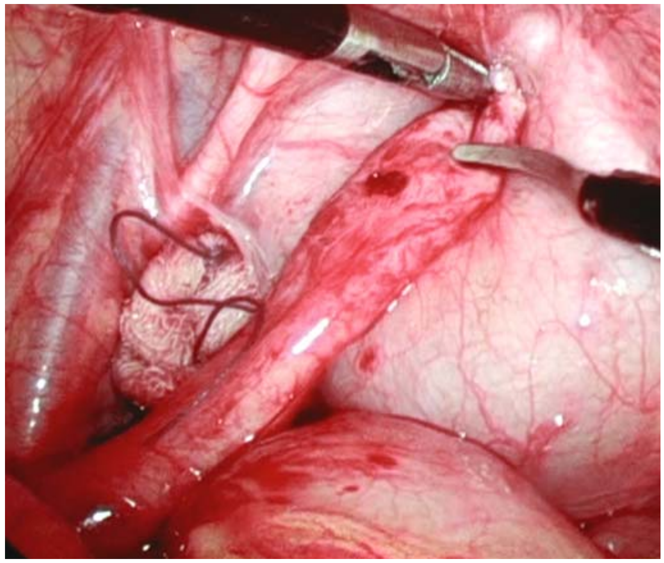
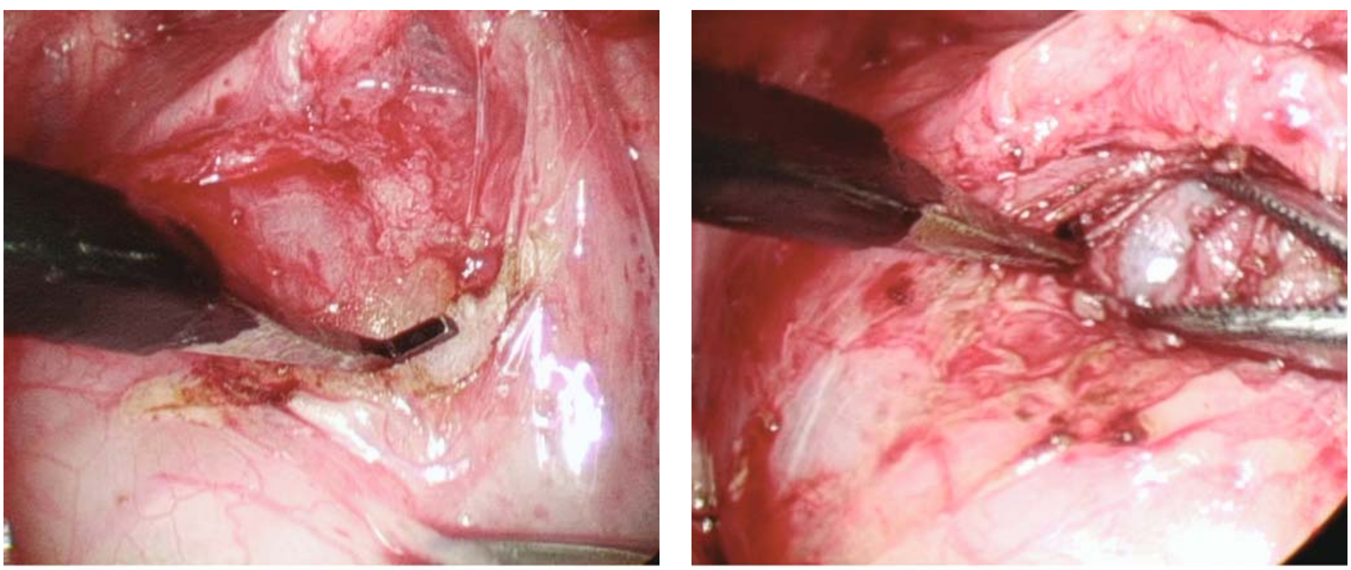


Fig. 13.68. Assessing the length and width of the ureter to decide the level of excision and tailoring



A B

Fig. 13.69. Detrusorotomy is performed until the mucosal bulge is seen

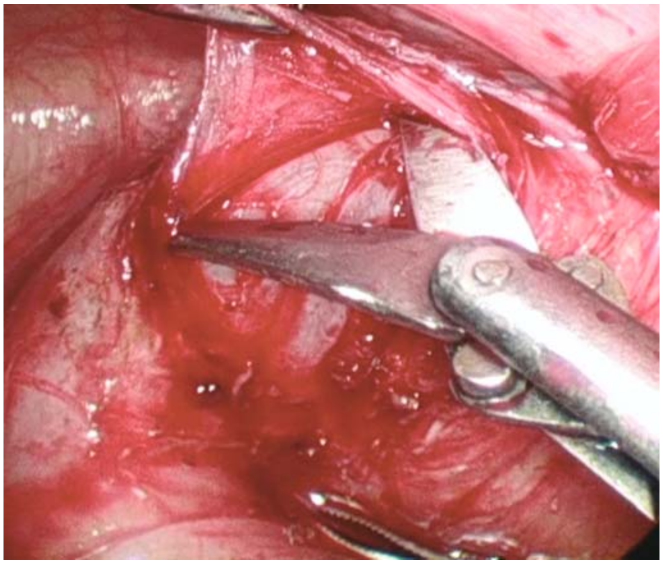


FIG. 13.70. Adequate mobilization of the detrusor for a good flap

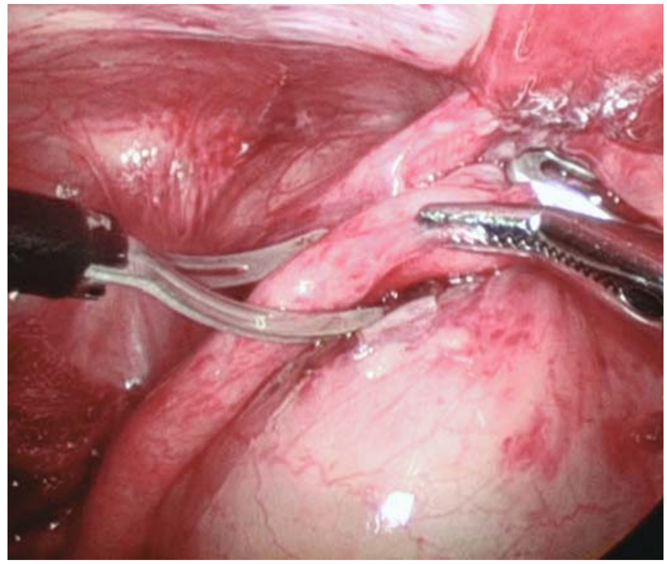
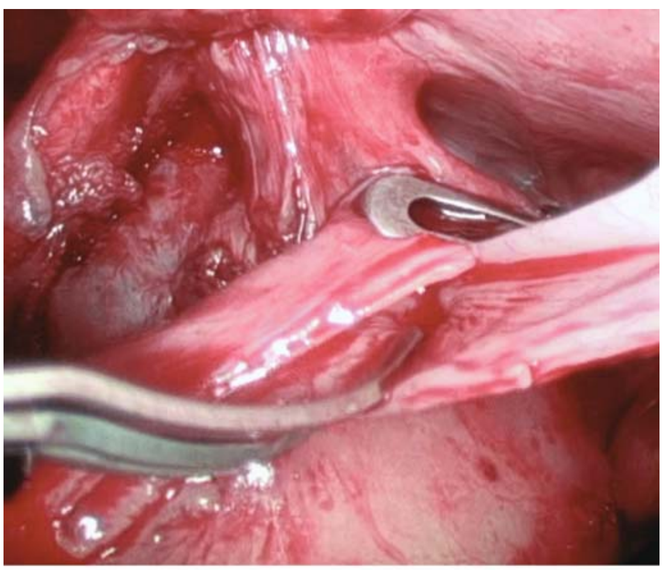
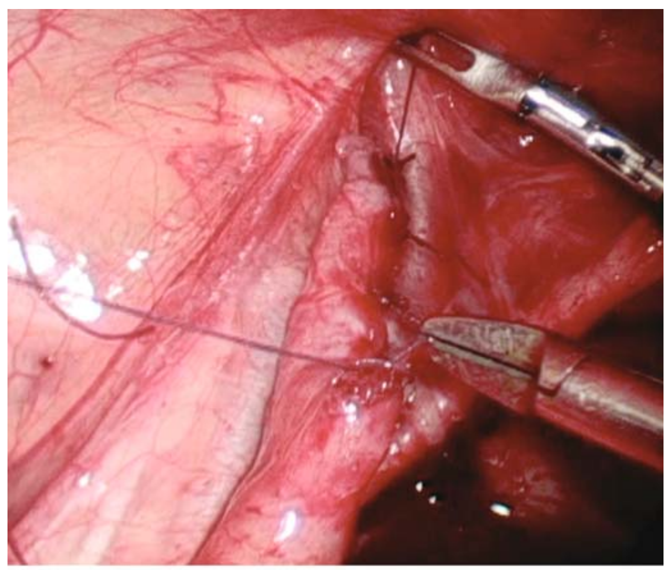


FIG. 13.71. Tailoring of the distal ureter

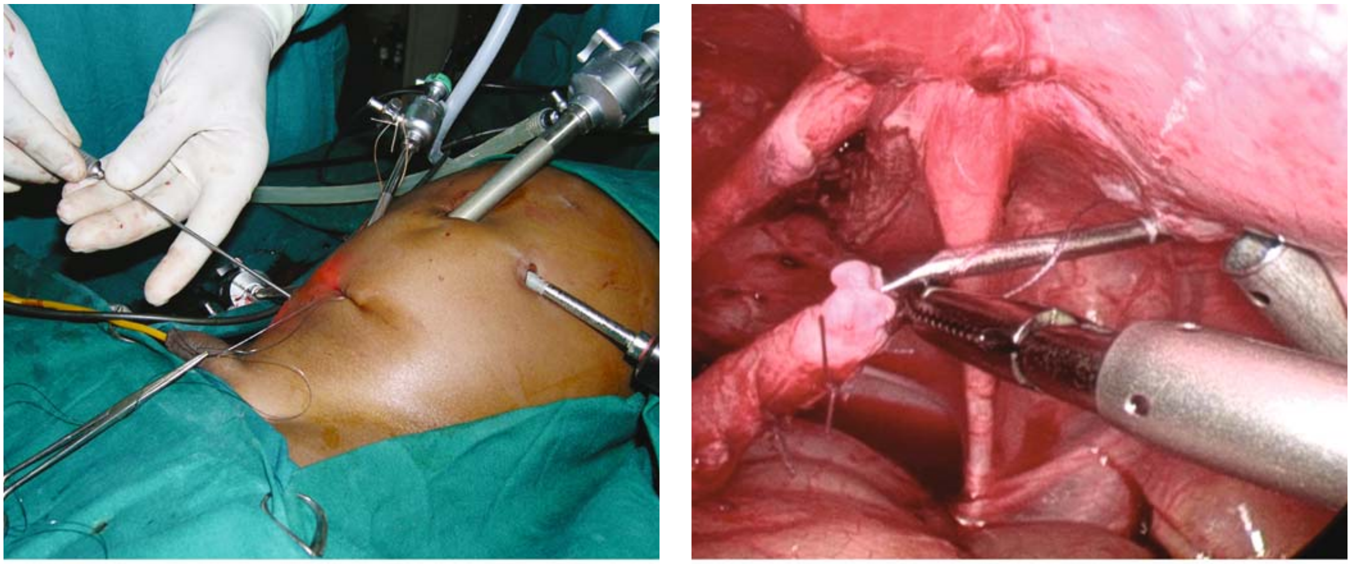


A



B

FIG. 13.72. The tailored distal ureter is sutured using interrupted 4-0 polyglactin suture



A B

Fig. 13.73. Retrograde stenting using a Veress needle as a port

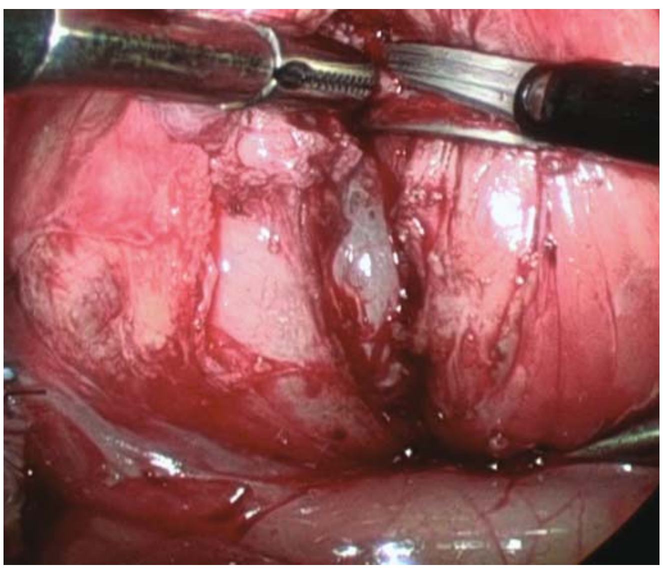


Fig. 13.74. Bladder mucosa opened at the medial end

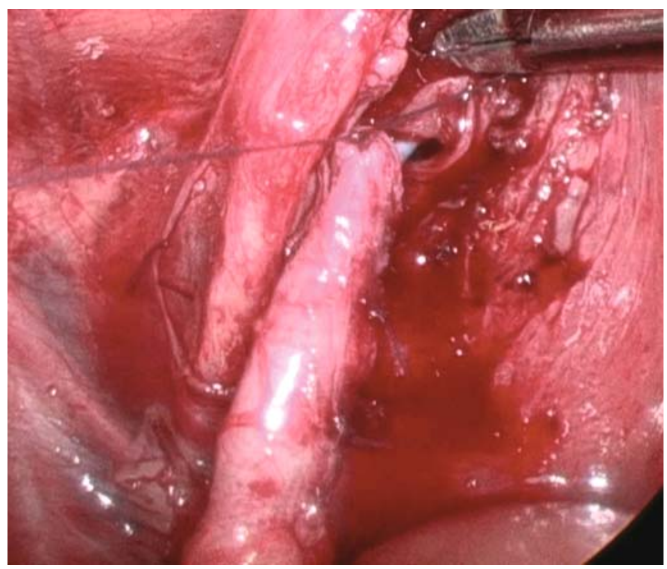
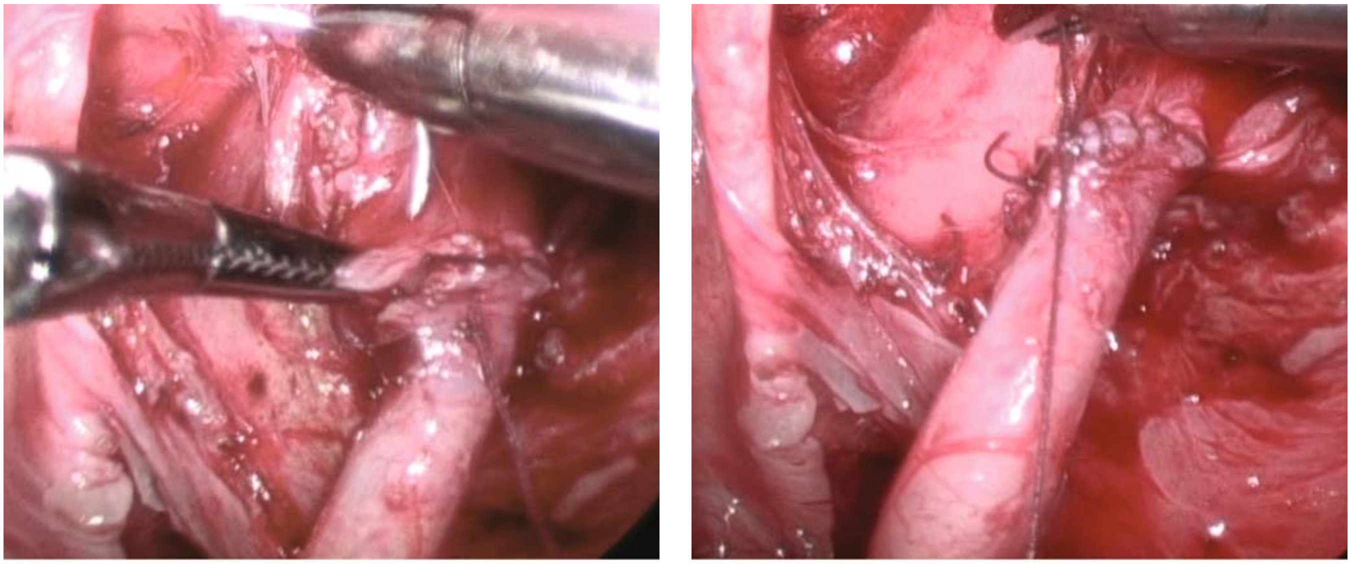


Fig. 13.75. Initial suture of the spatulated ureter to the bladder mucosal edge using 4-0 polyglactin suture



A B

FIG. 13.76. Ureterovesical suturing in progress

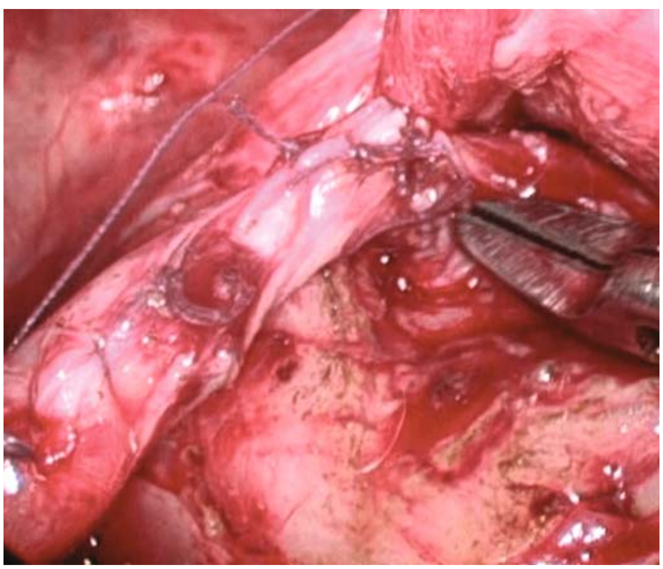


FIG. 13.77. View after completing the anastomosis

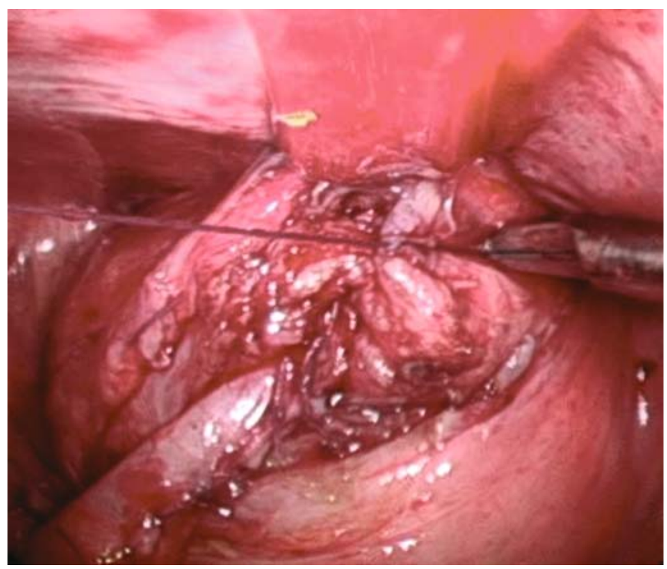
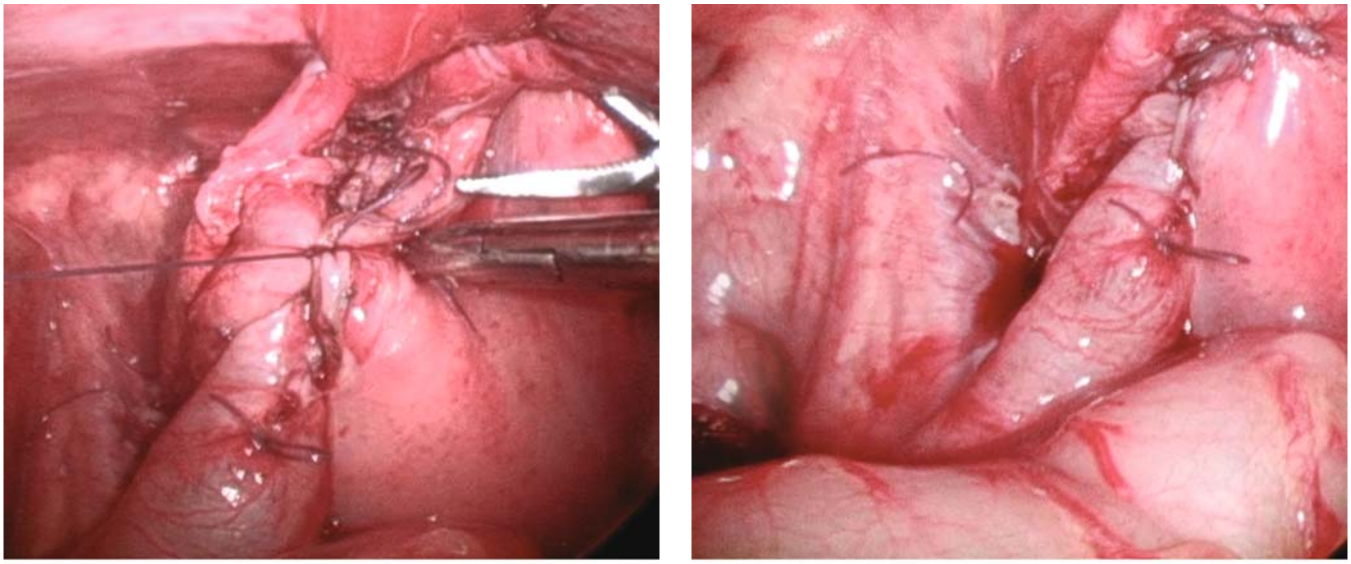


FIG. 13.78. Detrusor buttressing with 3-0 polyglactin over the terminal ureter



A B

Fig. 13.79. View after completing ureteric reimplantation

Fig. 13.80. A drain introduced through the flank port

Special Situation: Primary Obstructive Megaureter with Secondary Calculi

Transperitoneal Lich Gregoir's Technique and Stone Retrieval

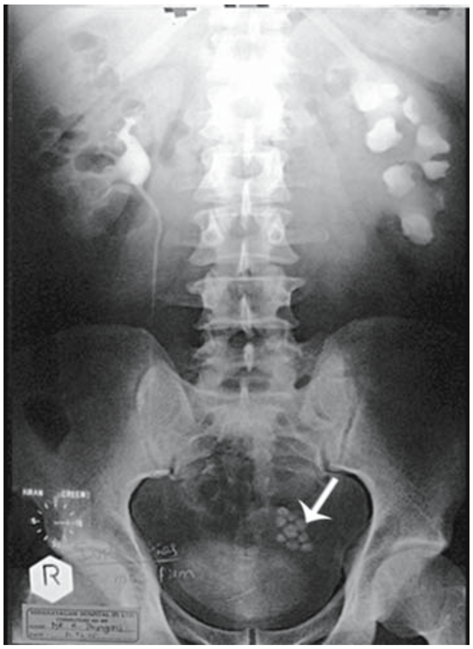


FIG. 13.81. An intravenous urogram (IVU) (15 minutes) shows multiple radiopaque shadows (arrow) at the ischial spine level on the left side

FIG. 13.82. Delayed IVU suggestive of primary obstructive megaureter (POM) with secondary calculi

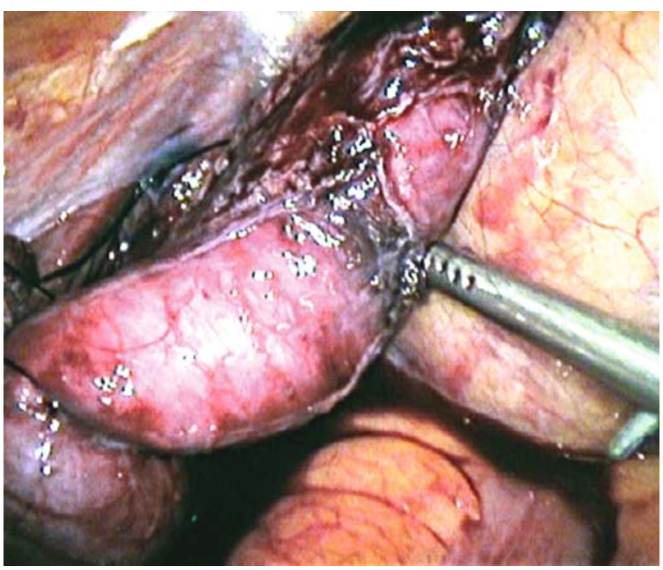


FIG. 13.83. Mobilized distal megaureter

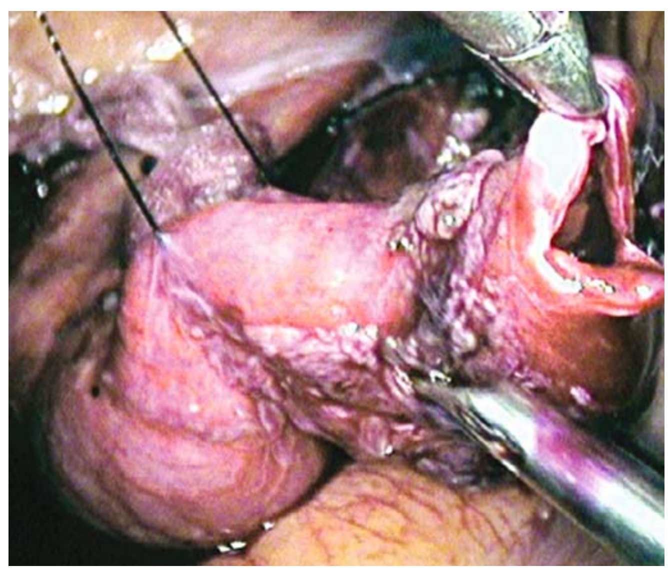


FIG. 13.84. Sling around midureter to prevent upward migration of calculi (patient is placed in the Trendelenburg position)

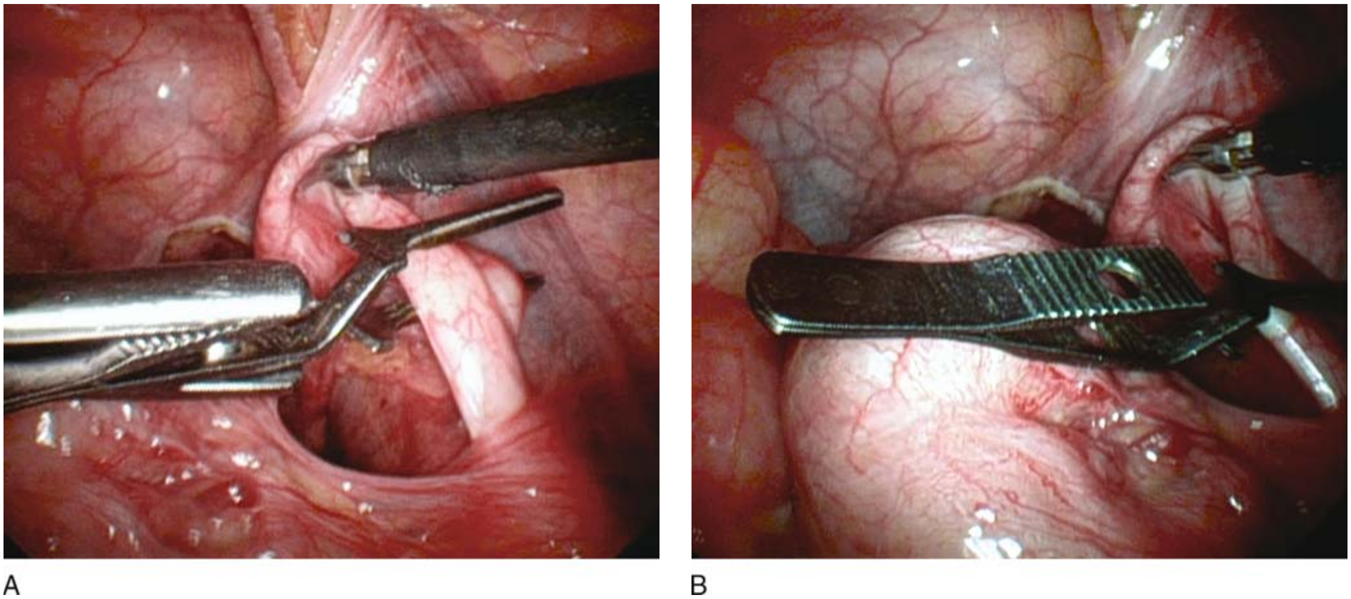


FIG. 13.85. Alternatively, an endo-bulldog clamp can be used to clamp the ureter to prevent stone migration

FIG. 13.86. In case the stone migrates upward, flexible cystoscopy may be introduced through the flank port and then into the ureter to retrieve the calculi

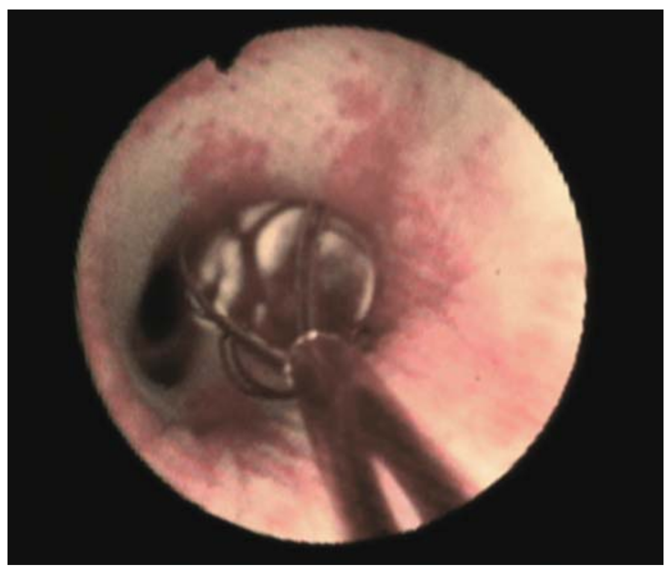


FIG. 13.87. Flexible cystoscopy: endoview of stone basketing

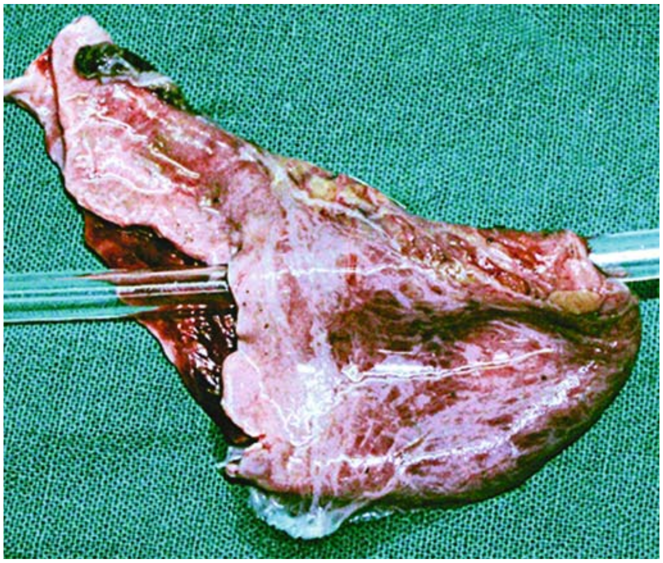


Fig. 13.88. Excised segment

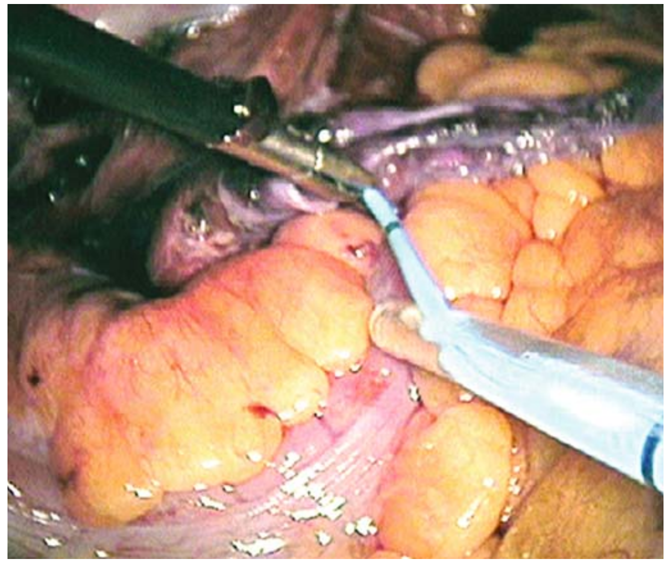


Fig. 13.89. Insertion of the stent through the right pararectus port

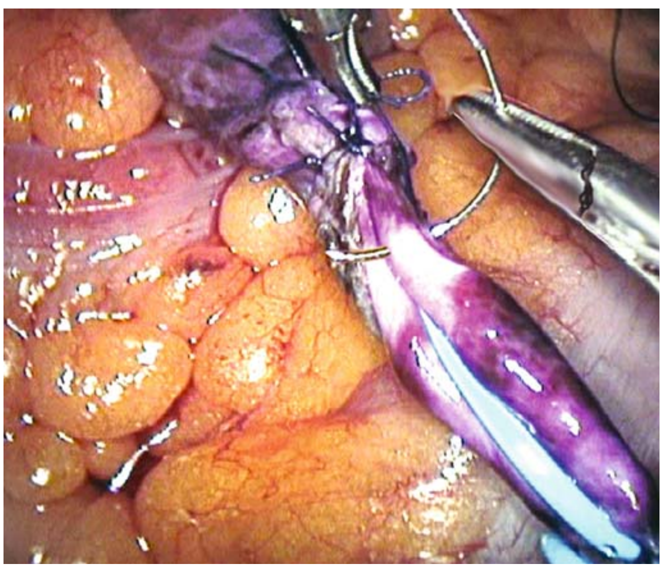


Fig. 13.90. Tapering the distal ureter with continuous 4-0 Vicryl suture

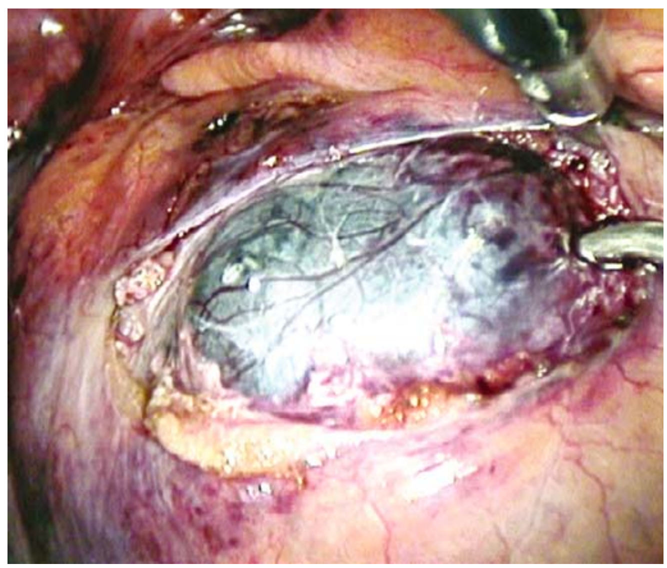
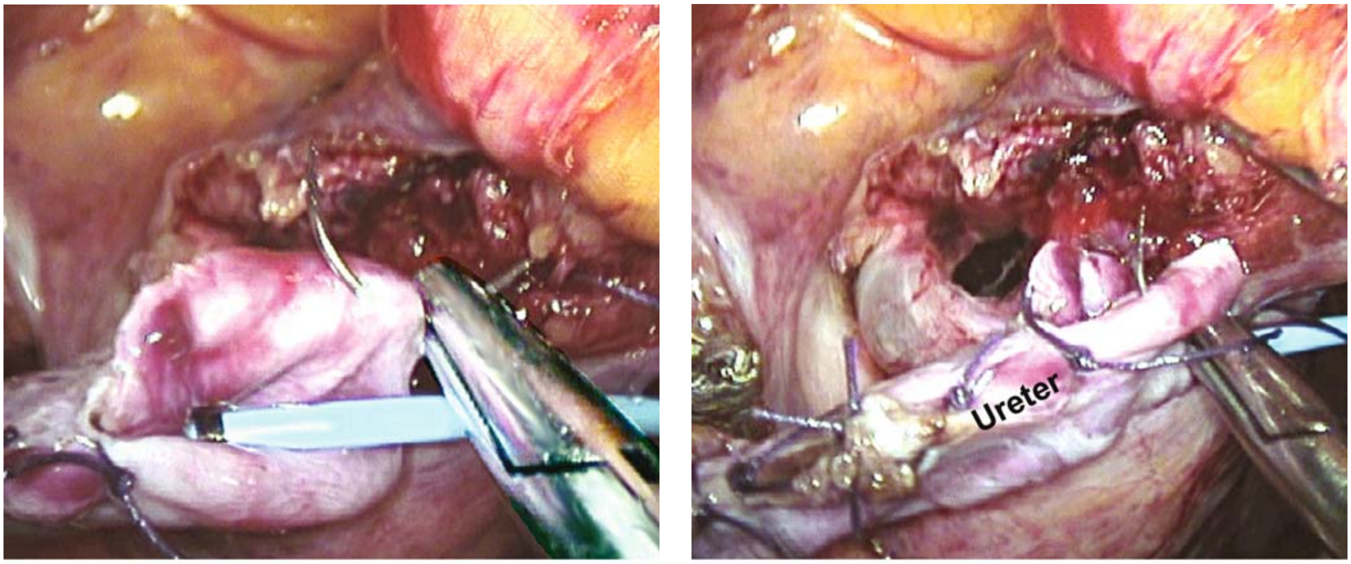


Fig. 13.91. The detrusorotomy completed



A B

Fig. 13.92. Ureter to bladder mucosal suturing in progress

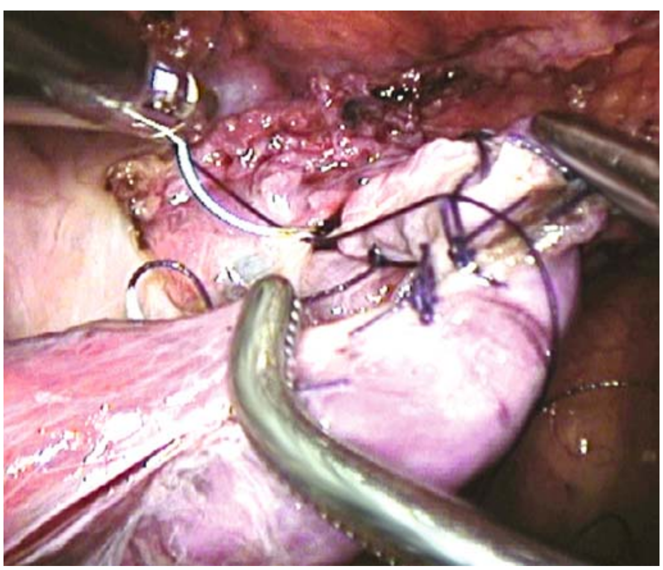


Fig. 13.93. Suturing of the lateral layer

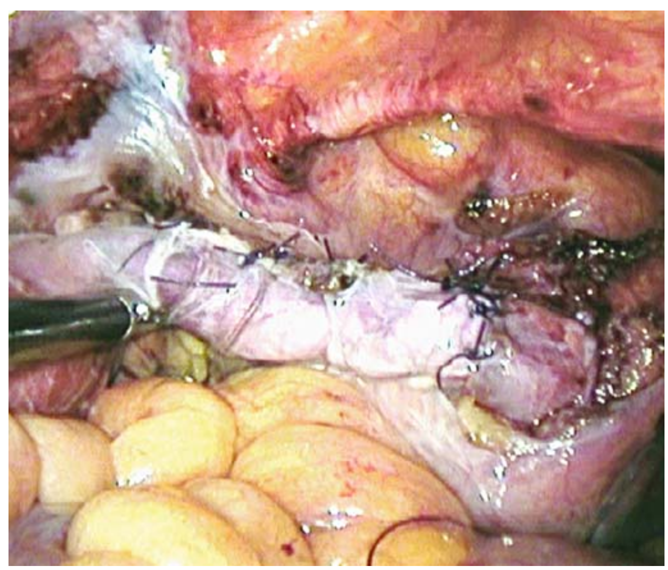


Fig. 13.94. View after completion of the anastomosis

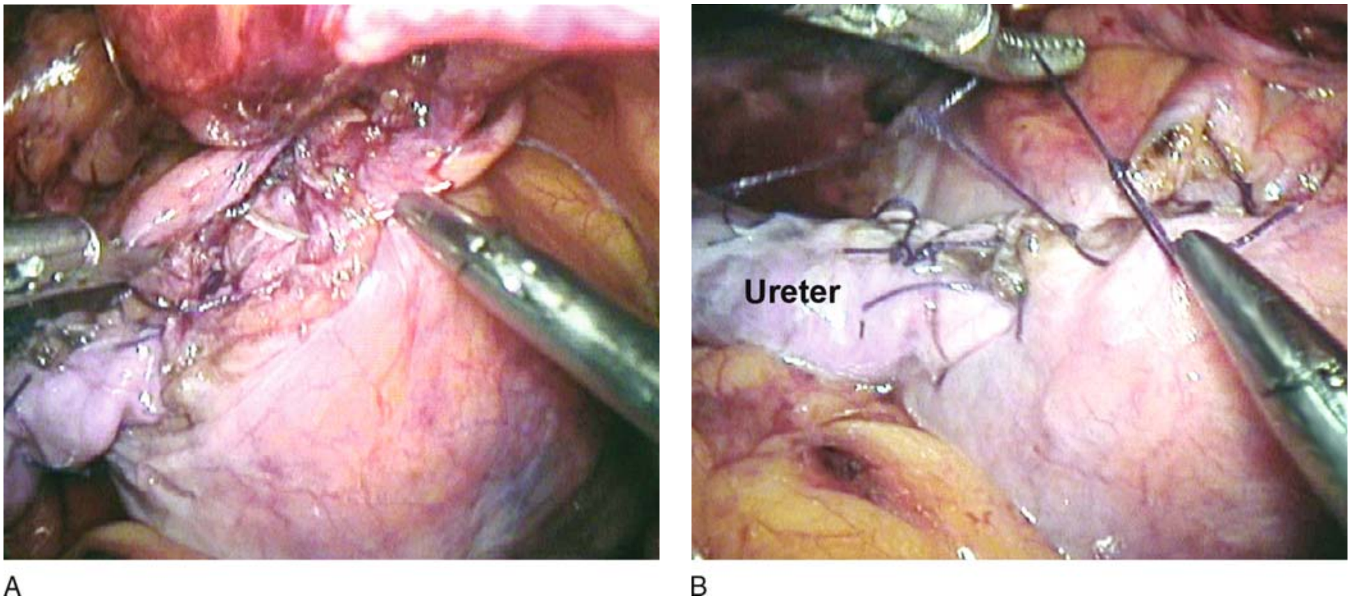


Fig. 13.95. Detrusor closure

Ureterovaginal Fistula: Ureteric Reimplantation (Lich Gregoir's, Nontailored)

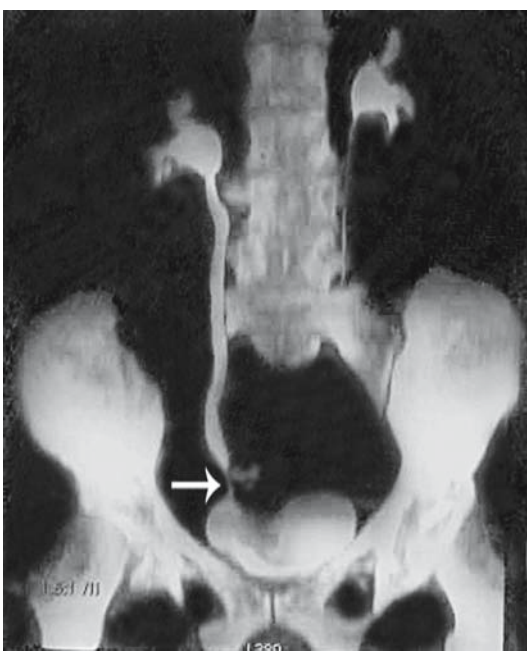


Fig. 13.96. An IVU in a posthysterectomy patient shows a urinary leak (extravasation at the right lower ureter [arrow])

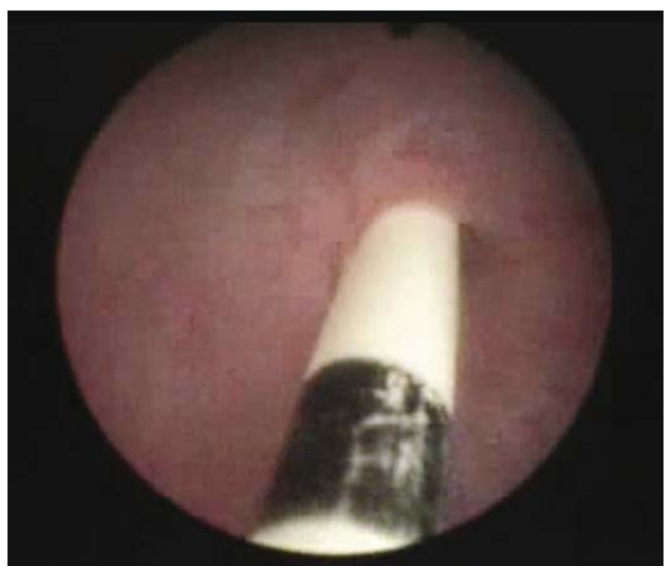


Fig. 13.97. Cystoscopy revealing intact bladder and ureteric orifice but admitting a ureteric catheter for about 3 cm only

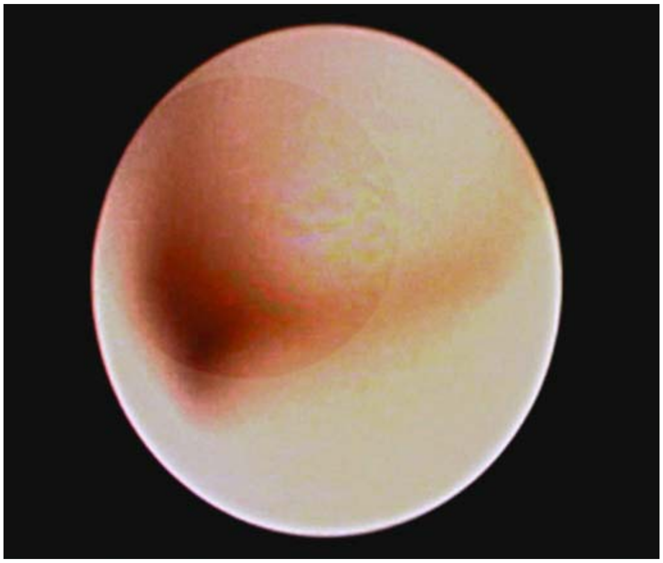


FIG. 13.98. Ureteroscopic view of the injured area, which is narrowed and pale

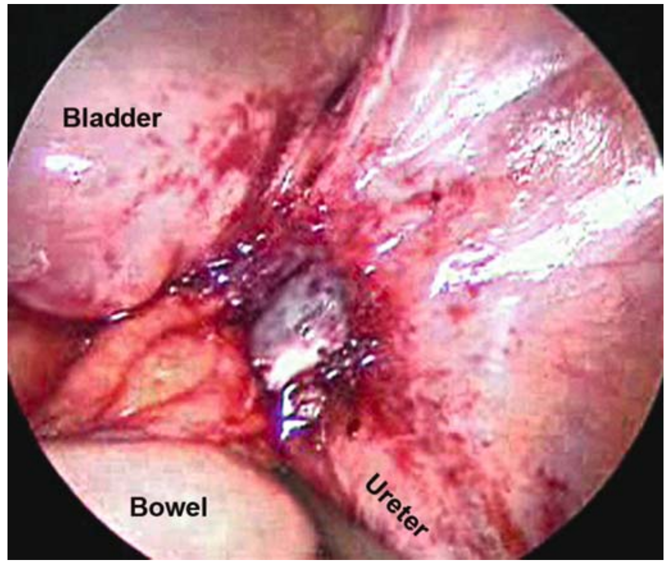


FIG. 13.99. Laparoscopic view of the site of ureteric injury

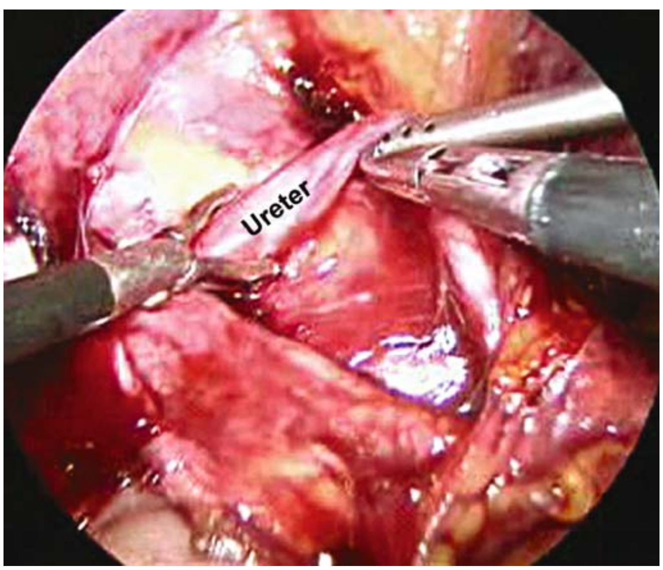


FIG. 13.100. Mobilization of the distal ureter as low as possible

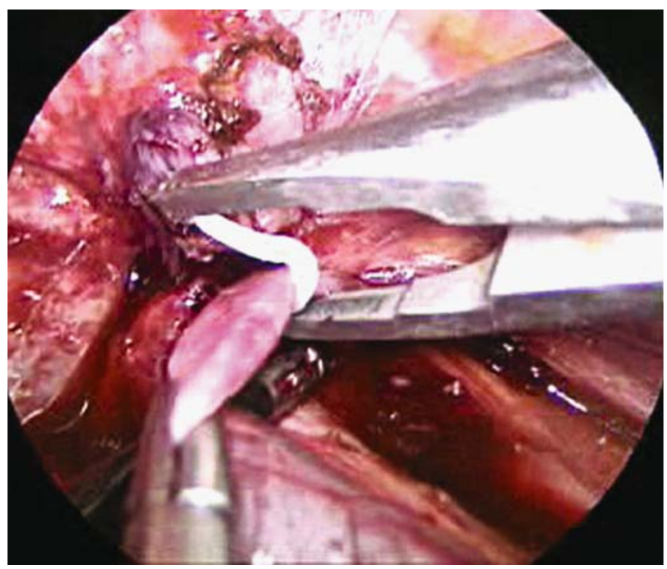


FIG. 13.101. Hem-o-Lok clip applied as distal as possible

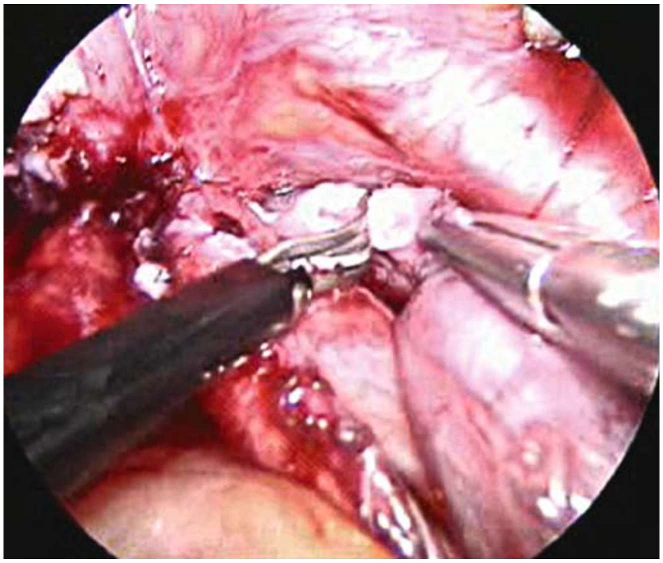


Fig. 13.102. Division of ureter just above the injured area

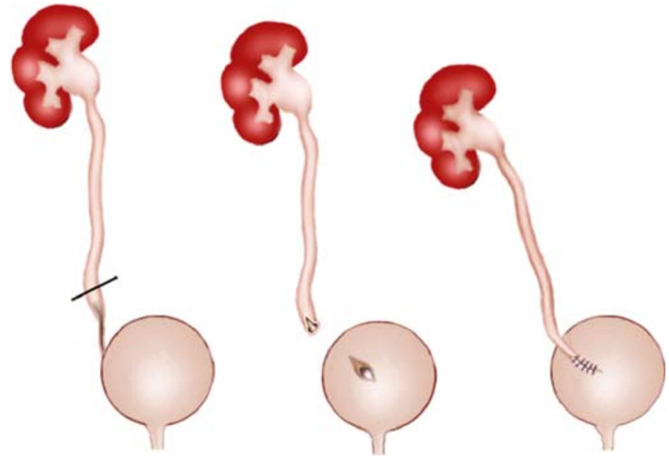


Fig. 13.103. Diagrammatic representation of the planned procedure

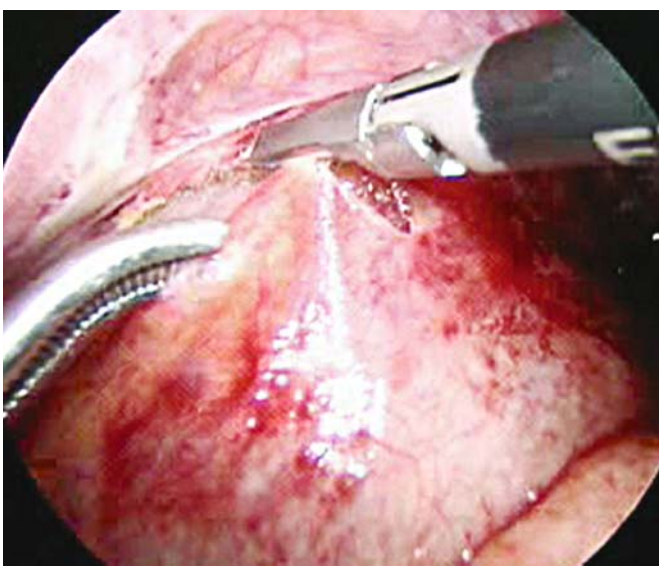


Fig. 13.104. Incising the detrusor on the anterolateral aspect of bladder (in preparation for extravesical reimplant)

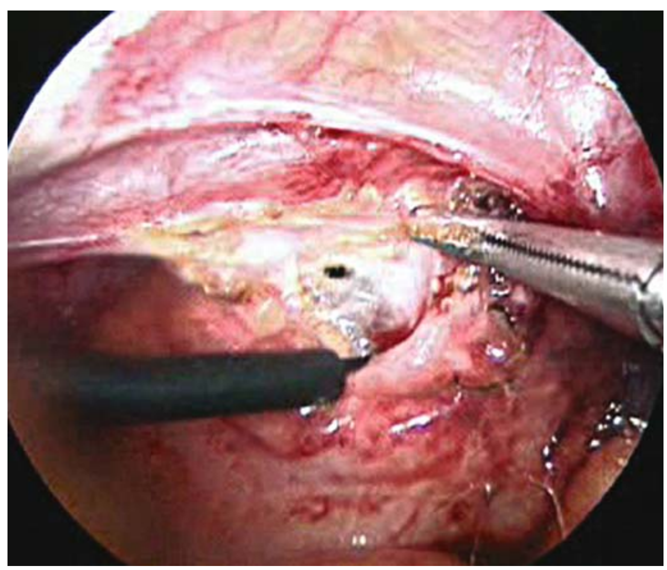


Fig. 13.105. Bladder mucosa incised on the medial aspect

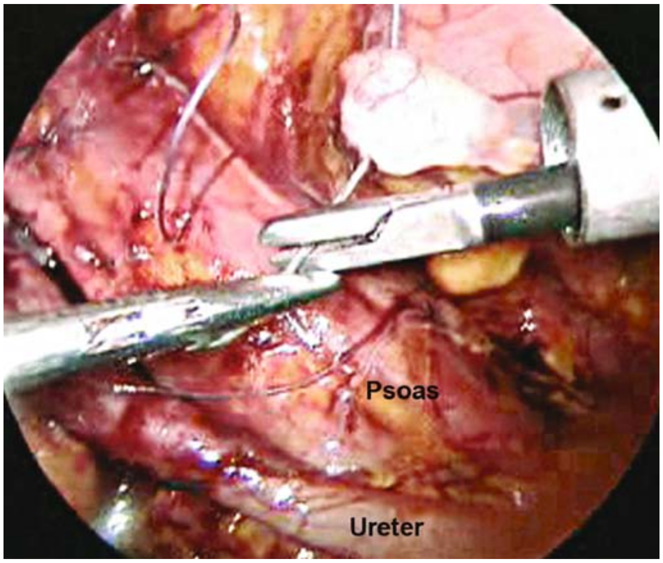


Fig. 13.106. Psoas hitch to reduce tension during subsequent uretero-vesical suturing

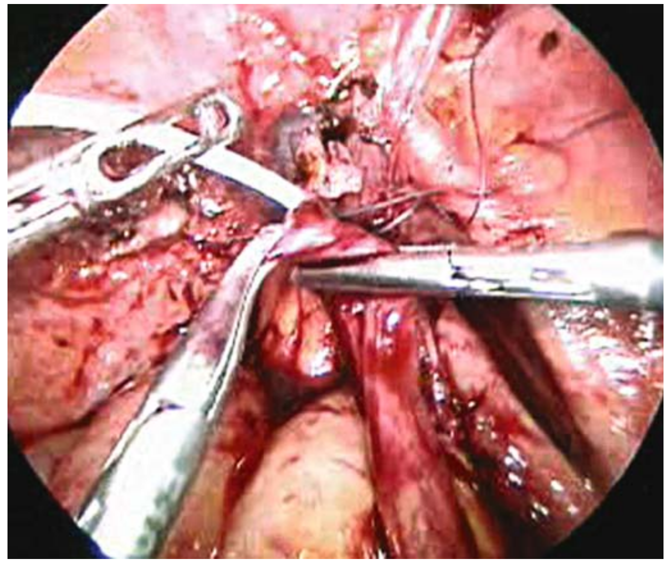


Fig. 13.107. Stent insertion through suprapubic port

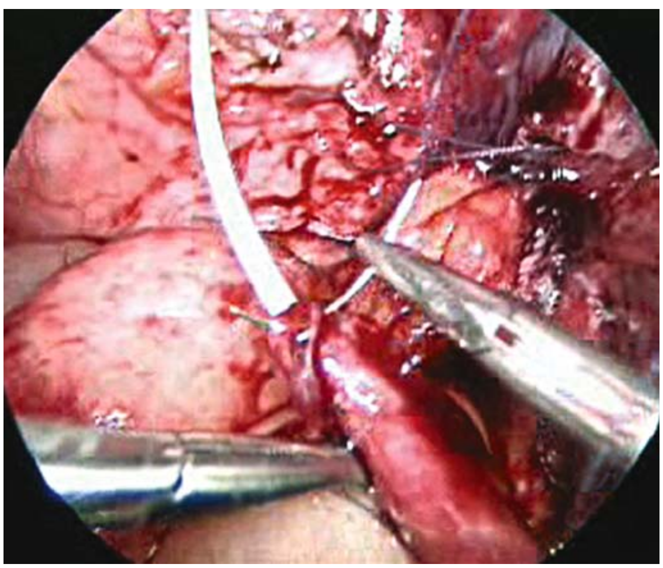


Fig. 13.108. Full-thickness ureteric suture taken outside-in with 4-0 Vicryl

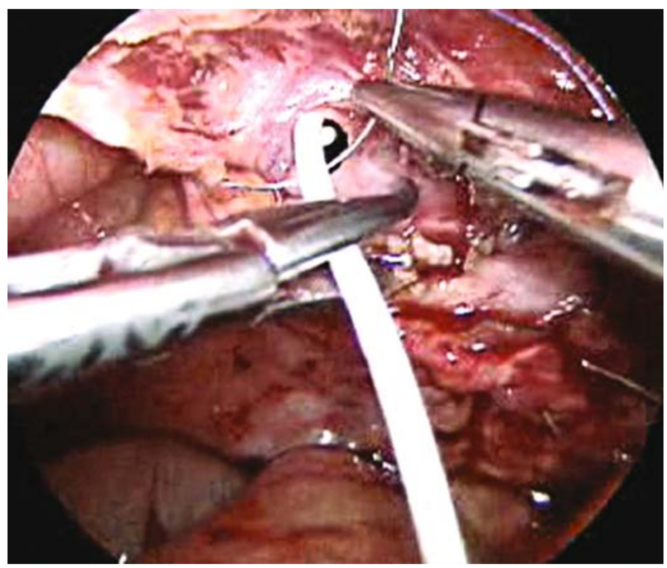


Fig. 13.109. Corresponding suture inside-out through the bladder mucosa

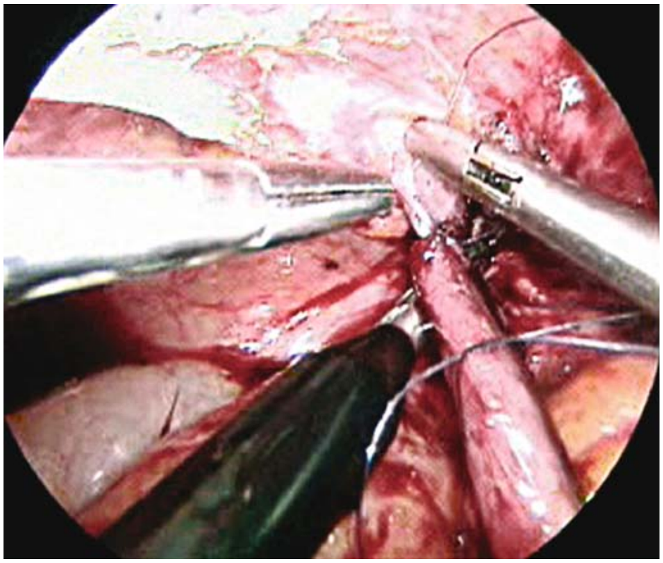


Fig. 13.110. With a few more interrupted sutures, the inner layer suturing is completed

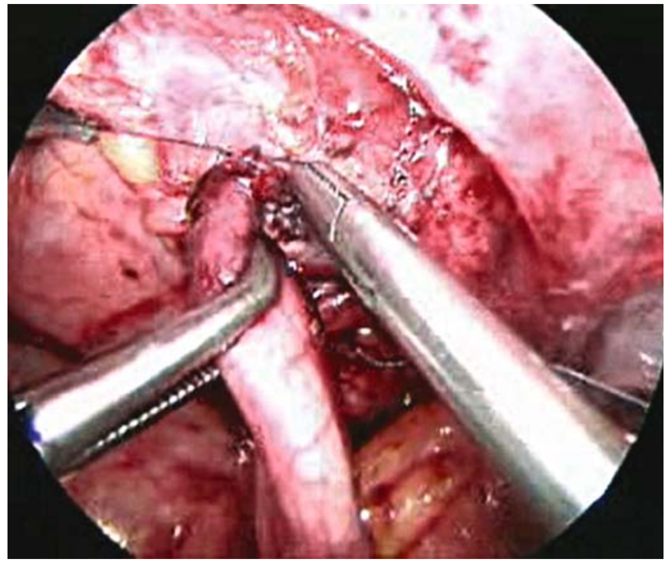


Fig. 13.111. Detrusor layer closure with interrupted 3-0 Vicryl suture; note the dissector inserted from the left flank port steadies the ureter

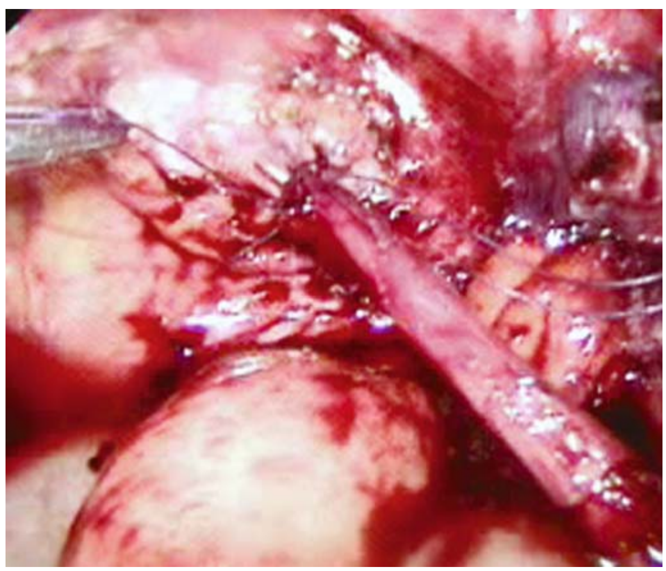


Fig. 13.112. View of ureteric reimplantation

Lower Ureteric Stricture: Reimplantation with Psoas Hitch

FIG. 13.113. A retrograde pyelogram (RGP) shows a narrowed right lower ureter

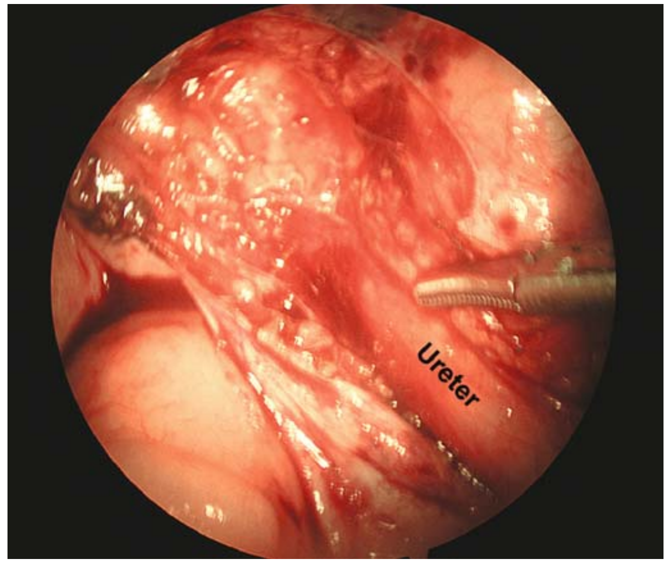


FIG. 13.114. Initial view of the strictured right lower ureter

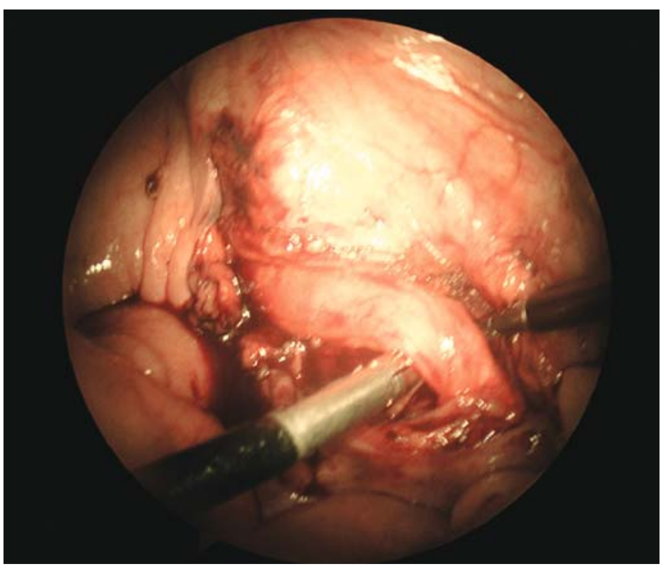


FIG. 13.115. Right lower ureter mobilized

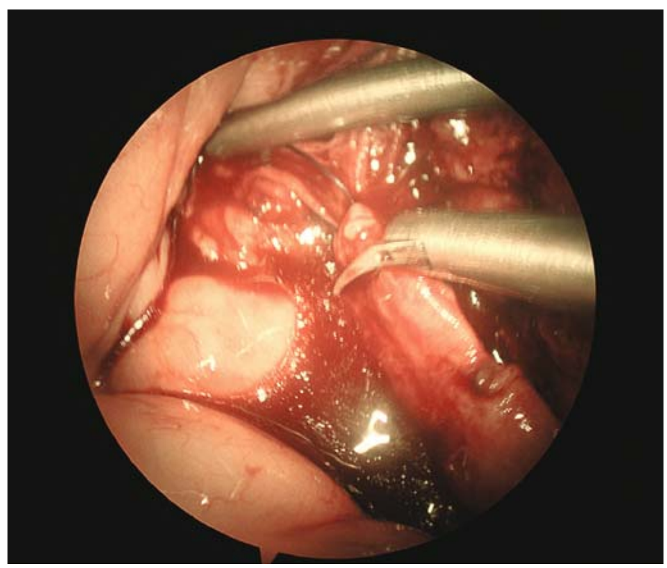


FIG. 13.116. Division at the juxtahiatal level

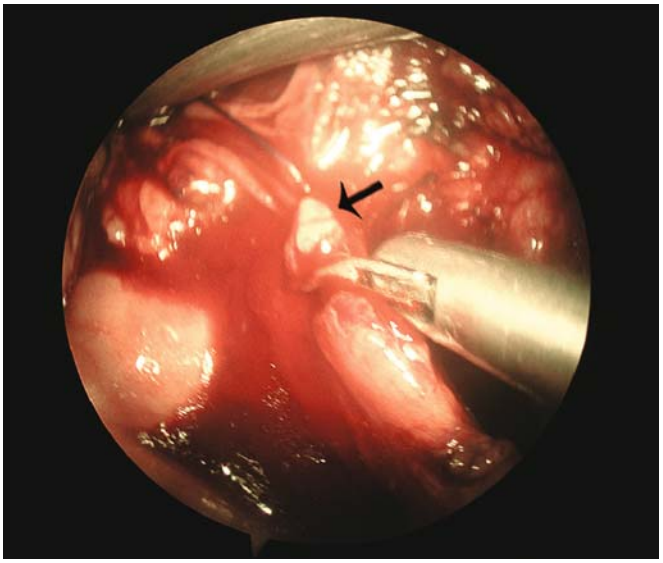


FIG. 13.117. Cut end (arrow) of the juxtahiatal ureter

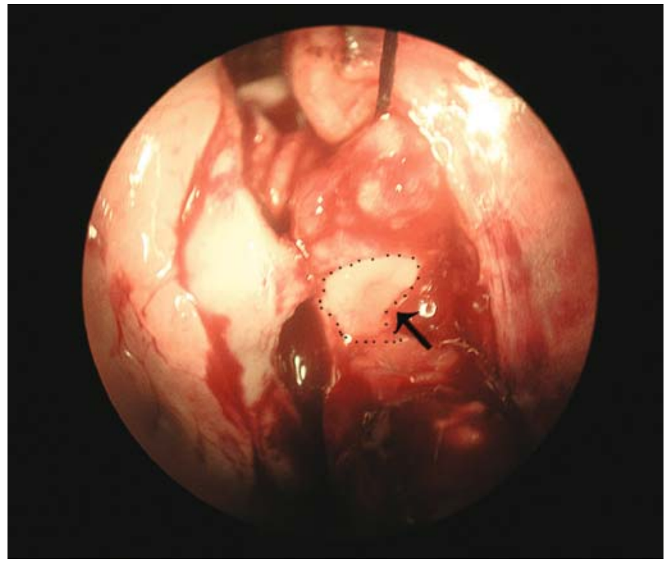


FIG. 13.118. Proximal end (arrow) of the ureter is spatulated

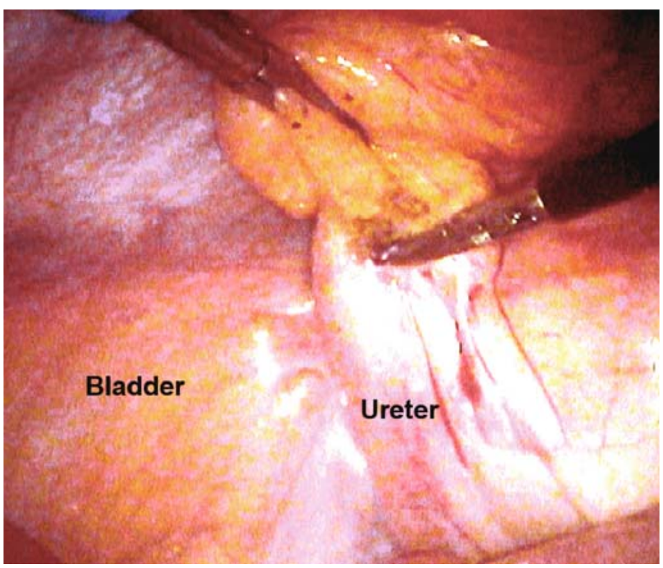


FIG. 13.119. Assessing a suitable area for tension-free ureteric reimplantation after distending the bladder

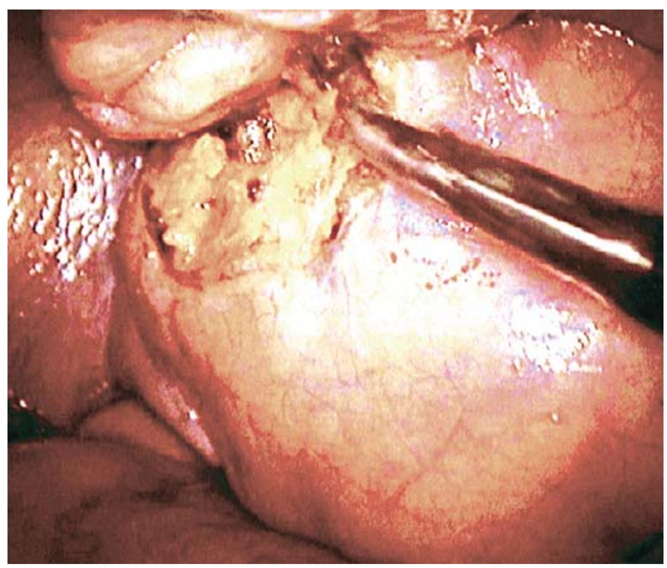


FIG. 13.120. Mobilizing the bladder on the contralateral side

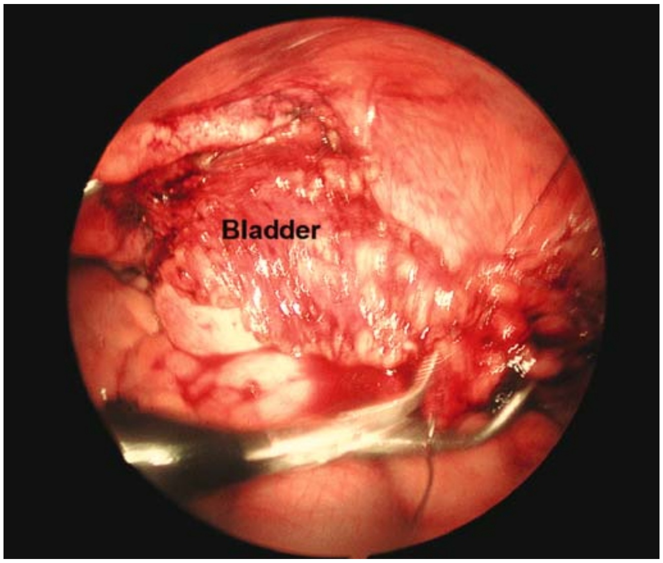


FIG. 13.121. The mobilized bladder being pulled on to the right side in preparation for the psoas hitch

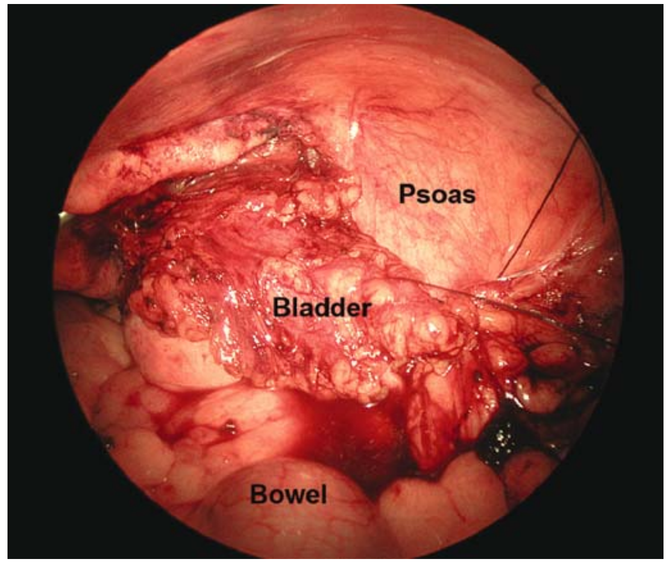


FIG. 13.122. The bladder anchored to the psoas muscle using 2-0 Vicryl

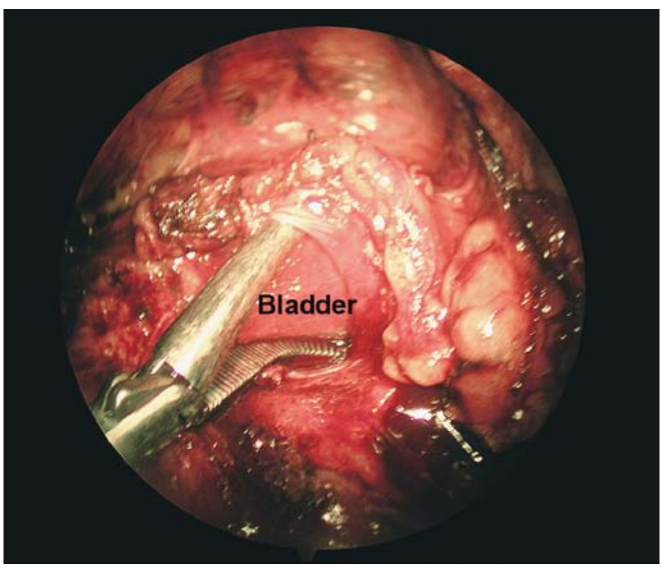


FIG. 13.123. The bladder mucosa being dissected off with a right-angle dissector after detrusorotomy

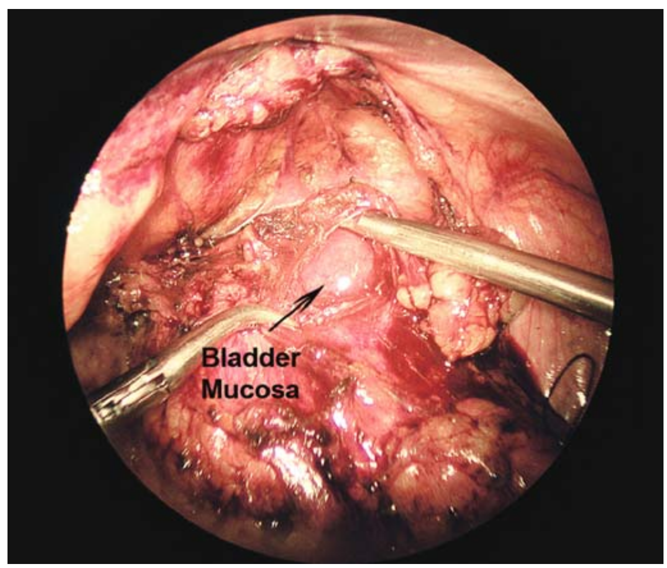


FIG. 13.124. The bladder mucosa seen bulging

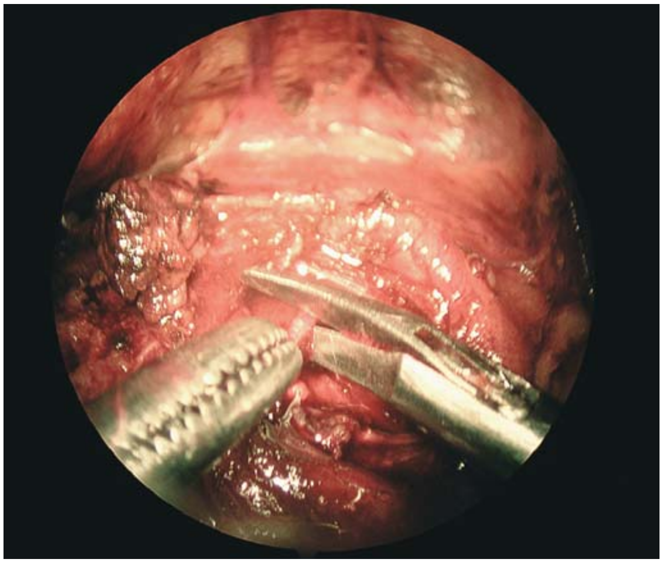


Fig. 13.125. Incising the bladder mucosa

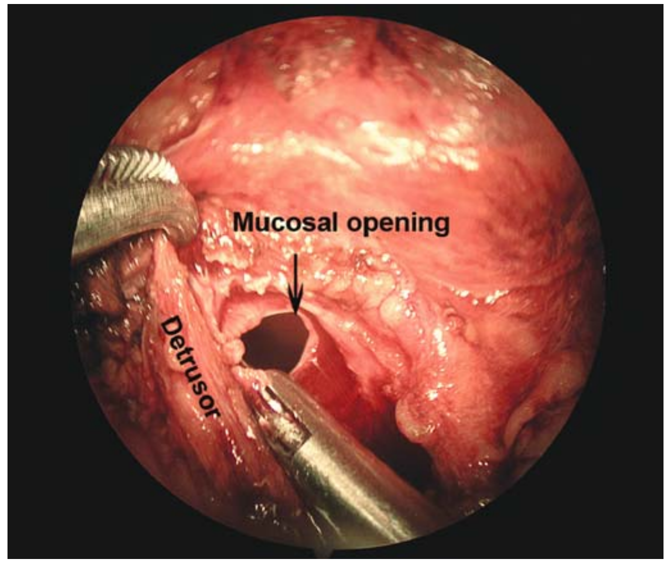
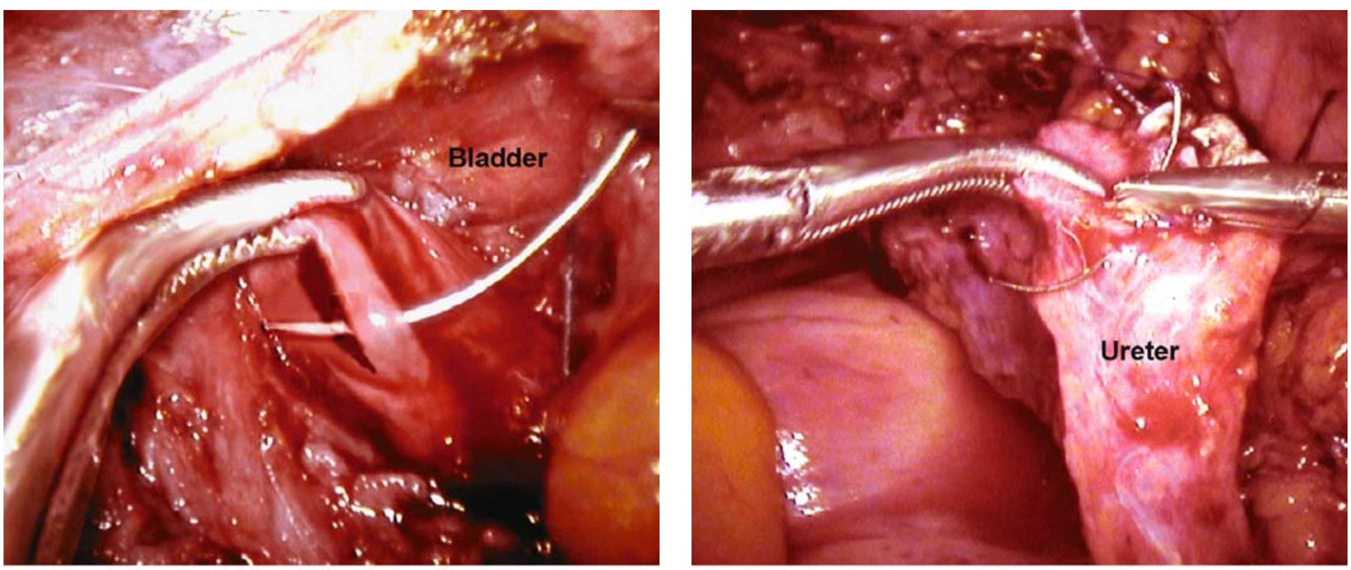


Fig. 13.126. Adequately incised bladder mucosa



A B

Fig. 13.127. Ureterovesical anastomosis in progress

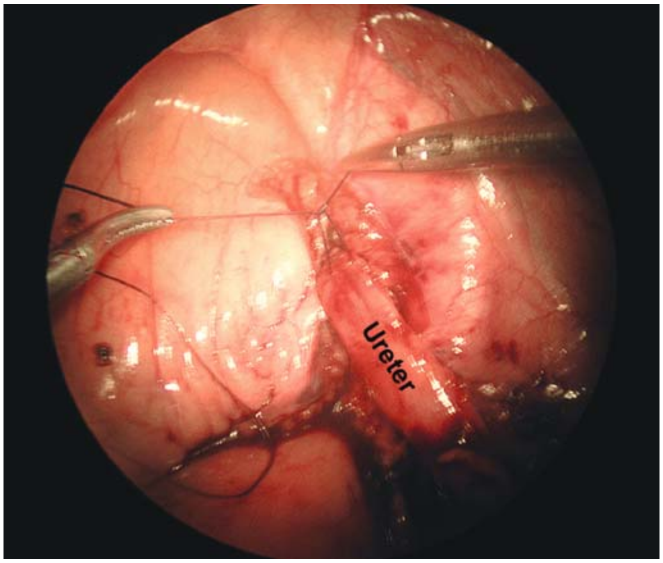


FIG. 13.128. Detrusor buttressing

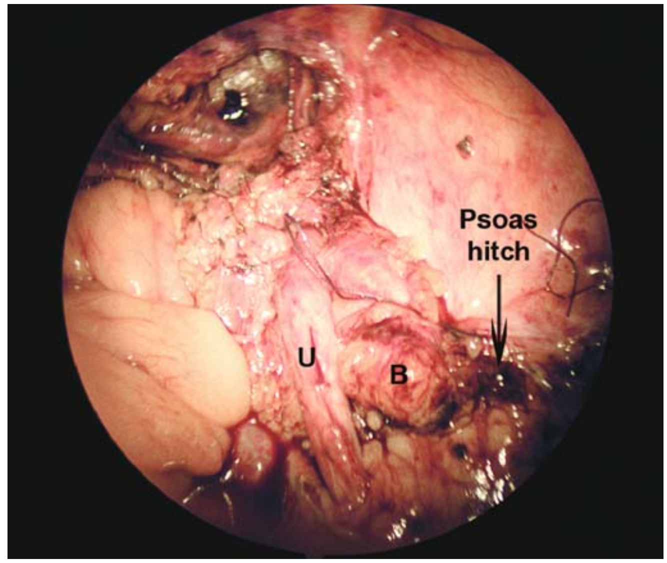


FIG. 13.129. The ureter lying tension-free after reimplantation (B, bladder; U, ureter)

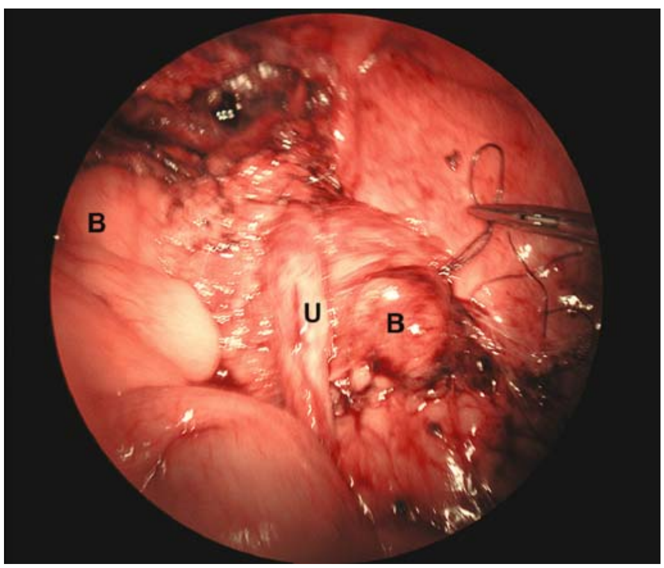


FIG. 13.130. Final appearance after the psoas hitch

Ectopic Ureter (Duplex System): Laparoscopic Lich Gregoir's Ureteric Reimplantation

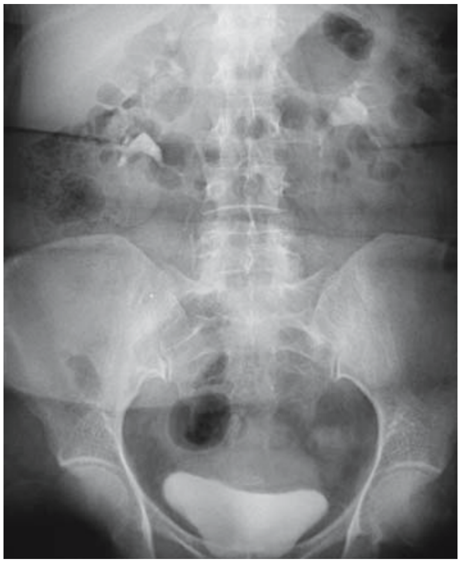


FIG. 13.131. An IVU shows a poorly visualized upper moiety and normally visualized lower moiety on the right side

FIG. 13.132. A CT urogram shows an obstructed upper moiety (arrow)

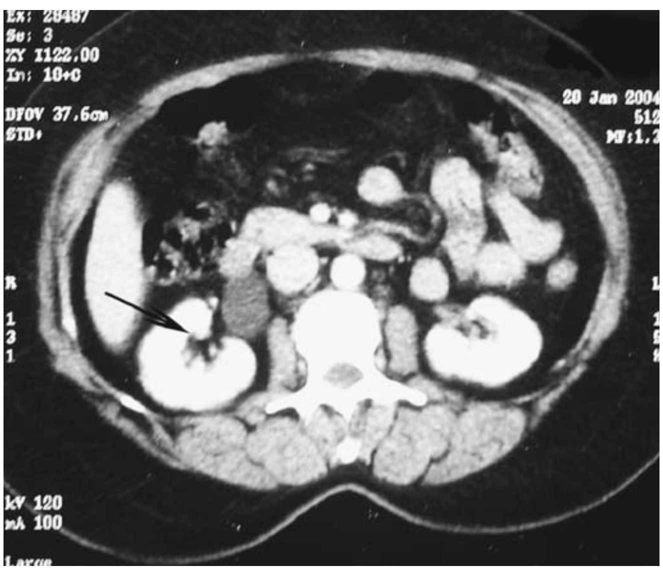


FIG. 13.133. A CT urogram shows a normal lower moiety (arrow)

FIG. 13.134. Note the course of the ureters of both moieties at the pelvic brim (←, normal lower moiety ureter; ↓, ectopic ureter)

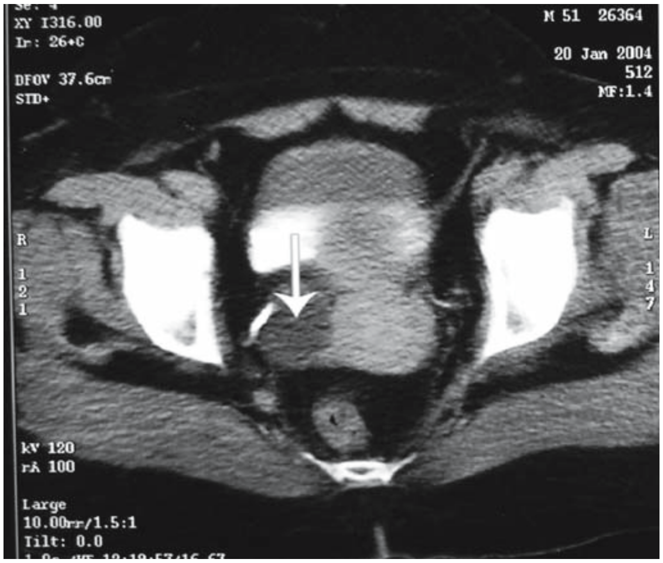


FIG. 13.135. Dilated upper moiety ureter seen coursing subtrigonally (arrow points to the obstructed upper moiety ureter)

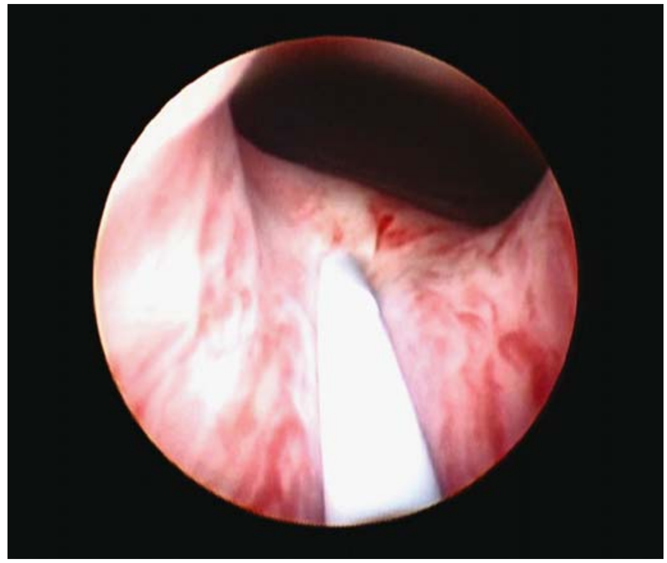


FIG. 13.136. Ectopic ureter seen opening in the bladder neck; note the stent placed as an intraoperative guide

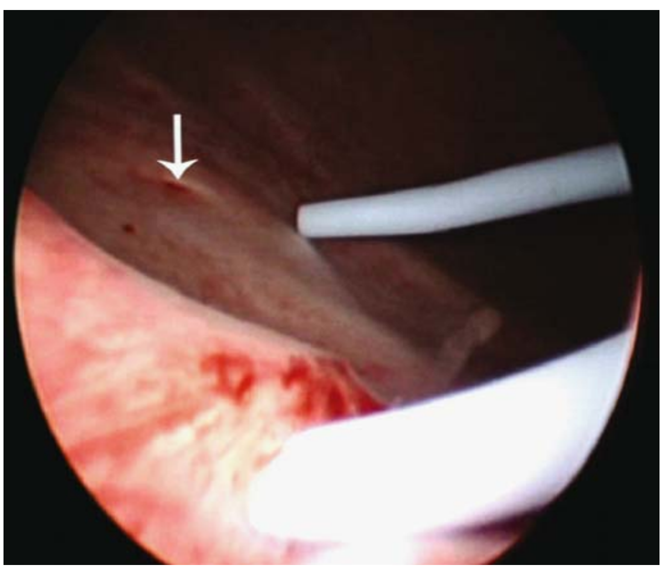


FIG. 13.137. Ureteric orifice of lower moiety located normally (arrow)

FIG. 13.138. External view of the port positions (for originally planned pyelopyelostomy) (H, head end; F, foot end)

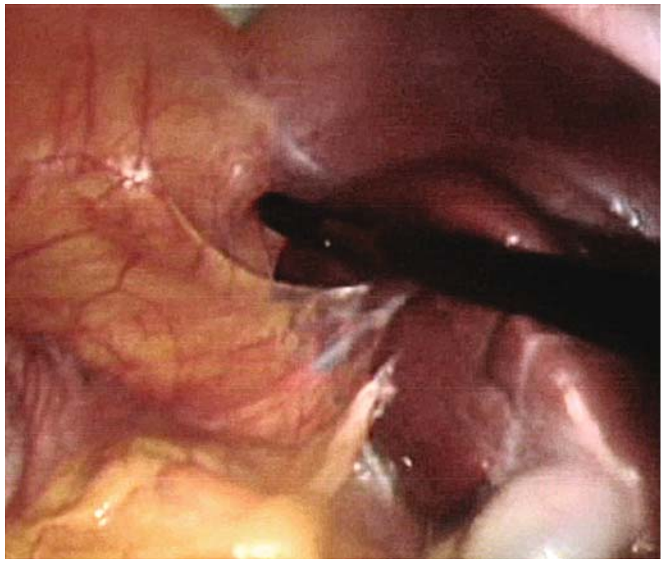
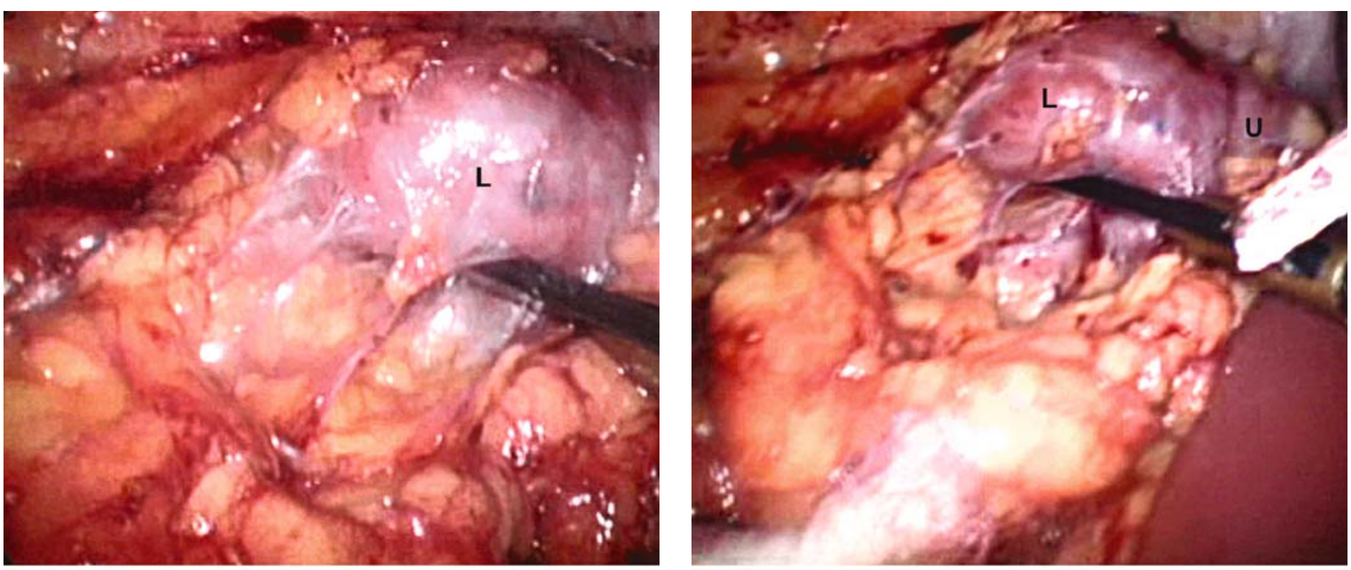
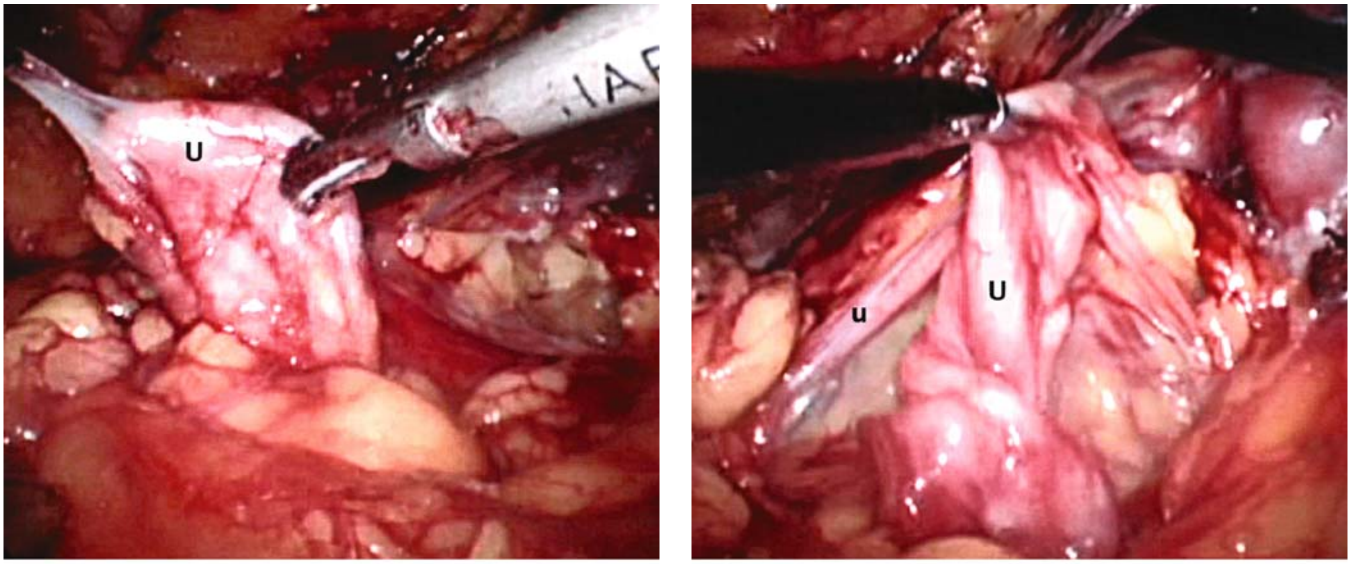


Fig. 13.139. Initial laparoscopic view of the renal area



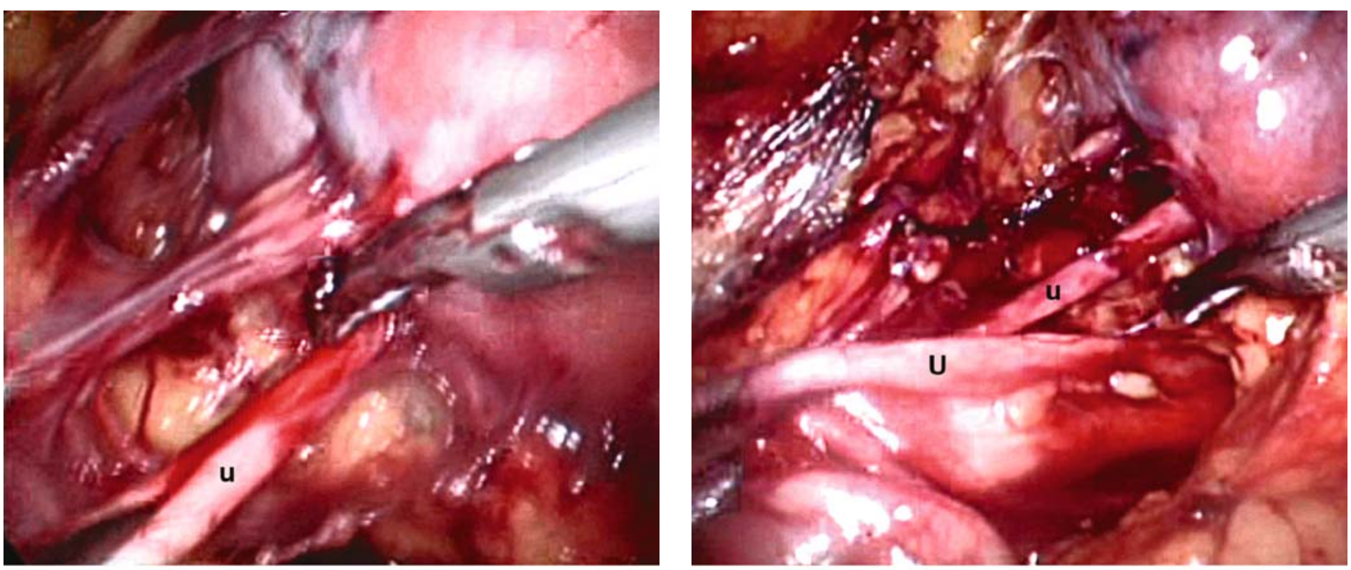
A B

Fig. 13.140. Colonic mobilization reveals normal lower moiety and thinner upper moiety of right kidney (L, lower moiety; U, upper moiety)



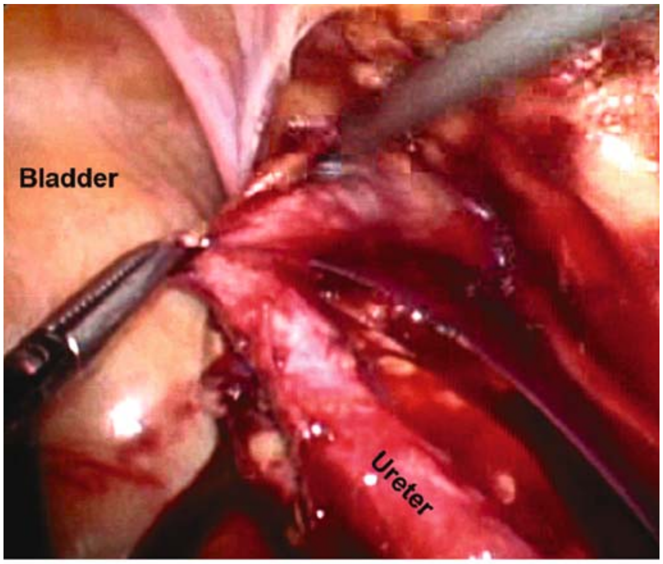
A B

FIG. 13.141. Mobilization of the upper and lower moiety ureters in progress (U, upper moiety ureter; u, lower moiety ureter)



A B

FIG. 13.142. Mobilization of ureters as high as possible to assess the feasibility of a pyelopyelostomy; it is preferable to avoid anastomosis of the hugely dilated upper moiety ureter to the thin lower moiety ureter



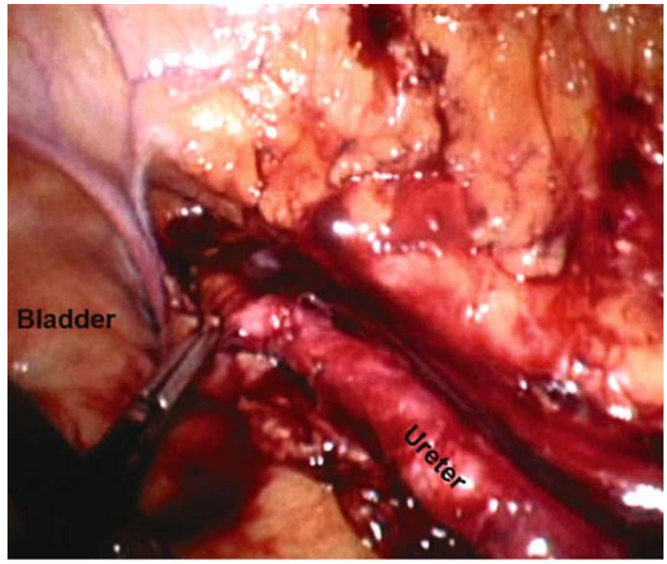


Fig. 13.143. As the pelvis of the lower moiety is intrarenal, the proposed pyelopyelostomy is not performed and the lower segment of the ectopic ureter is mobilized in preparation for reimplantation

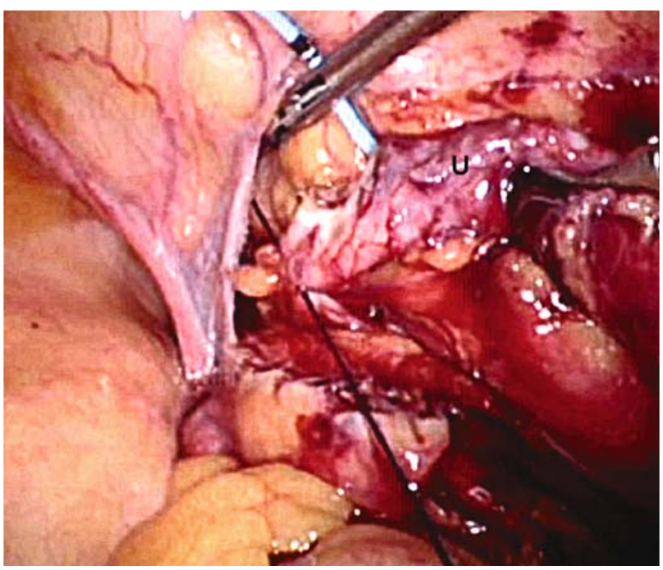


Fig. 13.144. Ectopic upper moiety ureter is ligated at the juxtahiatal level after retrieving the preplaced stent (through partial ureterotomy)

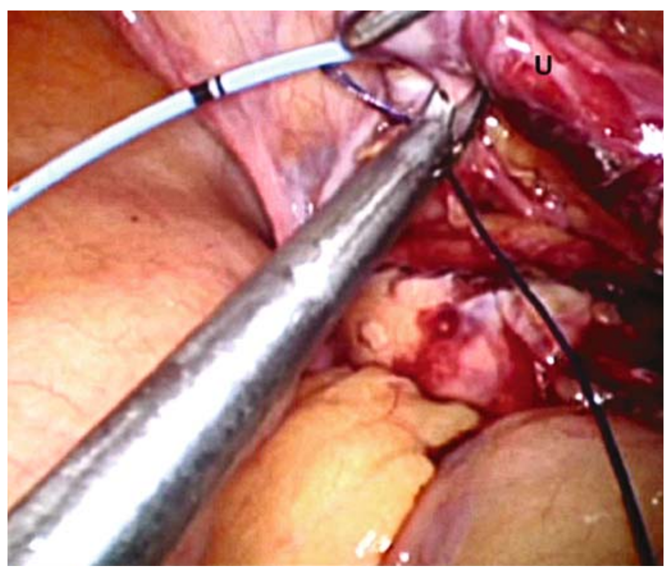


Fig. 13.145. Upper moiety ureter completely divided above the ligature

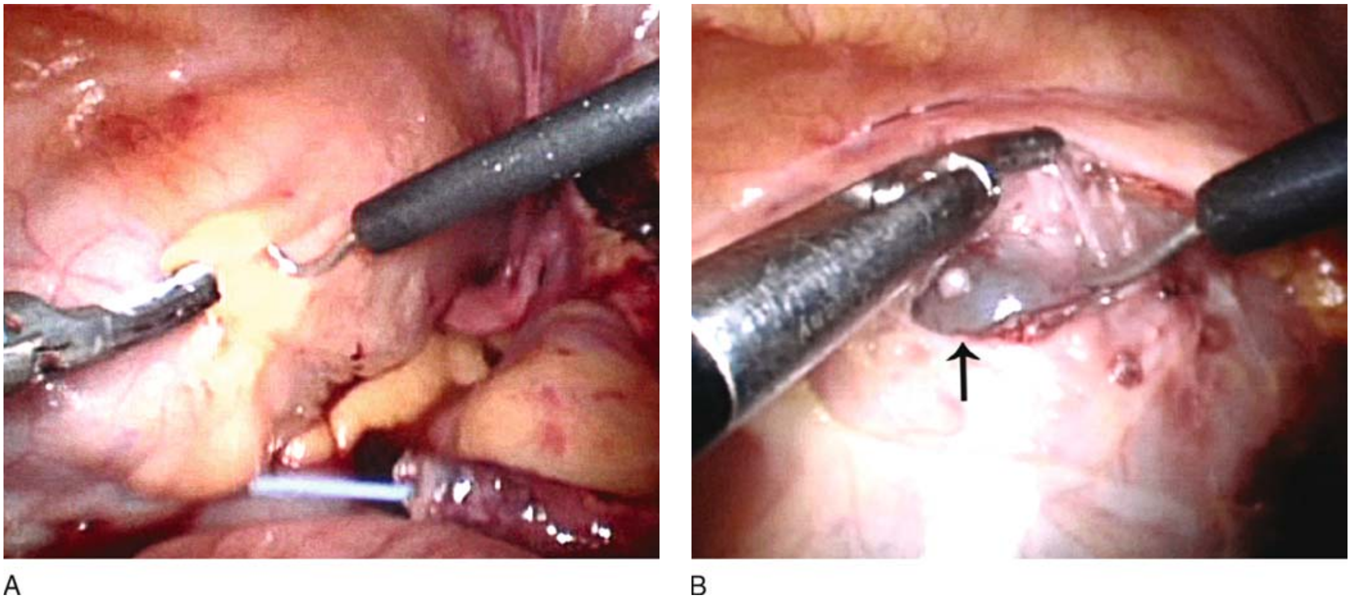


Fig. 13.146. Detrusorotomy with hook diathermy done on anterolateral aspect of distended bladder until the mucosal bulge(arrow) is seen

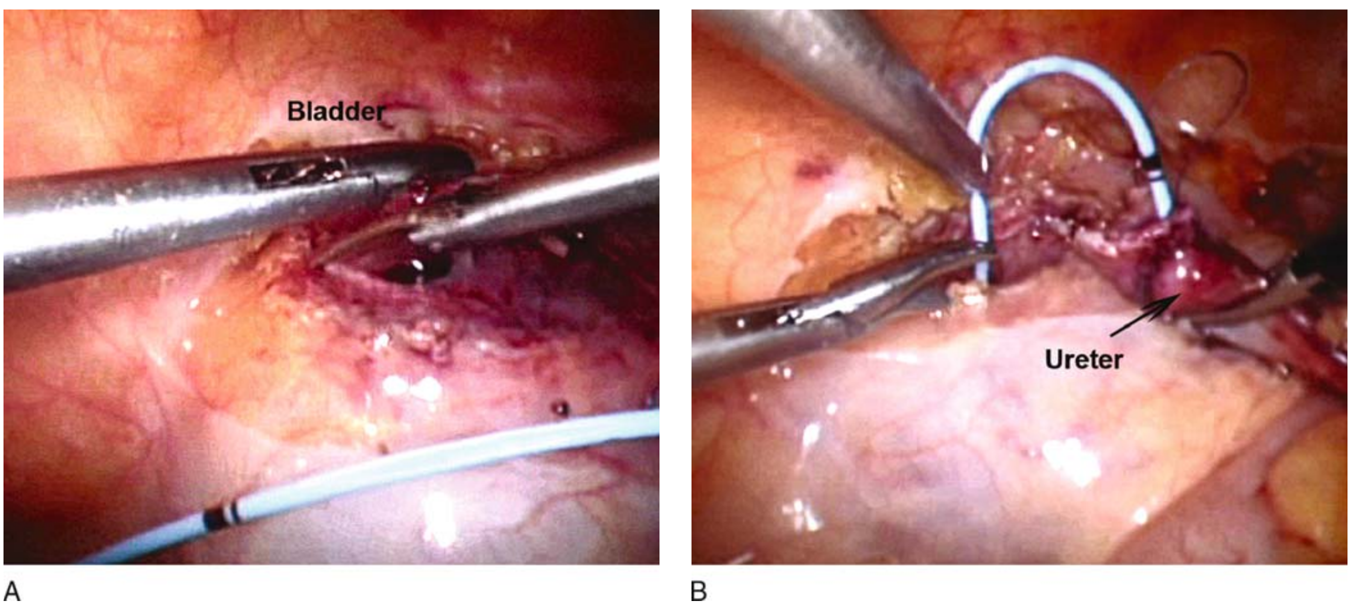
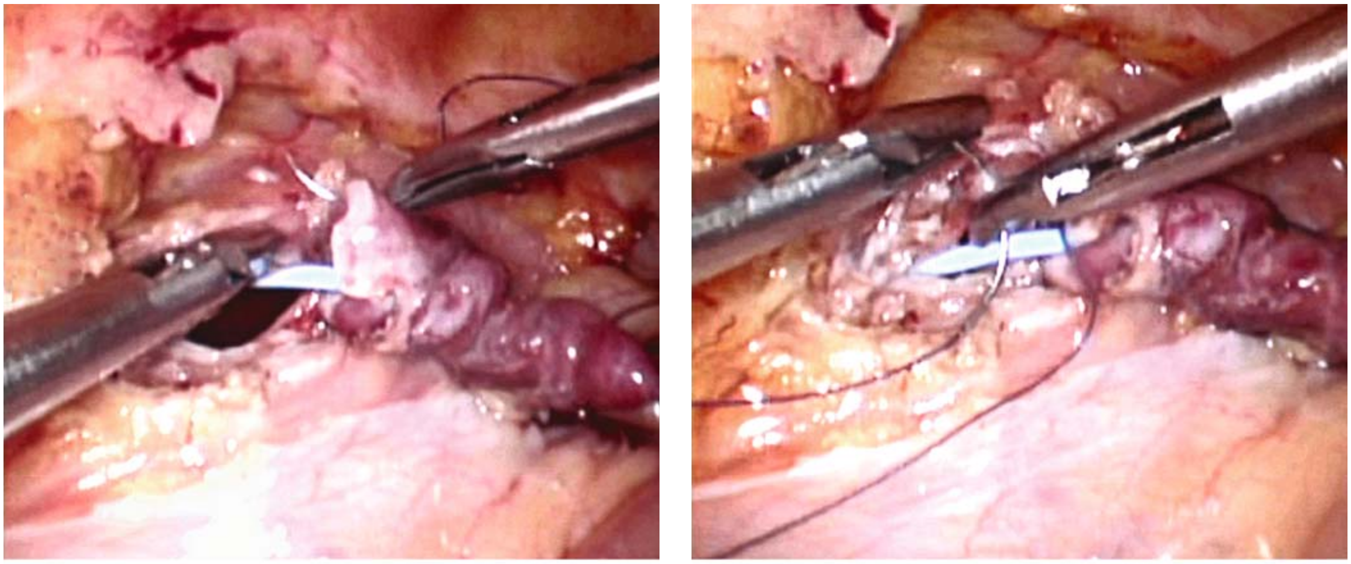
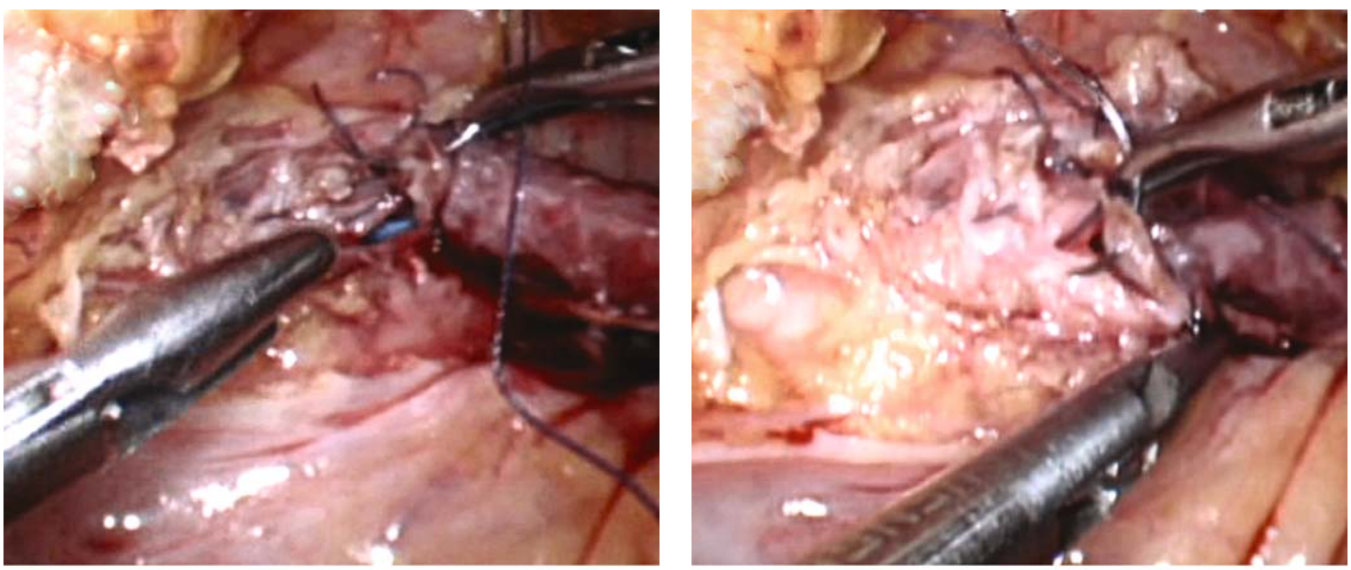


Fig. 13.147. Bladder mucosa opened distally and the lower end of the stent is inserted into the bladder



A B

FIG. 13.148. Initial suture (4-0 Vicryl) taken outside-in through the ureter and inside-out through bladder mucosa



A B

FIG. 13.149. A few more interrupted sutures

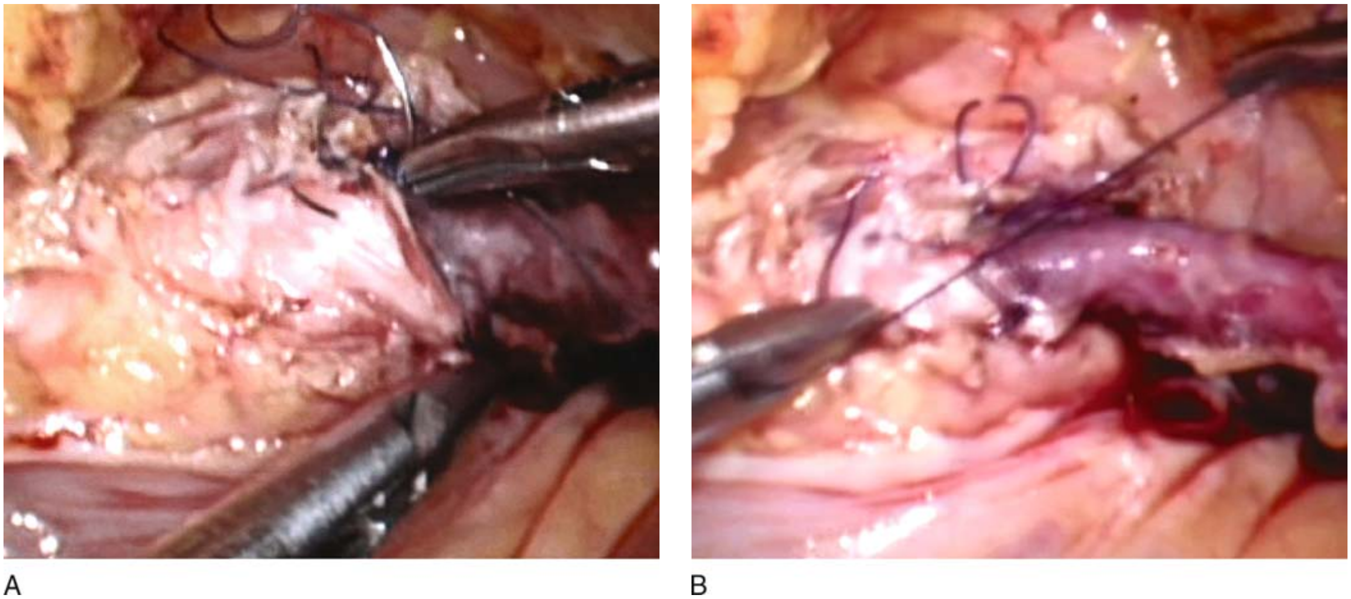


FIG. 13.150. Similar sutures on the medial edges done to complete the inner layer suturing

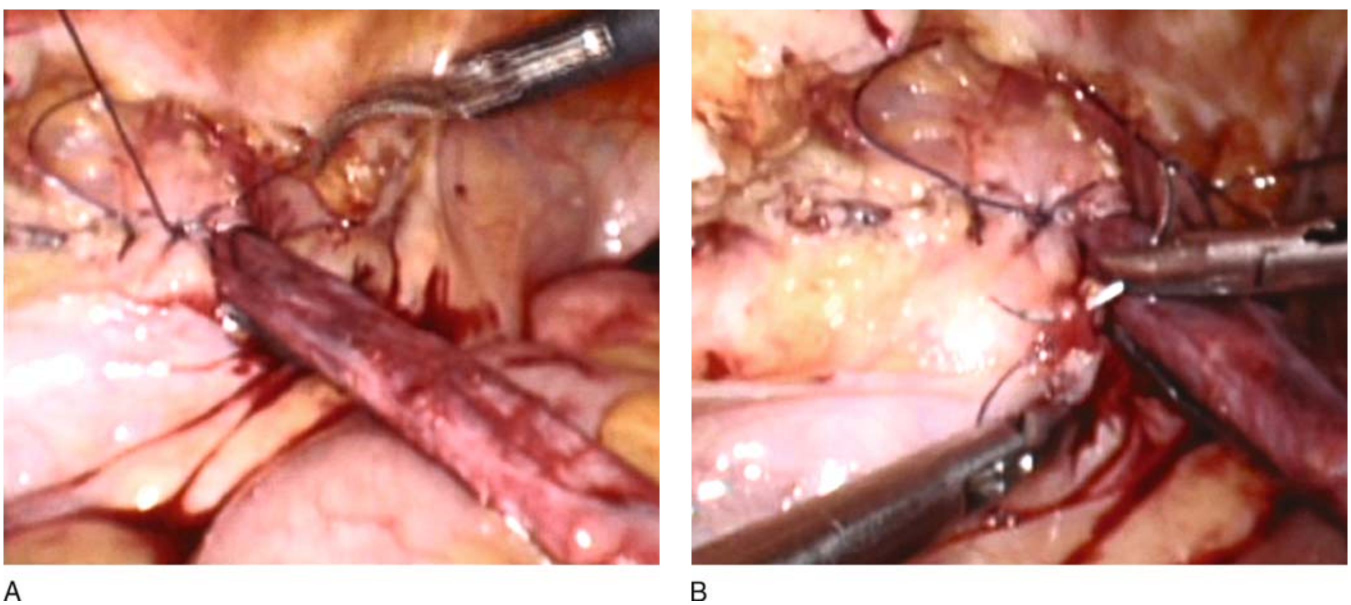


FIG. 13.151. The second layer of detrusor closure with 2-0 Vicryl (detrusor buttressing)

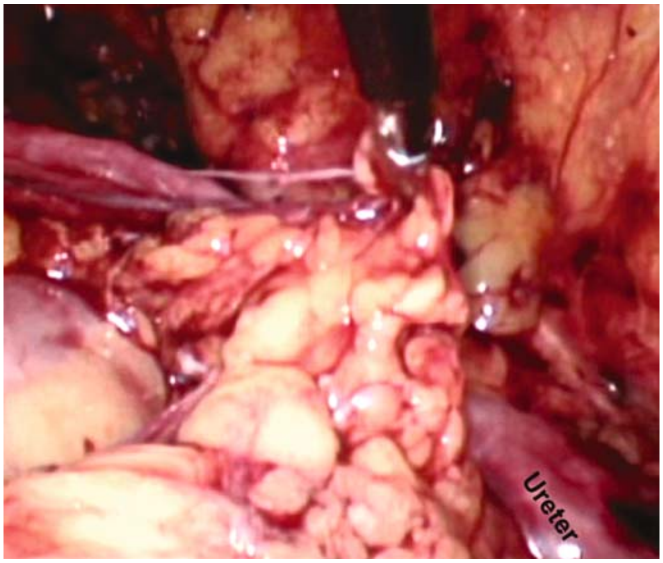


Fig. 13.152. Omental tacking over the distal ureter

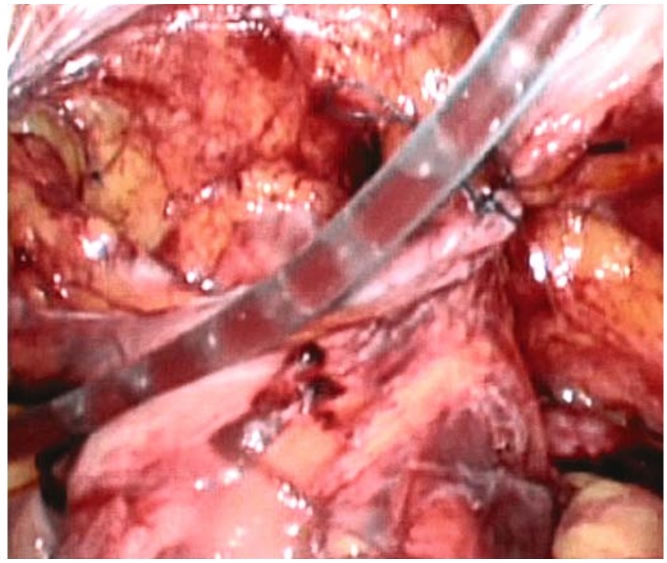


Fig. 13.153. A tube drain is introduced through the flank port

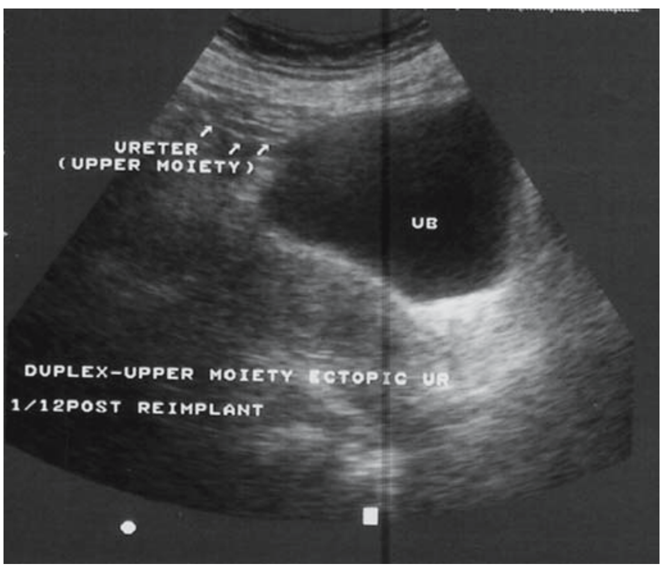


Fig. 13.154. Postoperative ultrasound scan shows the distal ureter entering the bladder

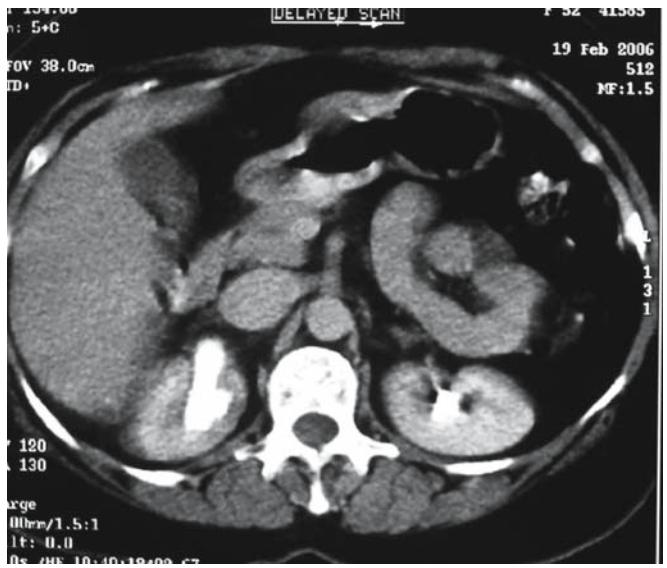


Fig. 13.155. A postoperative CT urogram shows improved function and drainage of the upper moiety

References

1. Lakshmanan Y, Fung LC (2000) Laparoscopic extravesicular ureteral reimplantation for vesicoureteral reflux: recent technical advances. J Endourol 14:589–593.
2. Olsen LH, Deding D, Yeung CK, Jorgensen TM (2003) Computer assisted laparoscopic pneumovesical ureter reimplantation (am). Cohen: initial experience in a pig model. APMIS Suppl 109:23–25.
3. Ramalingam M, Senthil K, Venkatesh V (2005) Laparoscopic repair of ureterovaginal fistula: successful outcome by laparoscopic ureteral reimplantation. J Endourol 19:1174–1176.

14
Laparoscopic Boari Flap Ureteric Reimplantation

M. Ramalingam and K. Senthil

Indications

The Boari flap is a useful option in the surgical management of long lower ureteric strictures [1–4,6,7]. The results are good as long as we use a well-vascularized bladder flap with a length to width ratio [5] of 3:2. The steps of open surgery can be extrapolated. Preliminary intravenous urogram (IVU) and cystoscopy are essential to rule out any intravesical pathology.

Surgical Techniques

Cystoscopy and retrograde pyelogram are performed to determine the length of the stricture and to decide about the flap to be fashioned. An optimum-sized Foley catheter is introduced and kept sterile in an accessible area for distending the bladder whenever needed.

The patient is positioned supine with the side of the lesion elevated by 45 degrees so that the bowel falls away by gravity. Pneumoperitoneum is created using a Veress needle. A camera port (10 mm) is placed in the supraumbilical region. Three additional 5-mm ports (lateral to rectus muscle on each side and one in suprapubic area) are inserted for hand instruments.

The narrowed segment of distal ureter is mobilized, excised, and sent to the lab for biopsy. The feasibility of direct reimplantation of the ureter (using the psoas hitch) is always considered before deciding on a Boari flap. The required length of the Boari flap (width of 6 cm at the base and 4 cm at the tip) is marked using diathermy. Subsequently the flap can be raised using electrocautery or preferably ultracision. The end of the flap is anastomosed to the spatulated ureter using interrupted 4-0 Vicryl sutures. Then a 6-French (F) double pigtail stent is passed through the suprapubic port into the ureter and its lower end is placed in the bladder. The flap can be tubularized and sutured in two layers, with continuous 4-0 Vicryl for the inner layer (mucosa and a part of the detrusor) and interrupted 3-0 Vicryl sutures for the outer layer. The bladder defect should be closed from lateral to medial in two layers as above. Omental wrapping can be done over the flap. A tube drain is placed through the pararectus port.

As we gain confidence in intracorporeal laparoscopic suturing, such reconstructive procedures are feasible. Even though the procedures are time-consuming, morbidity is low. Laparoscopic surgery would certainly evolve into a preferred approach for such advanced reconstructive urologic surgeries.

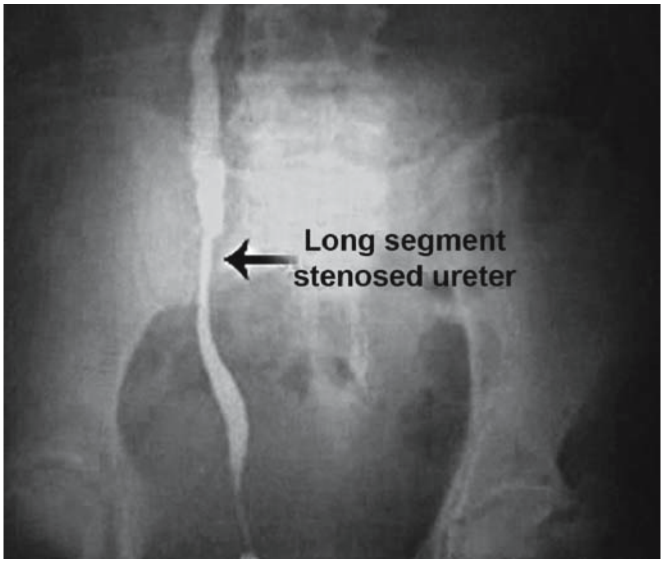


FIG. 14.1. A retrograde pyelogram (RGP) shows the long segment of the right lower ureteric stricture

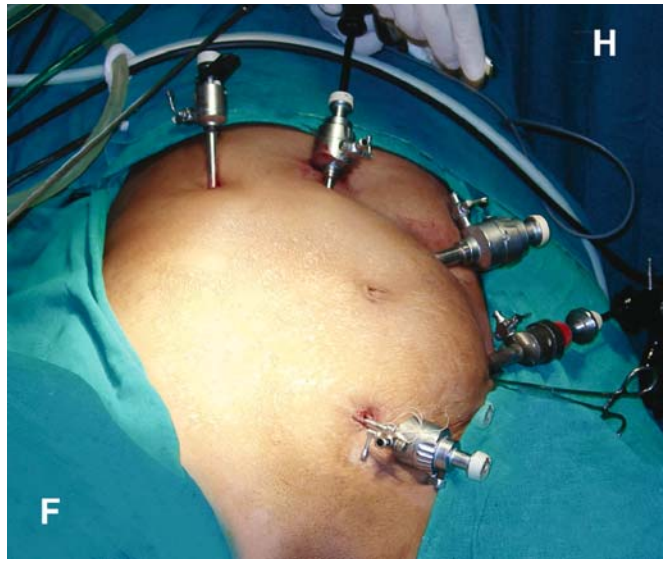


FIG. 14.2. External view of the port positions (H, head end; F, foot end)

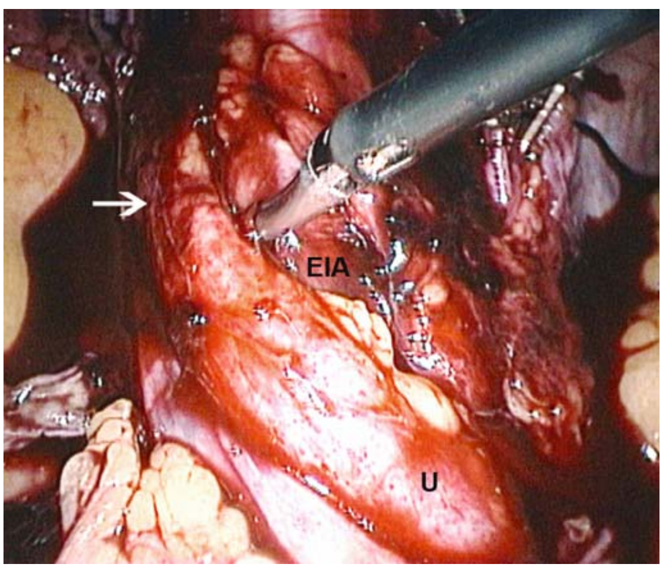


FIG. 14.3. Laparoscopic view of a strictured right lower ureter (arrow) at the level of the pelvic brim as seen from the umbilical port camera (U, proximal dilated ureter; EIA, external iliac artery)

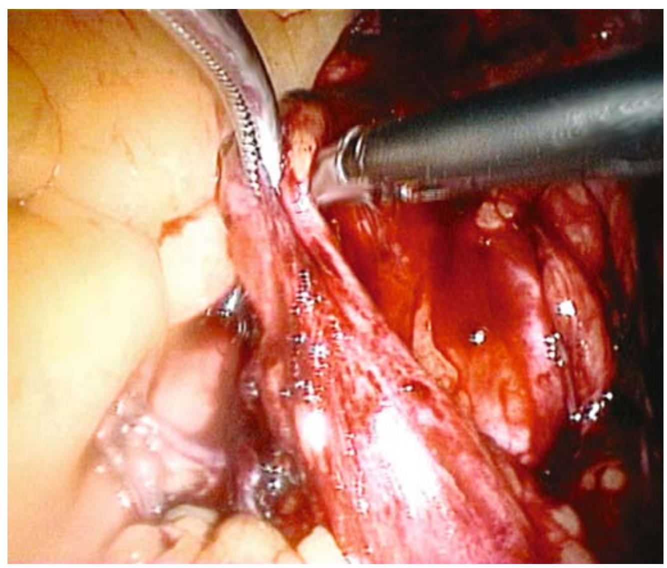


FIG. 14.4. Mobilizing the strictured segment

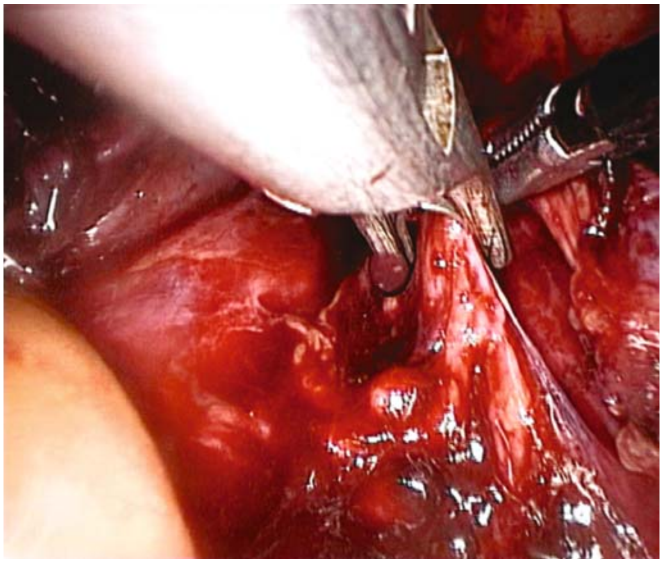


FIG. 14.5. Clipping the juxtahiatal ureter

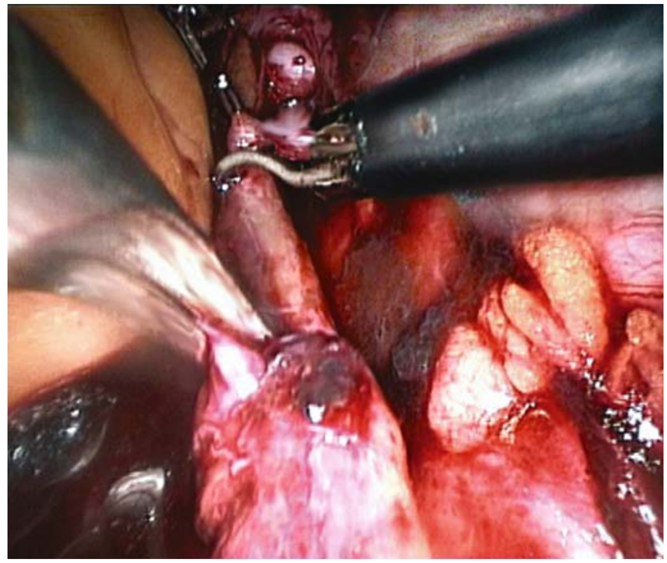


FIG. 14.6. Division of the ureter at the juxtahiatal level

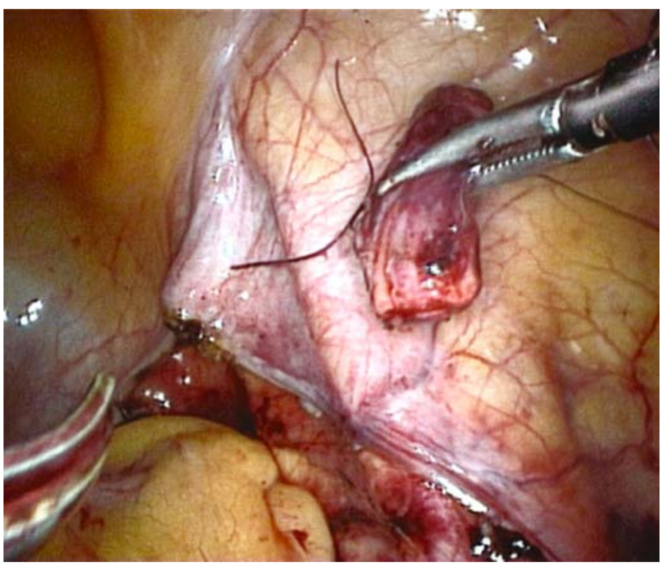


FIG. 14.7. Stricture segment excised and retrieved

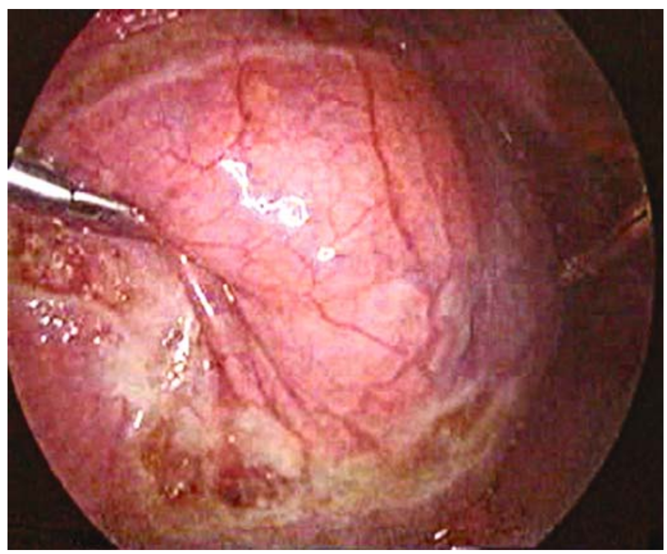


FIG. 14.8. After distending the bladder the probable site for the Boari flap is premarked with diathermy

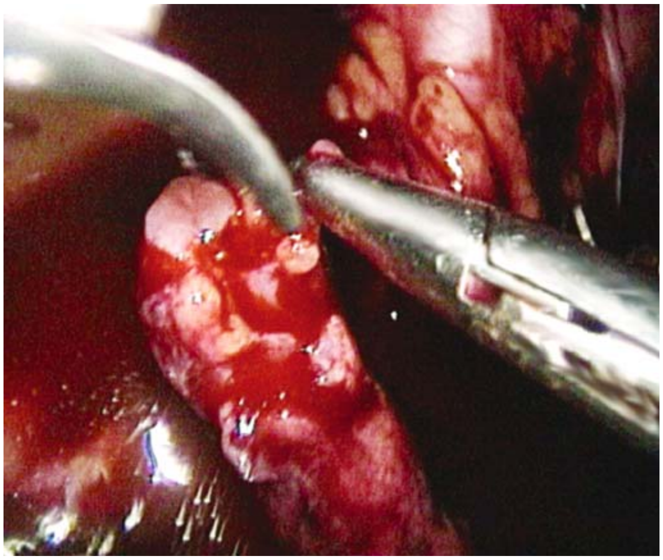


FIG. 14.9. Spatulating the normal-caliber ureter

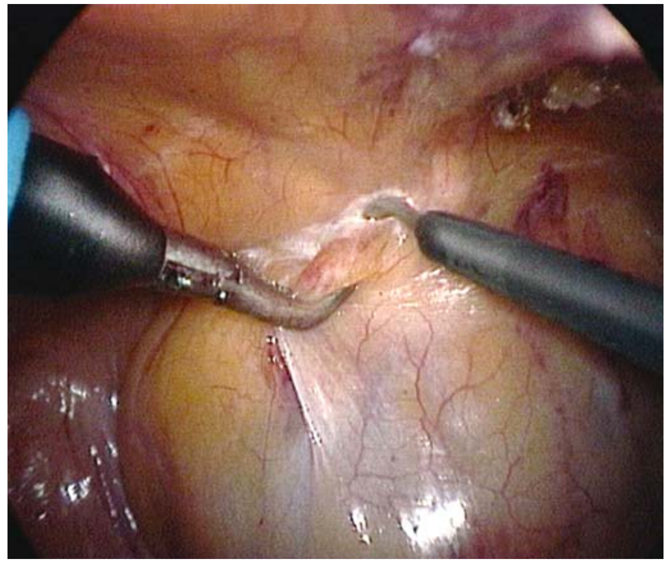


FIG. 14.10. Releasing the bladder by dividing the peritoneal attachment anteriorly

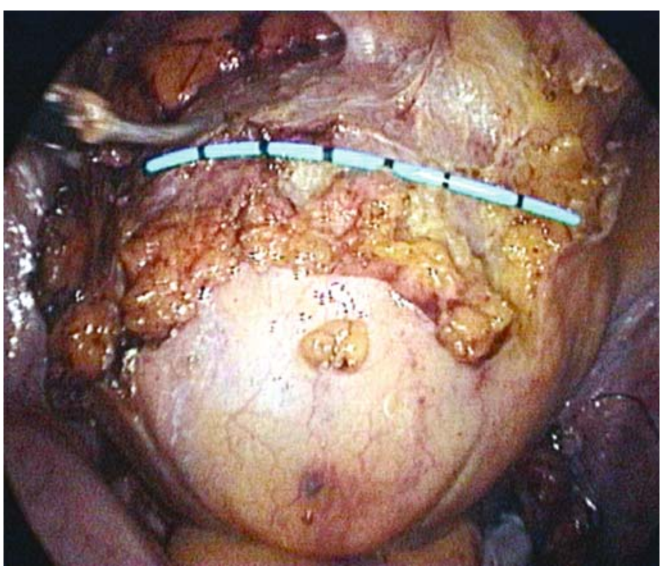


FIG. 14.11. Measuring the length of flap required using a piece of ureteric catheter

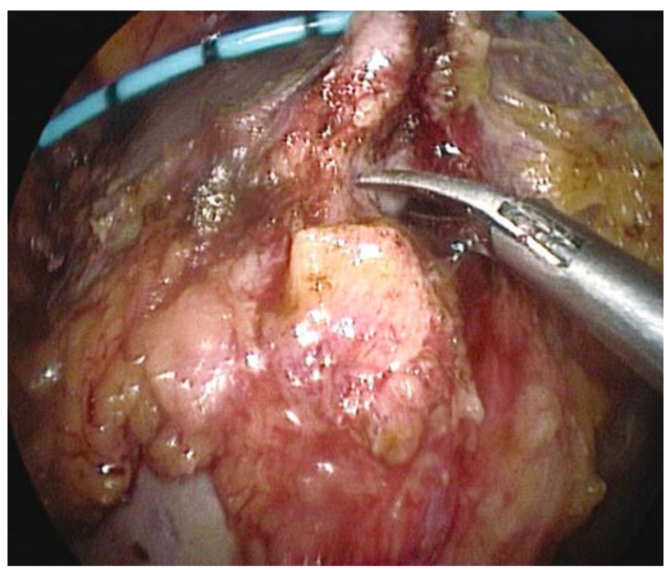


FIG. 14.12. A cystotomy done along the premarked line to raise the Boari flap

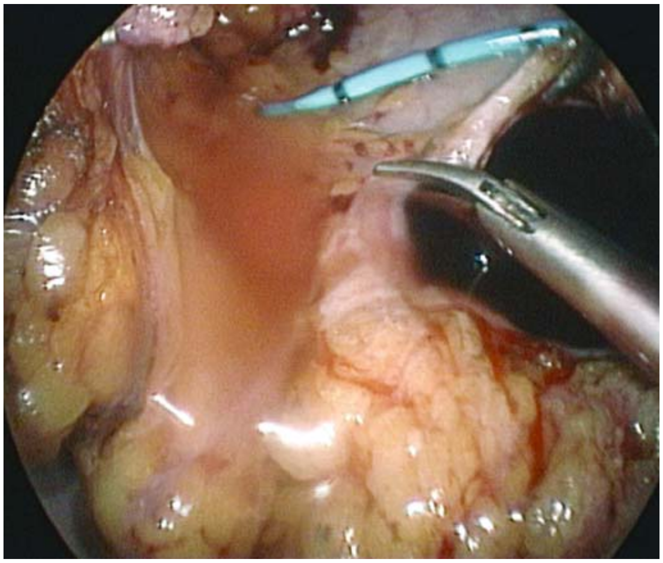


FIG. 14.13. The cystotomy continues distally

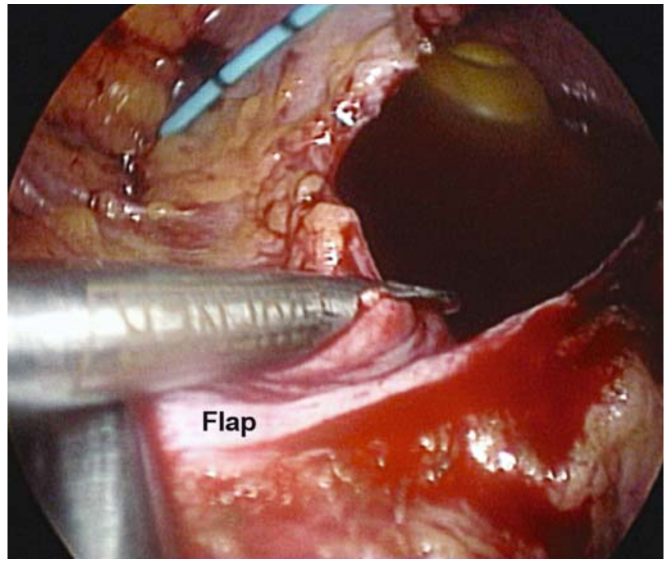


FIG. 14.14. Once the required length of cystotomy is made, the bladder flap can be fashioned (base about 6 cm wide and apex about 4 cm wide)

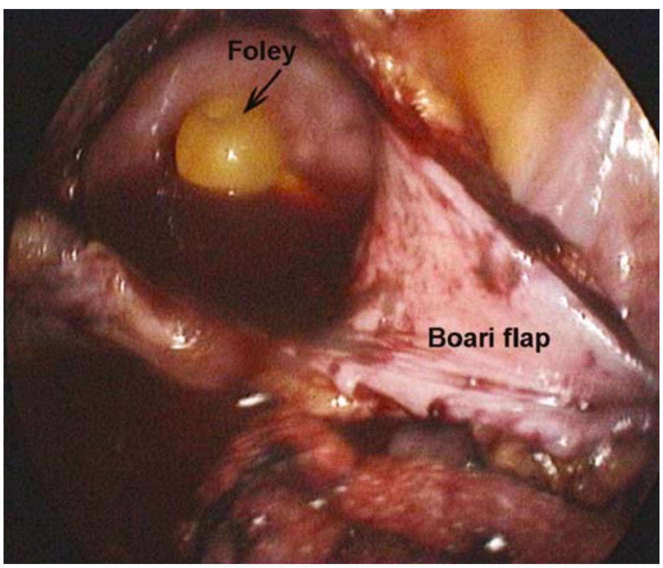


FIG. 14.15. Boari flap flipped to know the adequacy of the length

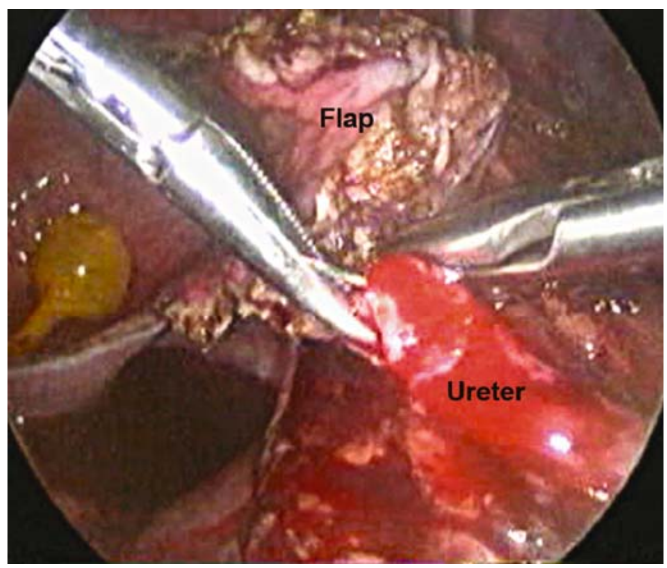


FIG. 14.16. Vicryl stitch (4-0) through the spatulated ureter in preparation for an end-to-end anastomosis with the flap

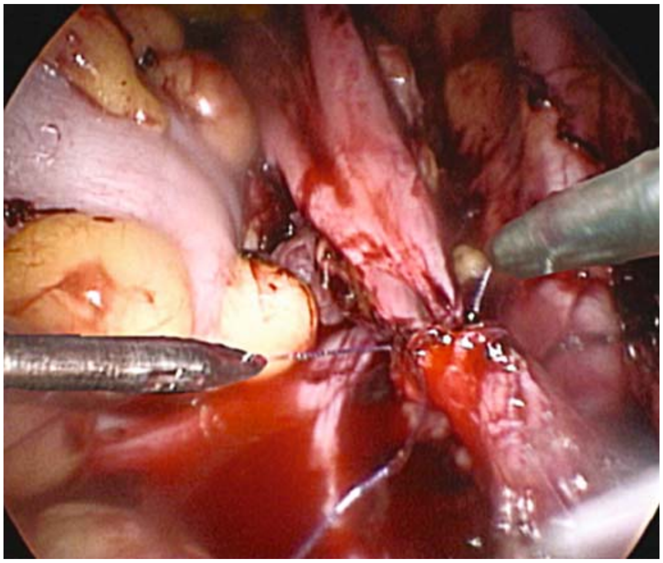


FIG. 14.17. End of ureter anastomosed to the apex of the Boari flap using interrupted 4-0 Vicryl sutures

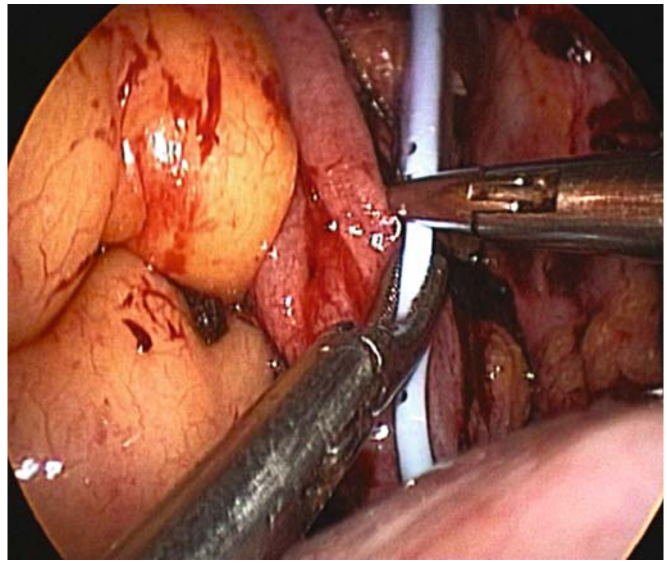


FIG. 14.18. A pigtail stent passed through the suprapubic port

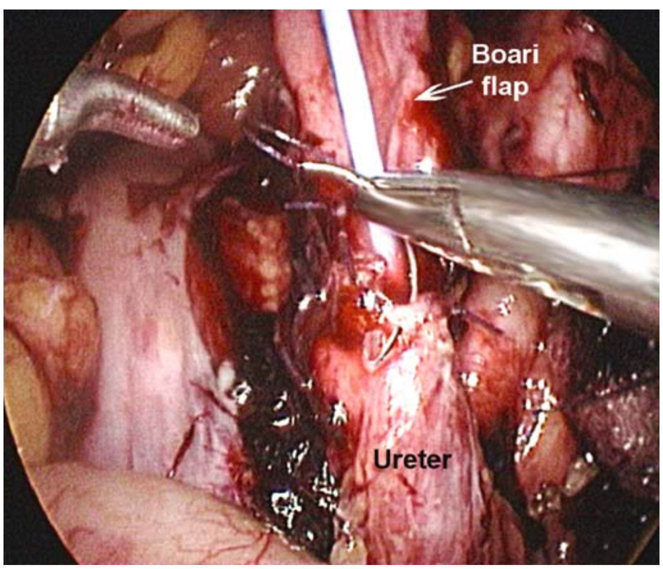


FIG. 14.19. Bladder flap being tubularized

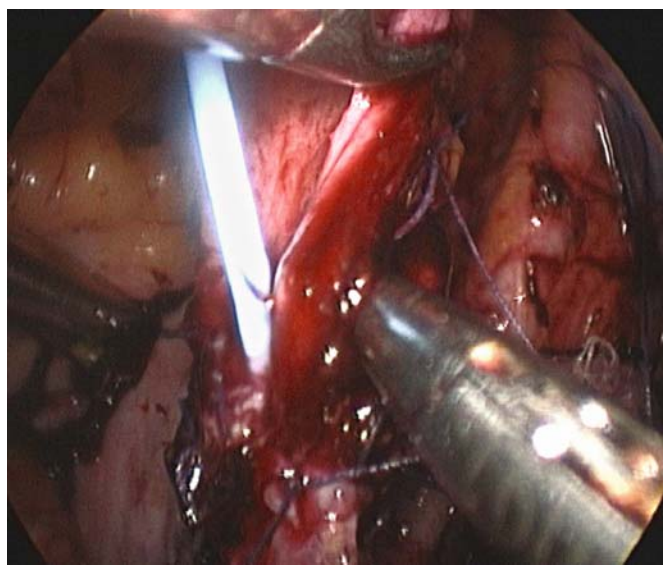


FIG. 14.20. Bladder flap being tubularized over the stent using continuous 3-0 Vicryl suture

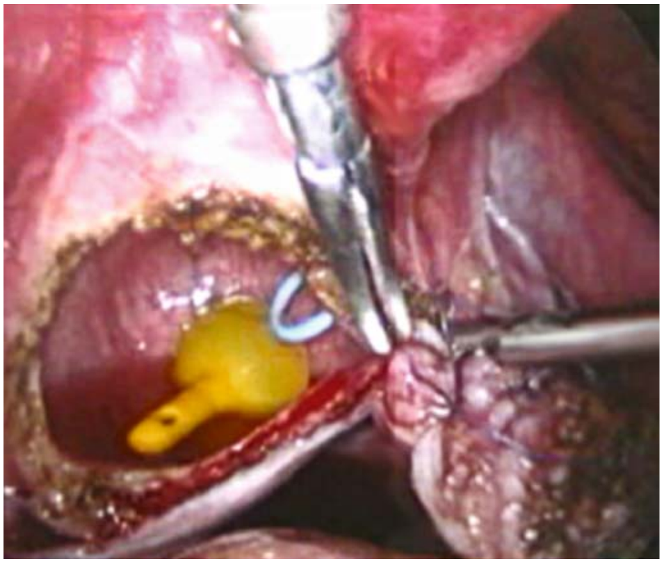


Fig. 14.21. The tubularization is nearly completed

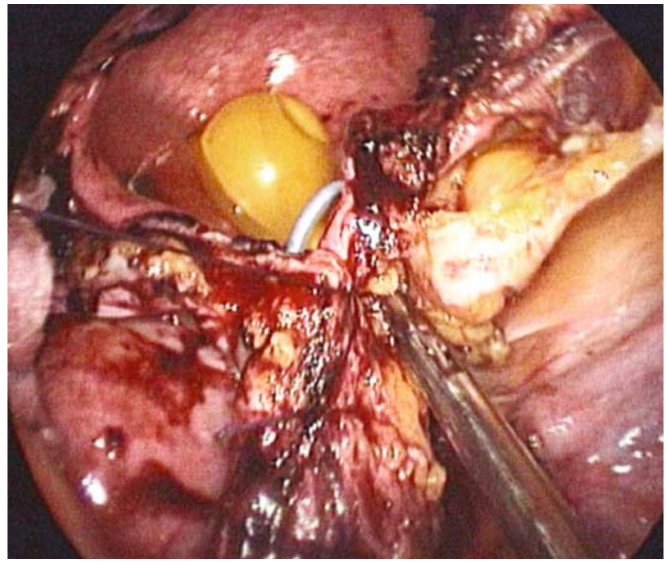


Fig. 14.22. A bladder defect being closed with continuous 3-0 Vicryl suture

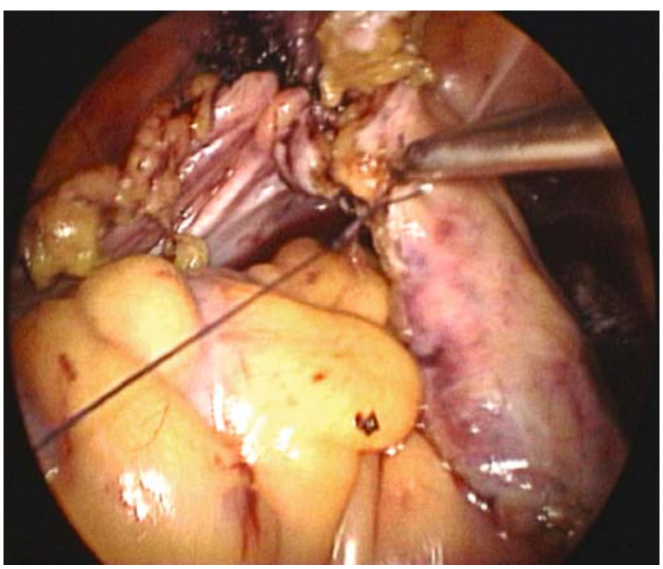


Fig. 14.23. A second layer of continuous 3-0 Vicryl suture of tubularized flap

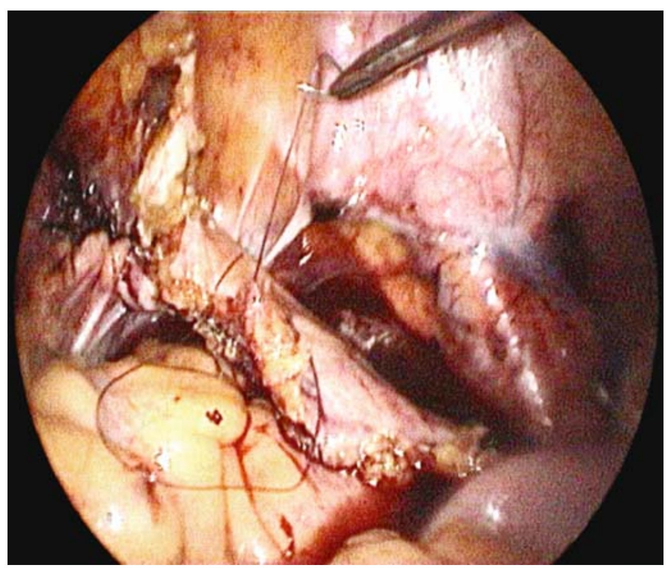


Fig. 14.24. Completed view of the second layer

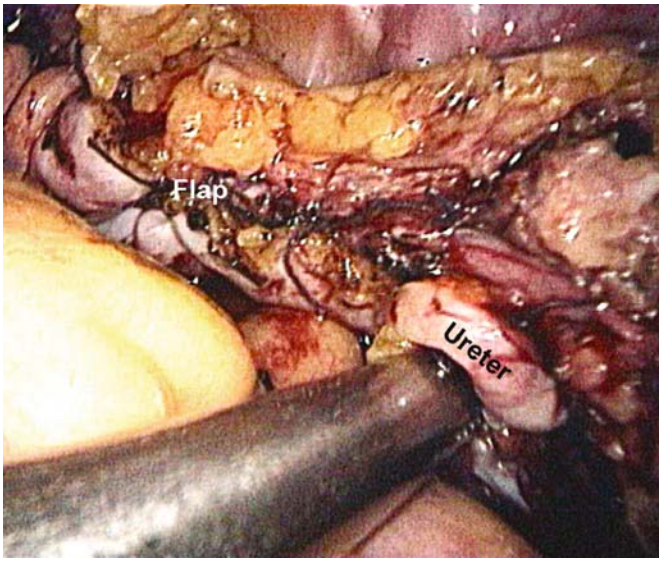


Fig. 14.25. Tension-free Boari flap can be appreciated

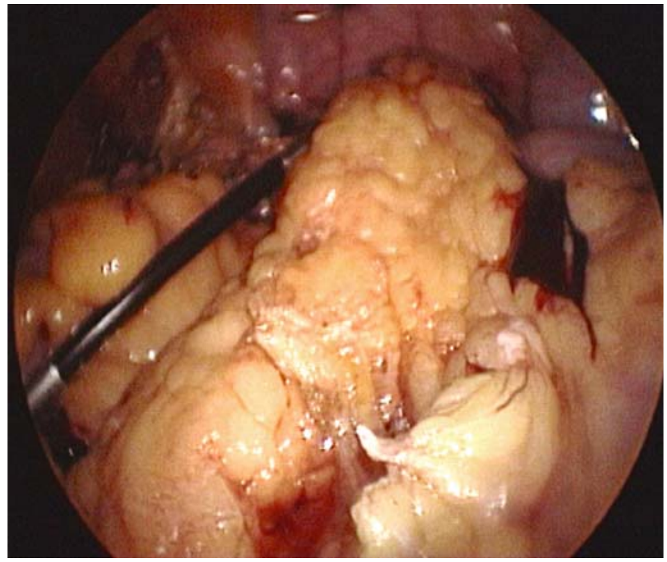


Fig. 14.26. Omental tacking onto the Boari flap

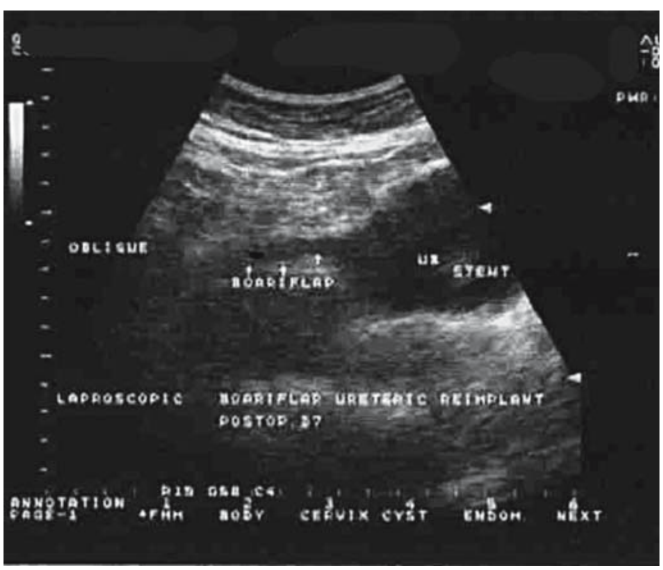


Fig. 14.27. Postoperative sonogram on day 7 shows the Boari flap with the stent in situ

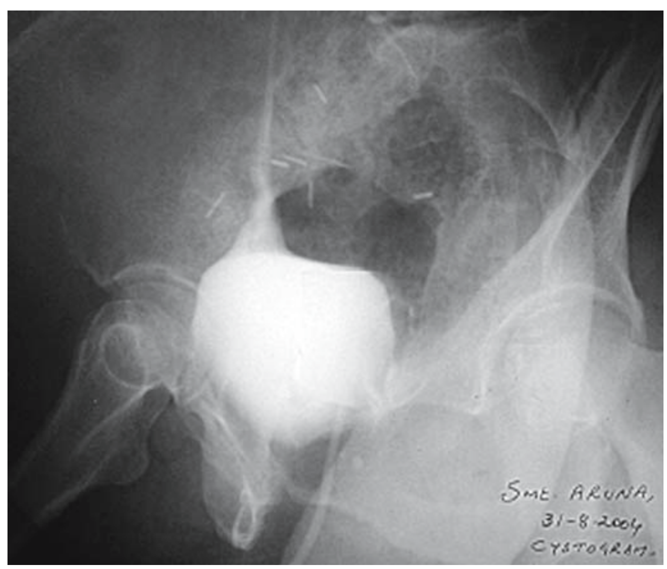


Fig. 14.28. Cystogram done 3 months later

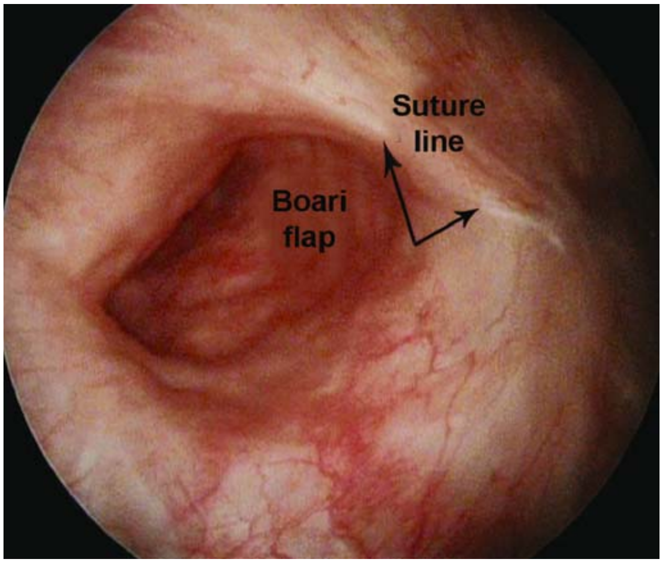


FIG. 14.29. Cystoscopic view of the Boari flap 6 months later

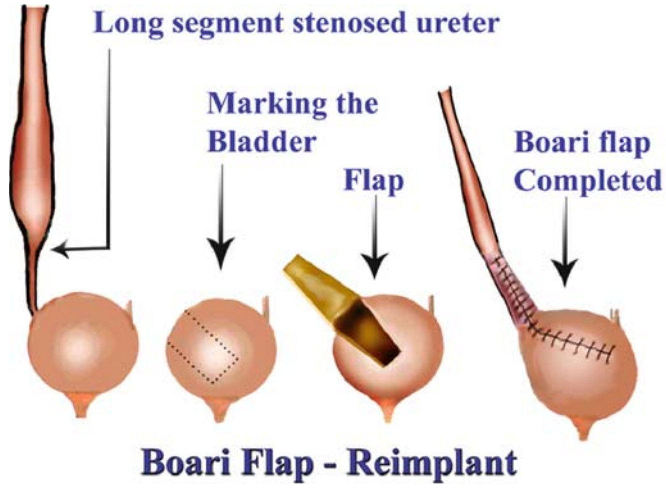


FIG. 14.30. Diagrammatic representation of the Boari flap executed

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15
Laparoscopic Ureterolithotomy

P. Rajendran and K. Senthil

Retroperitoneoscopic ureterolithotomy is one of the accepted procedures [1–3] in the management of ureteric calculi.

Indications

Retroperitoneoscopic ureterolithotomy is indicated for large ureteric stones where a few administrations of extracorporeal shock-wave lithotripsy (ESWL) fail to fragment the stones or there is technical difficulty during ureteroscopy.

Technique

With the patient in the lithotomy position, cystoscopy and a retrograde pyelogram (RGP) are performed. A 6-French (F) open-tip ureteral catheter is introduced and positioned in contact with the lower margin of the stone under fluoroscopic control. If the stone is impacted, we do not attempt to push the catheter or the guidewire past it. The distal end of the ureteric catheter with a guidewire is kept sterile so that it is accessible for subsequent stent advancement. The patient is positioned at 90 degrees (ipsilateral flank up). A 2-cm muscle-splitting incision is made just below the tip of the twelfth rib. The transversalis fascia is incised, and the posterior pararenal space is developed bluntly by finger dissection. The peritoneum is pushed forward to create sufficient space for the introduction of a balloon. We have sometimes used a size 8 glove finger stall fixed at the end of an 18F Nelaton catheter (custom made), for the initial creation of the retroperitoneal space. The balloon is placed under digital control and inflated to about 500 mL with saline, depending on the age and build of the patient. The inflated balloon is left for 5 minutes to achieve hemostasis before being deflated and removed. A 10-mm trocar is inserted and fixed at the level of incision. A pneumoretroperitoneum is created. A 0-degree 10-mm telescope is inserted to view the retroperitoneal space. Another 10-mm trocar is inserted under vision one fingerbreadth above the iliac crest in the midaxillary line. This port serves for the introduction of the telescope throughout the procedure. A third 5-mm port is inserted under vision on the anterior axillary line midway between the first and second ports. An optional fourth 10-mm trocar is inserted in the anterior axillary line just below the rib margin. This port is helpful in allowing the introduction of a fan retractor to retract the kidney in obese patients.

The ureter is identified, dissected, and traced to the stone, which is identified by a bulge. In thin patients this is an easy task, but in obese patients it is difficult. In these cases, a guidewire can be introduced into the ureteral catheter and moved gently back and forth to look for transmitted movement, to guide the dissection. The ureter is opened longitudinally over the stone using an endoknife.

The stone is extracted and placed on the psoas for later removal using a bag. A guidewire is introduced through the previously inserted open-tip ureteral catheter and passed into the renal pelvis under vision. This guidewire is used to place a double-J stent into the kidney at the end of the procedure. The ureterotomy is sutured with interrupted 3-0 Vicryl. A retroperitoneal drain is placed and the trocar port sites are closed.

Preventing Upward Migration

Measures to prevent upward migration of the calculus are as follows:

1. The patient may be placed in a head-up position.
2. A dissector or a sling is placed above the stone level.

The surgeon must be prepared with a flexible nephroscope and ureteroscope to retrieve the migrated calculus. A C-arm with image intensifier is very useful to locate the calculus especially when migration occurs.

Conclusion

Laparoscopic ureterolithotomy is preferable to open ureterolithotomy whenever indicated. Retroperitoneoscopic ureterolithotomy is less invasive and more appropriate.

Retroperitoneoscopic Ureterolithotomy

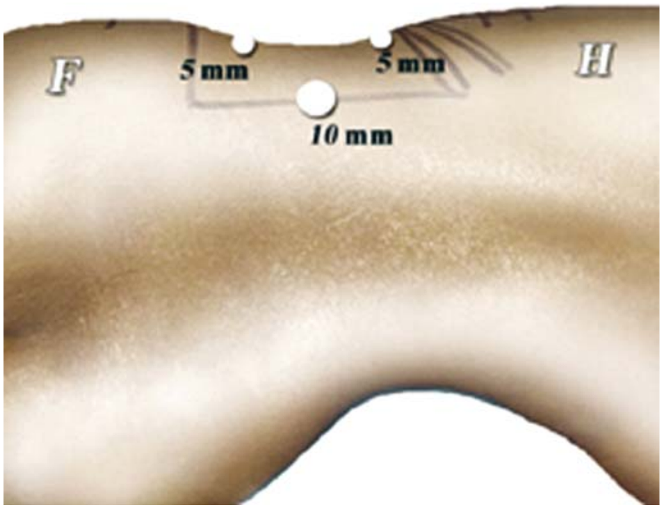


Fig. 15.1. The lateral position with the raised kidney bridge (H, head end; F, foot end)

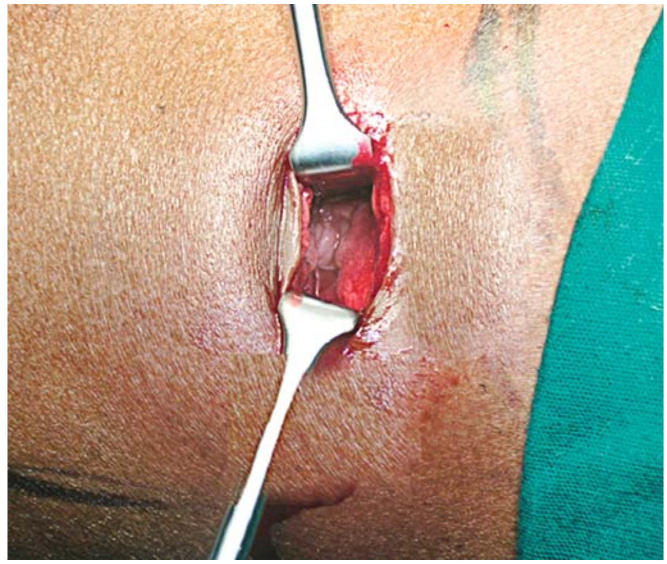


Fig. 15.2. Incision for the primary port at the renal angle

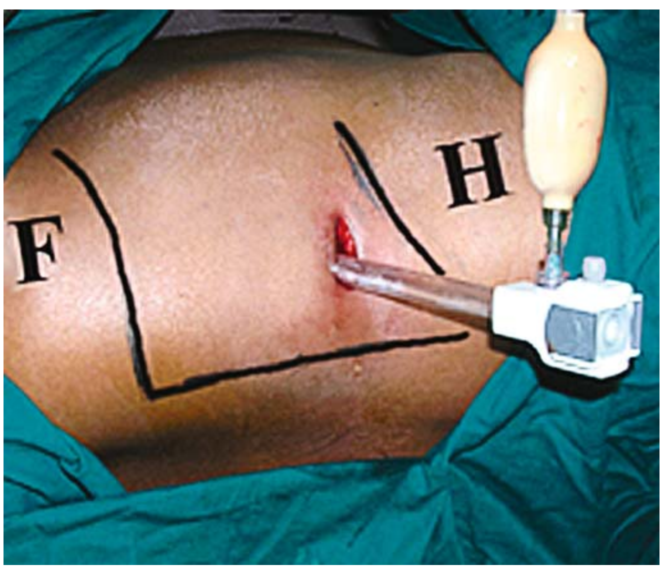


Fig. 15.3. Bulge in the flank on balloon inflation

Fig. 15.4. Finger guidance to insert the iliac port (index finger inserted into primary port)

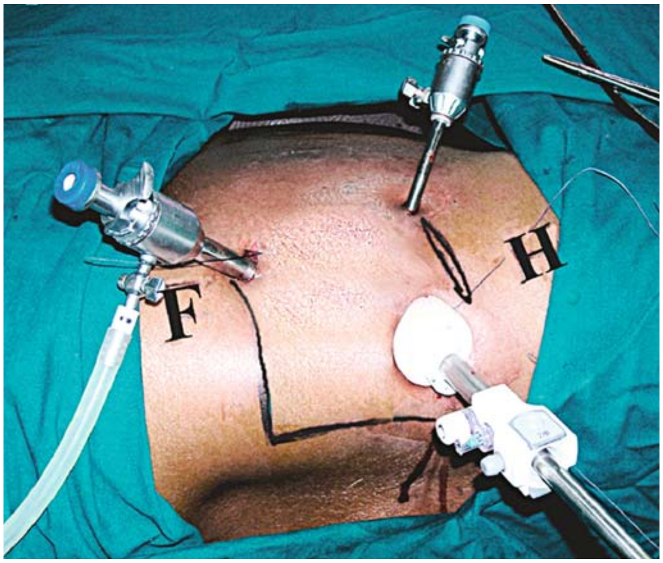


FIG. 15.5. External view of the port positions

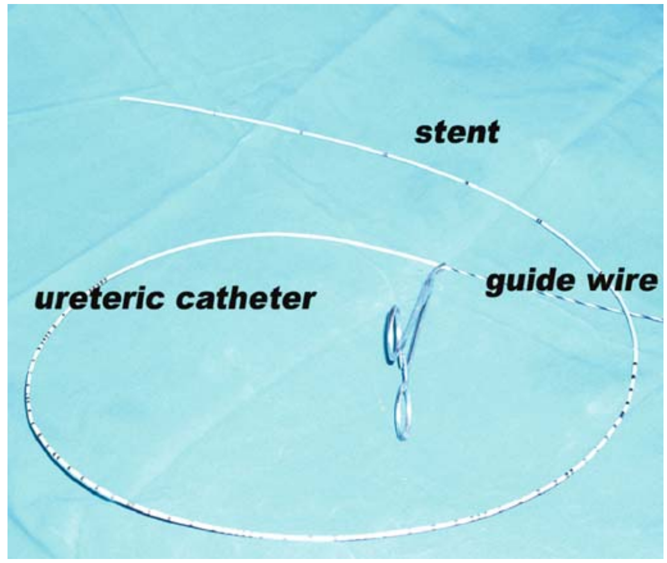


FIG. 15.6. Stent, ureteric catheter, and guidewire assembly

FIG. 15.7. Large radiopaque shadow in the left renal area in the lie of the left ureter (extracorporeal shock-wave lithotripsy [ESWL] failed)

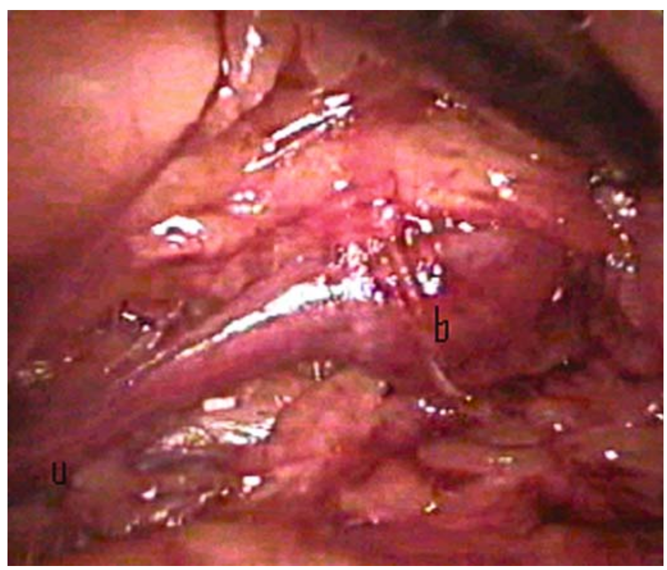


FIG. 15.8. Retroperitoneoscopic view of normal ureter (u) and the bulge (b) caused by a stone

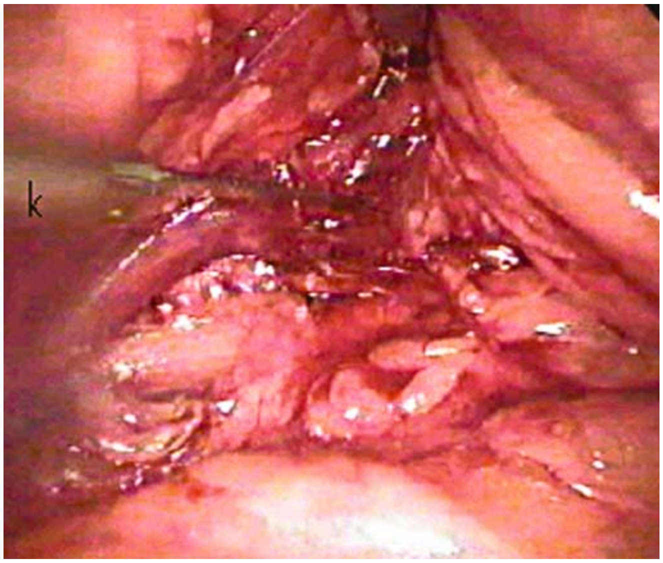


FIG. 15.9. Incising ureter with retractable endoknife (k)

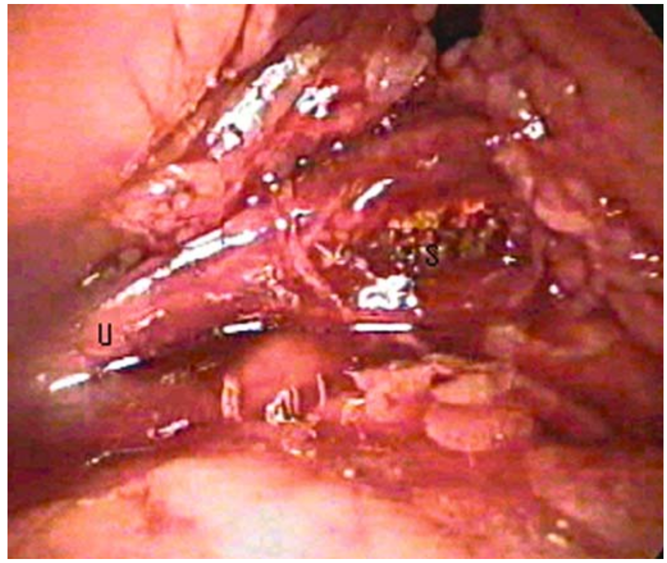
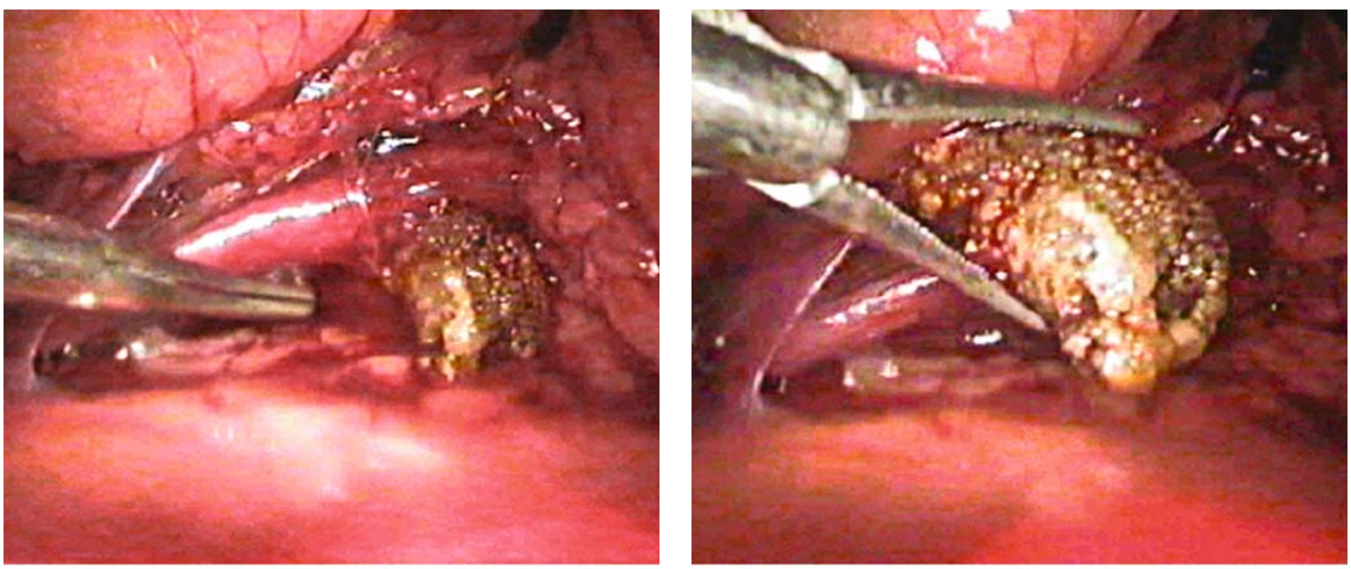


FIG. 15.10. Stone seen through a ureterotomy (u)



A B

FIG. 15.11. Stone being maneuvered out

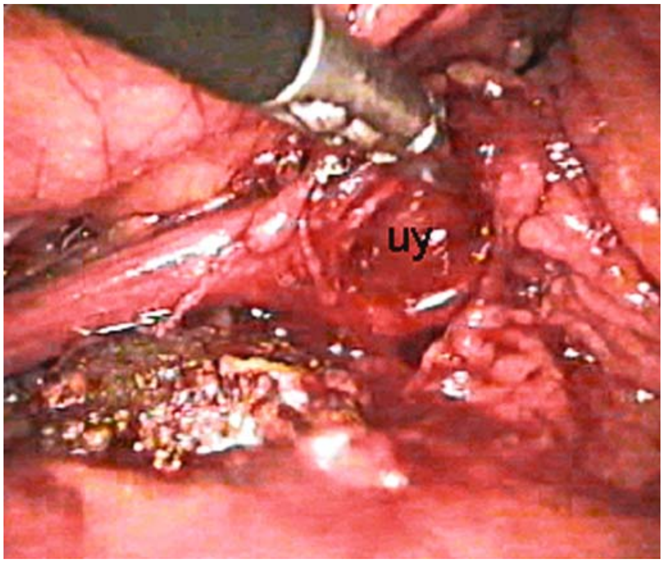


Fig. 15.12. Stone placed in an accessible area (uy, ureterotomy)

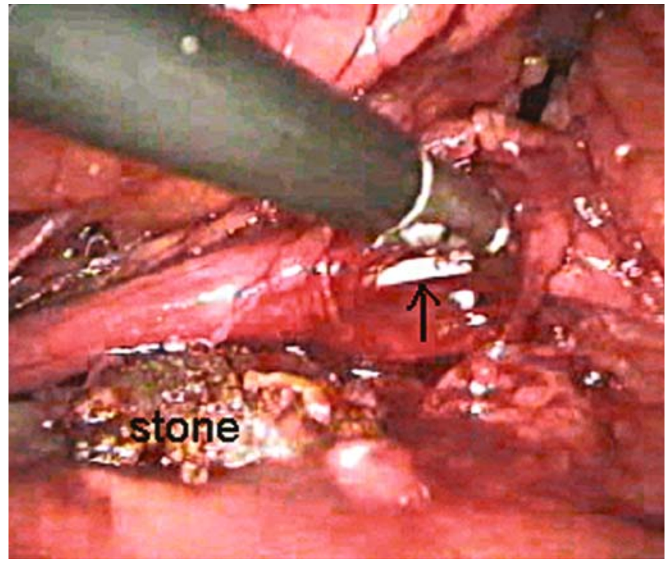
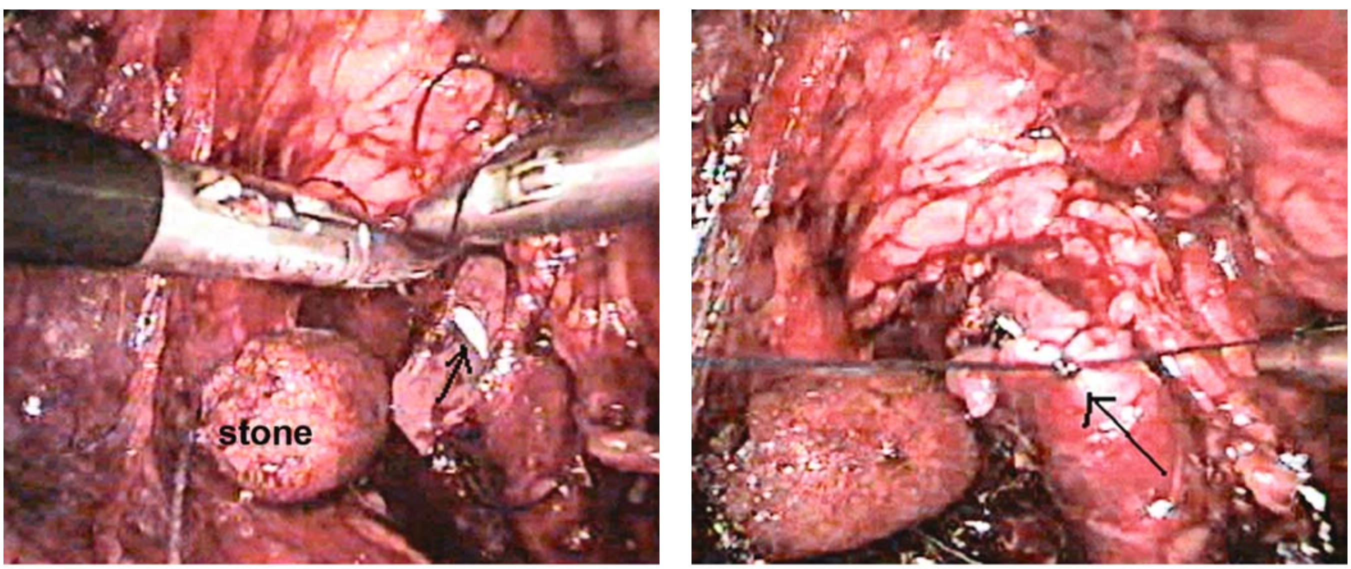
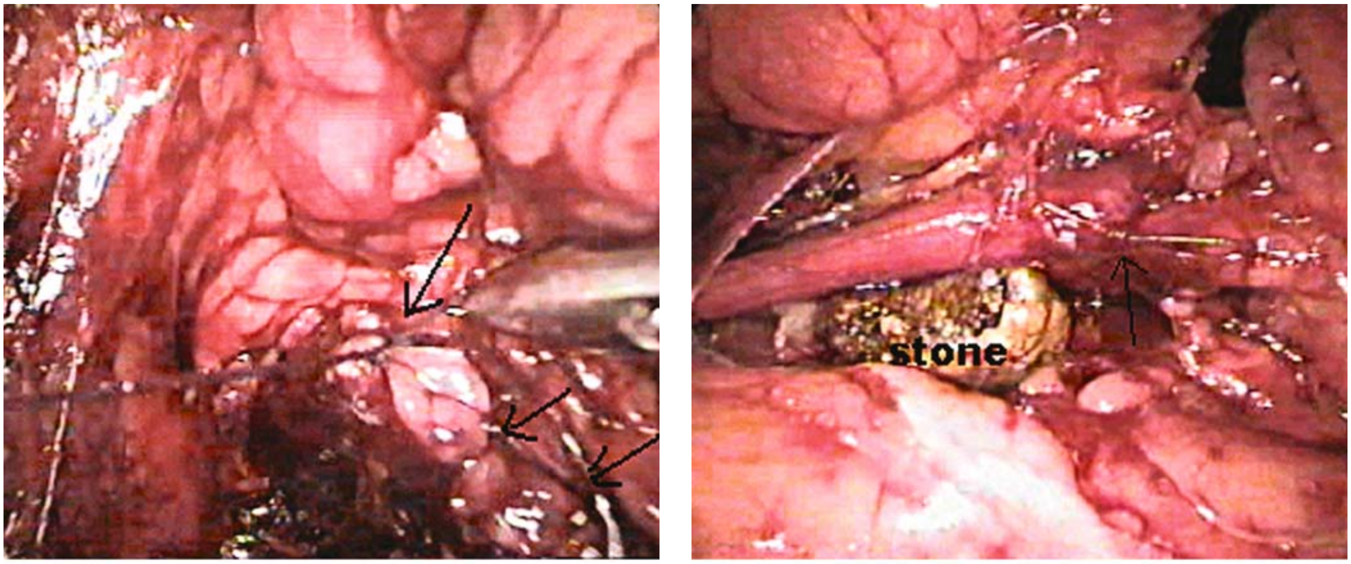


Fig. 15.13. Retrograde stent (arrow) advancement



A B

Fig. 15.14. Ureterotomy closure (arrow) using 4-0 absorbable suture



A B

Fig. 15.15. View after the ureterotomy closure (arrow showing the line of suture)

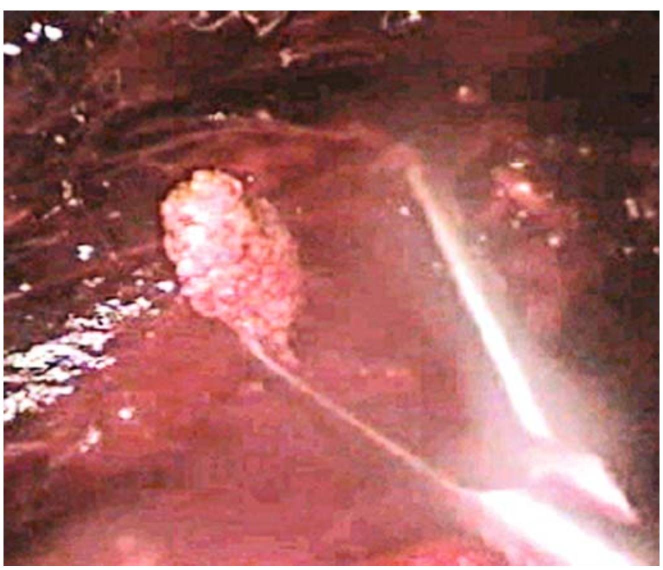


Fig. 15.16. Retrieval of the stone with the grasper

Fig. 15.17. Postoperative intravenous urogram (IVU) after 6 months

Laparoscopic Transperitoneal Ureterolithotomy

FIG. 15.18. An IVU shows a large right midureteric calculus (arrow) with back-pressure and delayed function

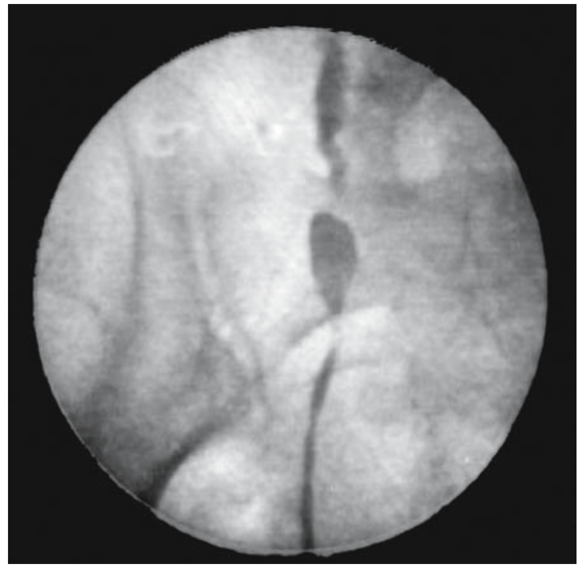


FIG. 15.19. A retrograde pyelogram (RGP) confirming a large stone over the right sacroiliac joint

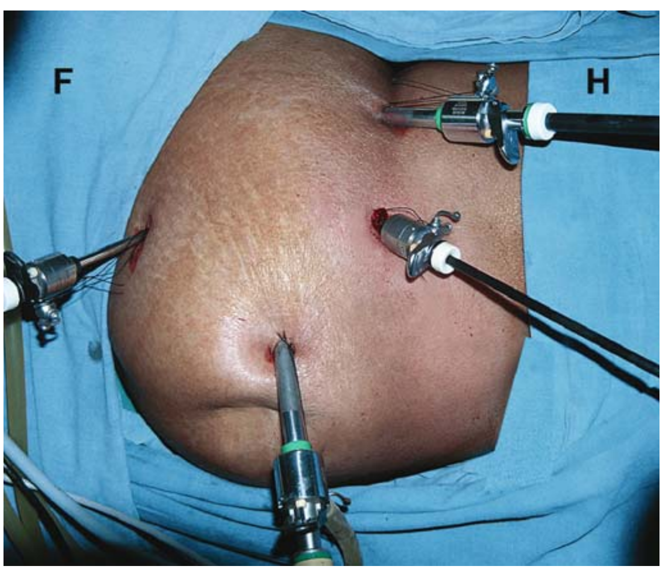


FIG. 15.20. Patient and the port positions

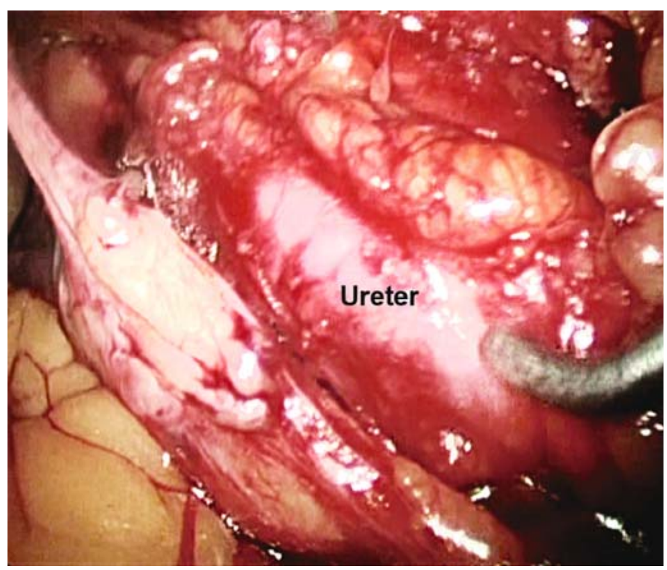


FIG. 15.21. Right colonic mobilization reveals dilated midureter

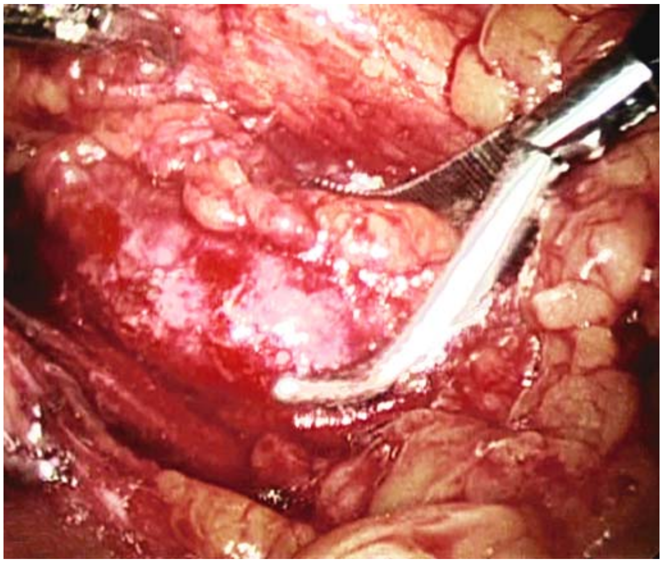


FIG. 15.22. Mobilized midureter shows a bulge due to a stone, which may be felt using an instrument

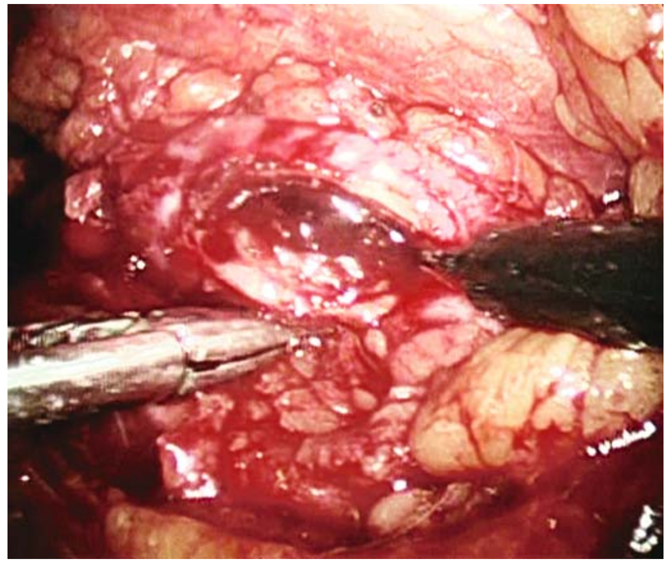
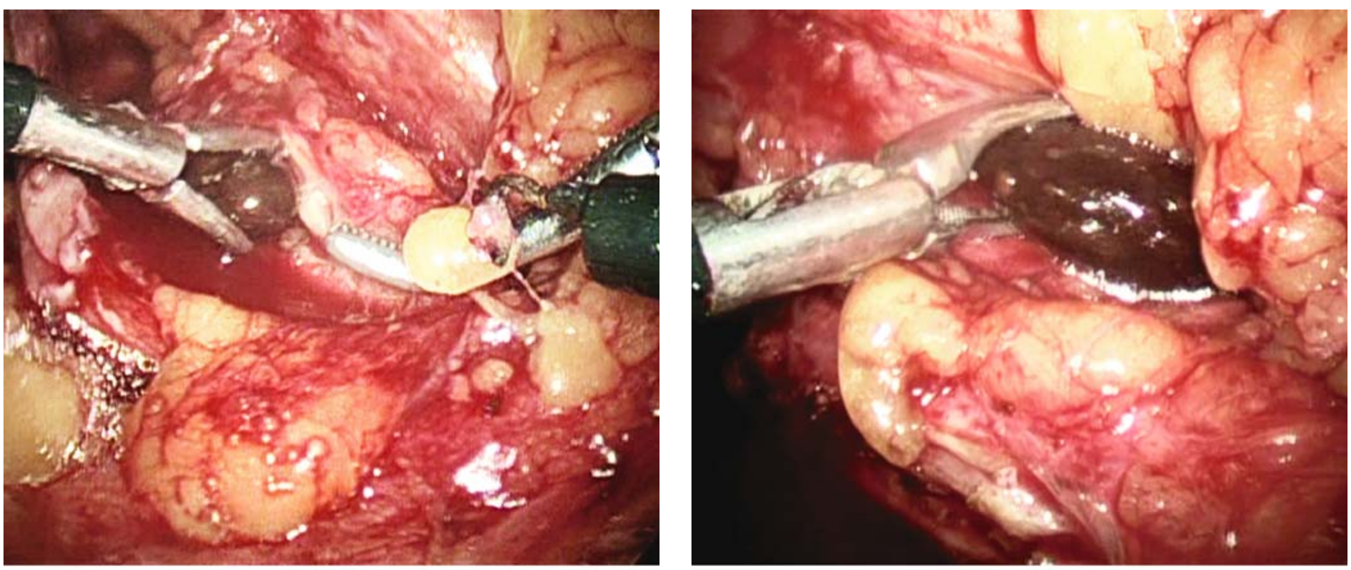


FIG. 15.23. Ureterotomy with hook cautery over the bulge revealing the stone



A B

FIG. 15.24. A ureterotomy performed adequately so that the stone can be extracted without mucosal laceration

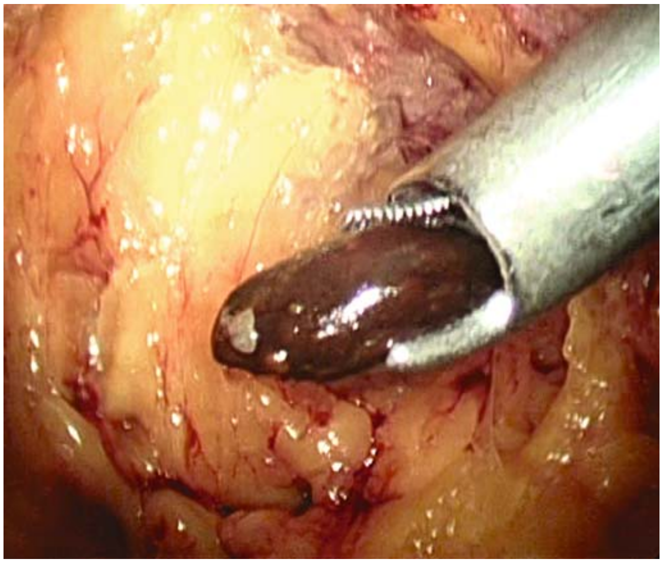


Fig. 15.25. The stone can be grasped along its long axis and retrieved

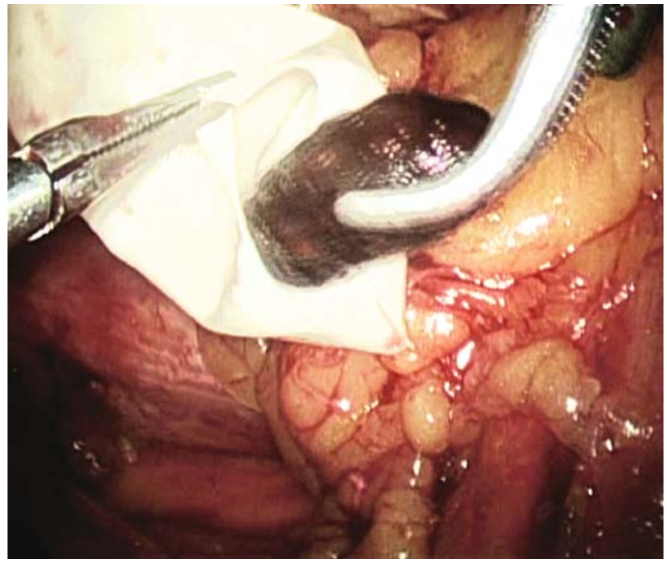


Fig. 15.26. The stone can also be entrapped in the finger stall of a glove and retrieved

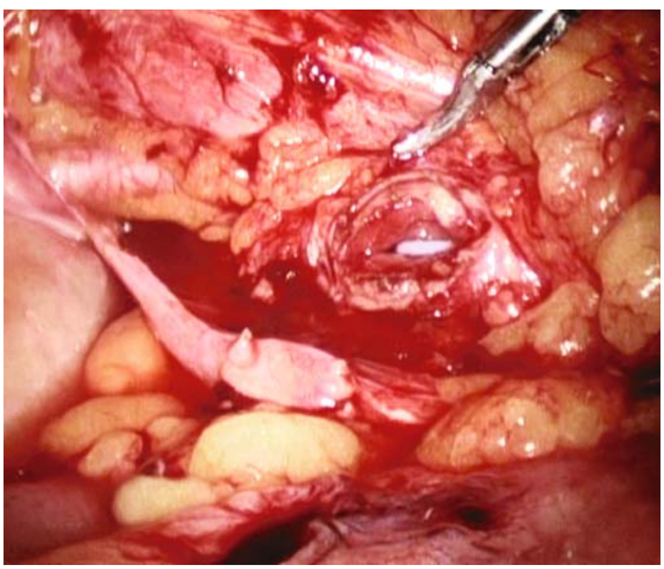


Fig. 15.27. Preplaced guidewire coming into view

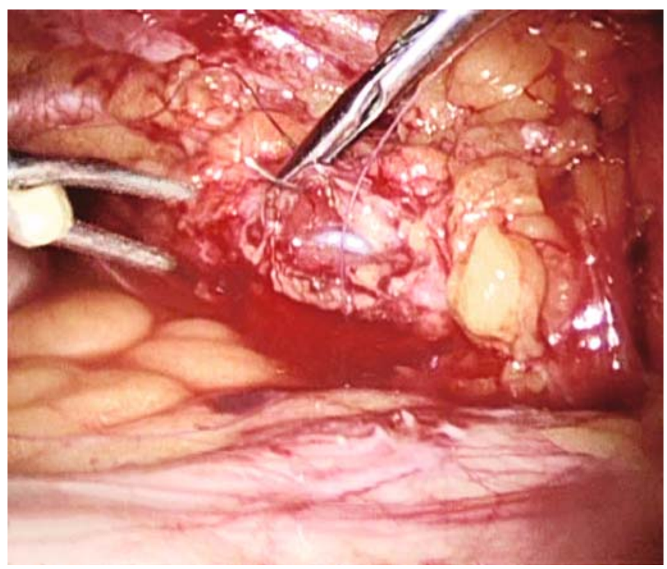


Fig. 15.28. After advancing a stent, the ureterotomy is closed with interrupted 4-0 Vicryl suture

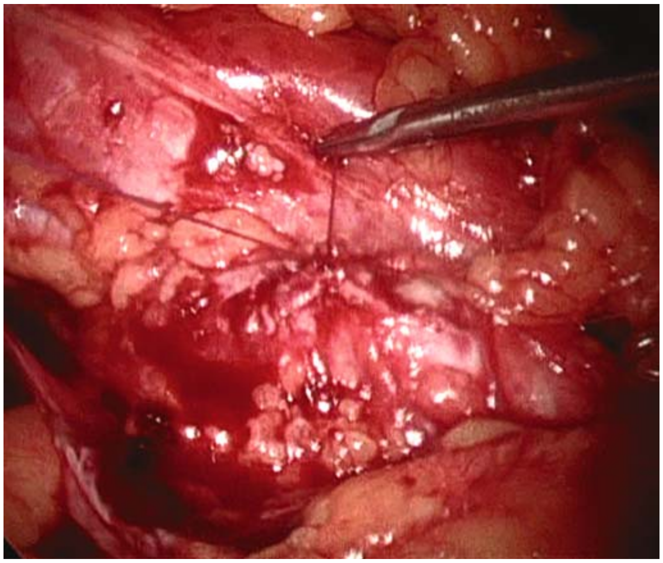


FIG. 15.29. View after the initial knot

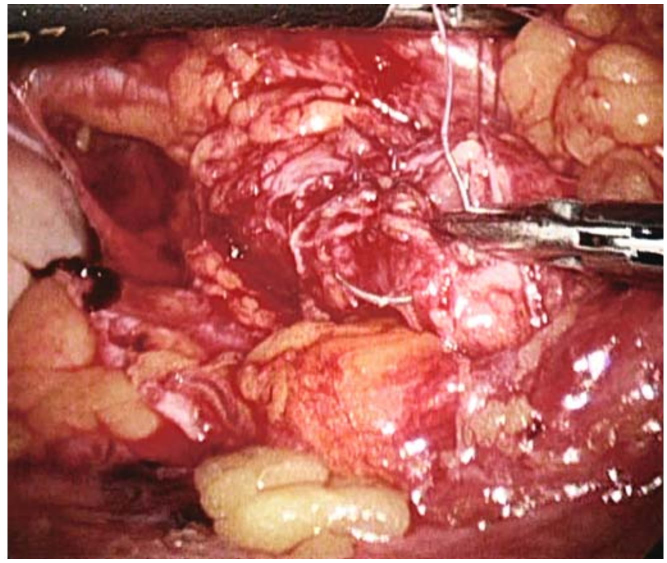


FIG. 15.30. A few more interrupted sutures underway

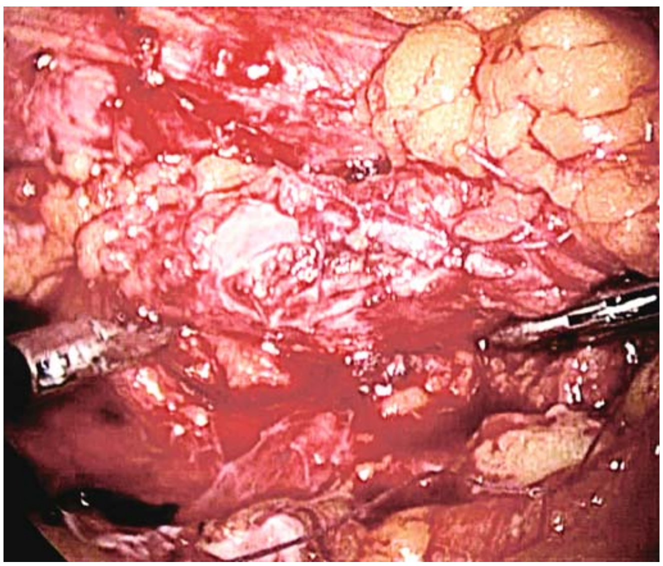


FIG. 15.31. Ureterotomy closure completed

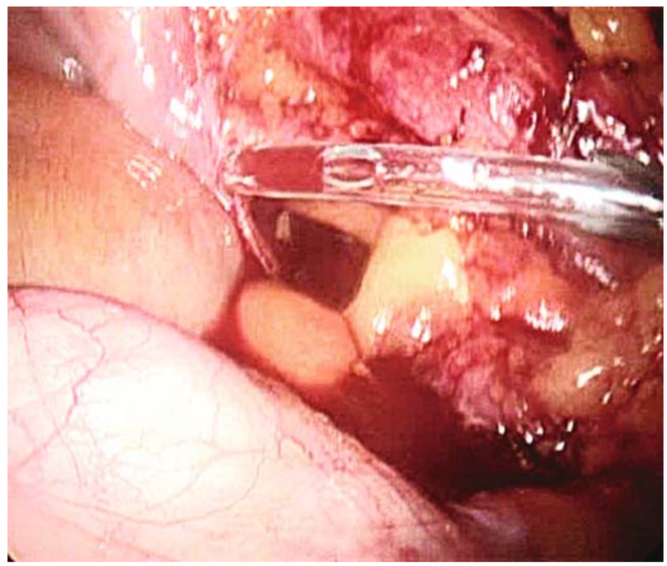


FIG. 15.32. A tube drain is introduced through the flank port

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16 Laparoscopic Ureterolysis

Sanjay B. Kulkarni

Primary or secondary nonmalignant extrinsic ureteral obstruction can be managed by open or laparoscopic ureterolysis [1–3].

Indications

Ureterolysis is warranted whenever there is a significant back-pressure change in the upper tract.

Surgical Technique

Preoperative ureteric stenting improves renal function. The stent also guides the procedure intraoperatively. The patient is placed in the 70-degree lateral position (for right and left sides accordingly). By the transperitoneal approach, using a para-umbilical camera port, two secondary ports in the midclavicular line, and a fourth port from the corresponding iliac fossa, the obstructed ureter is approached. By mobilizing the colon proximal to distal using ultracision or hook cautery, the ureter is identified and released. Fibrous plaque is sent to the lab for biopsy. The ureter can be lateralized and intraperitonealized. Omental wrapping is performed place the ureter away from fibrous plaque. The omentum also provides better vascularity and helps in healing.

Conclusion

Laparoscopic ureterolysis is a less morbid procedure.

Fig. 16.1. A computed tomography (CT) scan of the abdomen reveals fibrous plaque predominantly around the right ureter, great vessels, and to a lesser extent around the left ureter

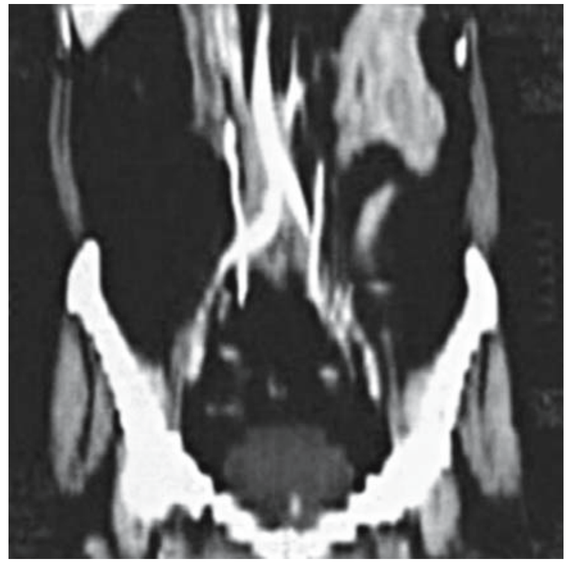

Fig. 16.2. A CT urogram (reformatted) shows medialization of both ureters

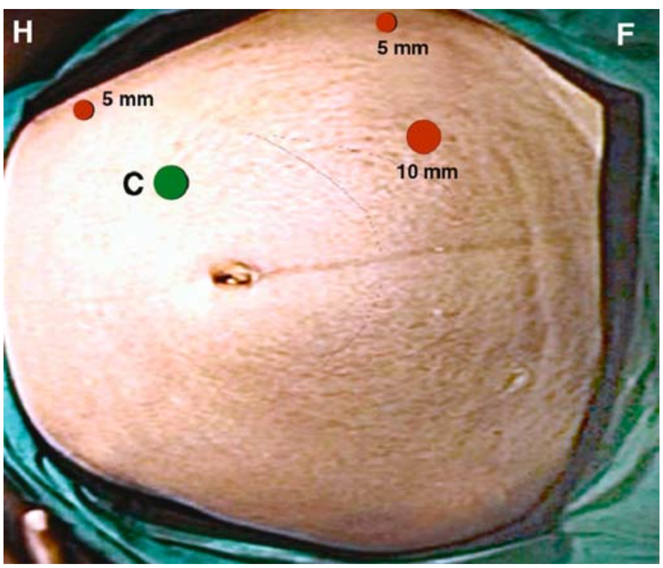

Fig. 16.3. Patient and the port positions (left ureterolysis initially) (C, camera port; H, head end; F, foot end)

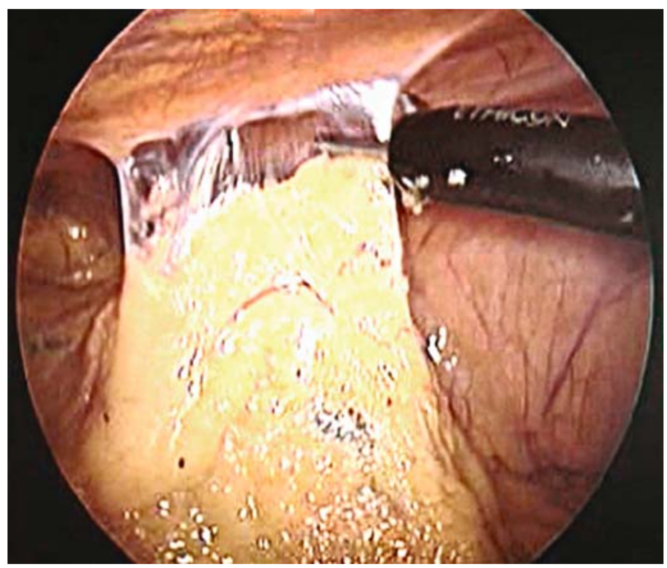

Fig. 16.4. Laparoscopic view of the left renal area shows adhesions

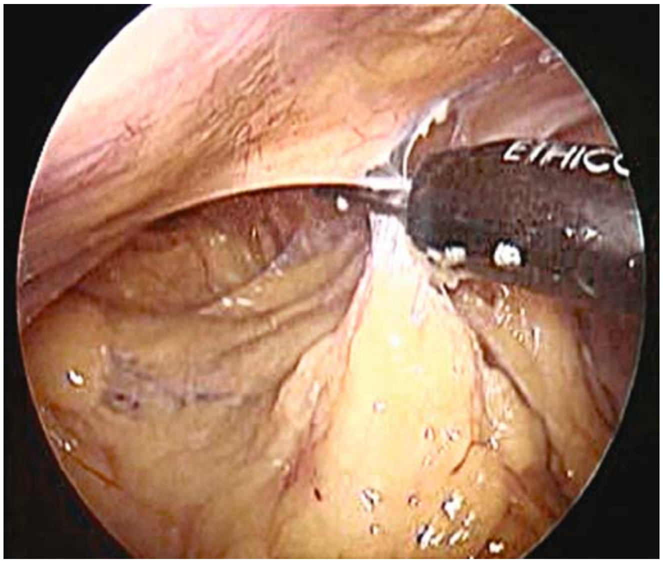

Fig. 16.5. Initial laparoscopic view of the left paracolic area

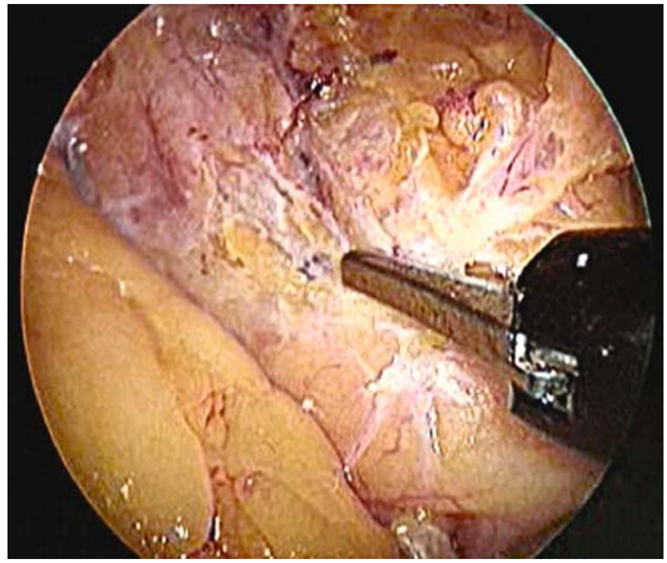

Fig. 16.6. Left colonic mobilization is performed

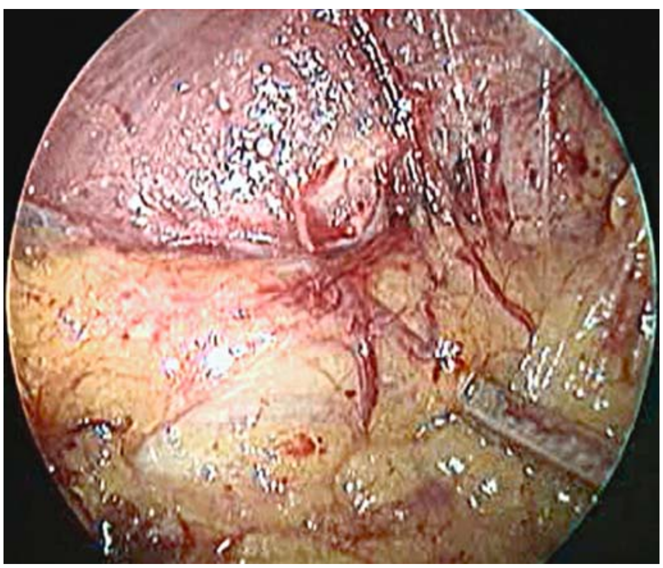

Fig. 16.7. Further mobilization reveals fibrous plaque over the probable area of the ureter

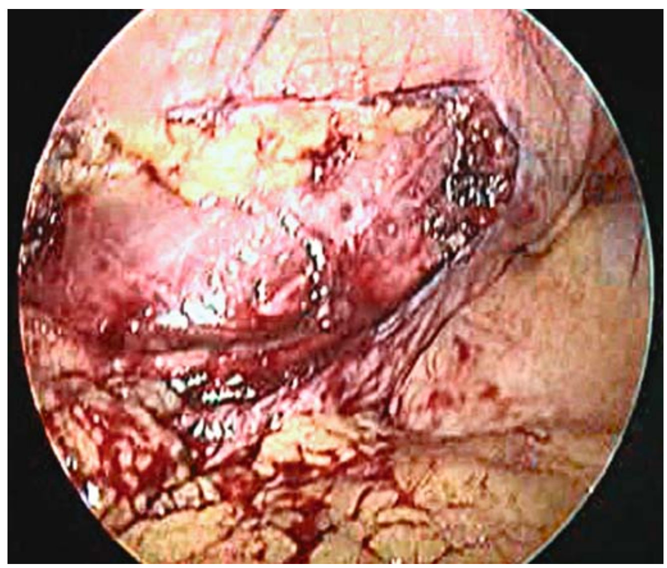

Fig. 16.8. Fibrous tissue reflected medially and dissection continued on the psoas to expose the upper ureter

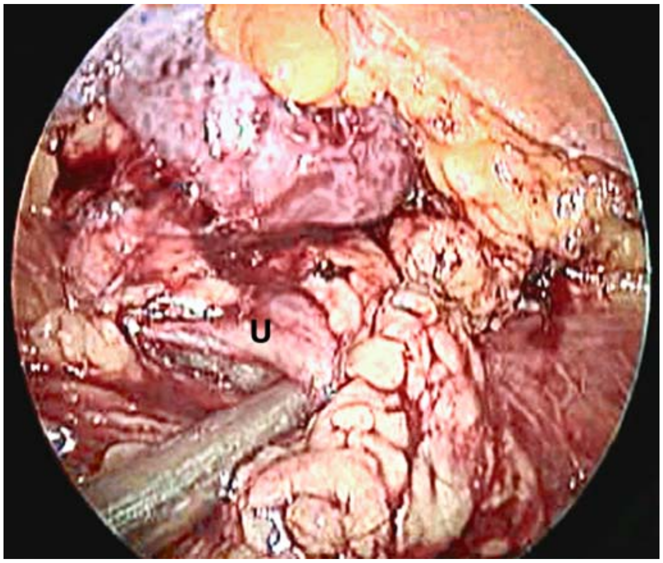

FIG. 16.9. Mobilization of the ureter starts in an area above the level of plaque so that the landmarks are clear (U, ureter)

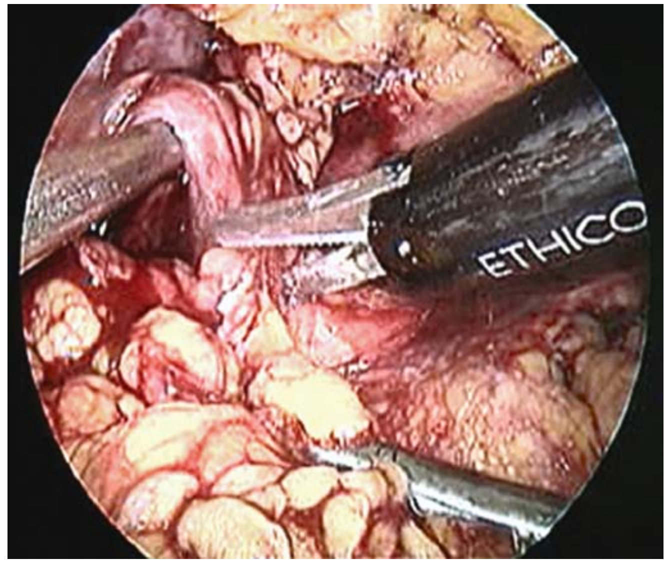

FIG. 16.10. Dissecting the ureter off the plaque using ultracision, which can be less damaging than electrocautery

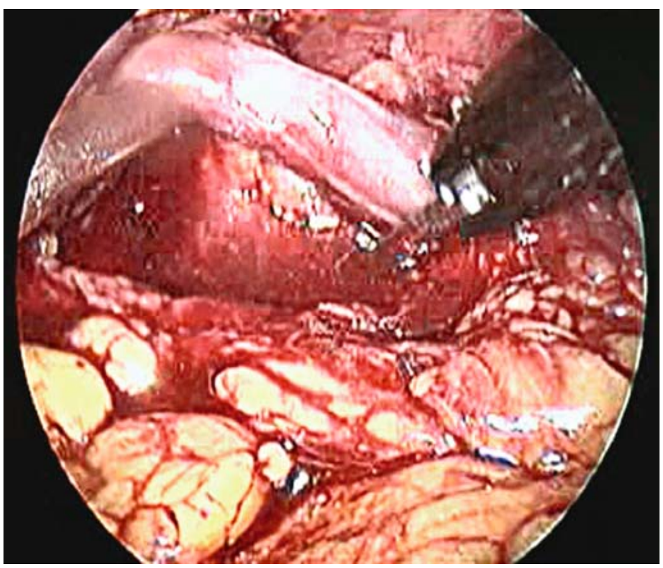

FIG. 16.11. Dissecting on the ureteric wall is essential (to avoid leaving any fibrous tissue over the ureter)

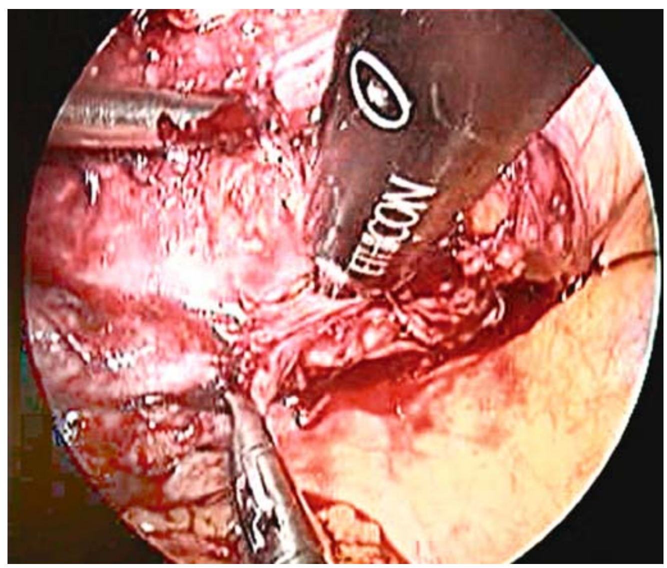

FIG. 16.12. Dissection at the level of iliac vessels has to be done carefully

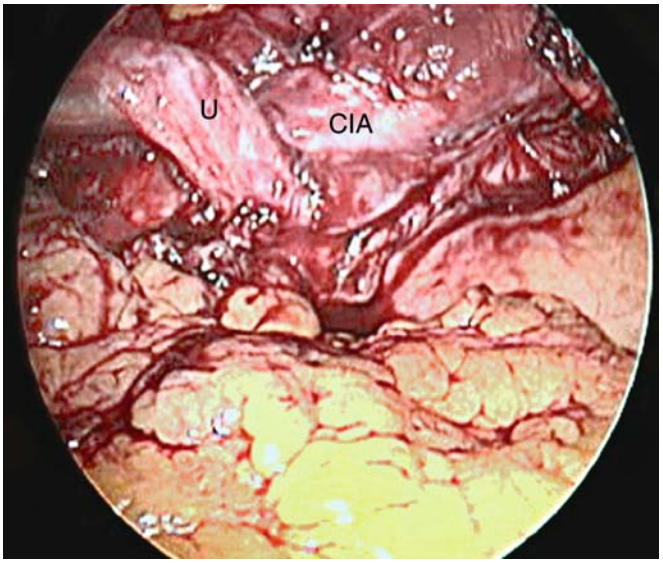

FIG. 16.13. Ureter dissected off the iliac vessels (CIA, common iliac artery; U, ureter)

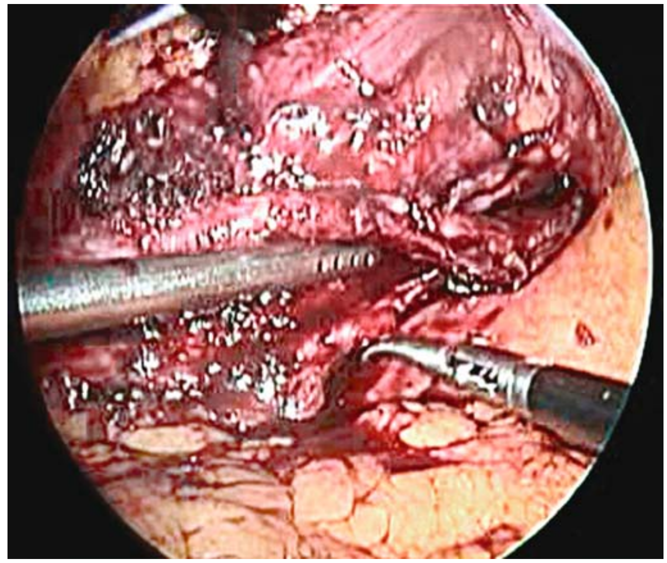

FIG. 16.14. Releasing the ureter below the pelvic brim

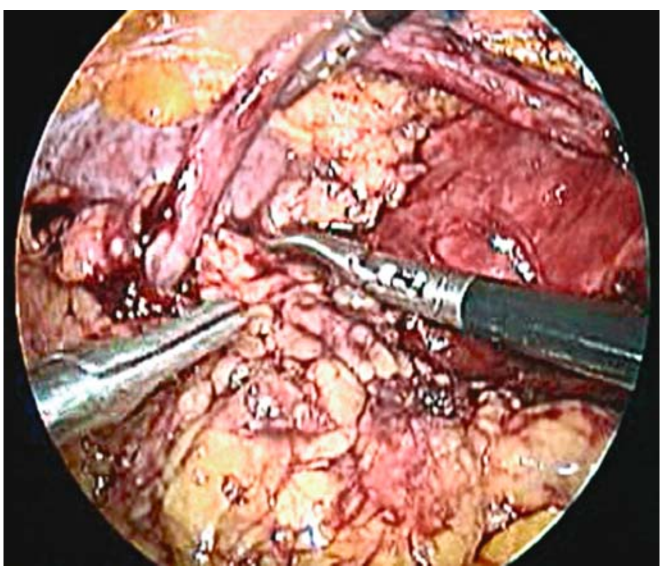

FIG. 16.15. Completely released upper and midureter lifted anteriorly in preparation for omental wrap

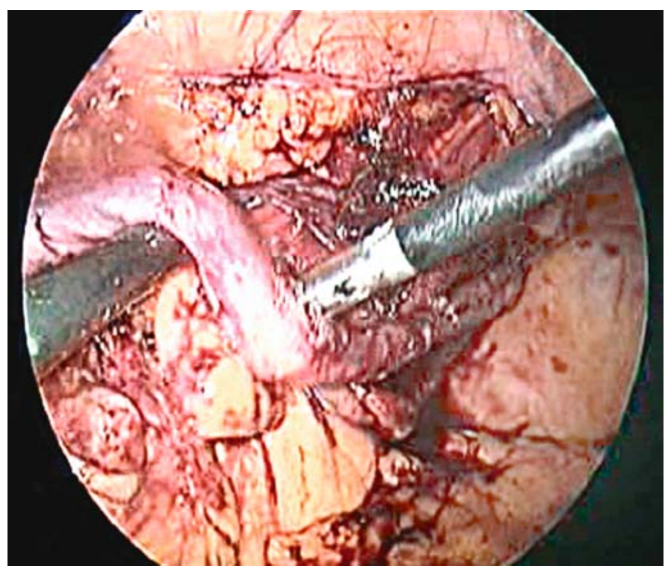

FIG. 16.16. Omental wrapping in progress

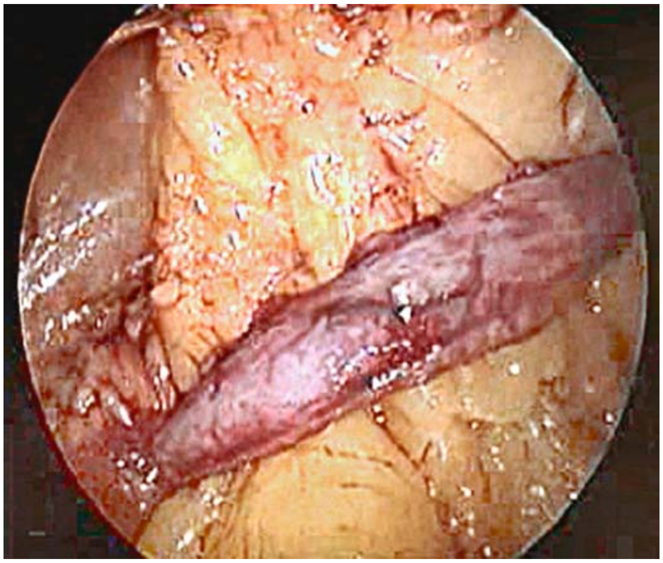

FIG. 16.17. The omentum has been mobilized and is wrapped around the left ureter

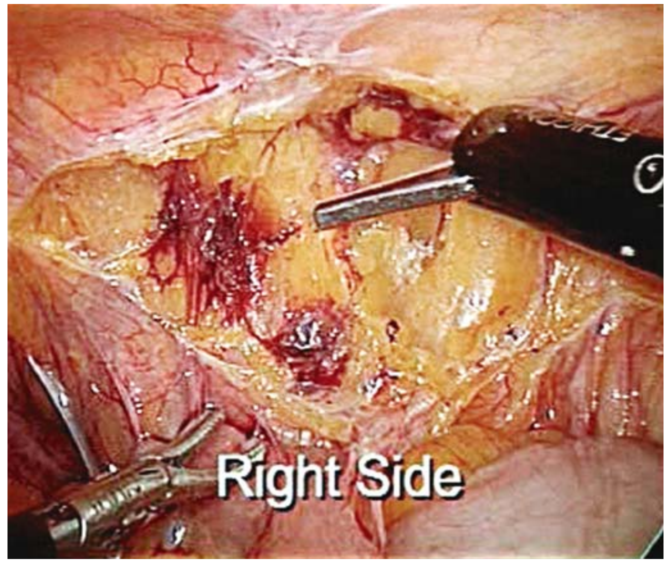

FIG. 16.18. After changing to the right-flank-up position, the right colon is mobilized similarly

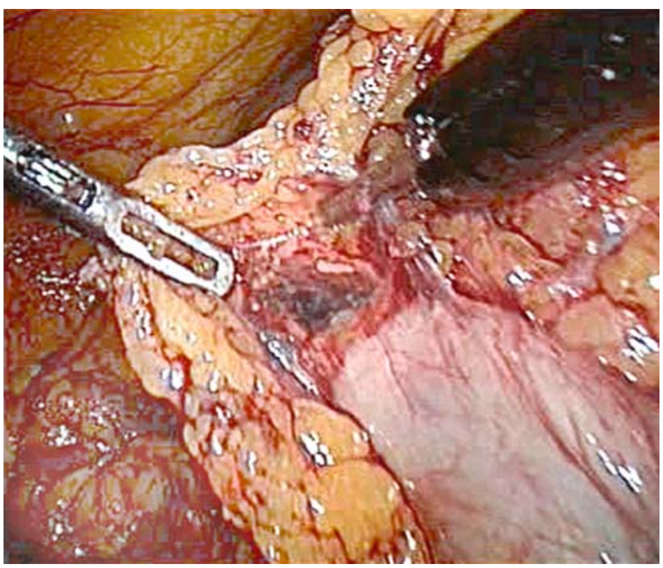

FIG. 16.19. Mobilization of right colon

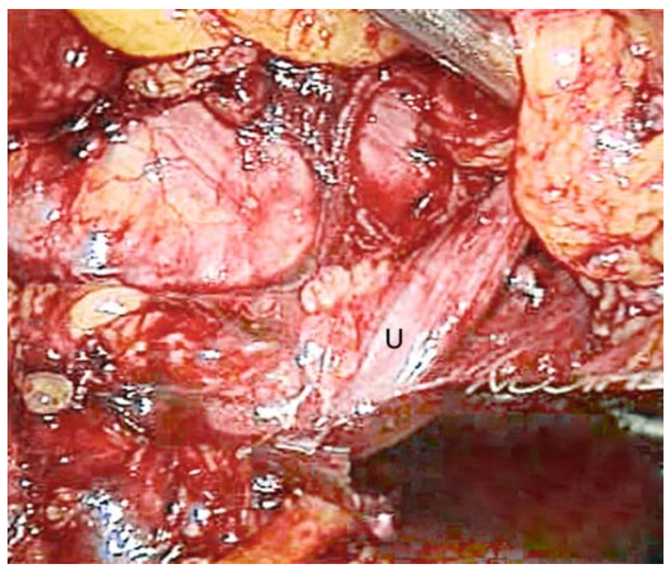

FIG. 16.20. Further dissection at the right pelvic brim reveals ureter (U)

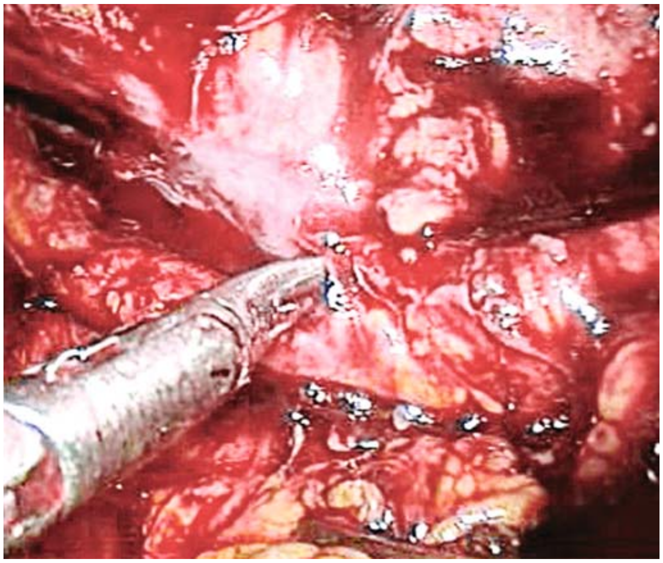

Fig. 16.21. Fibrous plaque being dissected off the right midureter

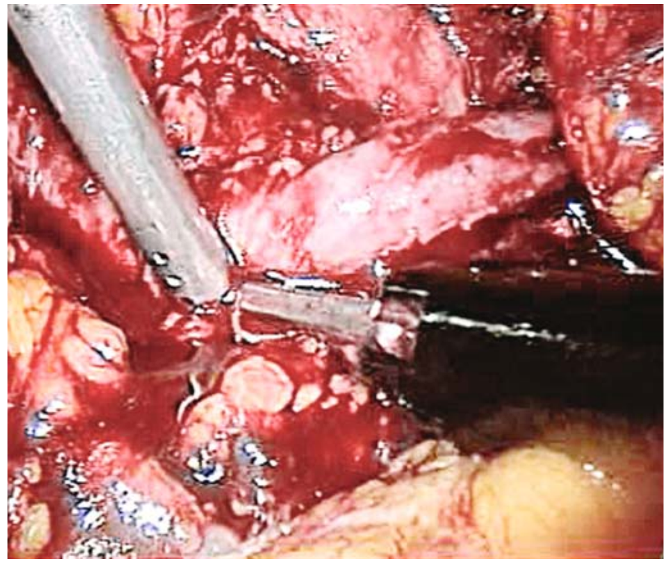

Fig. 16.22. Releasing the ureter all around

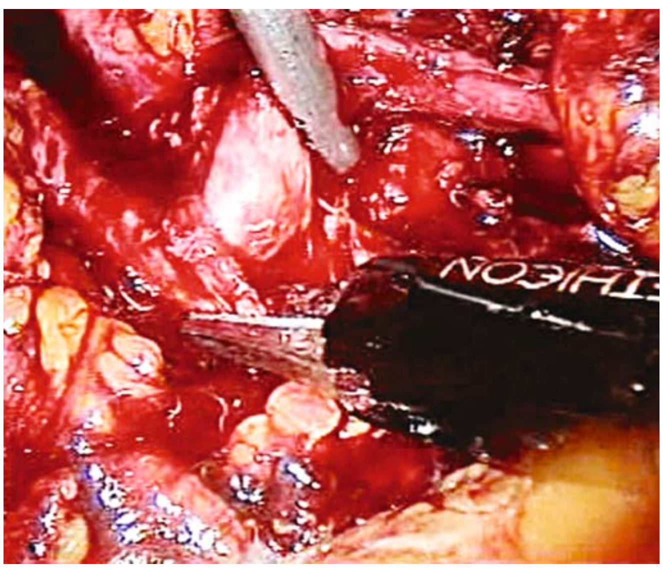

Fig. 16.23. Fibrous plaque appreciable around the right ureter

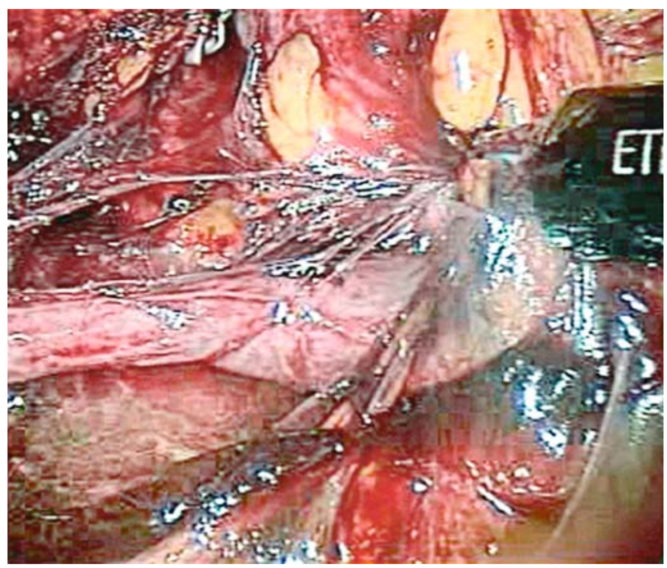

Fig. 16.24. Completely isolated right upper and midureter

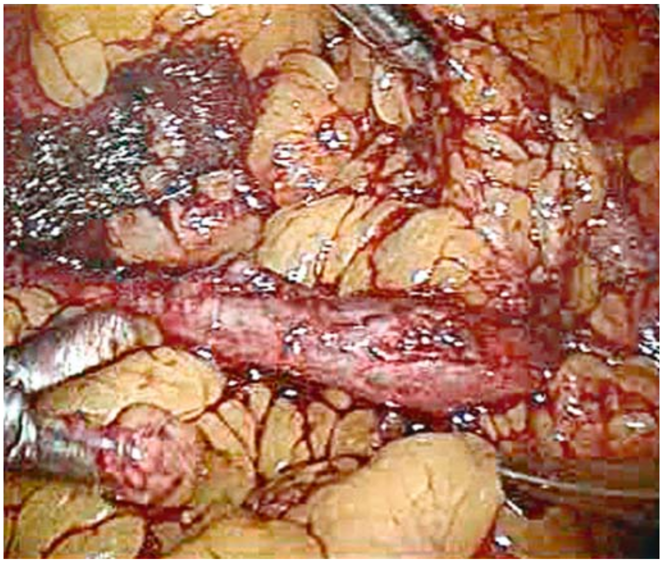

Fig. 16.25. Omental wrapping is performed

Fig. 16.26. Wrapped omentum is transfixed

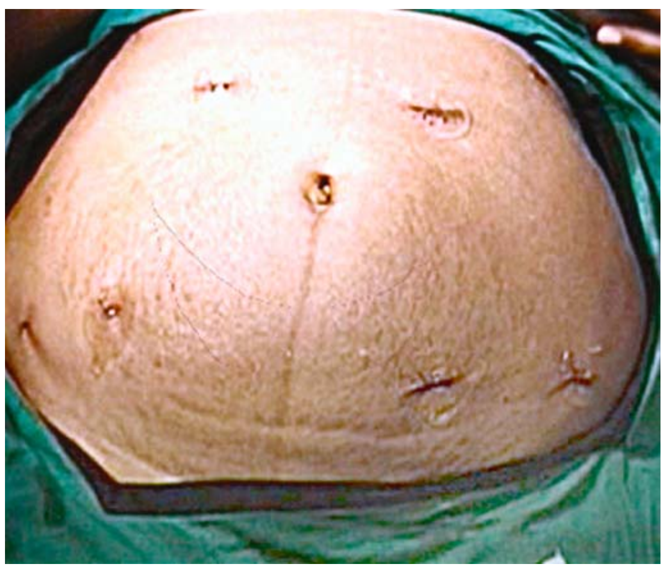

Fig. 16.27. Ports site for bilateral ureterolysis

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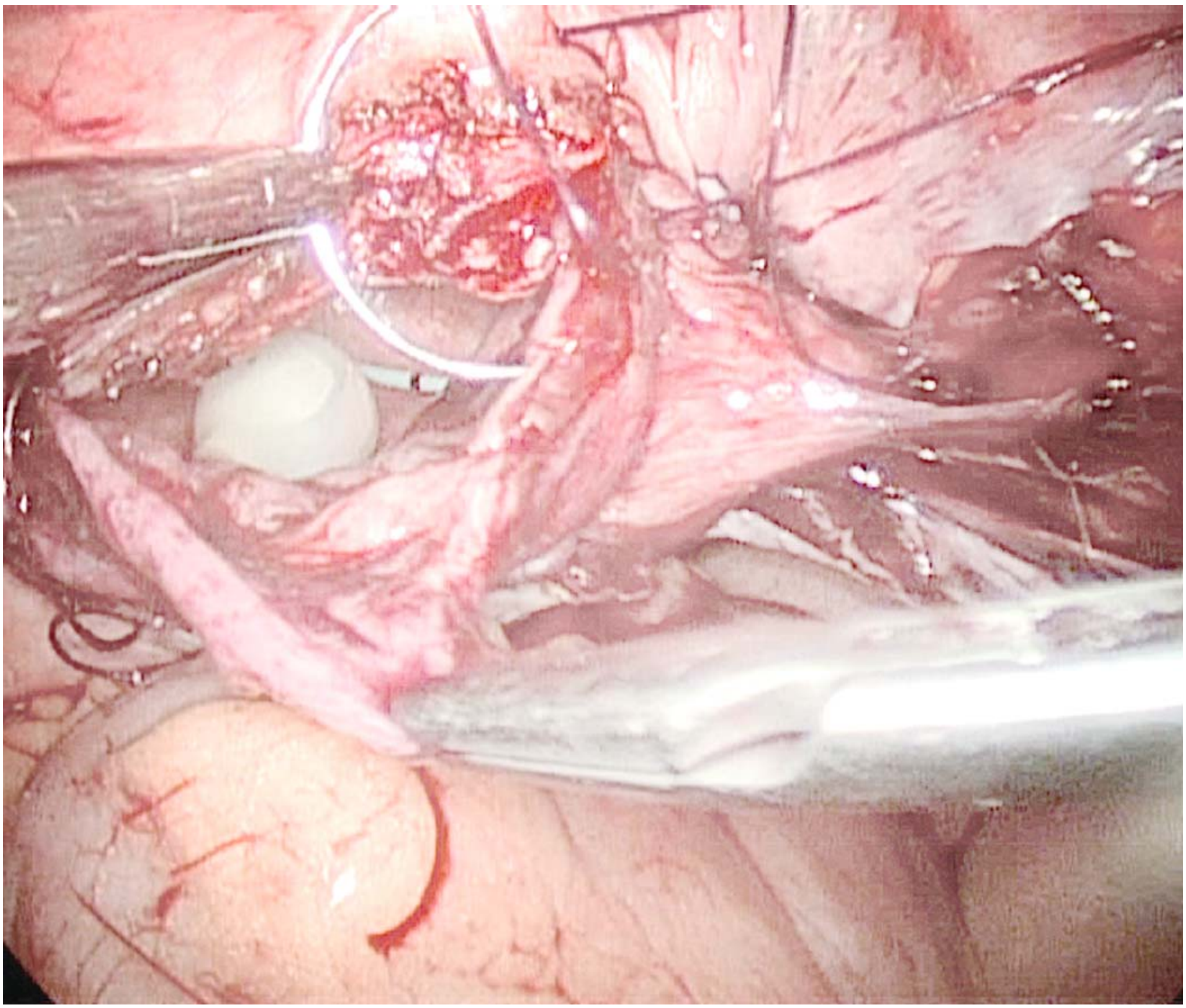
Section IV
Reconstructive Procedures on the Urinary Bladder



17 Laparoscopic Repair of Bladder Injuries

M. Ramalingam, V. Venkatesh, and Amudha Giridhar

Bladder injuries needing intervention, can be managed by a laparoscopic approach [1–5]. A computed tomography (CT) of the abdomen and cystogram demonstrate the extent of trauma.

Indications

Isolated bladder ruptures (traumatic or iatrogenic) can be managed laparoscopically if the patient is hemodynamically stable.

Contraindications

Laparoscopy may be contraindicated when the bladder injury is a component of multiorgan injuries or if the patient is unstable.

Surgical Technique

The bladder is catheterized and the Foley catheter is kept sterile for filling the bladder subsequently. After establishing a pneumoperitoneum with a Veress needle, a 10-mm trocar(subumbilical) is inserted into the peritoneal cavity to inspect and define the bladder tear. Two secondary trocars are inserted into the right and left iliac fossae. The cranial margin of the bladder laceration is picked up with a dissector, and the interior of the bladder is visualized with the laparoscope to rule out any other tear. The edges of the bladder wall require trimming. Free-hand suturing is done with 2-0 polyglactin running suture. A dissector passed through the 5-mm secondary trocar ensures that adequate tension on the suture is maintained. The bladder is distended gently with 150 mL of saline to visualize any leak that can be oversewn. A tube drain is introduced through one of the secondary ports. An indwelling catheter is left for 10 days.

Conclusion

Whenever the patient's condition allows, laparoscopic cystorrhaphy is preferable as it is a fairly simple and less morbid procedure.

Intraoperative Bladder Injury

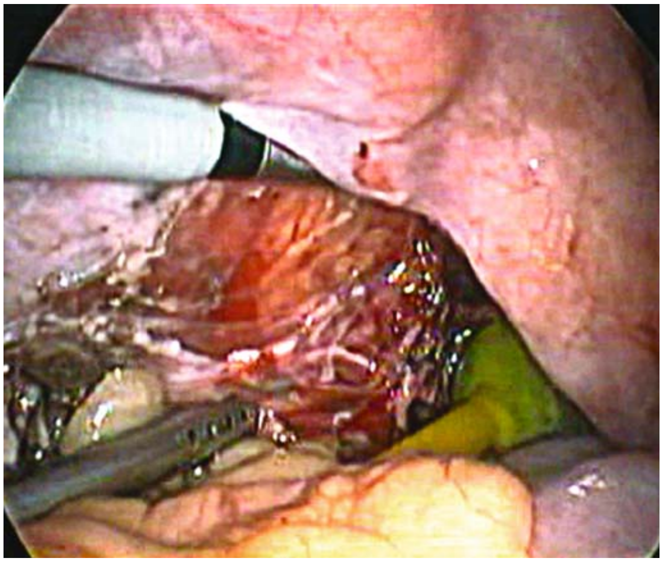


FIG. 17.1. Laparoscopic view during hysterectomy reveals a bladder tear, exposing the Foley catheter

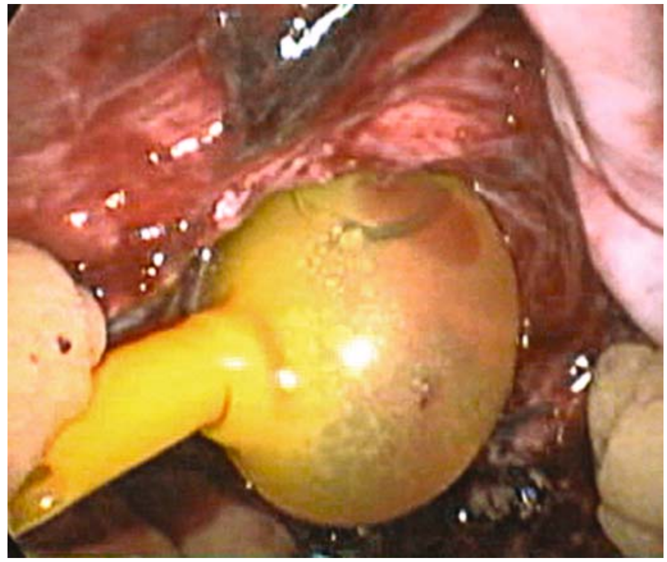


FIG. 17.2. Close-up view shows a tear in the posterior wall

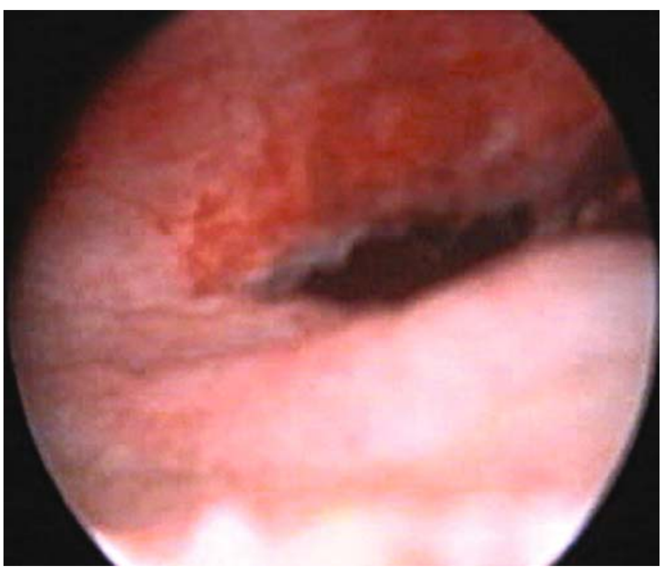


FIG. 17.3. A check cystoscopy revealing a supratrigonal tear

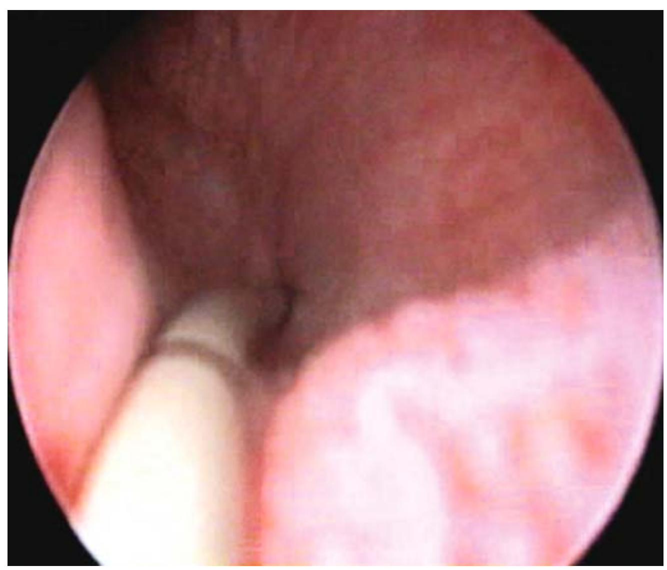


FIG. 17.4. Ureteric catheterization ruling out associated ureteric involvement

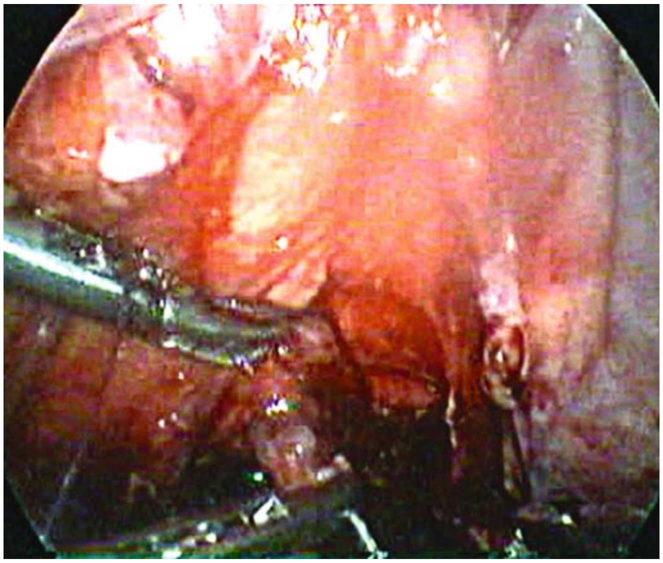


FIG. 17.5. Interrupted 3-0 Vicryl suture is used to approximate the edges

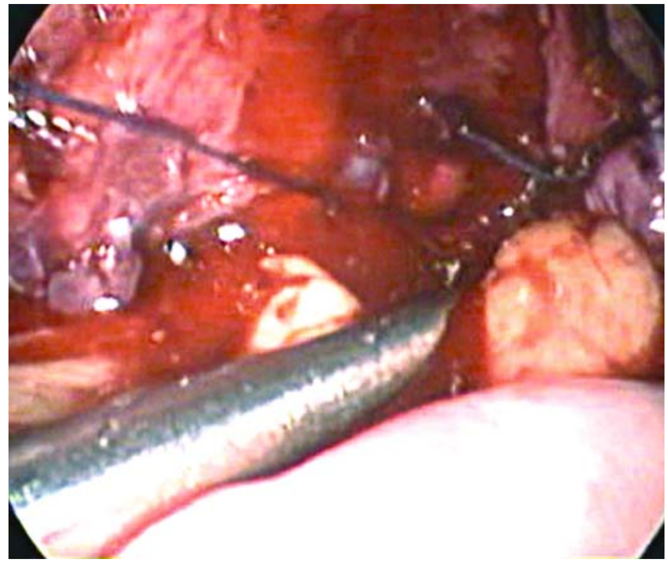


FIG. 17.6. A defect in the posterior wall is closed

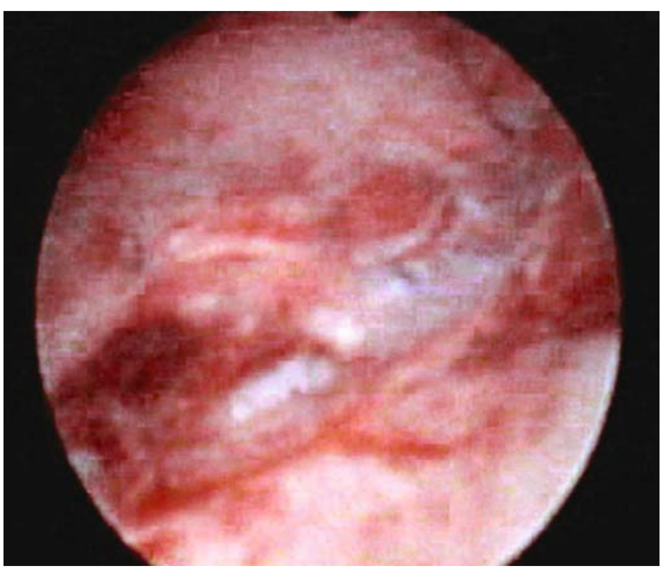


FIG. 17.7. A check cystoscopy at the end of repair revealing satisfactory closure

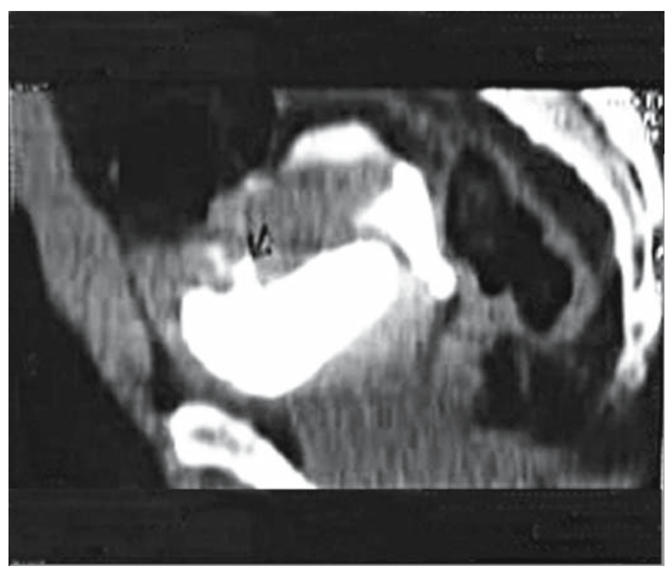


FIG. 17.8. A computed tomography (CT) cystogram shows evidence of an intraperitoneal rupture of the bladder (arrow)

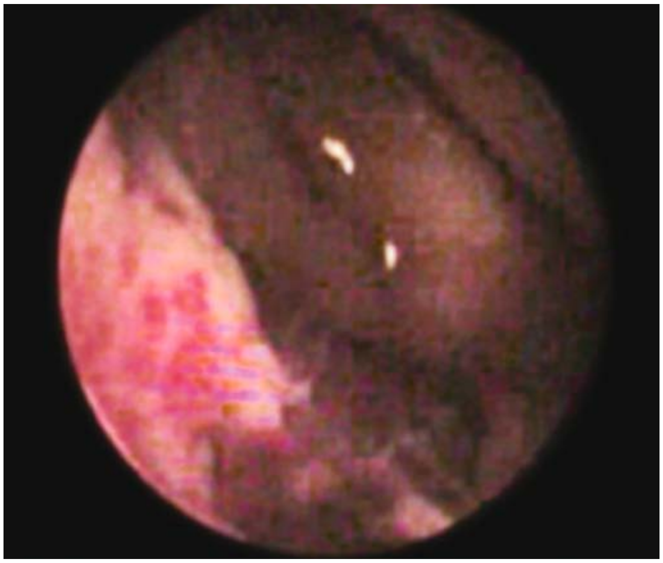


Fig. 17.9. Cystoscopy revealing a rent in the fundus of the bladder (clot concealing the rent partially)

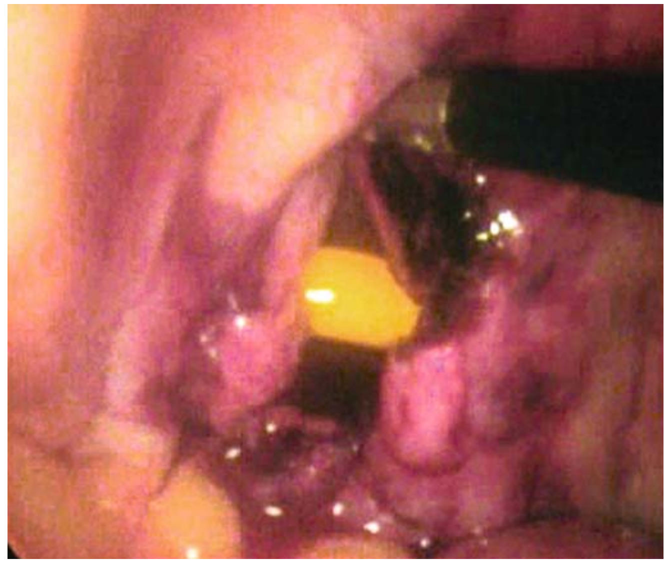


Fig. 17.10. Laparoscopic view of an intraperitoneal tear, exposing the Foley catheter

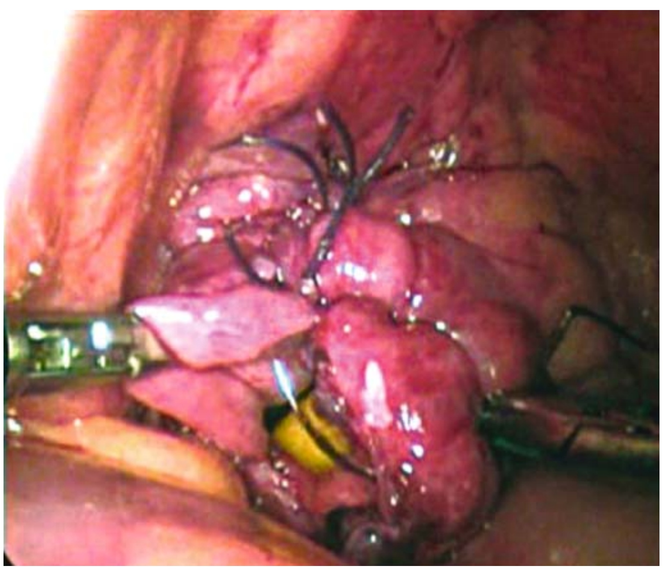


Fig. 17.11. A bladder rent being closed with 2-0 interrupted Vicryl suture

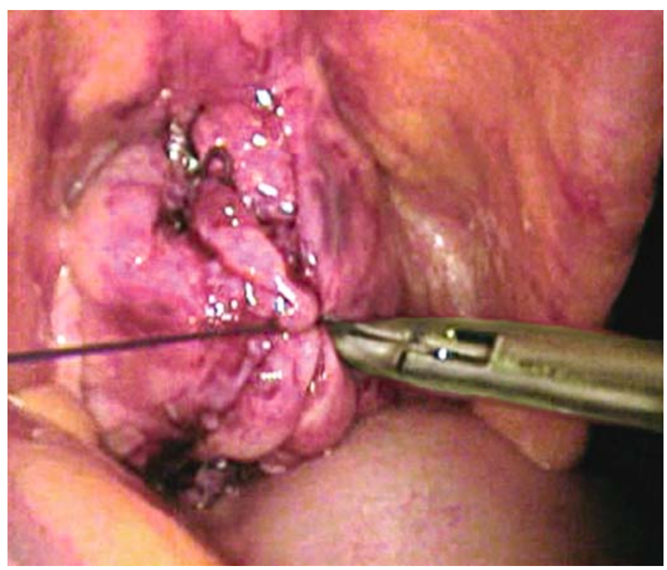


Fig. 17.12. Second layer of closure is being done

Fig. 17.13. A drain tube introduced through the flank port

Problems and Solutions

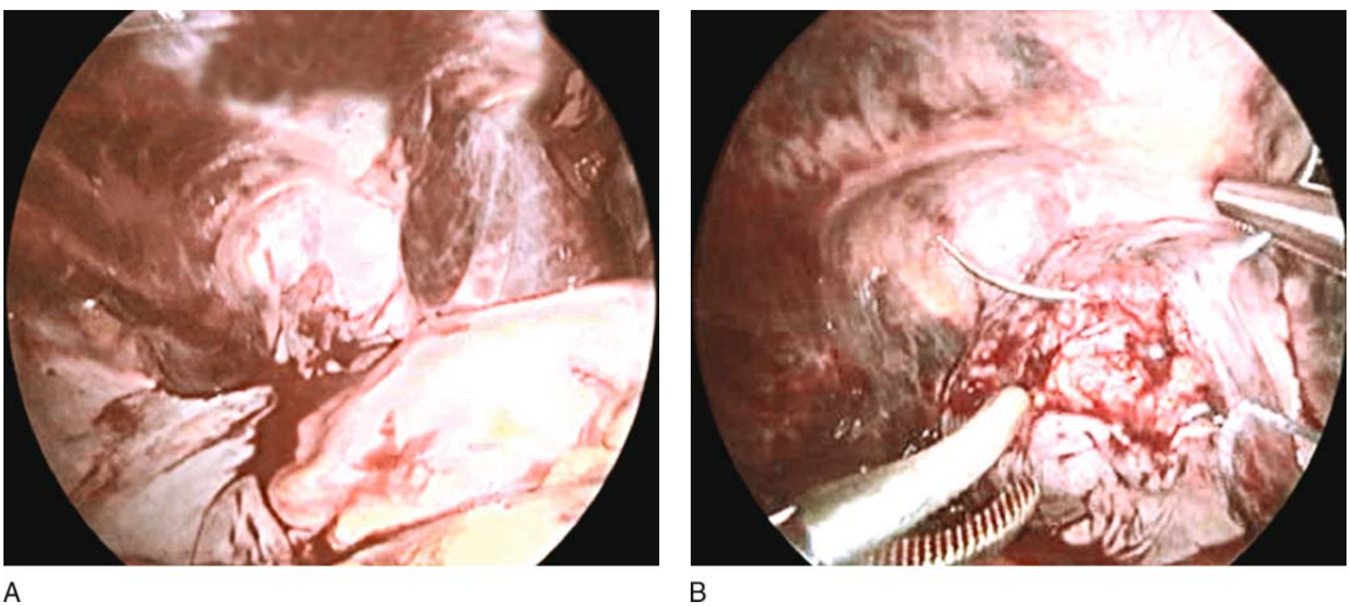


Fig. 17.14. In bladder tears associated with contusion, it is difficult to assess the thickness of the bladder wall during laparoscopic cystorrhaphy; in such instances a longer needle may be used for suturing

Fig. 17.15. Cystoscopic assessment of the repair can be done as the patient is in the lithotomy position

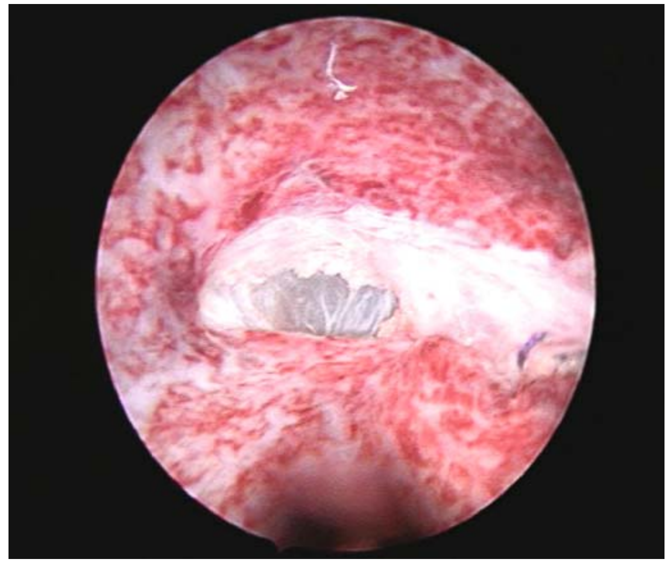


Fig. 17.16. The cystoscopic view shows less satisfactory suturing; one can always go back laparoscopically for a better cystorrhaphy

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18 Laparoscopic Bladder Diverticulectomy

M. Ramalingam, M.G. Pai, and M. Banumathy

Laparoscopic bladder diverticulectomy is a challenging procedure [1–4]. A large primary bladder diverticulum with narrow neck is prone for complications such as calculi, urinary tract infection (UTI), and malignancy.

Indications

1. Large diverticulum with narrow neck away from the ureteral orifice
2. Urachal diverticulum (as it is prone for complications frequently)

The approach has to be cautious in the following conditions:

1. Diverticulum adjacent to ureteric orifice
2. Diverticulum lodging tumor
3. Diverticulum secondary to bladder outlet obstruction needing bladder outlet correction

Surgical Technique

Preliminary cystogram and cystoscopy demonstrate the size and location of the diverticulum and its relation to the ureteric orifice. If the neck of the diverticulum is close to the ureteric orifice, a ureteric stent is preferable to protect the ureter. The patient is placed in the lithotomy position. A 14-French (F) Foley catheter is introduced to distend or empty the bladder as and when needed. By transperitoneal approach using an umbilical camera port and two ports in the midclavicular line, one on each side 5 cm below and lateral to umbilicus, the bladder diverticulum is identified by distending the bladder.

An incision is made in the peritoneum, and the diverticulum is exposed. The dome of the diverticulum is elevated using a grasper, and circumferential dissection of its neck is performed. The diverticulum is divided at the level of the neck using electrocautery or ultracision. The specimen can be left in the rectovesical or rectovaginal pouch to be retrieved at the end. The bladder defect is repaired with continuous 2-0 Vicryl suture. The bladder is filled with saline to confirm a watertight closure, and a drain is placed under direct vision. The excised diverticulum is removed through the 10 mm port.

Postoperative Follow-Up

A cystogram is done on the seventh postoperative day to check for any extravasation. A urethral Foley catheter can be removed on the tenth postoperative day.

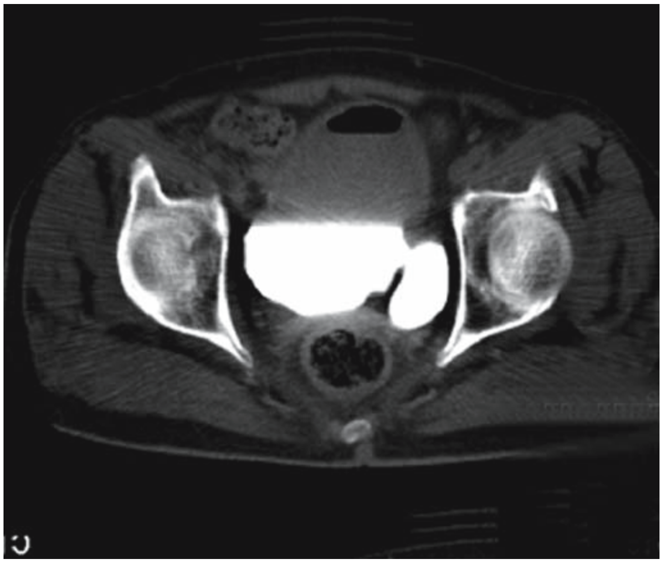


FIG. 18.1. A computed tomography (CT) scan shows a large bladder diverticulum on the left inferolateral wall

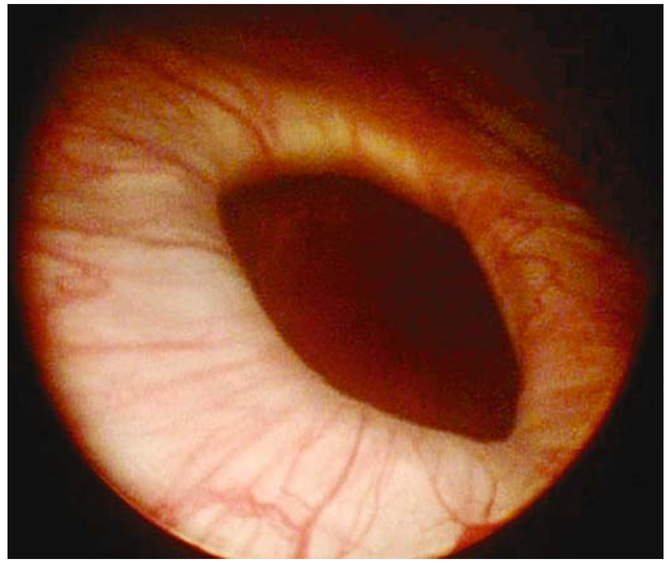


FIG. 18.2. Cystoscopic view of the diverticulum above and lateral to the left ureteric orifice

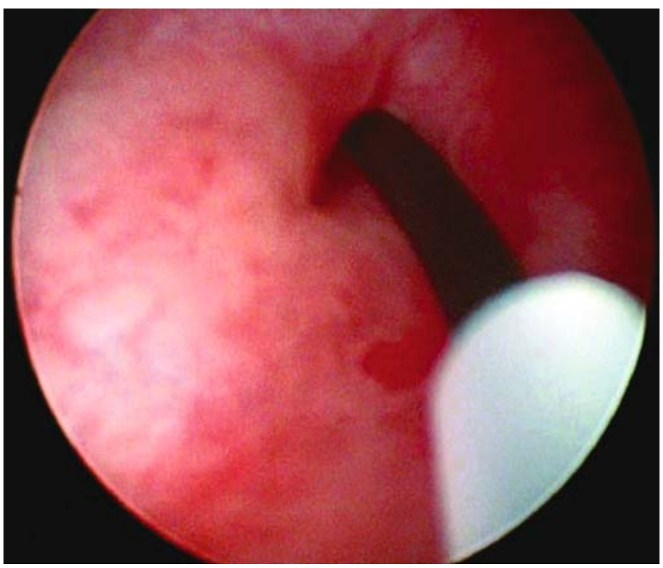
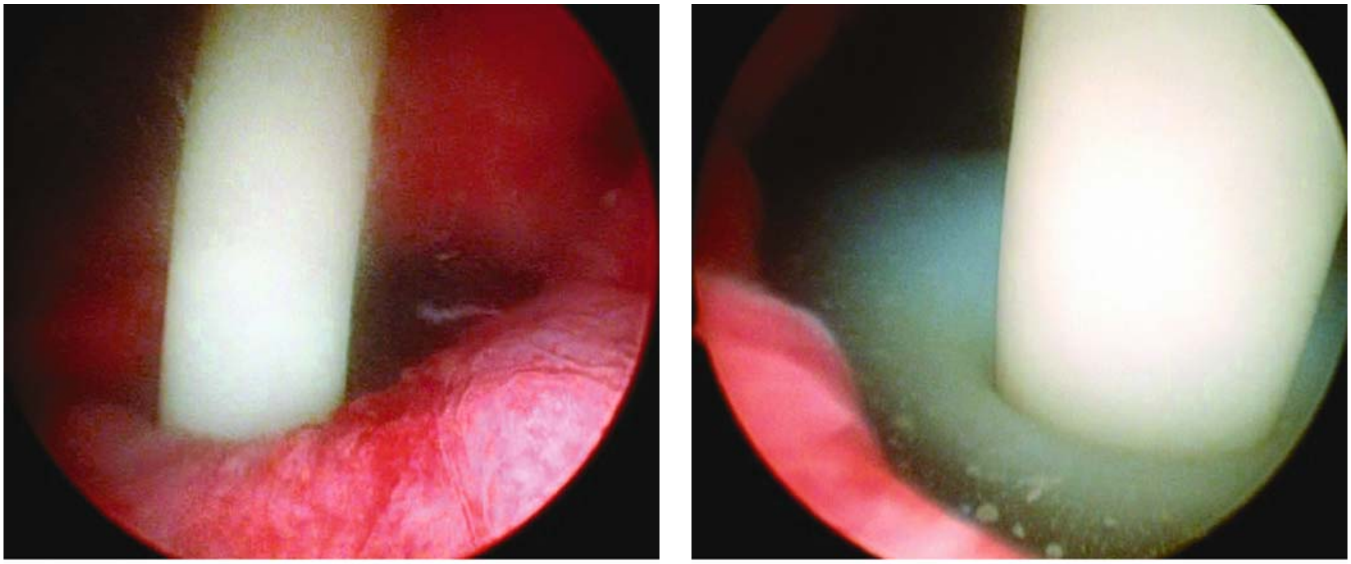


FIG. 18.3. A ureteric catheter is placed to safeguard the ureter during dissection

FIG. 18.4. A trocar suprapubic catheter is inserted through the bladder into the diverticulum



A B

Fig. 18.5. A balloon of the suprapubic catheter in the diverticulum inflated to 40 mL to help in identification and dissection of the diverticulum during the transperitoneal approach

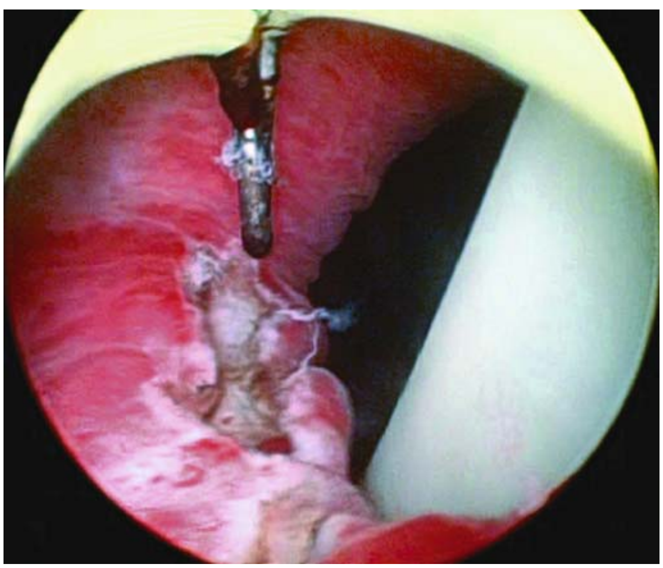


Fig. 18.6. Incision of bladder mucosa at the level of the neck of the diverticulum

Fig. 18.7. The port positions (supraumbilical 10-mm port for the telescope, two 5-mm ports in the pararectus area, and another 10-mm port in the right flank for the hand instruments

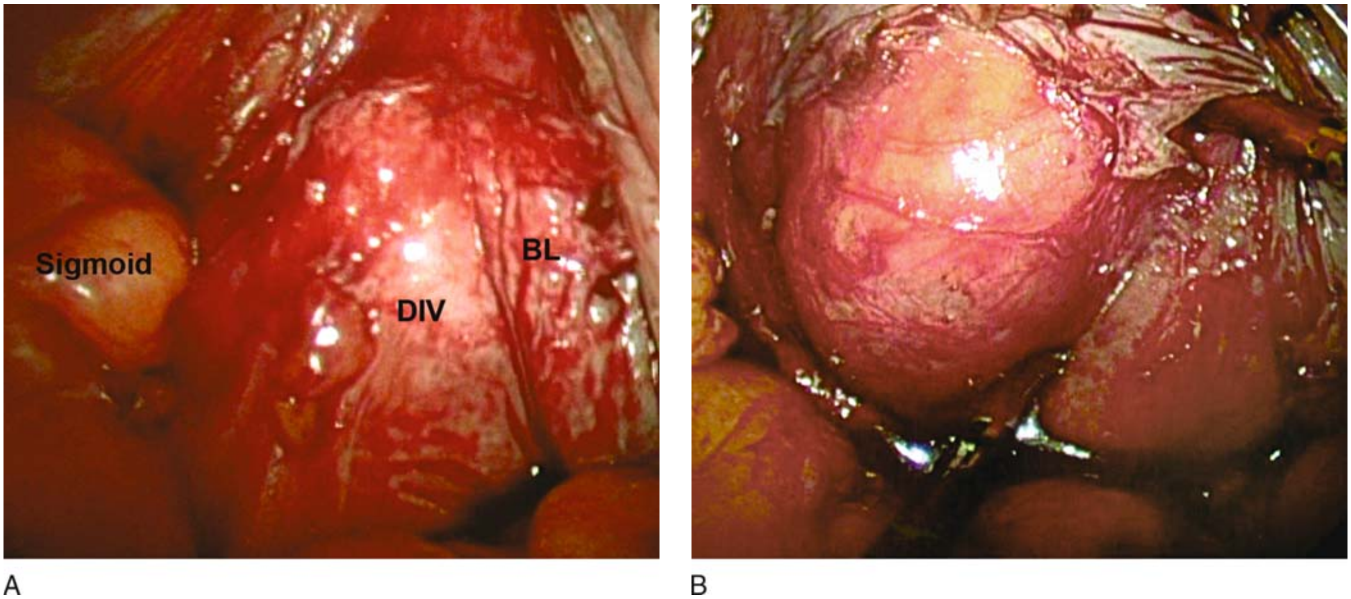


Fig. 18.8. Initial laparoscopic view of the diverticulum (BL, bladder; DIV, diverticulum)

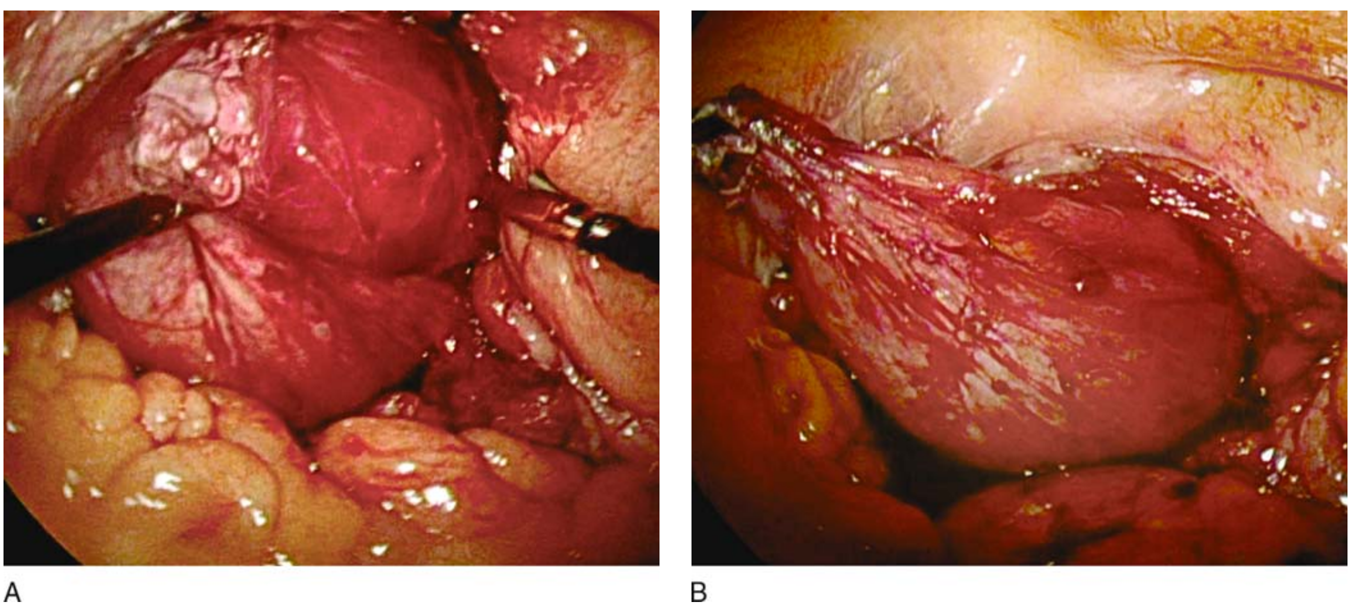
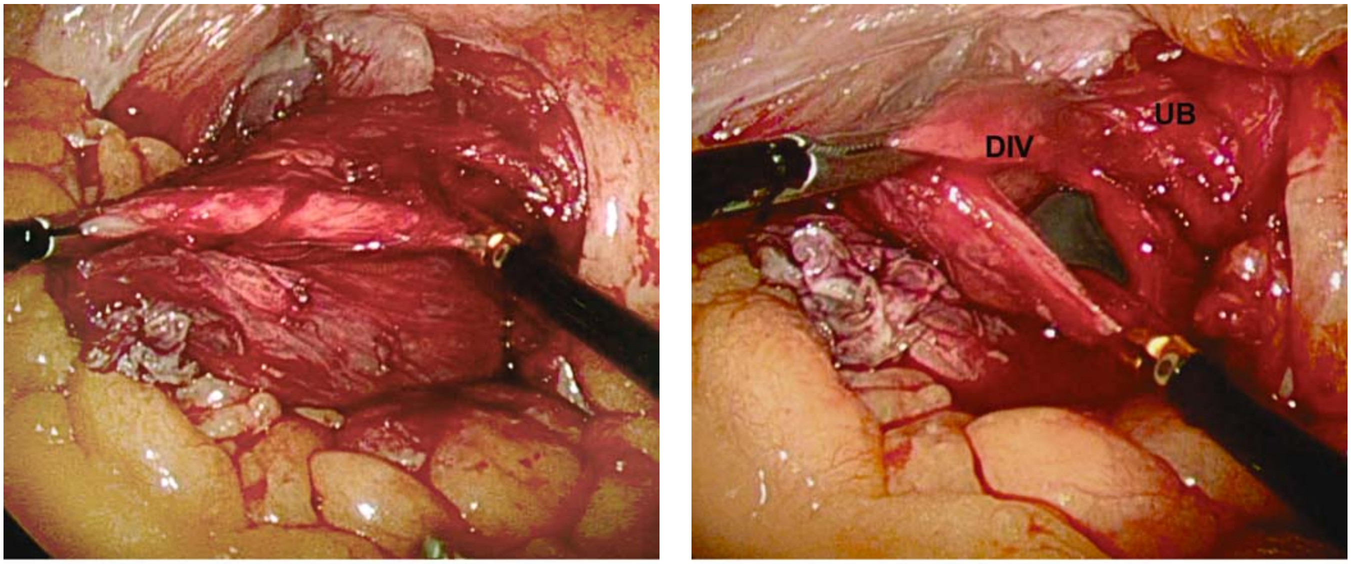
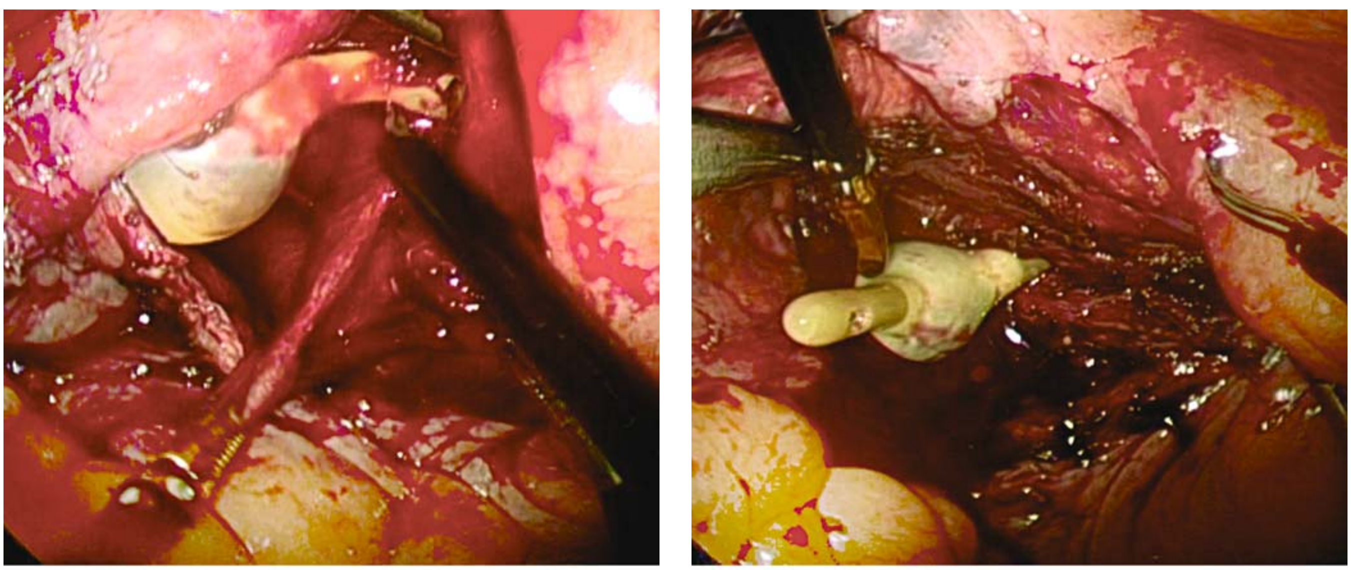


Fig. 18.9. Dissection of the diverticulum at the neck level



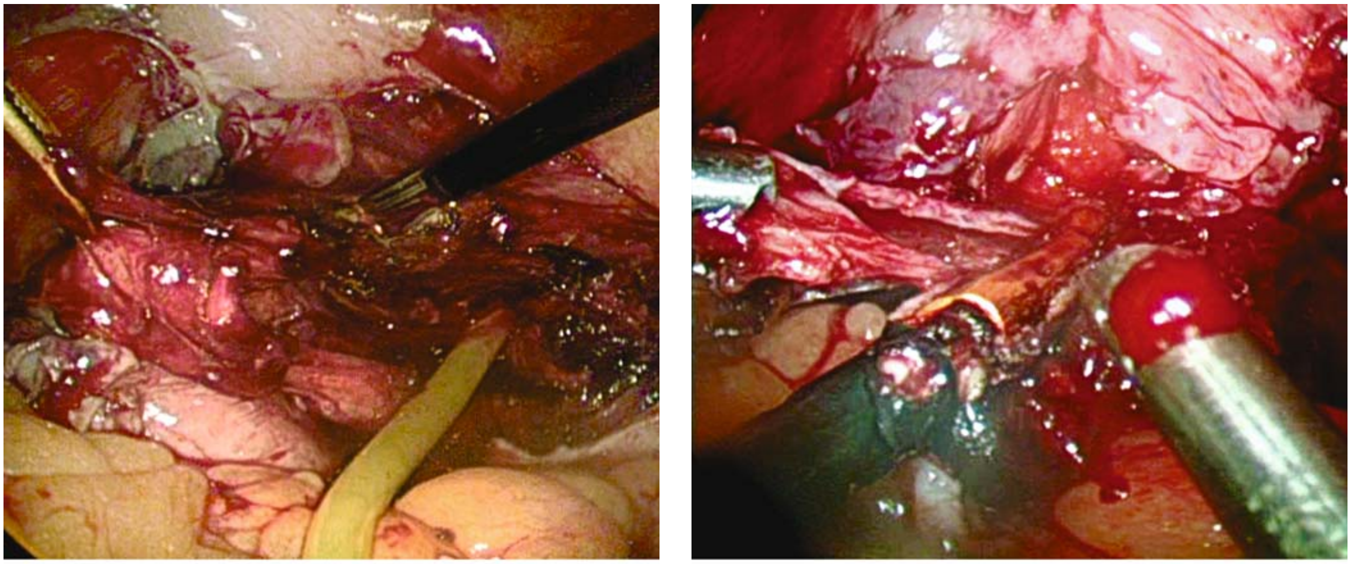
A B

FIG. 18.10. Division of the neck of the diverticulum (DIV, diverticulum; UB, urinary bladder)



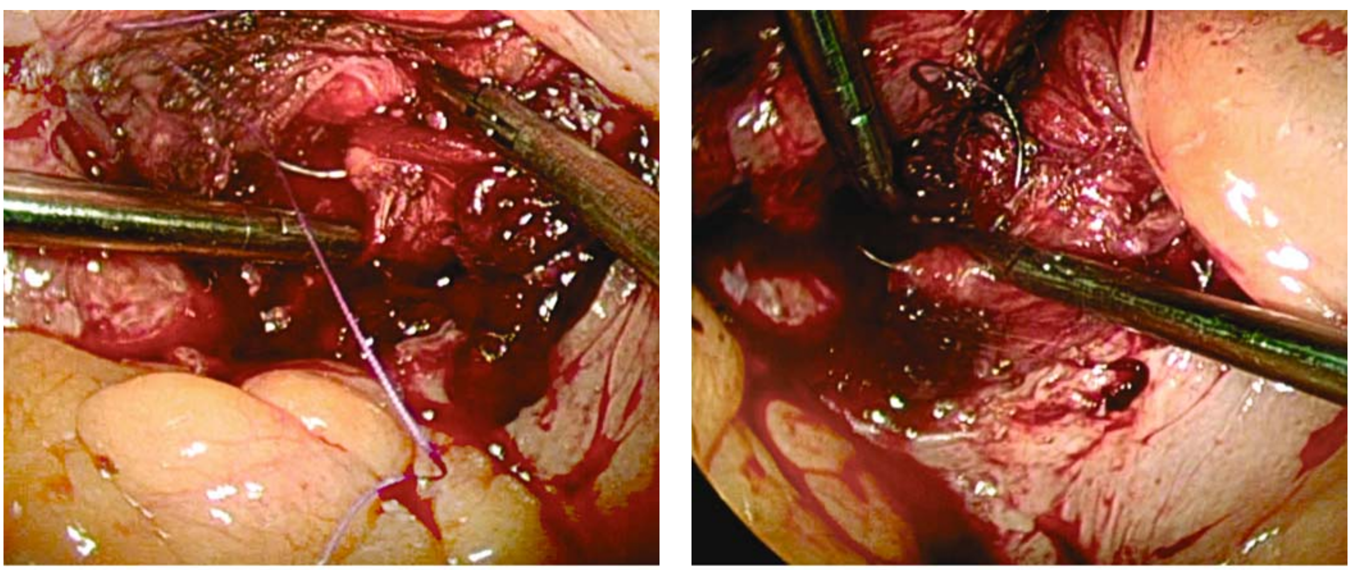
A B

FIG. 18.11. The narrow neck of a bladder diverticulum is oriented better with a Foley balloon



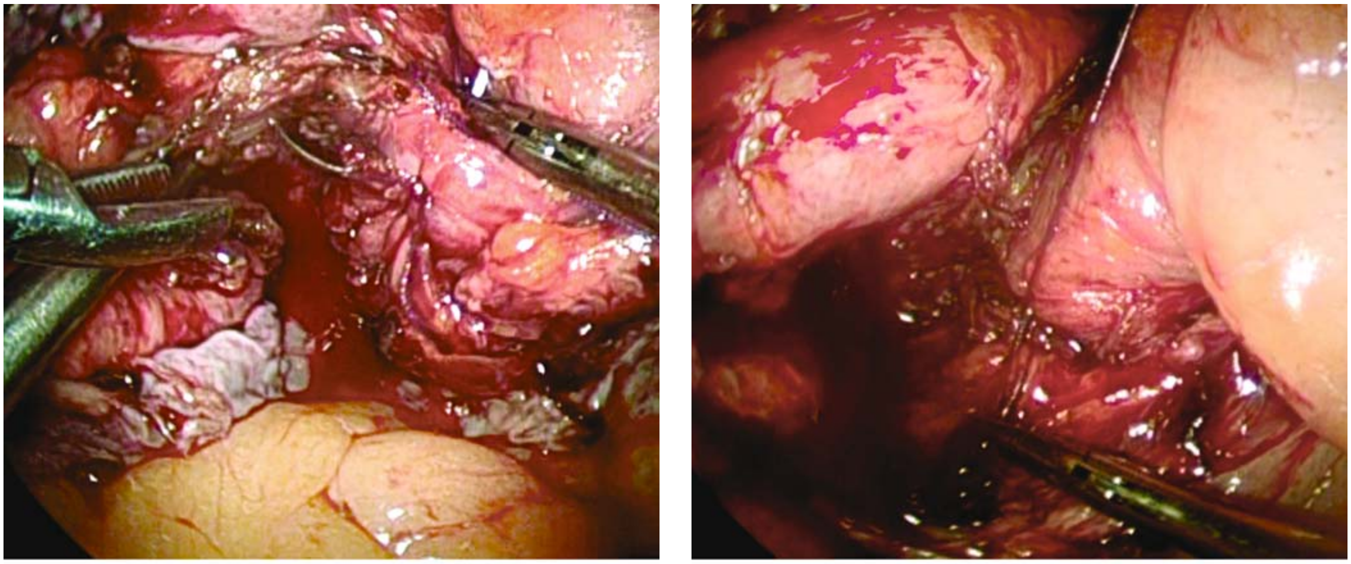
A B

FIG. 18.12. The diverticulum is divided close to its neck



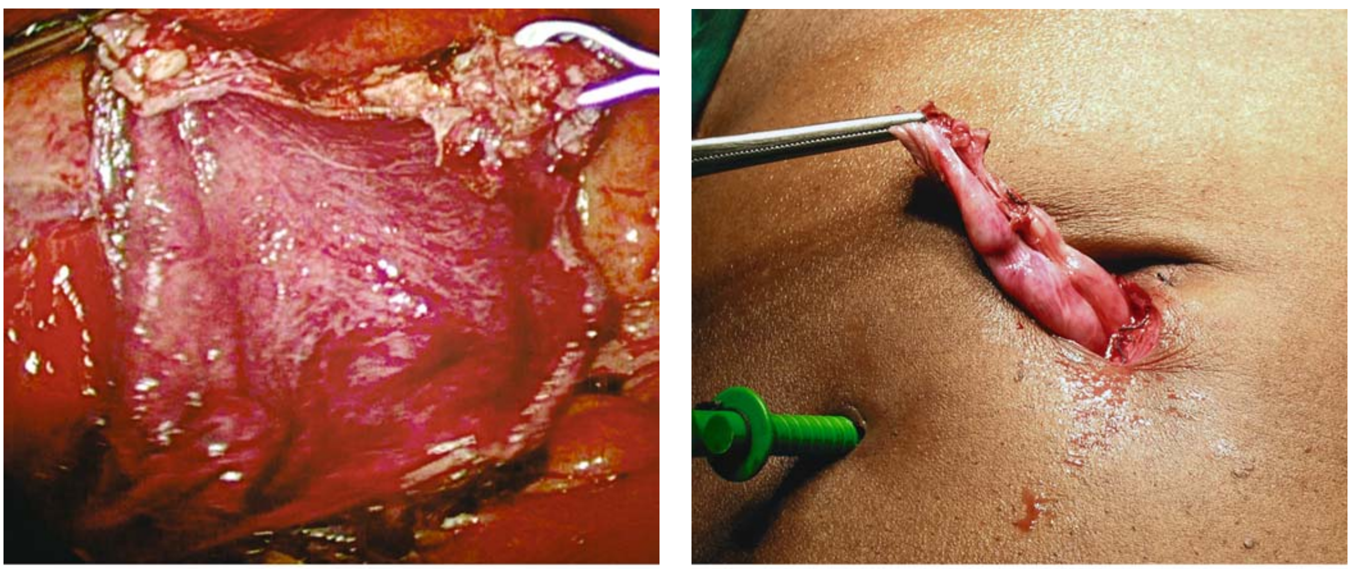
A B

FIG. 18.13. A bladder defect is closed with interrupted 3-0 polyglactin sutures



A B

Fig. 18.14. A second-layer closure of the cystotomy wound with 2-0 interrupted Vicryl suture



A B

Fig. 18.15. Excised diverticulum is retrieved through the 10-mm port

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19
Laparoscopic Repair of a Vesicovaginal Fistula

M. Ramalingam and Suma Natarajan

Open transabdominal and transvaginal approaches for repair of a vesicovaginal fistula (VVF) are well described [1,2]. Of late, the laparoscopic approach is also practiced in the repair of a VVF [5–9]. Transvesical transurethral repair has been described by McKay [3,4], wherein he used a transurethral port for suturing. But generally the repair continues to be a challenge even by the open technique as there is recurrence in about 5% to 10%. A VVF due to obstetric causes is repaired 3 months after the onset of vaginal urinary leak. But an iatrogenic VVF following pelvic surgery can be managed earlier as there is no ischemic etiology.

Surgical Technique

Preliminary evaluation includes an intravenous urogram (IVU) and cystoscopy to determine the location and relation of the VVF to the ureteric orifice and to rule out an associated ureterovaginal fistula.

Transperitoneal Approach (O'Connor's Technique)

Cystoscopy and ureteric stenting are performed to protect the ureteric orifice and ureters. The patient is placed in the supine position. An optimum-sized urethral catheter is inserted and kept sterile and accessible for subsequent bladder filling. Four ports—a 10-mm supraumbilical camera port, two 5-mm ports in each midclavicular line for hand instruments, and one 5-mm suprapubic port for suction and irrigation—are used. Cystotomy is performed in the midline using electrocautery or ultracision up to the edge of the fistula. Subsequently adequate mobilization of the bladder wall from the vaginal wall is performed. The fistula is excised with cold scissors. The bladder defect and vaginal defect are trimmed. Initially the vaginal defect is closed horizontally using interrupted 3-0 Vicryl sutures. Whenever possible, omentum can be mobilized and sutured over the anterior wall of vagina. Then the bladder defect is closed in two layers (an inner layer with 3-0 continuous Vicryl sutures and an outer layer with 2-0 interrupted Vicryl sutures), bringing in trimmed, healthy bladder wall over the previously fistulous area. A trocar suprapubic catheter is introduced extraperitoneally after distending the bladder. A 14-size transabdominal drain is left through suprapubic port or one of the pararectus ports.

Transvesical Approach (Cystorrhaphy)

After a preliminary cystoscopy and colposcopy to assess the defect, the vagina is packed with large packs to prevent the leak of water. Using cystoscopic view and irrigation, two 5-mm transvesical suprapubic ports are inserted for hand instruments. Usually some of the irrigating fluid escapes and the transvesical ports tend to slip out of the bladder. It is also important to keep the bladder distended to have some working space. Hence a trocar with a self-retaining mechanism needs to be used. Subsequently the pneumovesicoinsufflation is performed. The urethra can be used as a third port for transurethral suturing. The edges of the fistula are trimmed (any suture material of previous surgery that is seen can be removed). Transurethral suturing of the vesical defect is carried out using 3-0 interrupted Vicryl.

If the vaginal defect is small, it can be left alone. Otherwise, the vaginal defect can be closed with continuous 2-0 Vicryl suture by the vaginal route as in open surgery. The bladder is drained by a suprapubic catheter (inserted through one of the ports) and the urethral Foley catheter is left in for about 10 days.

Follow-Up

The suprapubic catheter can be removed on the seventh postoperative day. The tube drain can be removed on the eighth postoperative day if there is less drainage. The urethral Foley catheter can be removed on the tenth postoperative day following a cystogram.

Conclusion

Laparoscopic repair of a vesicovaginal fistula is feasible by a minimally invasive technique. This is certainly more acceptable for the distressed patient than open repair. Transvesical cystorrhaphy appears to be the least morbid procedure.

O'Connor's Technique

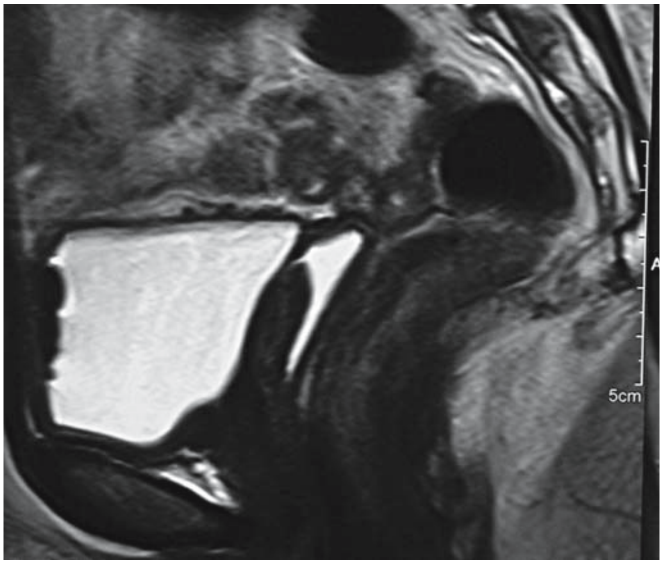


FIG. 19.1. A computed tomography (CT) scan shows contrast leaking into the vagina

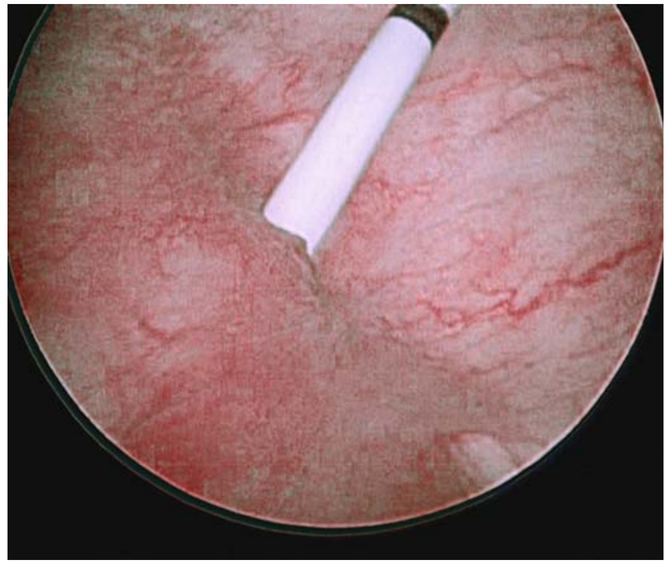


FIG. 19.2. Cystoscopy shows a fistulous communication (ureteric catheter introduced through a simultaneous colposcope)

FIG. 19.3. Colposcopic view of the fistula with a guidewire and a ureteric catheter being passed through it

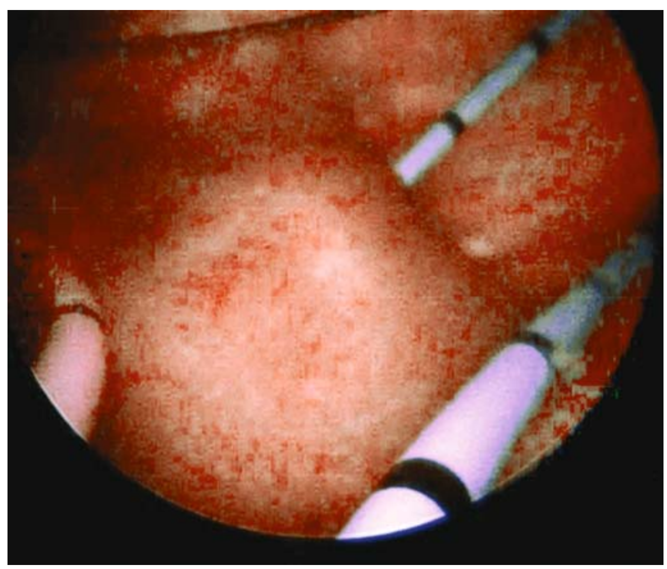


FIG. 19.4. Ureteric catheterization to safeguard the ureteric orifices; note another ureteric catheter through the supratrigonal fistula

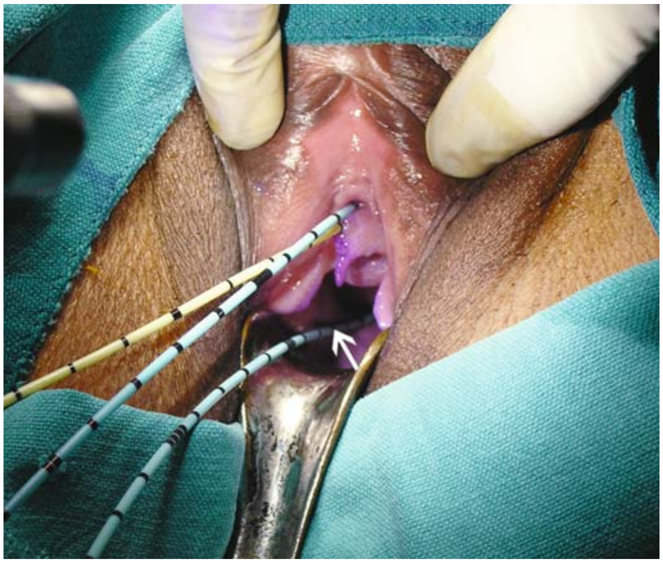


Fig. 19.5. Ureteric catheters exiting through the urethra; arrow points to another ureteric catheter entering the bladder through the fistula

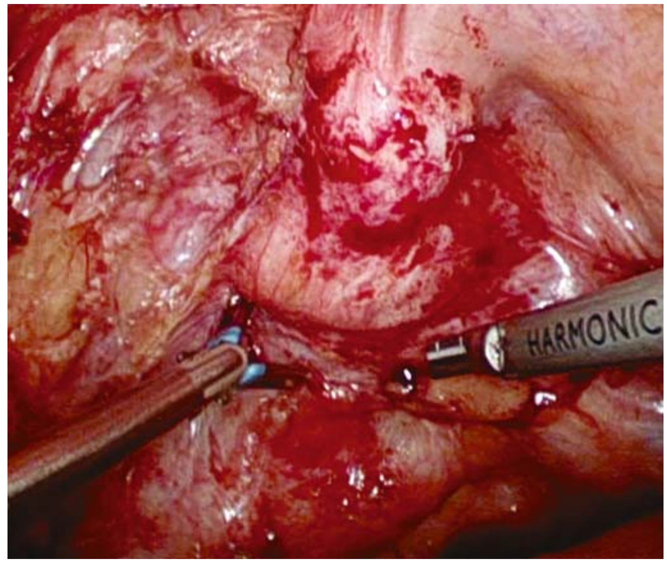


Fig. 19.6. View of the bladder and vault of vagina after releasing the adhesions

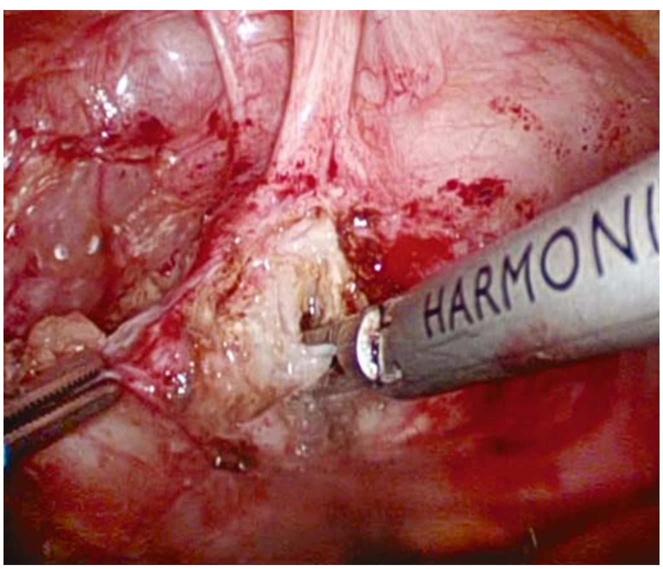


Fig. 19.7. Bivalving the bladder using a hormonic scalpel

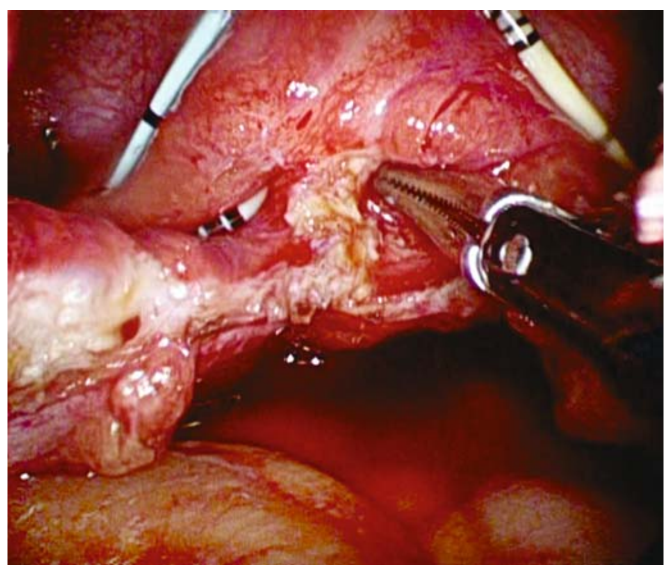


Fig. 19.8. Bivalving the bladder reveals supratrigonal fistula; ureteric catheters are seen

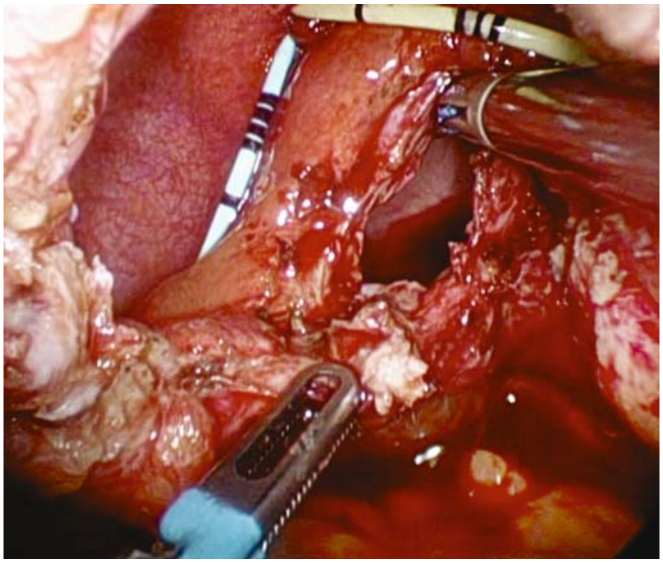


FIG. 19.9. Excision of the fistula in progress

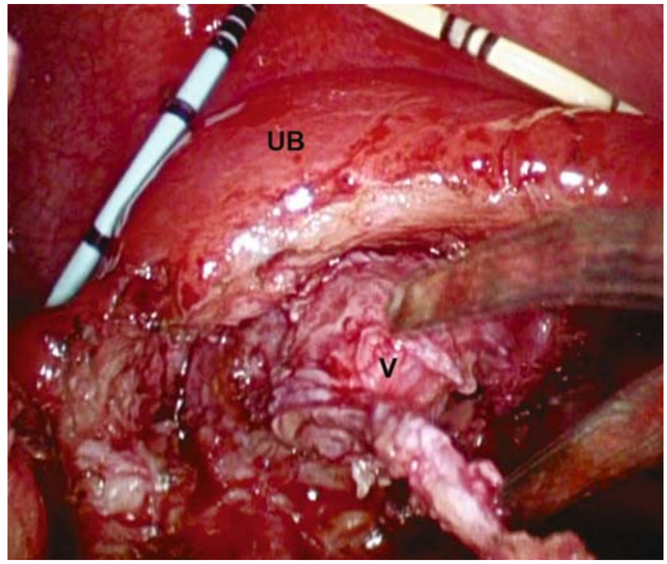
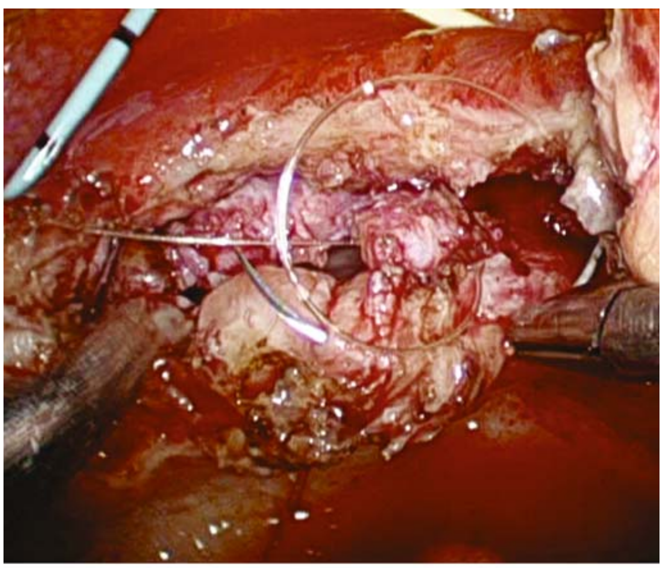


FIG. 19.10. Developing a plane between the bladder and the anterior vaginal wall (V, vagina; UB, urinary bladder)



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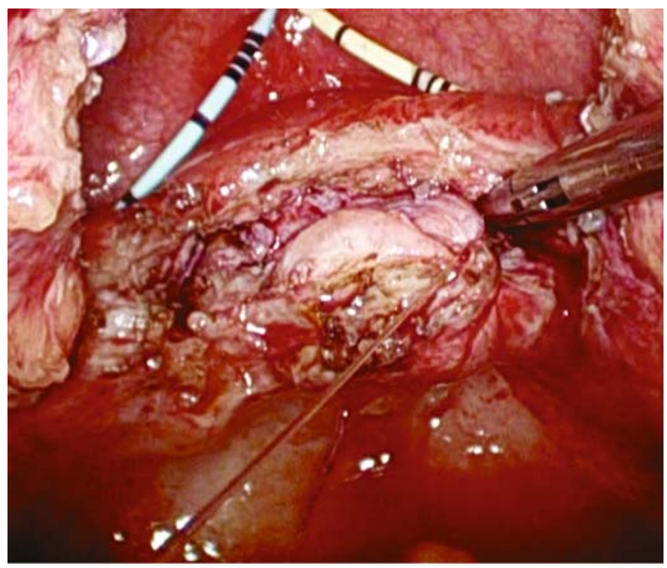
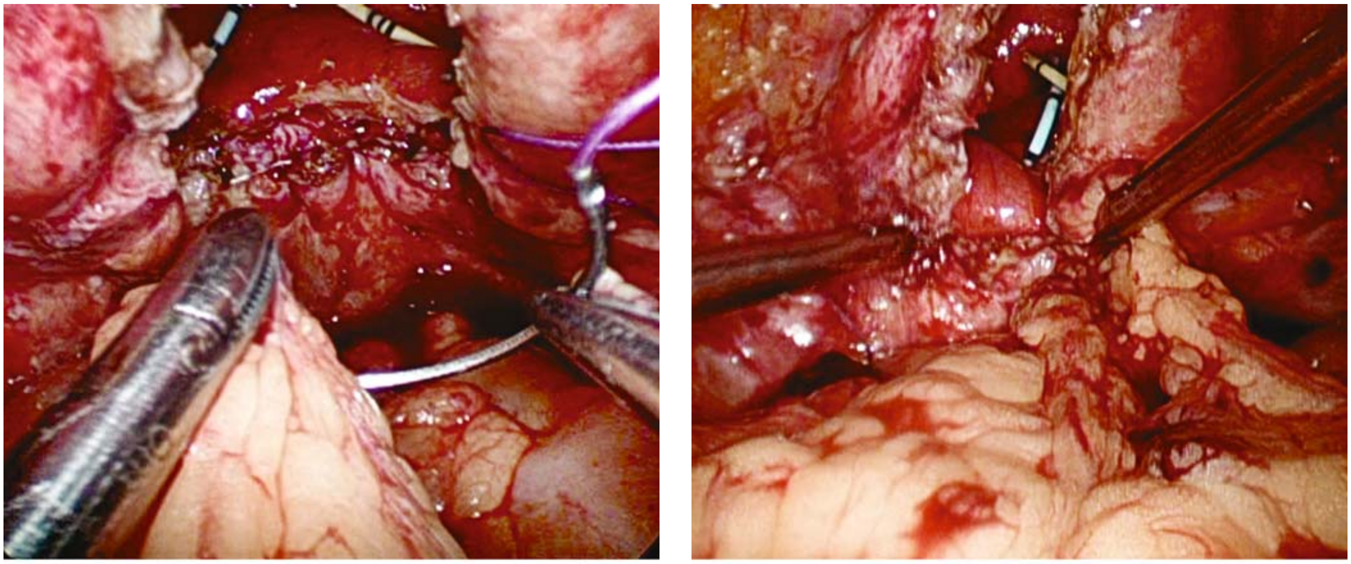


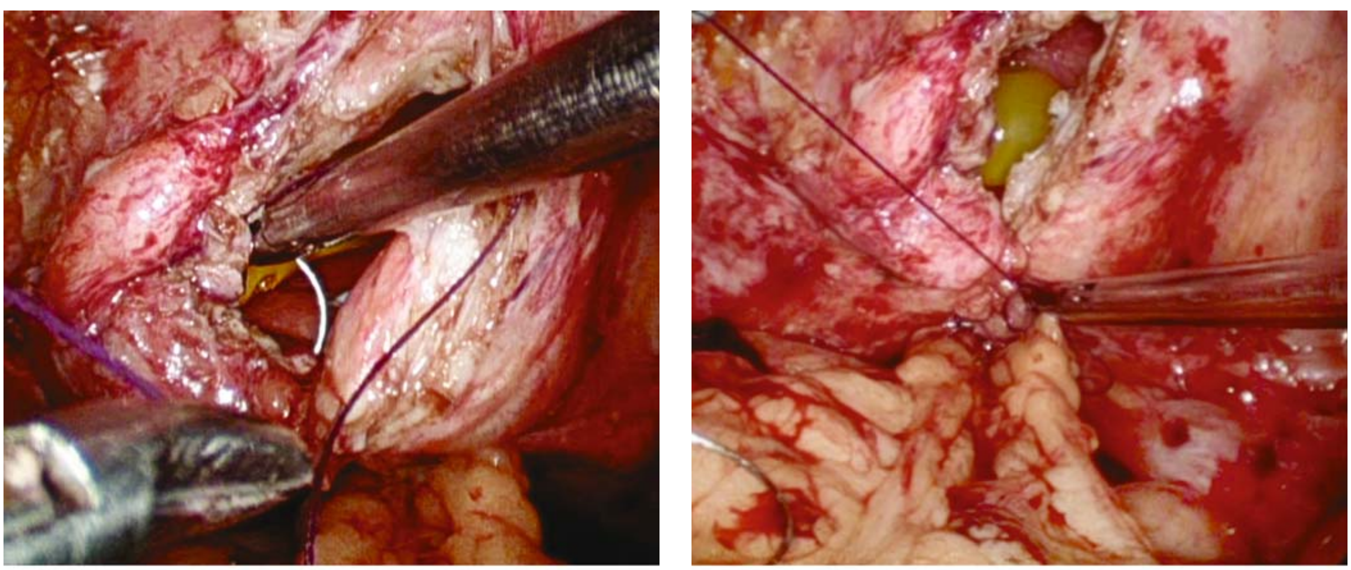
B

FIG. 19.11. Closure of vaginal defect (after trimming the edges) with 3-0 continuous polyglactin suture



A B

Fig. 19.12. Omentum tacked to the anterior vaginal wall



A B

Fig. 19.13. Closure of the bladder defect with 3-0 polyglactin continuous suture

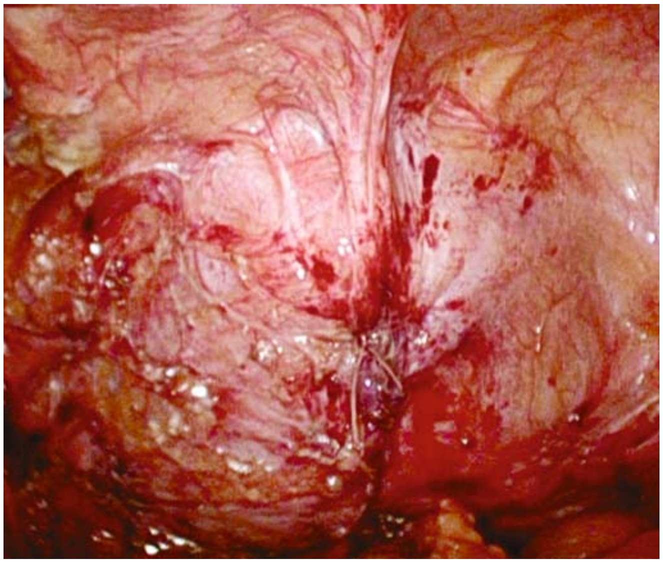


FIG. 19.14. View after completing the bladder closure

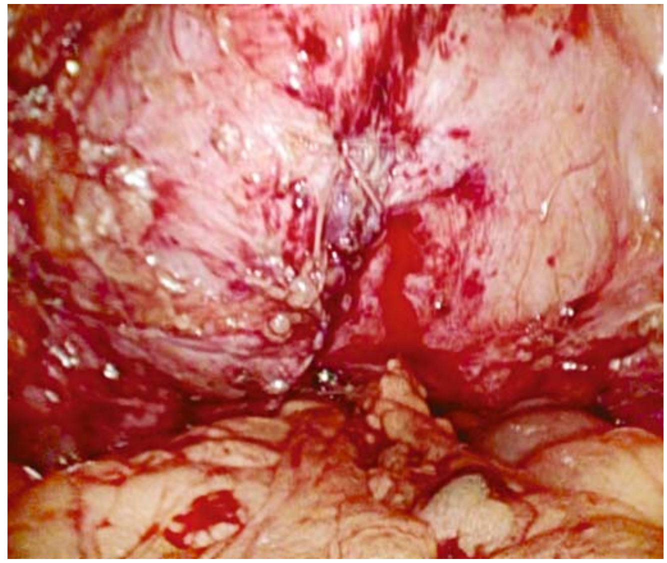


FIG. 19.15. Distending the bladder at the end to rule out any leak

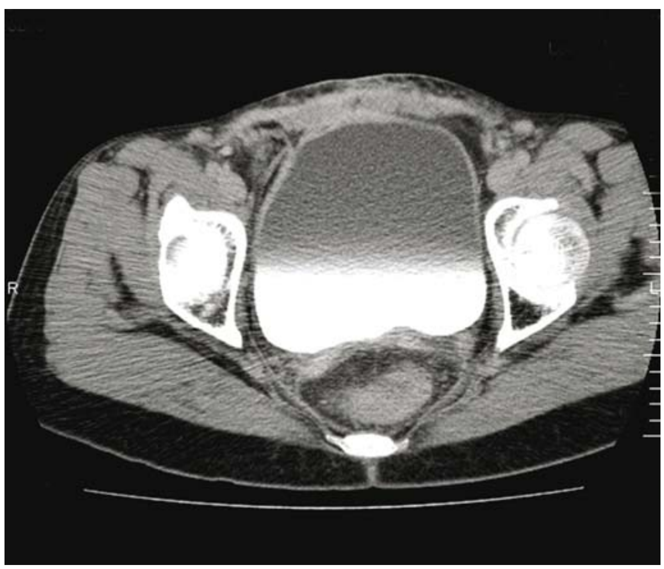


FIG. 19.16. CT cystogram done 3 months later does not show any leak

Transvesical Cystorrhaphy

FIG. 19.17. Cystoscopy shows the VVF in the supratrigonal area following a hysterectomy

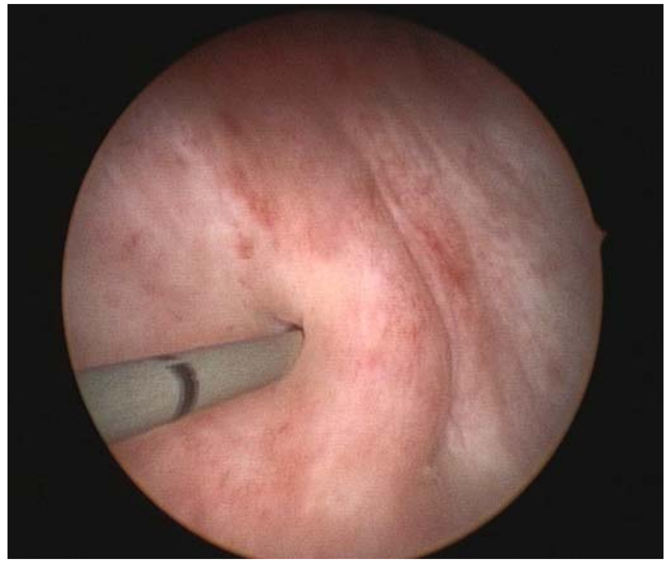


FIG. 19.18. Left ureteric catheterization is performed to safeguard the left ureter as it is close to the VVF

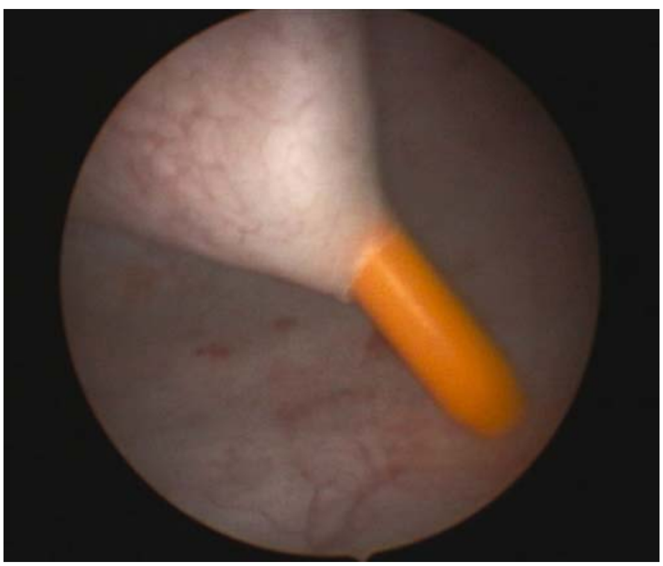


FIG. 19.19. Transvesical port insertion under cystoscopic guidance

FIG. 19.20. External view of the port positions for the transvesical approach; note the cystoscope through the urethra

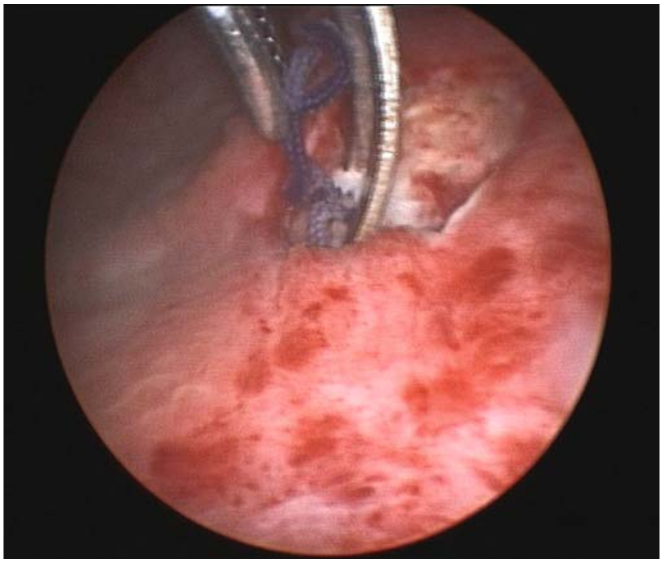


FIG. 19.21. Trimming the edges of the bladder defect

FIG. 19.22. View after trimming the edges

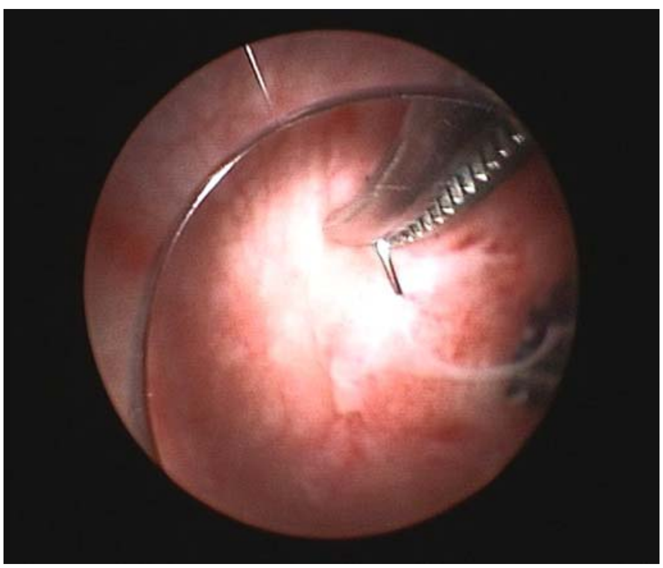


FIG. 19.23. A common difficulty in the transvesical approach is the escape of air through the VVF, preventing bladder distention

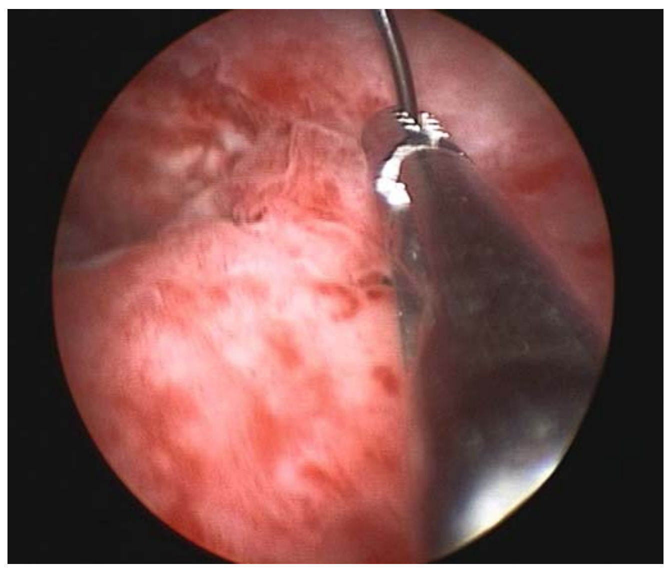


FIG. 19.24. Closing the bladder defect transvesically using 3-0 interrupted Vicryl sutures

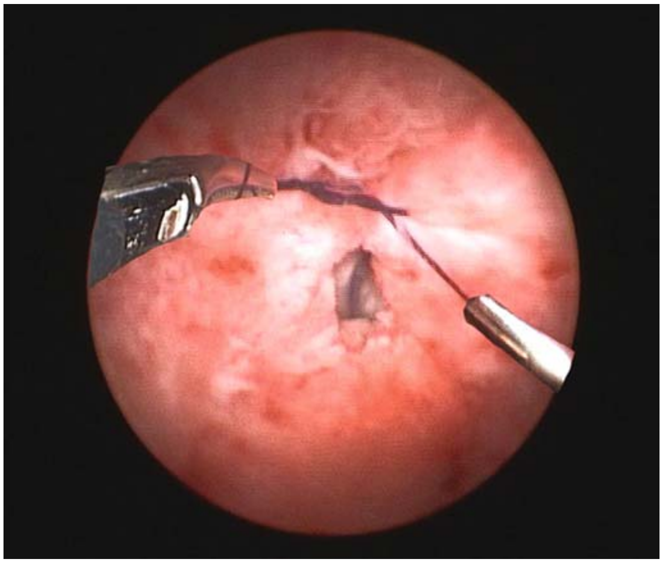


FIG. 19.25. Closure of the defect in progress

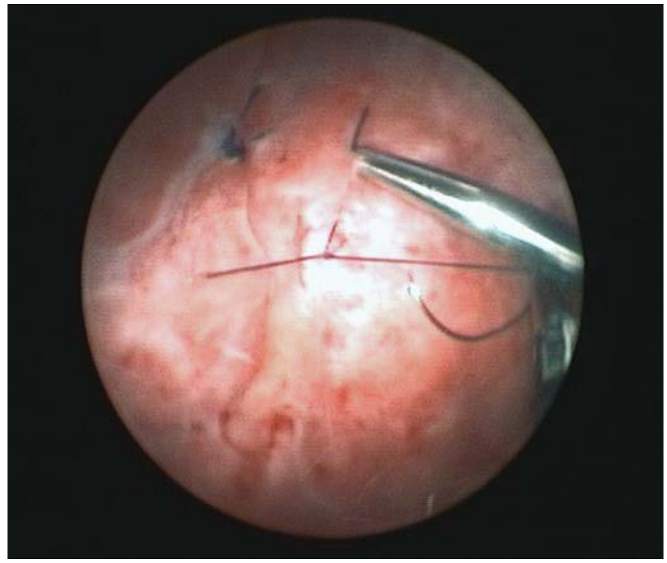


FIG. 19.26. The defect is nearly closed

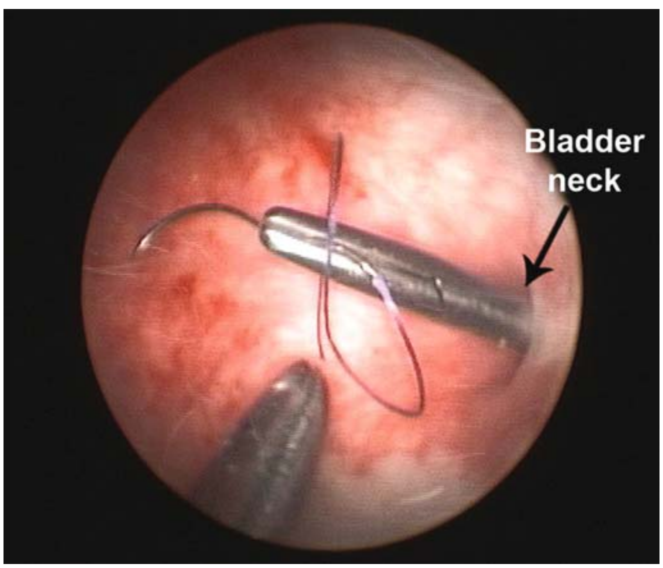


FIG. 19.27. If closure of the defect is difficult, the urethra can be used as a port for the needle holder (as seen by the transvesical 5-mm camera port)

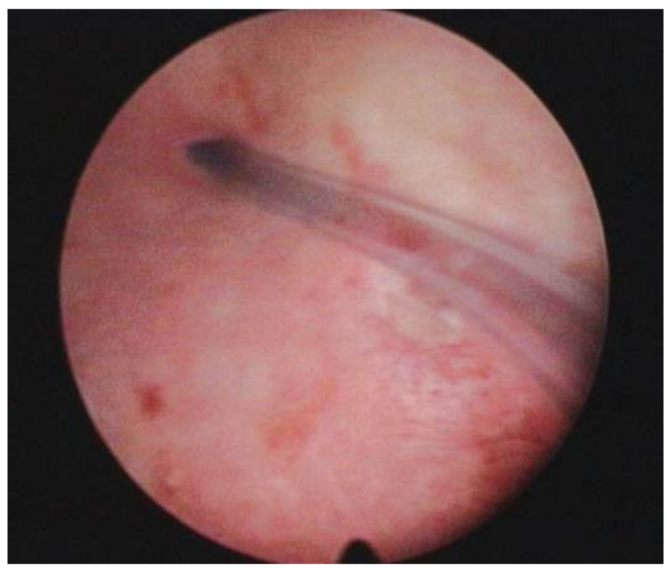


FIG. 19.28. A tube drain (a suprapubic catheter) is introduced through the transvesical port

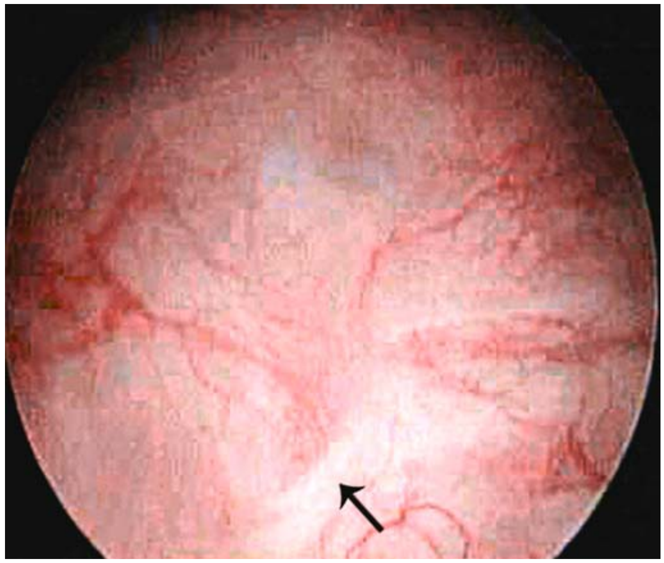


FIG. 19.29. Cystoscopic view 3 months later shows a well-healed scar (arrow) (at the previous site of fistula)

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20
Laparoscopic Repair of a Vesicouterine Fistula

M. Ramalingam, K. Senthil, Renuka Ramalingam, and Vaijayanthi Raja

A vesicouterine fistula is a rare complication after lower segment cesarean section. Patients usually present with cyclical hematuria. Though combined abdominal and vaginal approach has been described, the preferred management is disconnection by abdominal route. The laparoscopic approach has been described [1,2].

Surgical Technique

Preliminary cystoscopy and computed tomography (CT) cystogram demonstrate the orientation of the fistula. The patient is placed in the lithotomy position to facilitate an intraoperative cystoscopic view, to maneuver the uterus, and to instill methylene blue into the uterus for confirming the fistulous connection to the bladder.

Four ports—an umbilical camera port, two ports in the midclavicular line 5 cm below and lateral to the umbilicus, and one right flank port for hand instruments—are used. The fistula is disconnected from the uterus using ultracision or bipolar scissors. Cystotomy is performed, excising the fistula. A uterine rent is closed with interrupted 2-0 Vicryl. The omentum is tacked onto the anterior wall of cervix. The bladder rent is closed in two layers using 3-0 Vicryl sutures. A tube drain is left in for about 5 days. The bladder is drained by a Foley catheter for 7 days.

Follow-Up

A cystogram is performed on day 7 to rule out urinary extravasation. The Foley catheter is removed on day 10.

Conclusion

With increasing laparoscopic suturing skill, a vesicouterine fistula can also be managed laparoscopically.

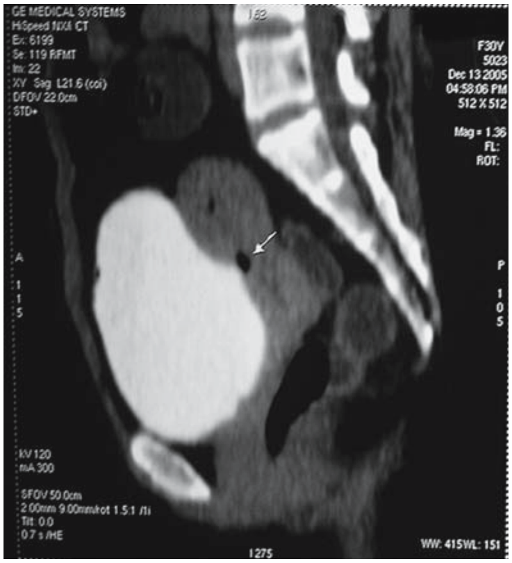


FIG. 20.1. A computed tomography (CT) urogram shows the communication between the posterior wall of the bladder and the uterus

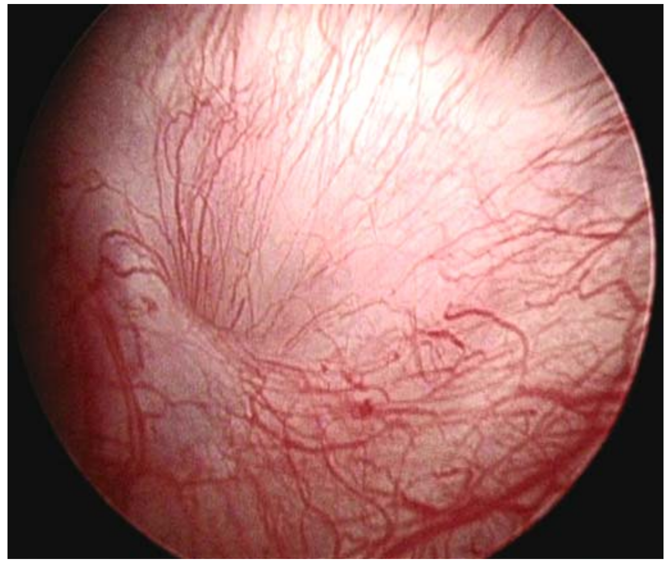


FIG. 20.2. Cystoscopy shows a fistulous opening in the midposterior wall of the bladder

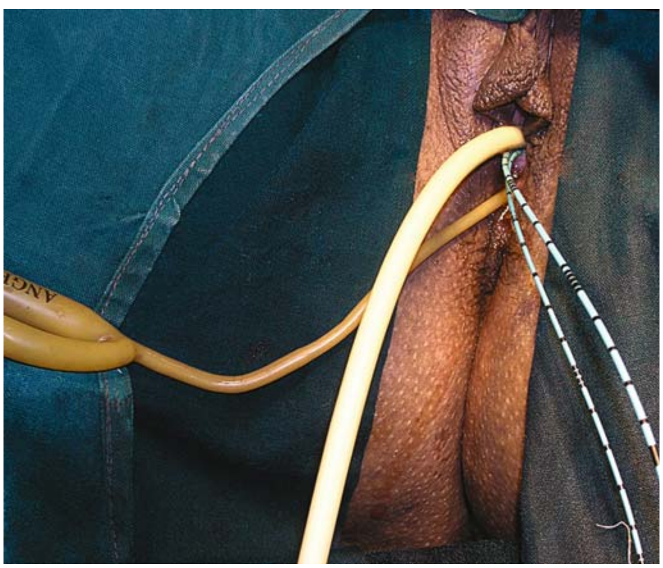


FIG. 20.3. An 8-French Foley catheter inserted into the uterus for methylene blue infusion; note that both ureters are stented (to guide intraoperatively)

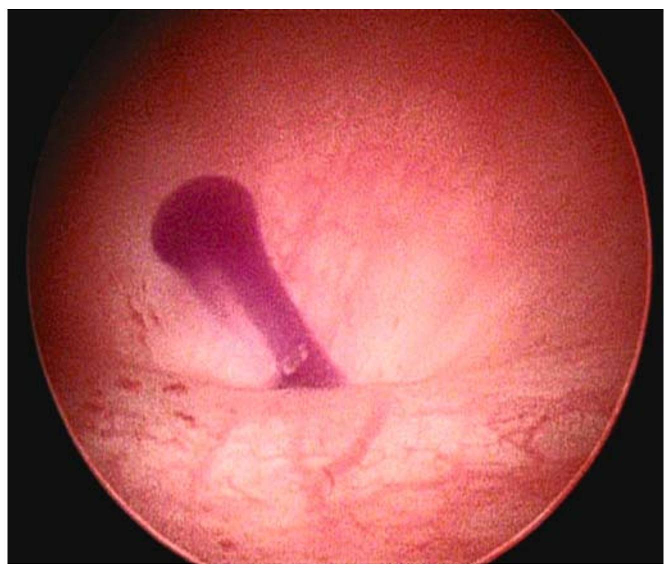


FIG. 20.4. A jet of methylene blue is seen through the cystoscope on intrauterine instillation of the dye

FIG. 20.5. A Veress needle is inserted in the left subcostal area as the patient has a midline scar in the lower abdomen (as seen from foot end)

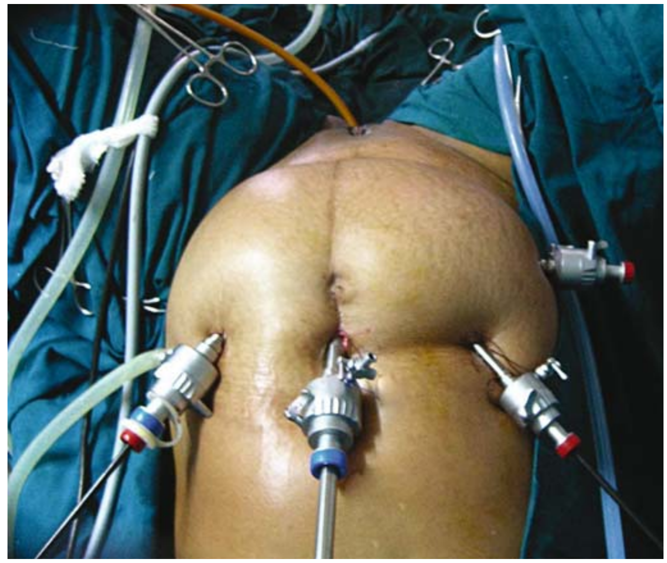


FIG. 20.6. The port positions for laparoscopic repair of a fistula disconnection

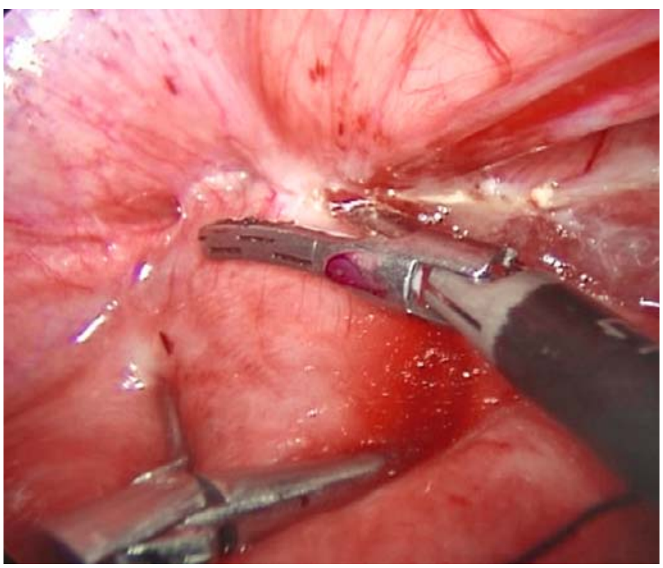


FIG. 20.7. Initial laparoscopic view

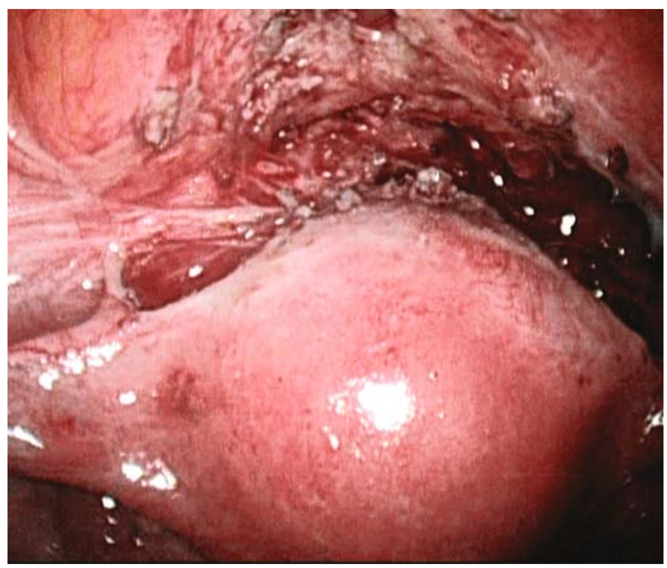
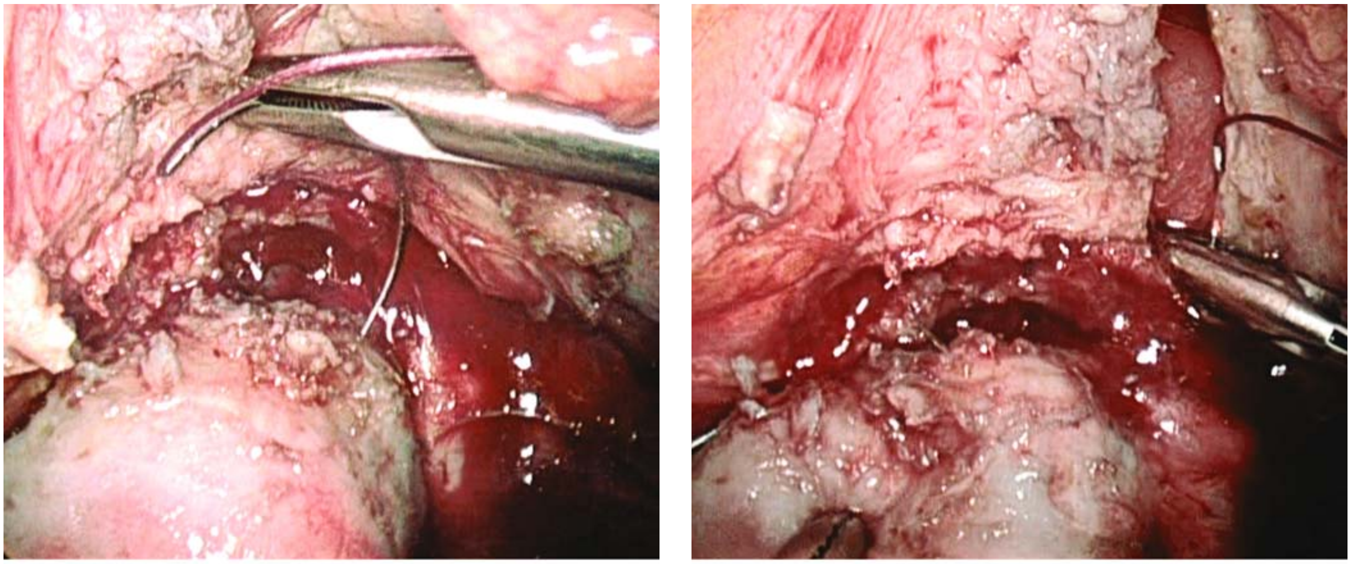
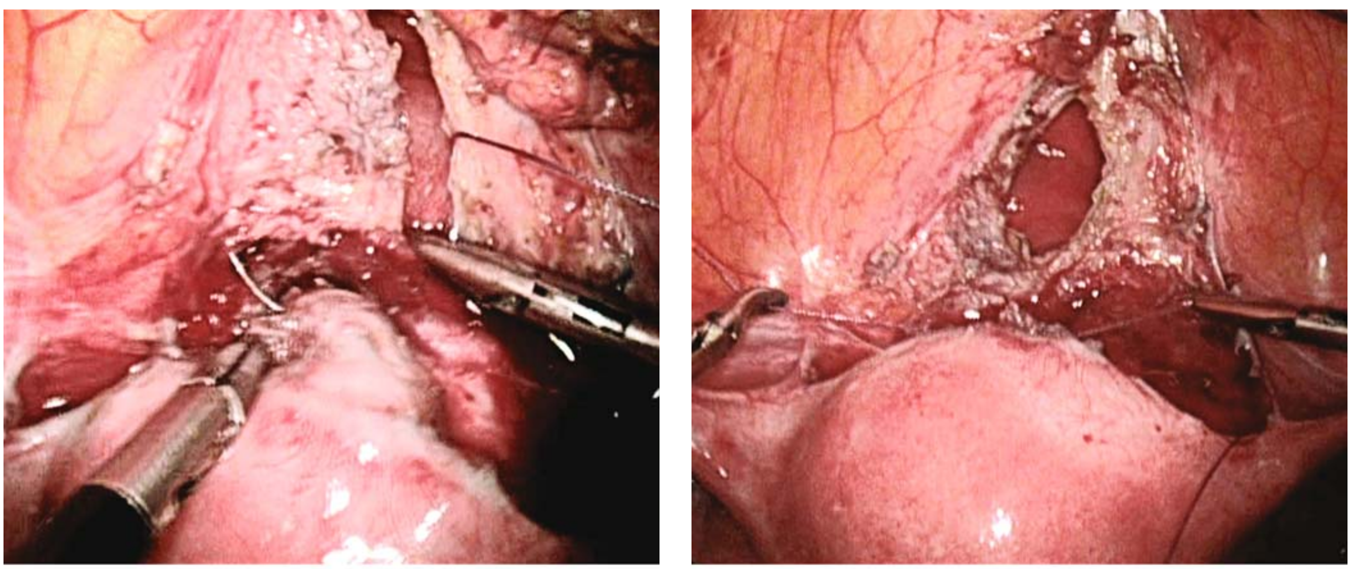


FIG. 20.8. Dissection between the uterus and the posterior wall of the bladder



A B

Fig. 20.9. Closure of the uterine defect with interrupted 1-0 Vicryl suture



A B

Fig. 20.10. A few more interrupted 1-0 Vicryl sutures are used to close the uterine rent

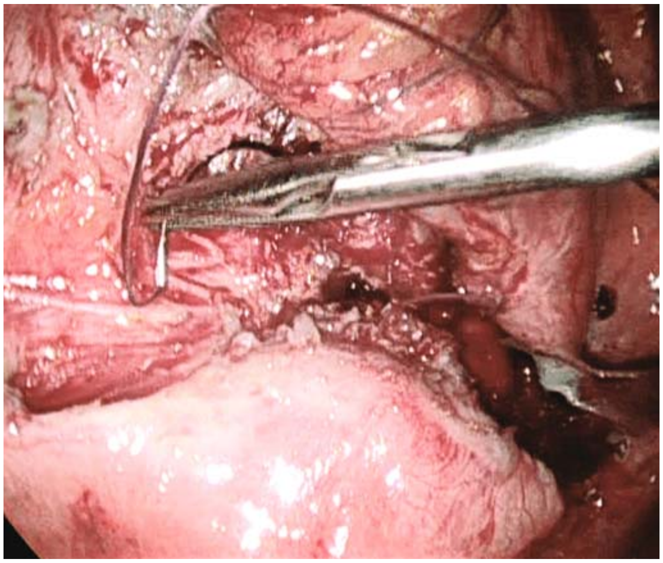


FIG. 20.11. Suturing is nearly completed

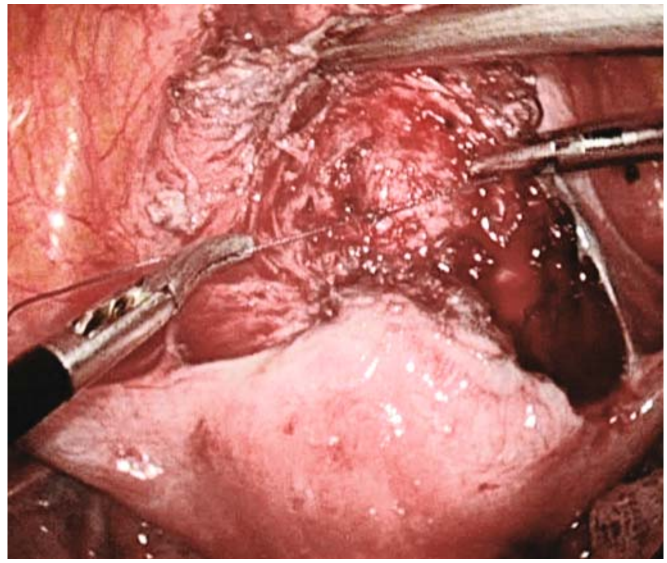
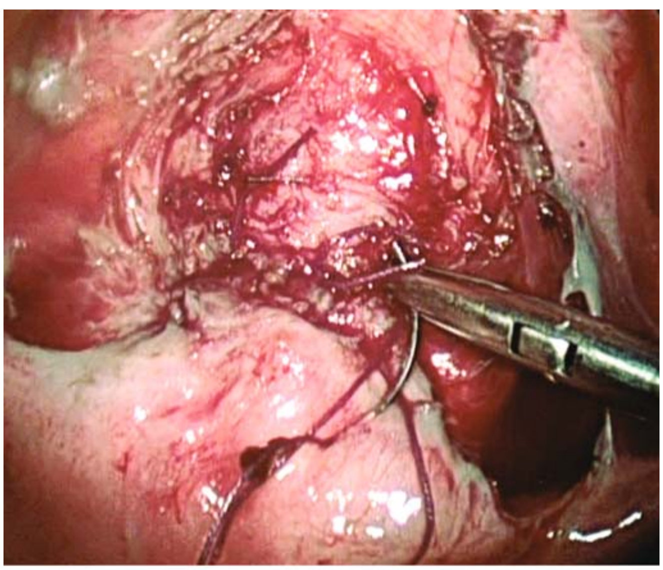


FIG. 20.12. View after closure of the uterine rent



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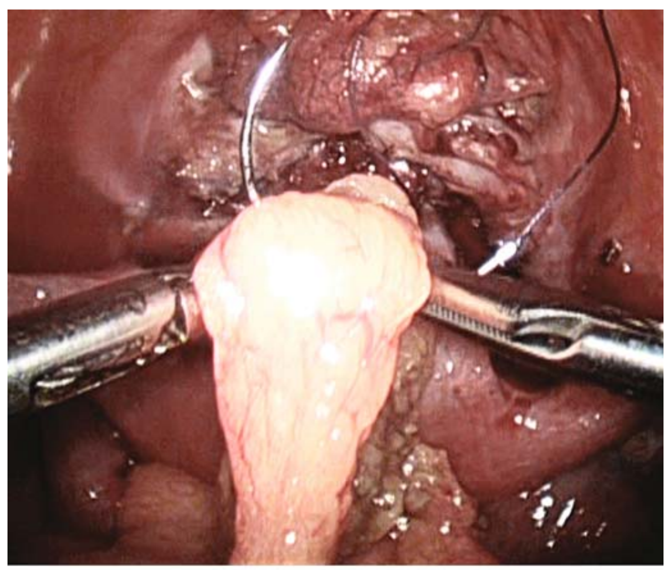


B

FIG. 20.13. Vicryl suture (2-0) taken through the anterior wall of the cervix to tack the omentum

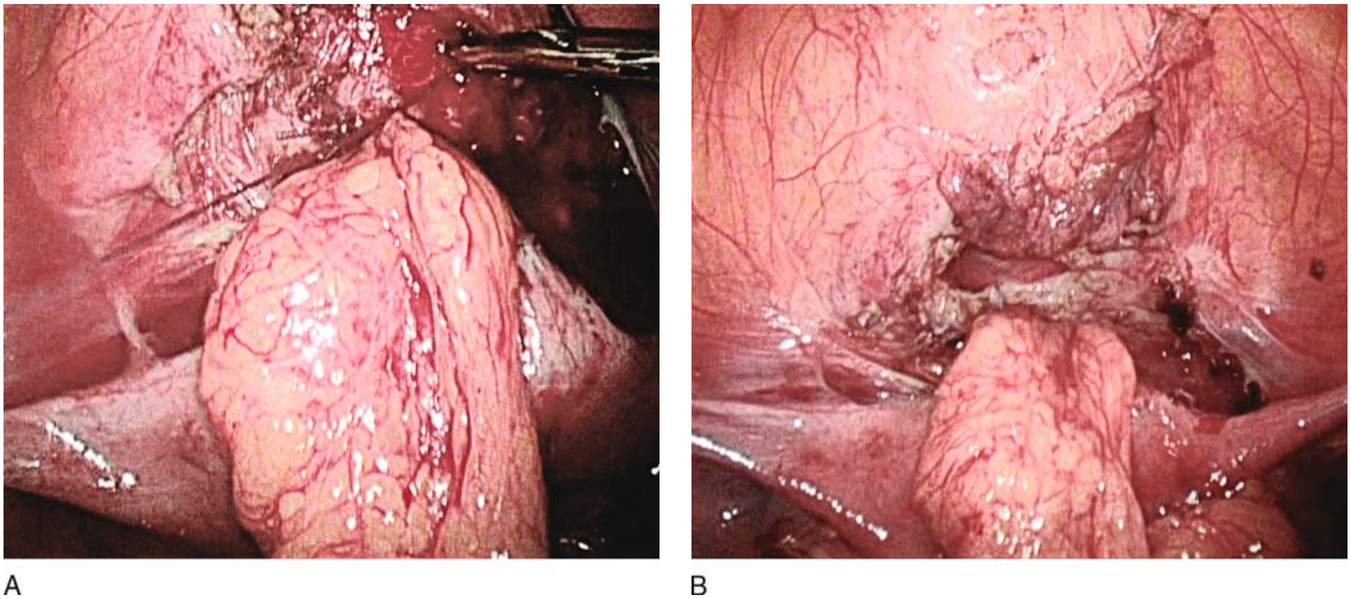


Fig. 20.14. View after omental tacking

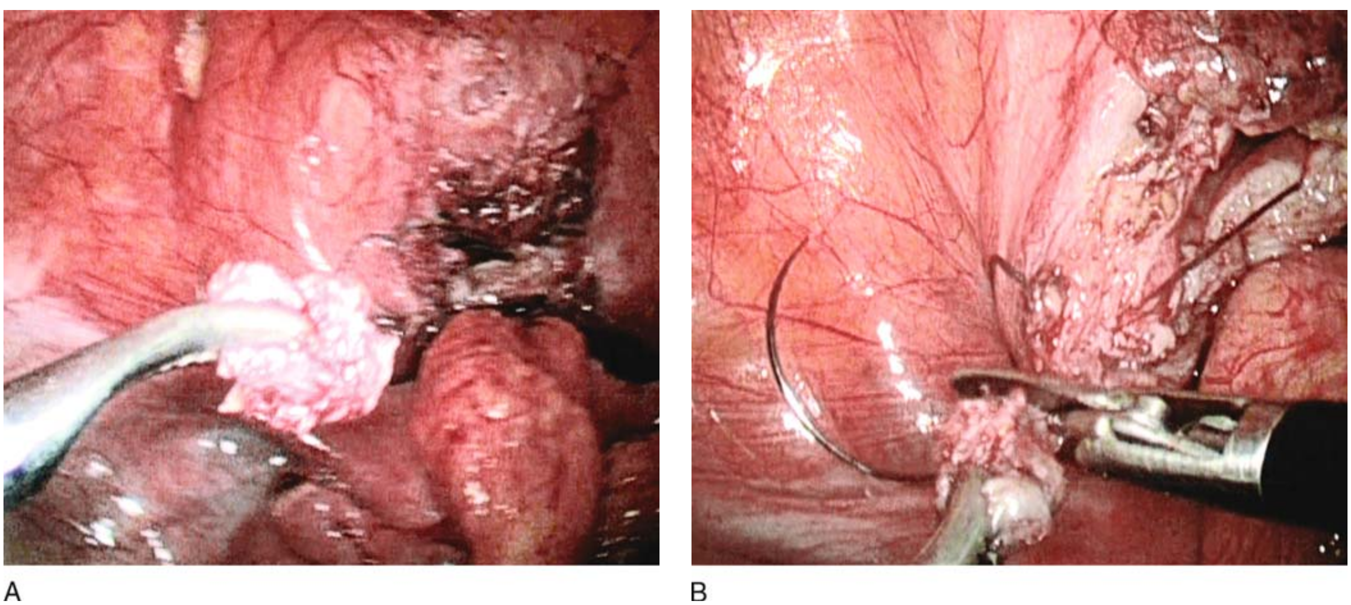
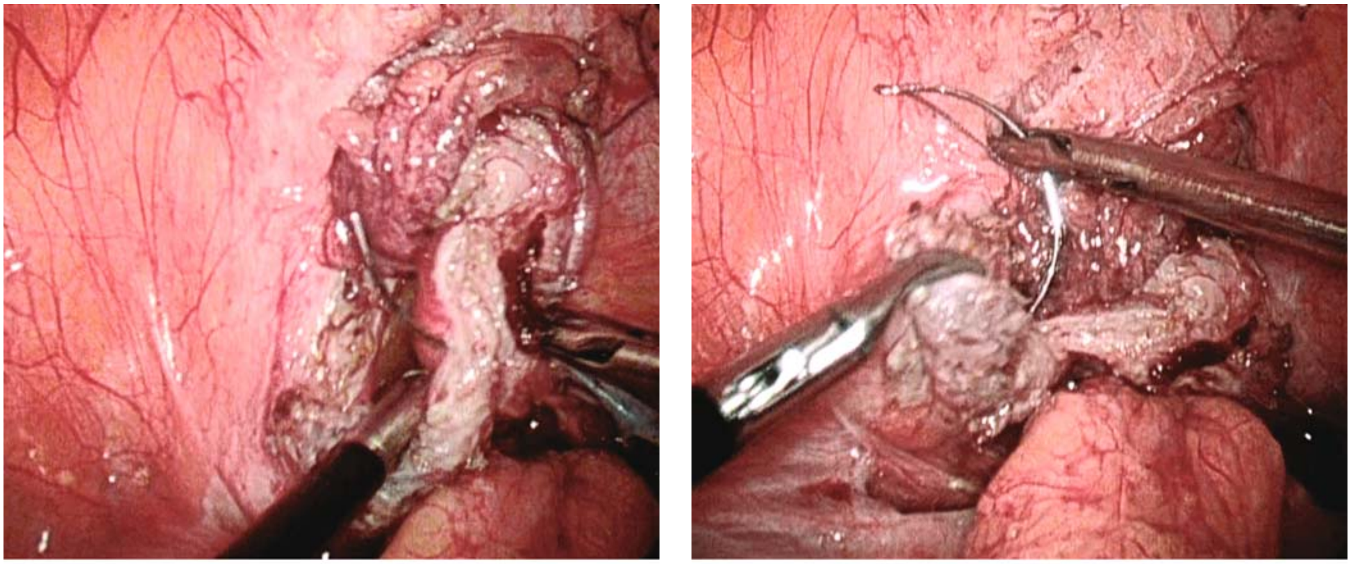
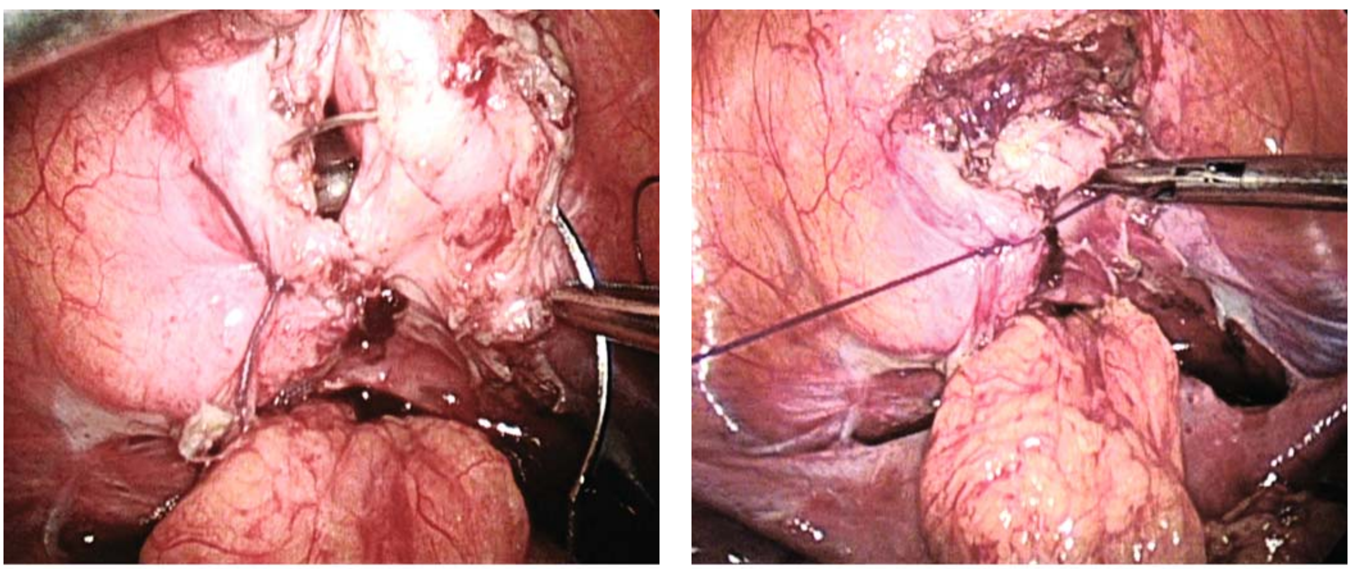


Fig. 20.15. Excision of the fistulous connection from the bladder



A B

FIG. 20.16. Closure of the bladder defect with 3-0 interrupted Vicryl suture



A B

FIG. 20.17. A few more interrupted sutures are used to close the cystotomy

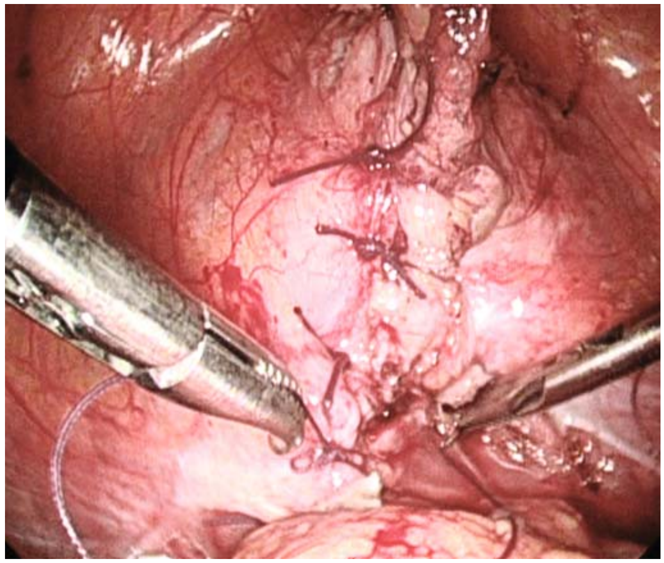
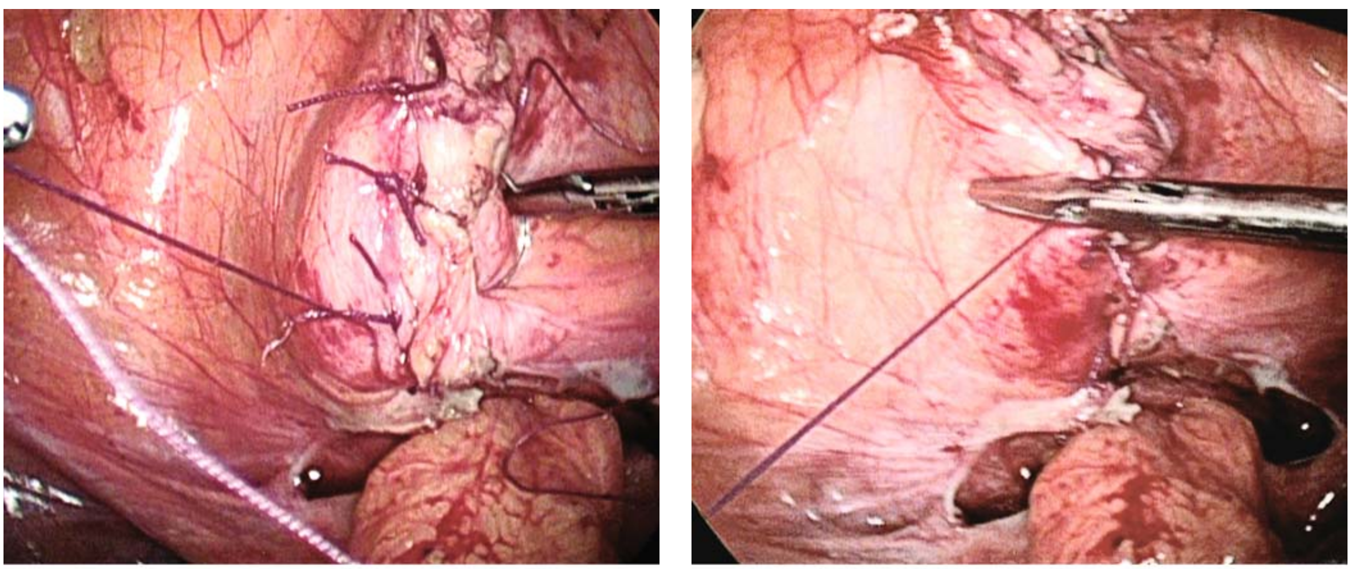


Fig. 20.18. Any leak from the sutural line of the cystotomy can be appreciated on distending the bladder and can be oversewn



A B

Fig. 20.19. A second layer of continuous suture with 3-0 Vicryl

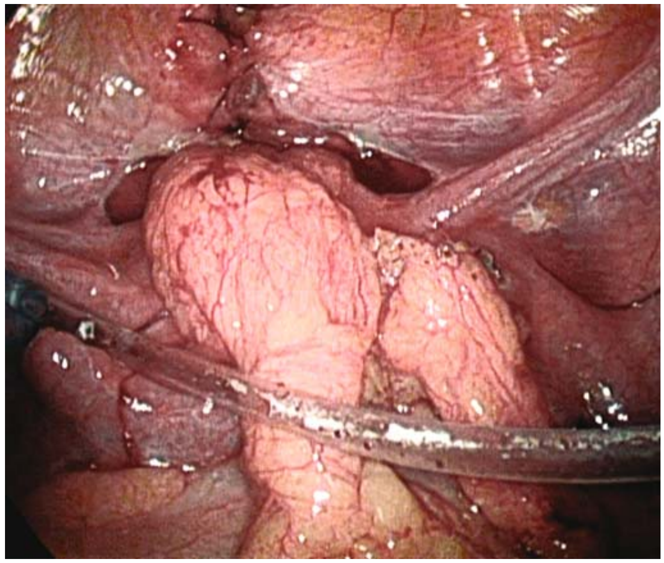
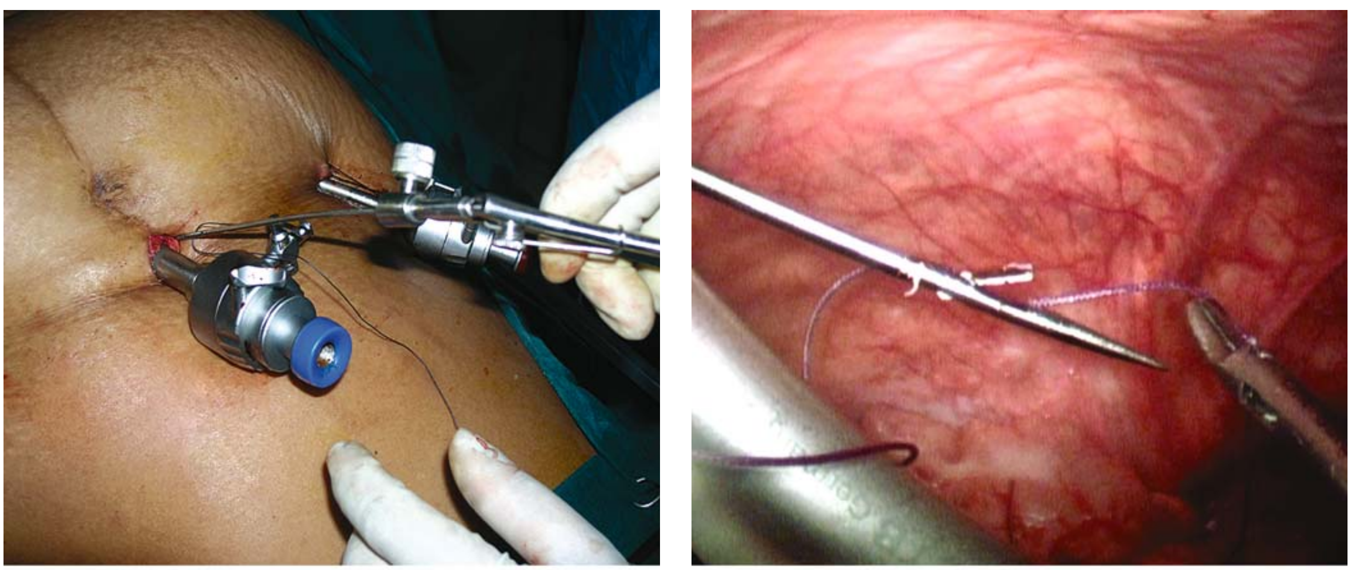


Fig. 20.20. A tube drain is inserted through the right flank port



A B

Fig. 20.21. External and endoview of port closure using the port closure needle

FIG. 20.22. Postoperative cystoscopy shows a well-healed wound in the bladder

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21 Laparoscopic Partial Cystectomy

Renuka Ramalingam and K. Senthil

Laparoscopic Partial Cystectomy for Endometriosis

Indications

Symptomatic benign conditions of the urinary bladder that do not involve the ureteral orifice may be managed by laparoscopic partial cystectomy [1–3].

Preliminary Evaluation

A computed tomography (CT) scan or magnetic resonance imaging (MRI) scan and cystoscopic biopsy are helpful to plan the procedure.

Surgical Technique

The transperitoneal approach is preferable to access most of the areas of bladder.

The patient is placed in either the lithotomy or the supine position with a Trendelenburg tilt. Using four ports—an umbilical telescope port, two ports in the midclavicular line 5 cm below and lateral to umbilicus, and a flank port for hand instruments—the bladder lesion can be approached. Provision for an intraoperative cystoscopy helps in locating the lesion and determining the probable line of cystotomy. Electrocautery or ultracision can be used for the cystotomy. Once the edge of the lesion is seen, it is easier to complete the excision. The bladder defect is closed with continuous or interrupted 2-0 Vicryl sutures. Distending the bladder will reveal any leak that can be oversewn. Omental reinforcement on the sutural line is preferable. A tube drain is left in place through the flank port. A specimen can be retrieved by enlarging the 10-mm port or through a colpotomy.

Follow-Up

A postoperative cystogram on day 7 will rule out any extravasation, and the Foley catheter can be removed on day 10.

Conclusion

Partial cystectomy for benign conditions such as endometriosis is a fairly straightforward procedure with obvious advantages especially when the specimen can be removed by colpotomy, avoiding extension of the port incision.

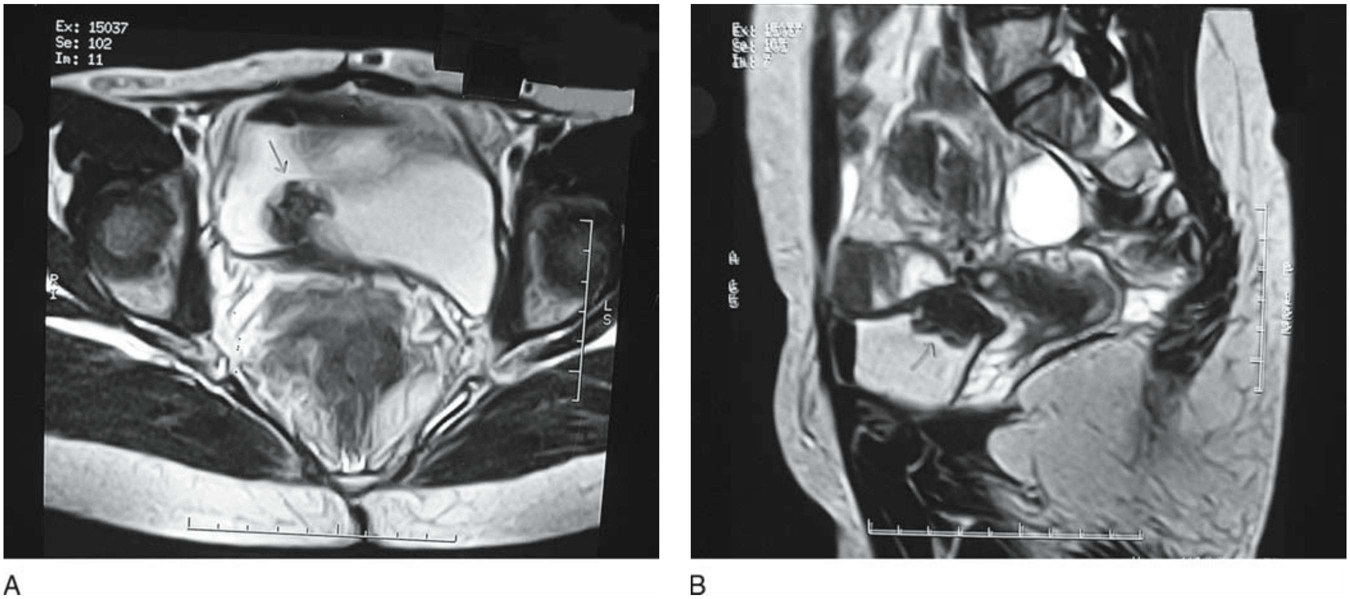


FIG. 21.1. Magnetic resonance imaging (MRI) of the pelvis shows a polypoid mass (arrow) in the posterior wall of bladder; patient underwent two cesarean sections earlier

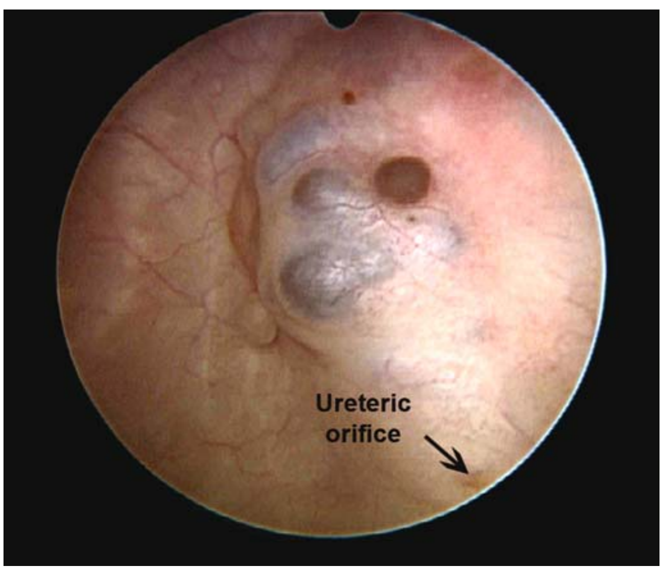


FIG. 21.2. Cystoscopic view shows a solid polypoid lesion supratrigonal area with purplish hue suggestive of endometriosis (about 1 cm away from right ureteric orifice)

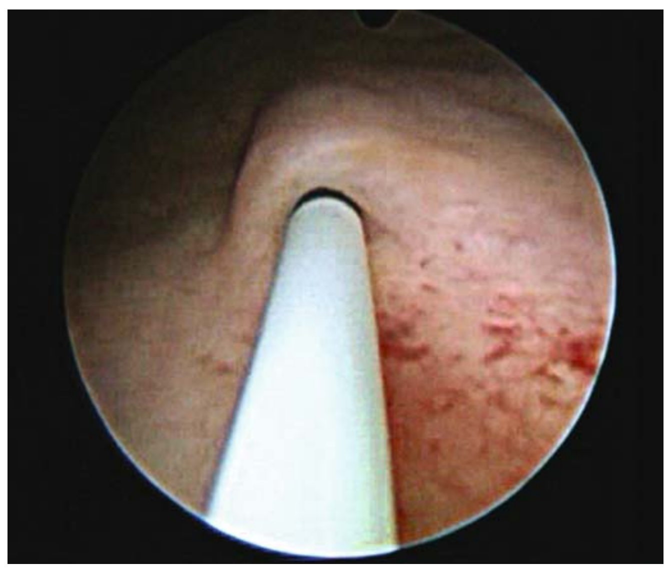


FIG. 21.3. Ureteric stent passable on the right side

Fig. 21.4. External view of the port positions

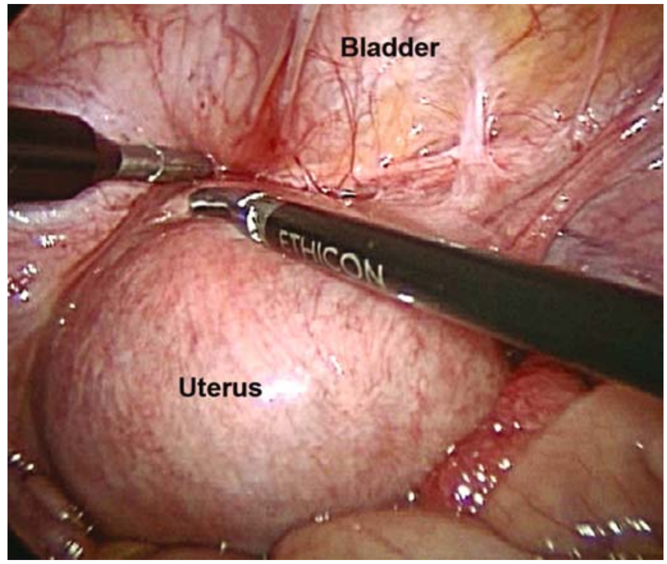


Fig. 21.5. Initial laparoscopic view shows the bladder adherent to the uterus

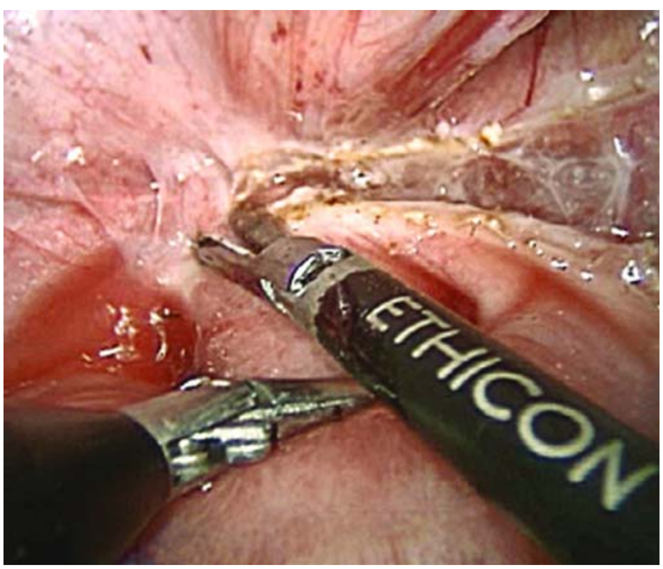


Fig. 21.6. An attempt to dissect between the uterus and the posterior wall of the bladder after incision of the peritoneum at the vesicouterine angle

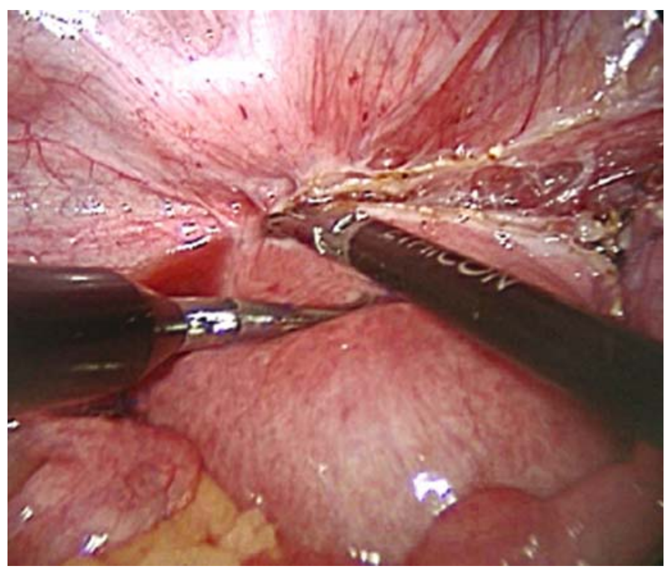


Fig. 21.7. Dissection in progress

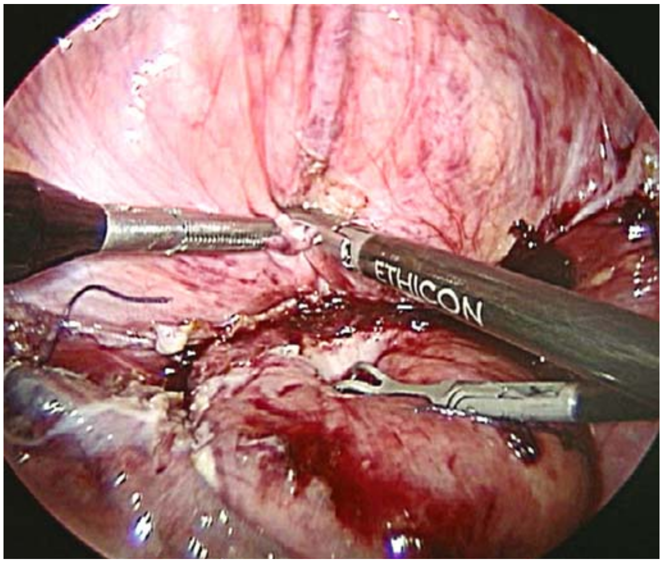


FIG. 21.8. As a plane between the bladder and the uterus could not be developed, cystotomy is done close by, so that the edges of the lesion can be better viewed

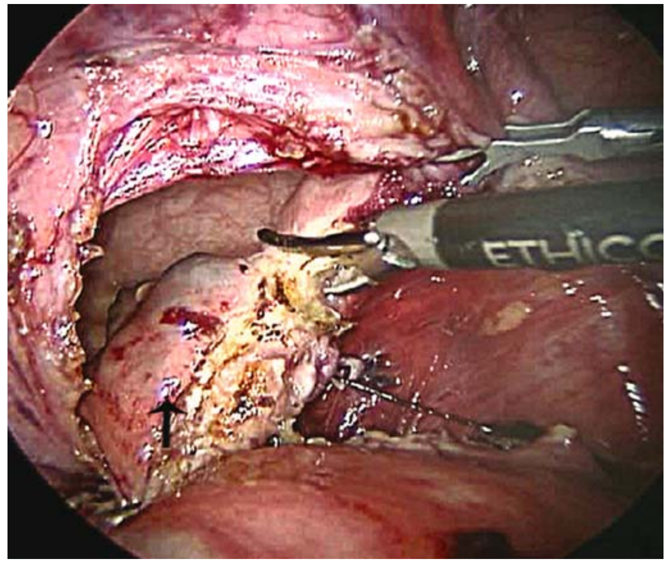


FIG. 21.9. Cystotomy in progress; the arrow points to a mass

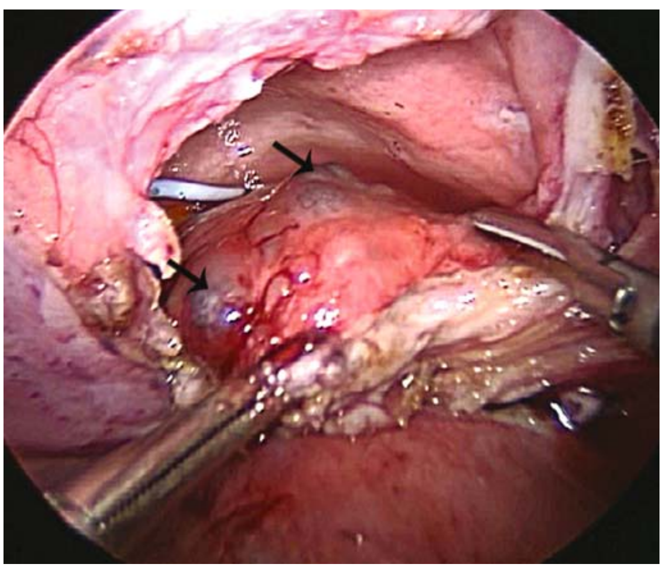


FIG. 21.10. Cystotomy revealing solid mass (arrows) in the supratrigonal area (the ureteric stent is seen in the background)

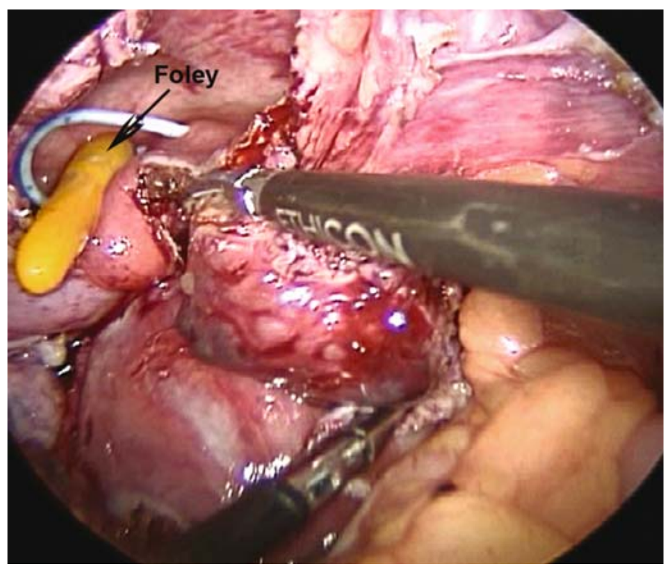


FIG. 21.11. Mass being excised

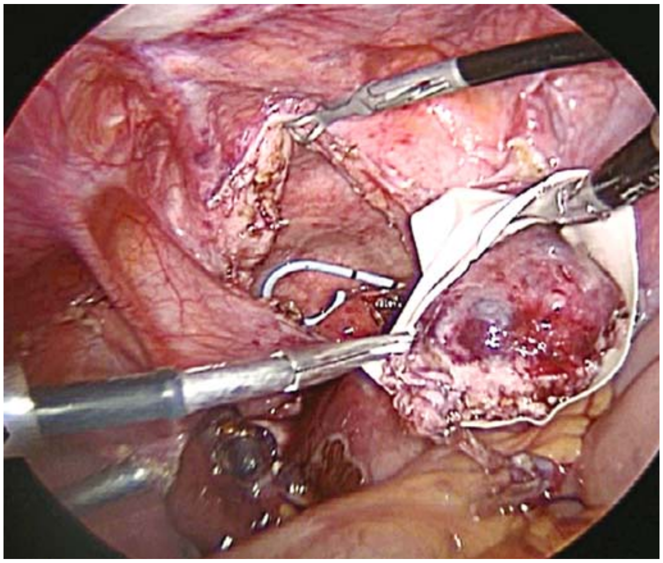


Fig. 21.12. Mass entrapped in a glove finger stall

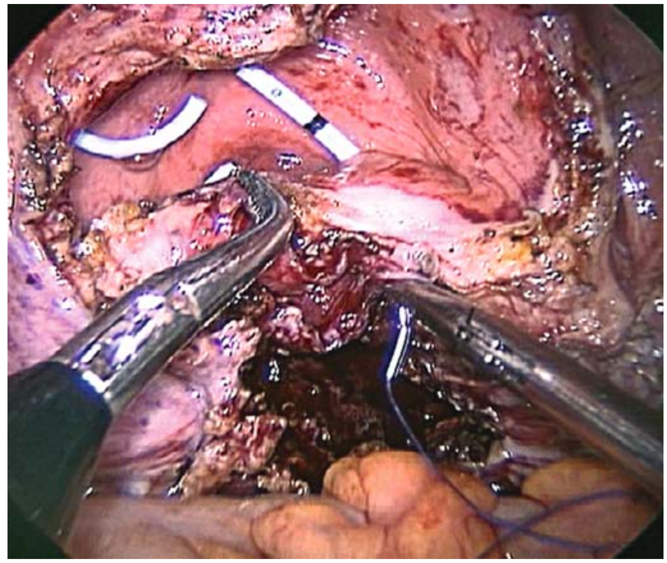
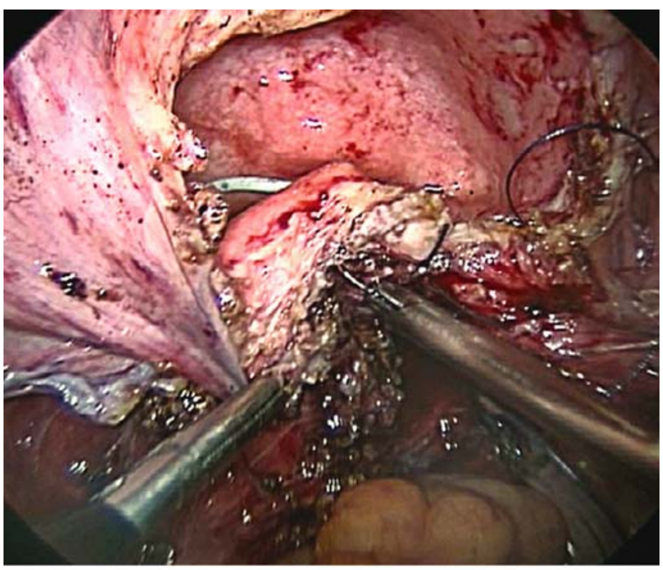
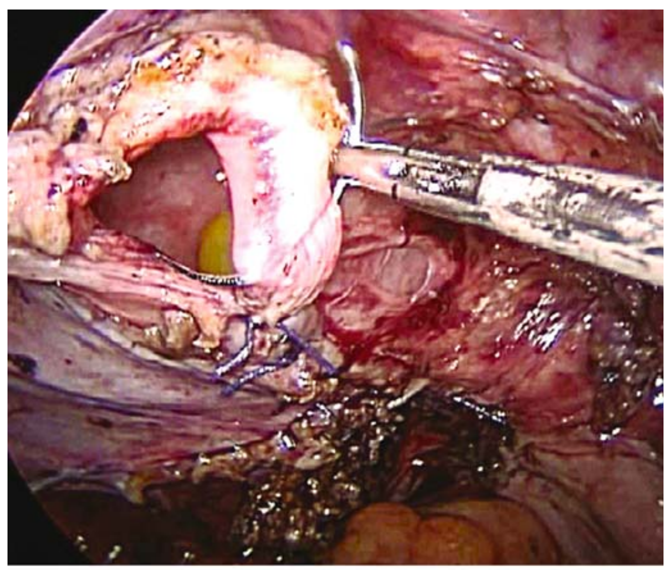


Fig. 21.13. Bladder defect suturing started with interrupted 2-0 Vicryl



A



B

Fig. 21.14. Further suturing with interrupted 2-0 Vicryl

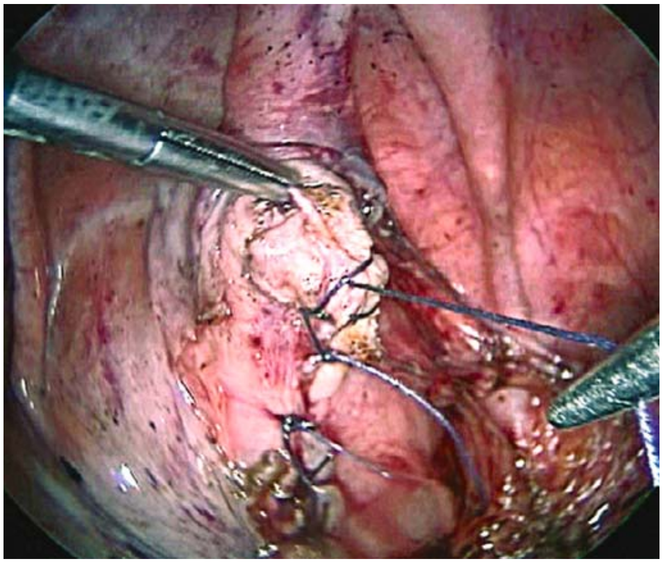


FIG. 21.15. Cystotomy closure completed

FIG. 21.16. A drain is introduced through the lateral port

FIG. 21.17. Cystoscopy (3 months postoperative) does not reveal any residual endometriosis and shows well-healed scar

References

1. Chapron C, Dubuisson JB, Jacob S, Fauconnier A, Da Costa Vieira M (2000) Laparoscopy and bladder endometriosis. Gynecol Obstet Fertil 28(3):232–237.
2. Chapron C, Dubuisson JB (1999) Laparoscopic management of bladder endometriosis. Acta Obstet Gynecol Scand 78(10):887–890.
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Partial Cystectomy in Urachal Tumor

Mahesh R. Desai

Indications

Partial cystectomy may be offered for patients with a small tumor usually in the dome, where a 2-cm clearance is possible. Tumor in a bladder diverticulum and urachal carcinoma are other possible indications for a partial cystectomy.

Preliminary Workup

A CT scan of the abdomen is done to rule out regional metastasis. Cystoscopy and transurethral resection of the lesion with multiple cold-cup biopsies of the base and the adjoining area of the tumor and suspicious areas is a must to confirm that there is no carcinoma in situ changes or tiny tumors.

Surgical Technique

The patient is placed in the lithotomy and head-low position. Cystoscopic marking of the line of excision with a bee-sting knife is a useful step but is optional. Using four ports, a bilateral iliac lymph-node dissection is carried out. This is done by incising the peritoneum over the external iliac artery and removing the lymphatic package between the iliac vessels and obturator nerve sweeping from the lateral pelvic wall (this may be sent to the lab for a frozen section biopsy).

Subsequently the probable area of tumor is located and a cystotomy is performed at least 2 cm away from the likely edge of tumor (if needed a cystoscopic guidance can be used). After the small cystotomy is performed, the telescope is introduced through the cystotomy into the bladder to define the line of division. Electrocautery or ultracision is used to complete the excision of the tumor with a clear margin. The bladder defect is closed with continuous or interrupted 2-0 Vicryl. The specimen is entrapped and retrieved by a 5-cm muscle-splitting incision in the iliac region. The ports and wound are closed.

Laparoscopic Partial Cystectomy for Urachal Tumor

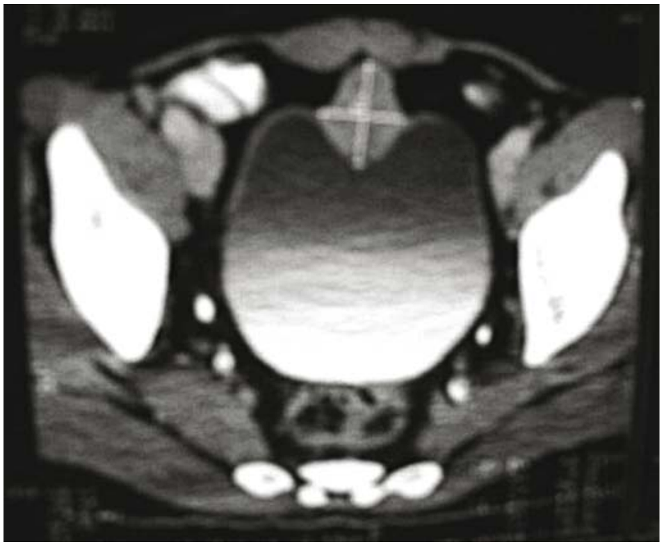


FIG. 21.18. A CT scan shows a solitary urachal tumor apparently confined to the bladder wall (about 3 cm diameter)

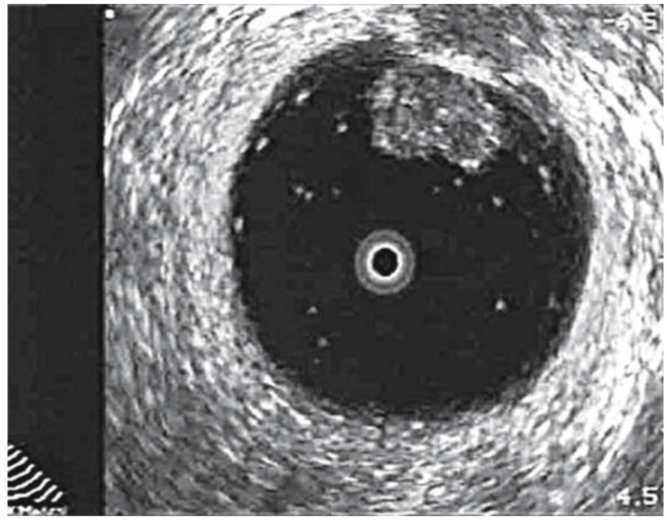


FIG. 21.19. Intracavitary ultrasound scan shows the tumor in the dome

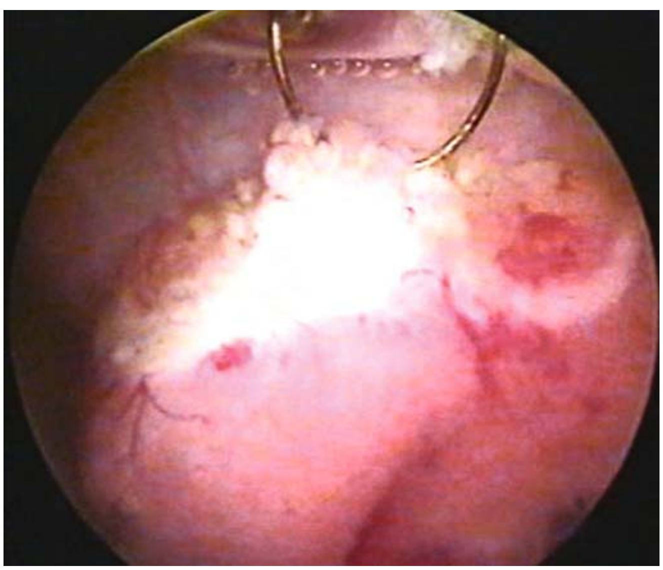
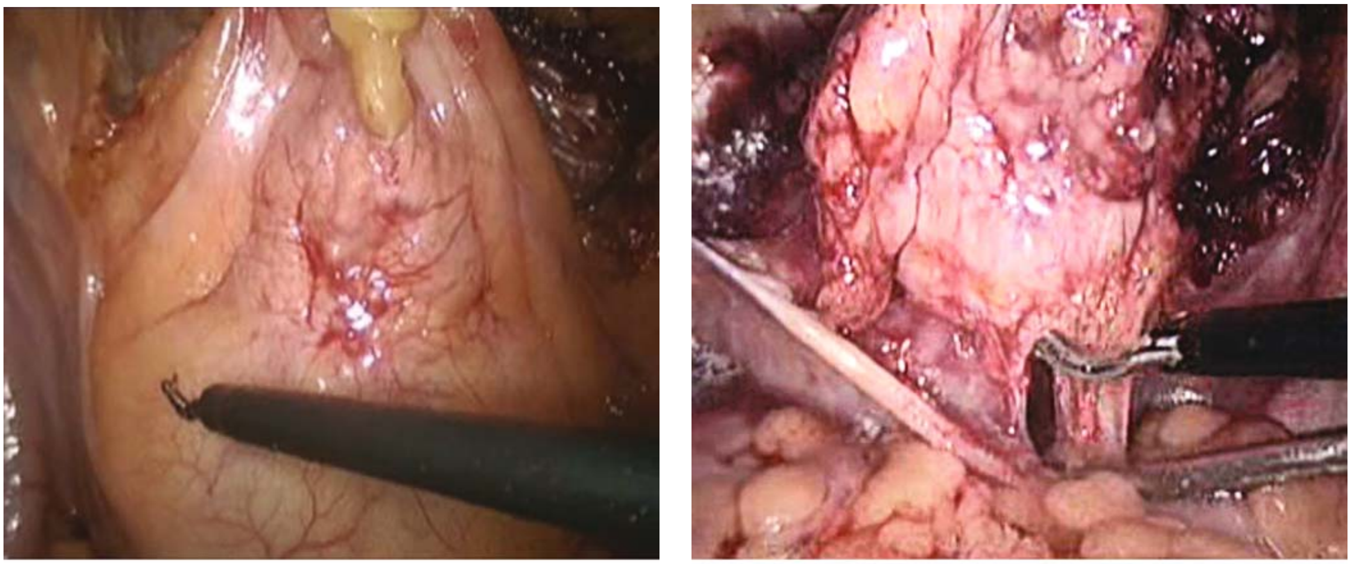


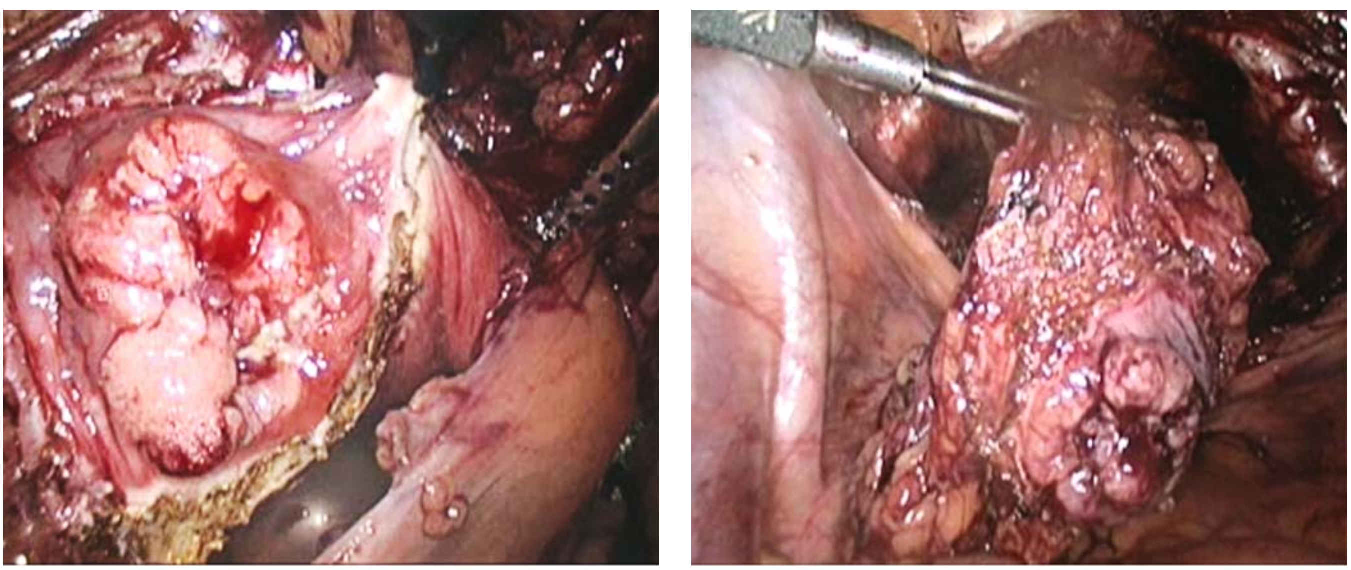
FIG. 21.20. Cystoscopy shows a solid tumor in the dome of the bladder; a transurethral resection (TUR) biopsy is performed

FIG. 21.21. The initial laparoscopic view shows a tumor in the dome of the bladder



A B

FIG. 21.22. Incision of the dome after dissecting the urachus



A B

FIG. 21.23. Excision of the urachal tumour with a clear margin

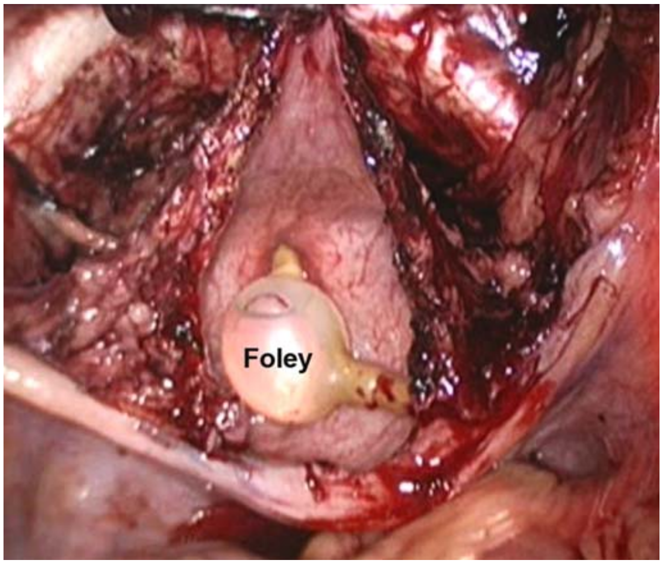


FIG. 21.24. View after excision of the tumor

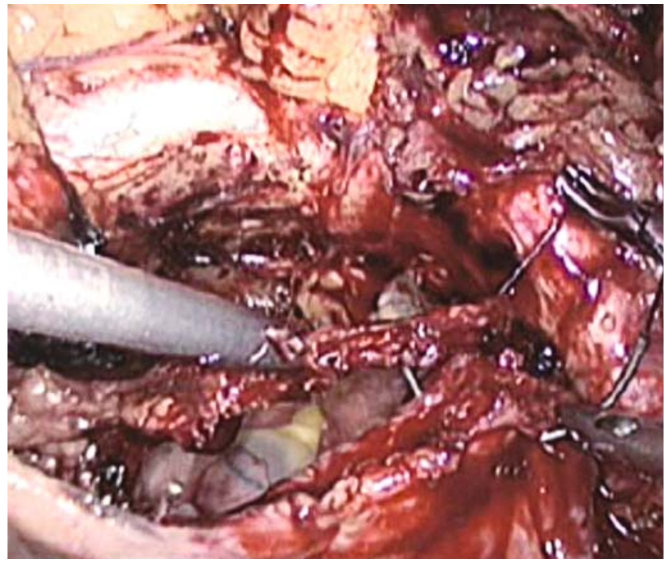


FIG. 21.25. Cystotomy closure using continuous 2-0 Vicryl suture

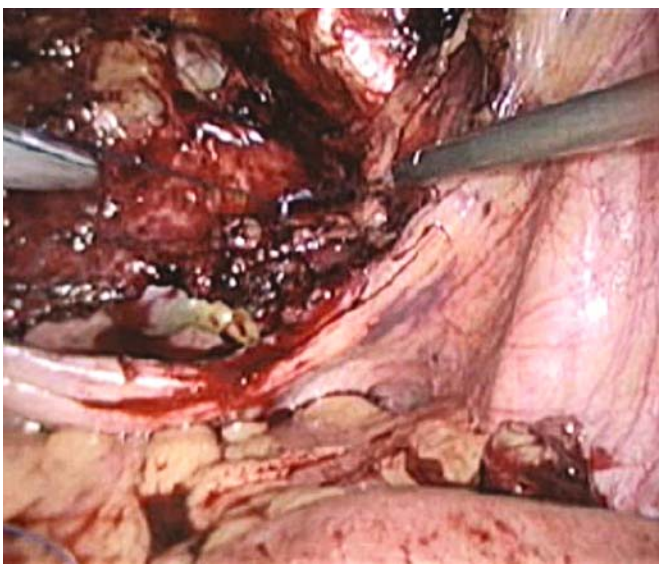


FIG. 21.26. Cystotomy closure using continuous 2-0 Vicryl suture

FIG. 21.27. Partial cystectomy specimen shows a good tumor-free margin

Partial Cystectomy for Solitary Invasive Bladder Tumor (Transitional Cell Carcinoma)

M. Ramalingam and M.G. Pai

When partial cystectomy is indicated for a malignancy of the bladder, it can be performed laparoscopically.

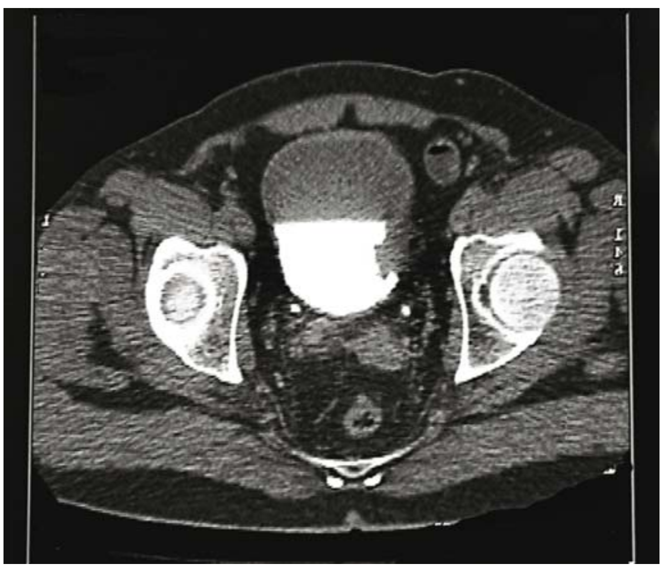


Fig. 21.28. A CT scan shows a solitary papillary mass

Fig. 21.29. Cystoscopic view of the mass in the left inferolateral wall

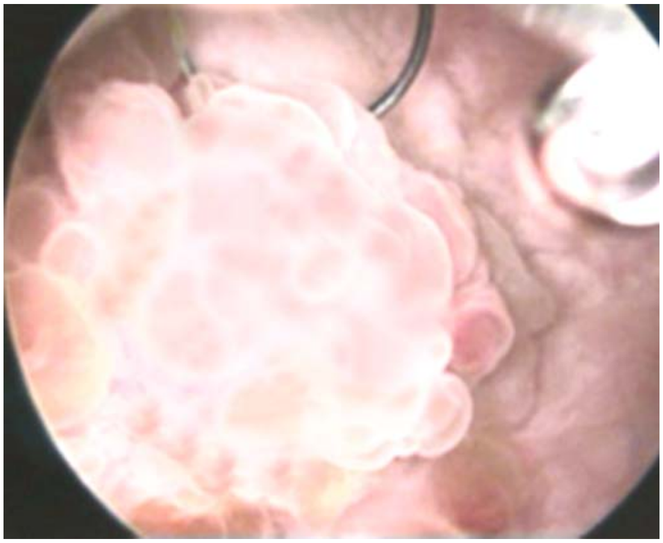


Fig. 21.30. Transurethral resection (TUR) of the bladder tumor

Fig. 21.31. Tumor base biopsy revealed grade II transitional cell carcinoma invasive in the muscle

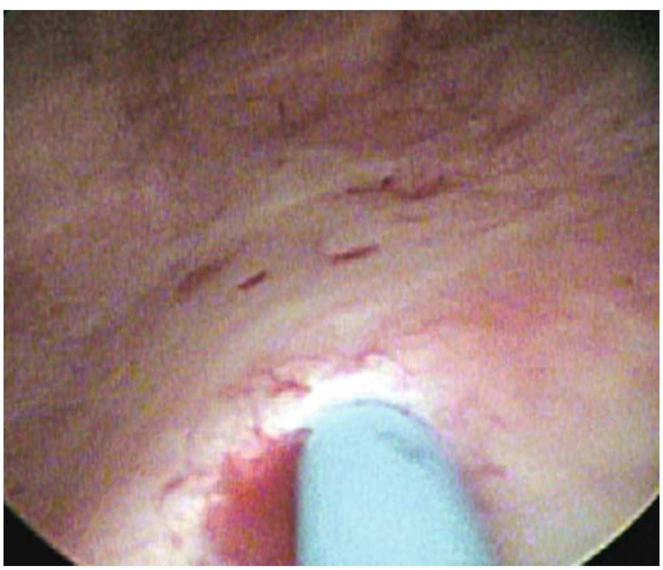


Fig. 21.32. Cystoscopy; left ureteric stenting just before a partial cystectomy (to safeguard the ureter)

Fig. 21.33. Marking the probable line of excision with a bee-sting knife

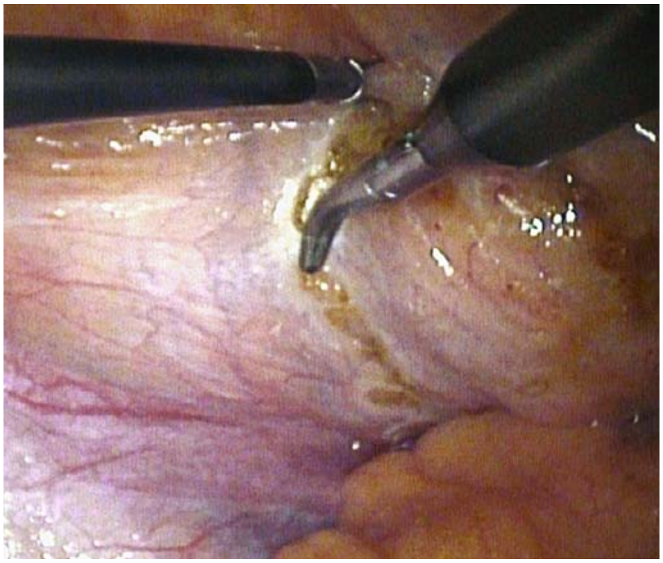


FIG. 21.34. Marking the line of cystotomy after inserting the laparoscopic ports

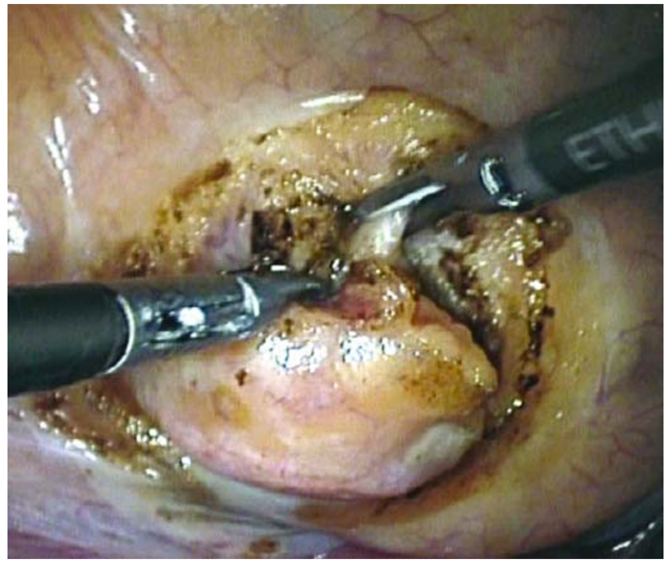


FIG. 21.35. Cystotomy using ultracision (as guided by cystoscopy as and when needed)

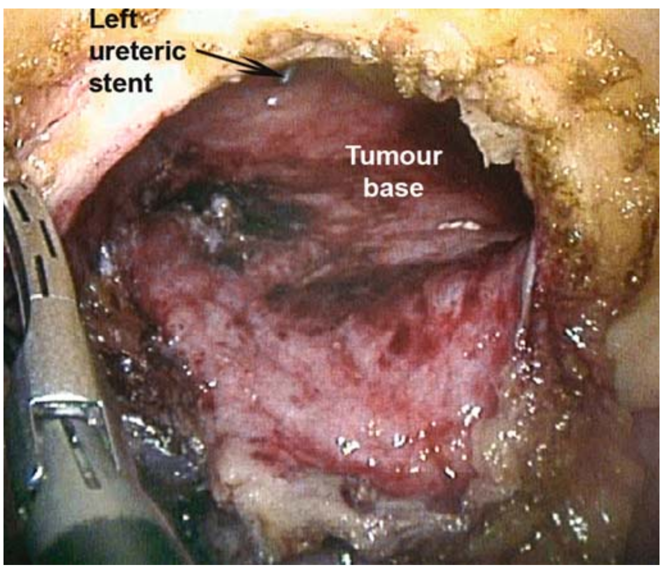


FIG. 21.36. Excision of the mass in progress with a margin of about 1.5 cm

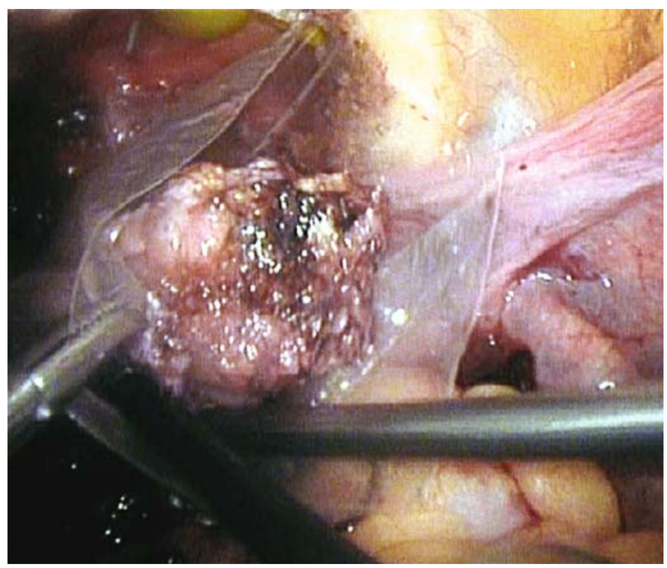


FIG. 21.37. Specimen entrapment in a plastic bag

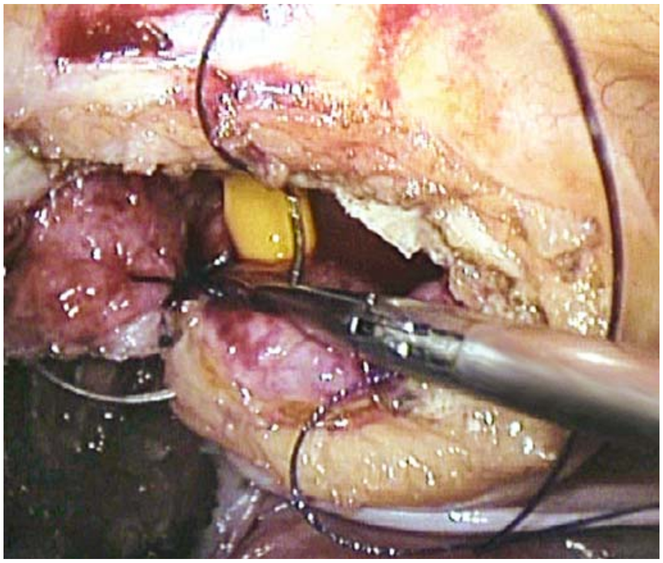


FIG. 21.38. Cystotomy closure with 3-0 interrupted Vicryl suture

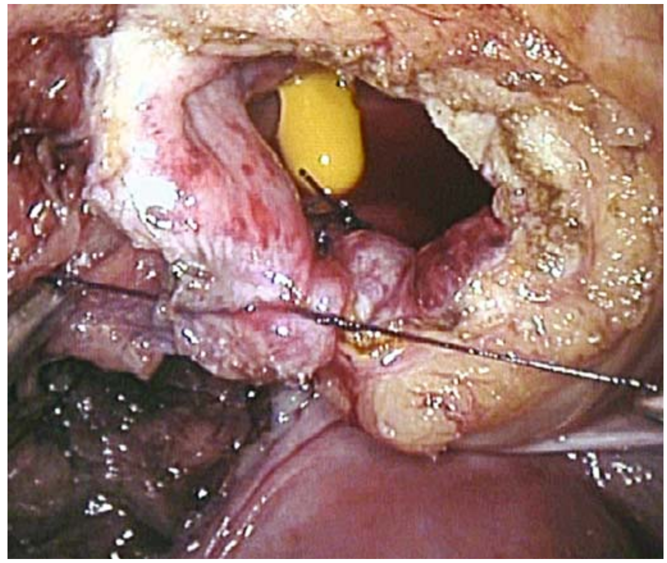


FIG. 21.39. Cystotomy closure with 3-0 interrupted Vicryl in progress

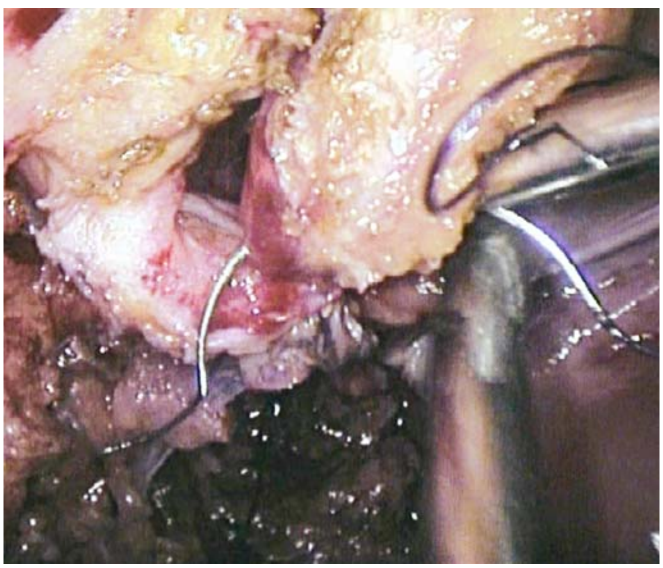


FIG. 21.40. Bladder closure in progress

FIG. 21.41. Second layer closure in progress

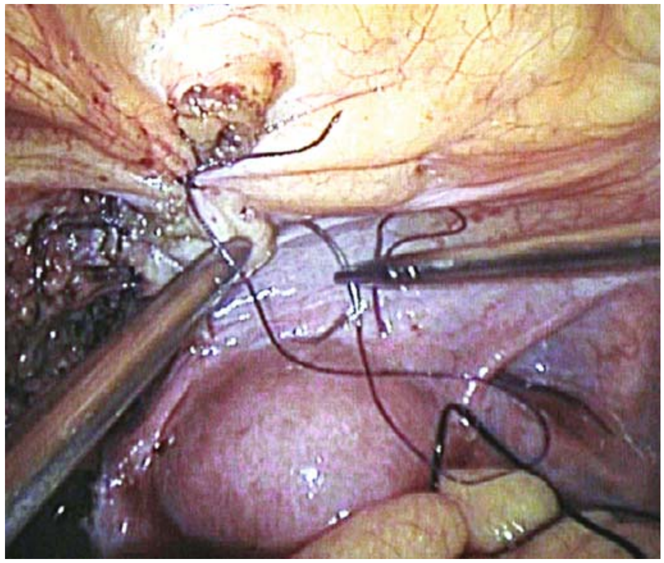


Fig. 21.42. View after second layer closure

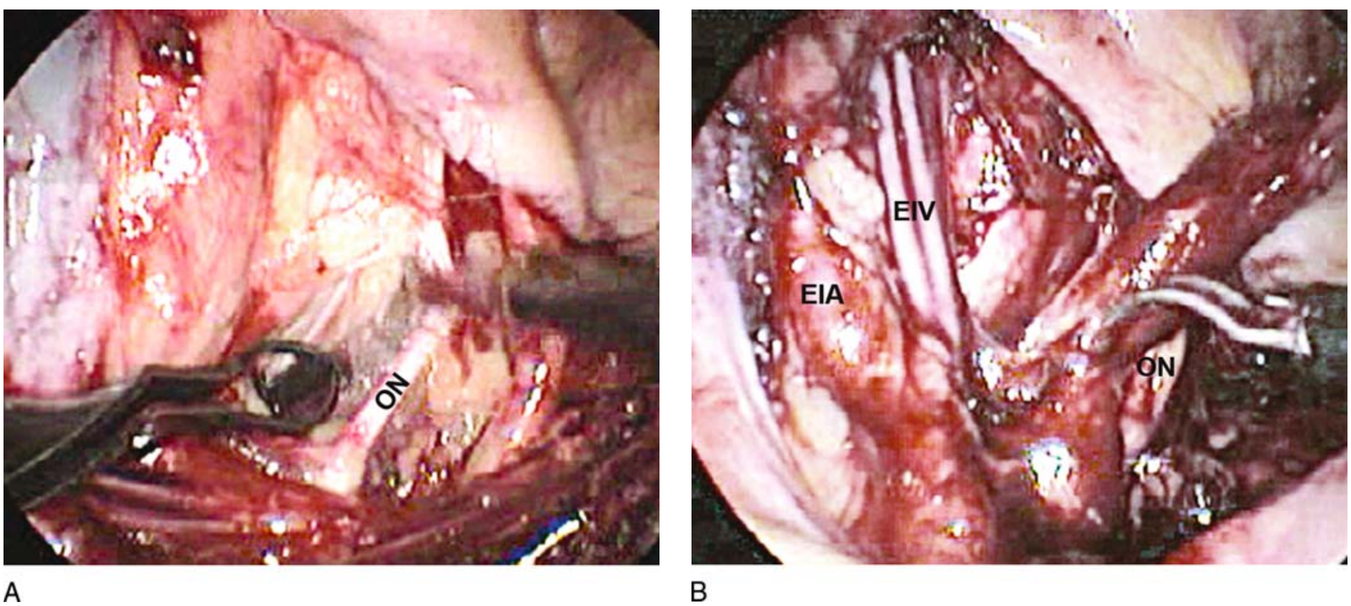


Fig. 21.43. Left iliac lymph-node dissection in progress (EIV, external iliac vein; EIA, external iliac artery, ON, obturator nerve)

Fig. 21.44. Specimen retrieval

22
Laparoscopic Excision of a Patent Urachus

K. Senthil and M. Ramalingam

The urachus extends from the anterior dome of the bladder to the umbilicus. It has three distinct layers. Incomplete obliteration of the urachus manifests in various forms (e.g., urachal cyst, urachal sinus, urachal diverticulum, and patent urachal fistula. Symptomatic urachal cyst and patent urachal fistula warrant surgical excision and can be accomplished laparoscopically [1,2]. Simple drainage of a urachal cyst is associated with recurrent infections and even late occurrence of an adenocarcinoma.

Surgical Technique

The patient is placed in the supine head-low position. An initial cystoscopy is performed to determine the site of the urachal fistula. In a patient with a patent urachal fistula, a leak can be demonstrated through the umbilical sinus. A supraumbilical 10-mm camera port is inserted, and two 5-mm working ports are inserted 4 cm lateral to the umbilicus. The fistula is detached at the umbilical end using ultracision or diathermy. It is rarely necessary to remove the umbilicus in benign lesions in children. The dissection is carried on up to the dome of the bladder. The patent urachus with a rim of bladder is excised. The bladder defect is closed with 2-0 Vicryl interrupted sutures, and a Foley catheter is left indwelling urethrally. An omental patch may be tacked on top of the suture line in the bladder. The specimen can usually be retrieved through the 5-mm port. If that is not possible, then it may be removed through the 10-mm port. The umbilical defect closes secondarily without the need for any surgical closure.

Excision of the urachal fistula can be completed laparoscopically with minimal morbidity to the patient. The chance of recurrent fistula is minimal with the use of an omental patch.

Laparoscopic Excision of the Urachal Remnant

FIG. 22.1. An umbilical sinus through which urine dribbles continuously

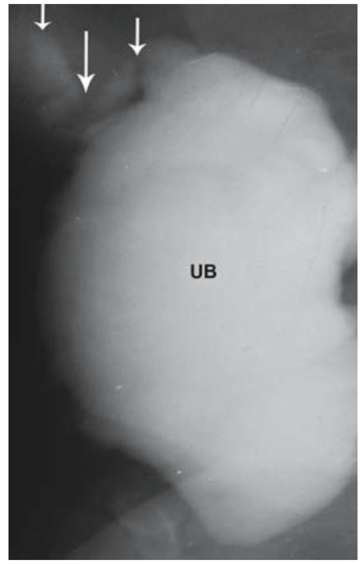


FIG. 22.2. A micturating cystourethrography (MCU) reveals a patent urachal remnant in a child; arrows point to the urachus (UB, urinary bladder)

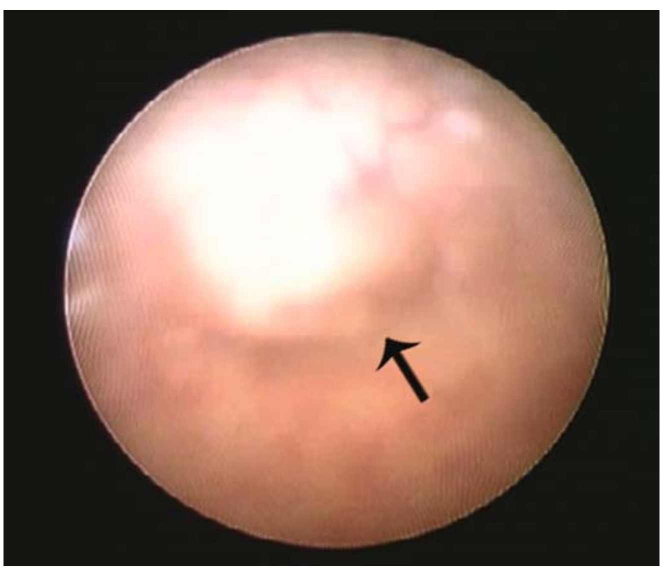


FIG. 22.3. Cystoscopy shows a sinus (arrow) in the dome of the bladder (while the bladder is being filled, saline escapes through the umbilical sinus)

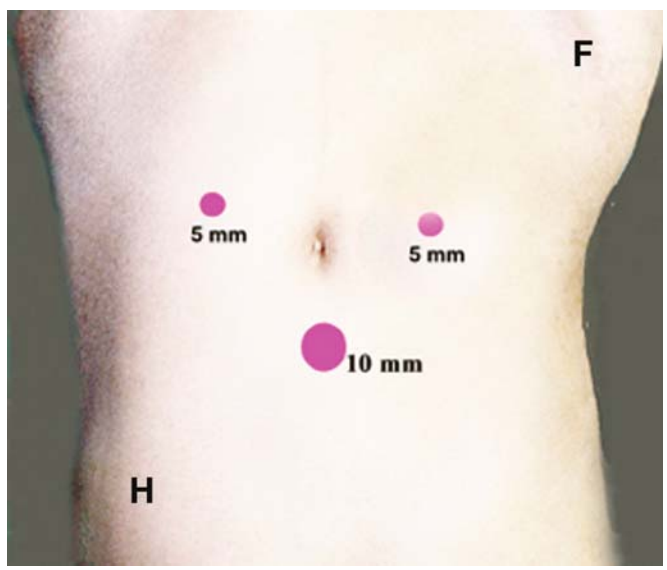


FIG. 22.4. External view of the port positions (H, head end; F, foot end)

FIG. 22.5. Laparoscopic view shows the urachal fistula extending from the dome of the bladder toward the abdominal wall

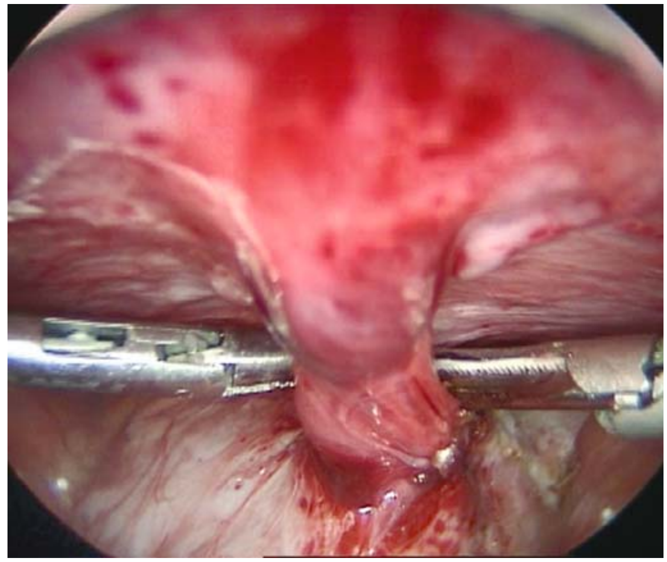


FIG. 22.6. View of the patent urachus after skeletonization

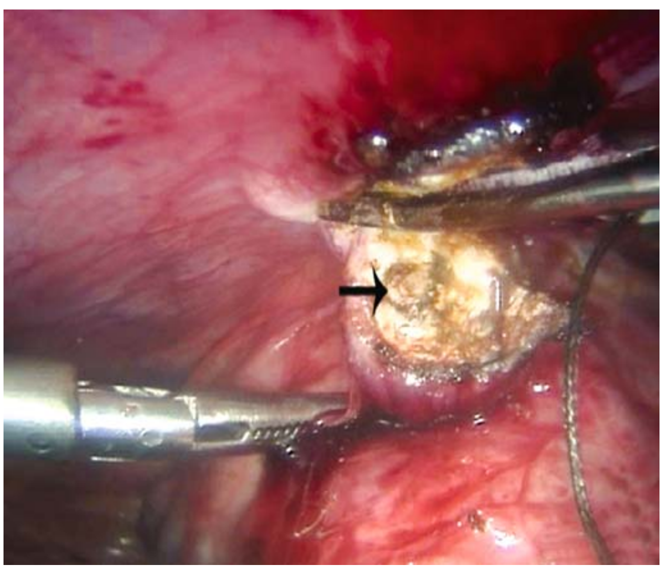


FIG. 22.7. Excision of the patent urachus at the umbilical end using ultracision; the arrow points to the lumen

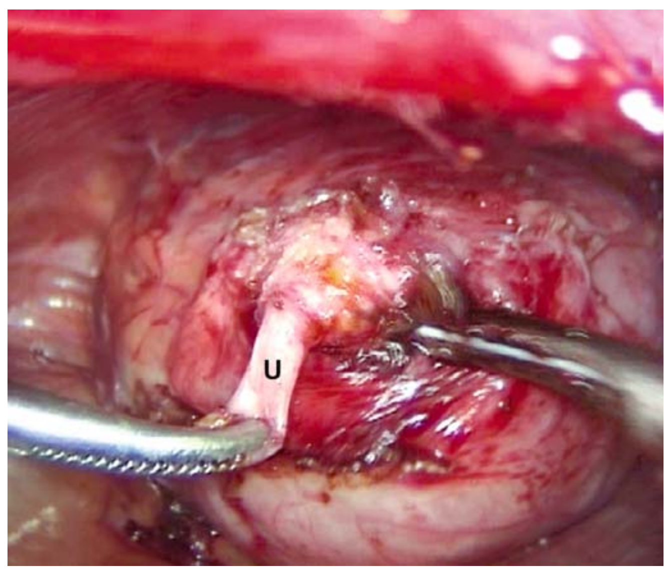


FIG. 22.8. The patent urachus (U) is dissected toward the dome of the bladder

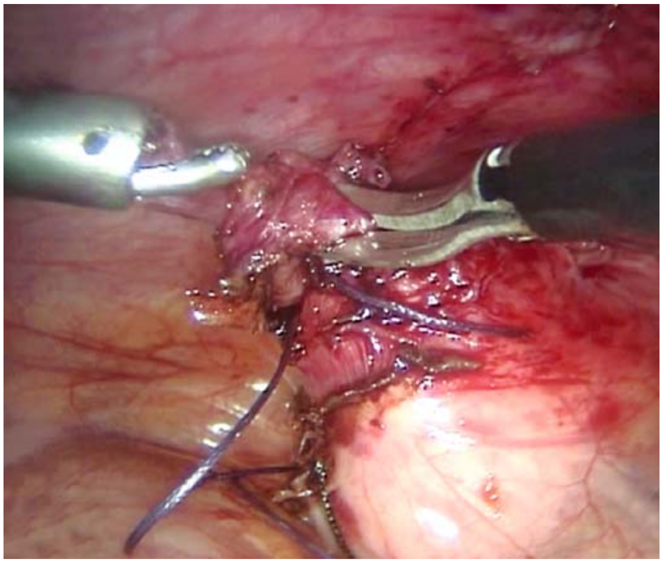


FIG. 22.9. Division of the patent urachus with a rim of bladder

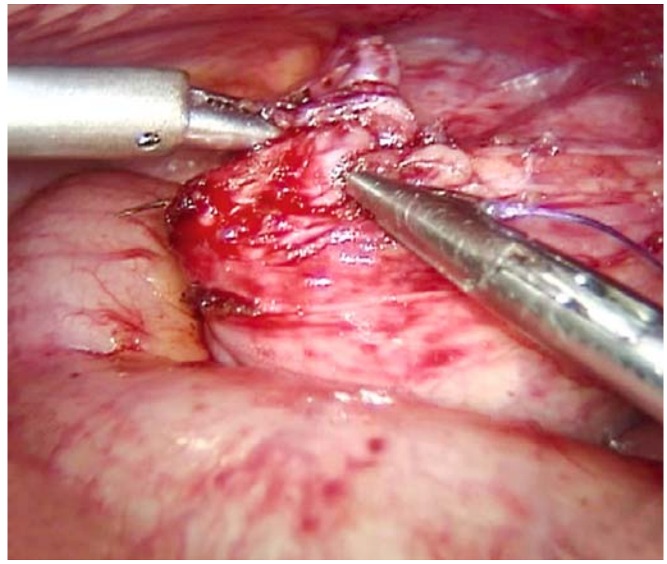


FIG. 22.10. The dome of the bladder is transfixed with 2-0 Vicryl suture

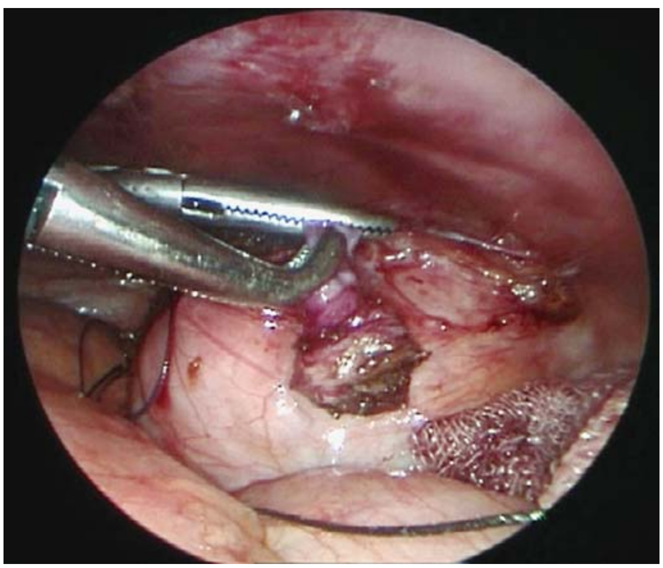


FIG. 22.11. The excised specimen is retrieved

References

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2. Khurana S, Borzi PA (2002) Laparoscopic management of complicated urachal disease in children. J Urol 168(4 pt 1):1526–1528.

23 Laparoscopic Autoaugmentation of the Bladder

M. Ramalingam and K. Selvarajan

Indications

Autoaugmentation is a useful procedure in neurogenic bladders that have poor compliance, instability, a reasonable capacity, and are not responding to medical management [1–4]. Autoaugmentation is a fair option prior to subjecting the patient to ileocystoplasty (which involves bowel with its inherent immediate and delayed complications).

Preliminary Evaluation

A micturating cystourethrography (MCU), an intravenous urogram (IVU), an isotope renal study, cystometry, and cystoscopy are done to determine the baseline capacity, renal function, compliance, and stability.

Surgical Technique

The patient is placed in the Trendelenburg position and three ports are used: an umbilical port for the telescope, and two ports in the midclavicular line 5 cm below and lateral to umbilicus for hand instruments. The peritoneum over the bladder is incised. Then using hook diathermy, the detrusor is divided. The incision starts vertically from close to the bladder neck and is extended posteriorly (up to the point that the mucosa bulges out). Diathermy should not be used when dissecting close to the mucosa. It is preferable to raise a rectangular flap of detrusor from the anterior wall on either side that can be sutured to Cooper's ligament, which gives a better long-term result with autoaugmentation. Any inadvertent bladder mucosal injury can be sutured using a 4-0 Vicryl stitch. There is no need for a drain if the mucosa is not breached.

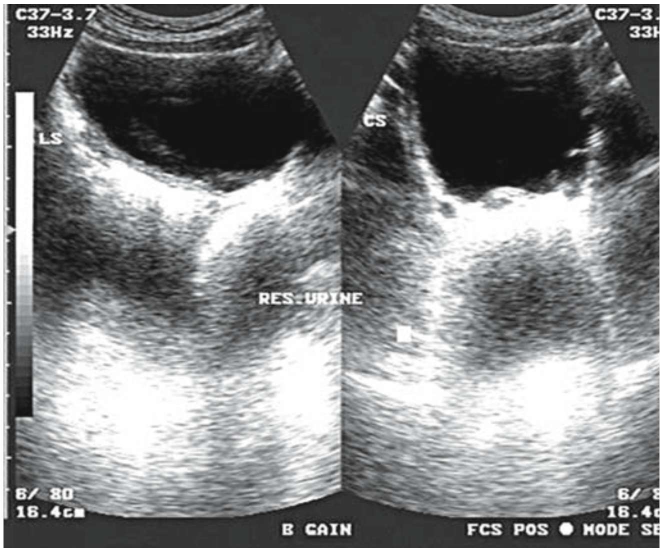

FIG. 23.1. An ultrasound scan shows a thickened bladder wall

FIG. 23.3. An intravenous urogram (IVU) shows compromised bilateral renal function

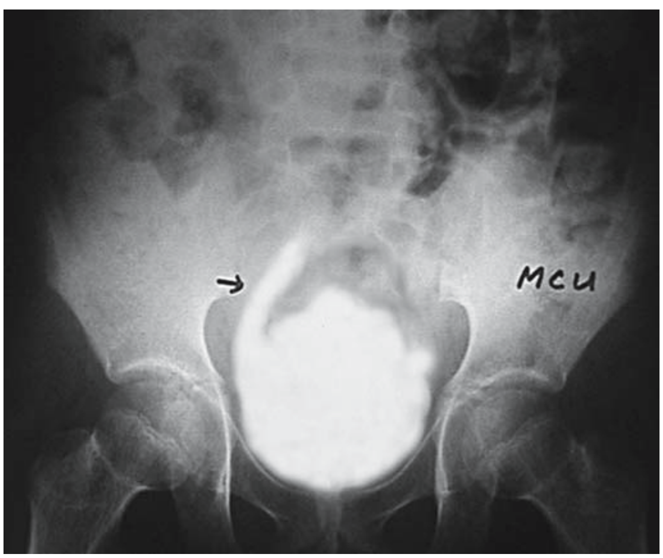

FIG. 23.2. A micturating cystourethrography (MCU) shows an irregular contour of the bladder and reflux on the right side

FIG. 23.4. External view of the port positions

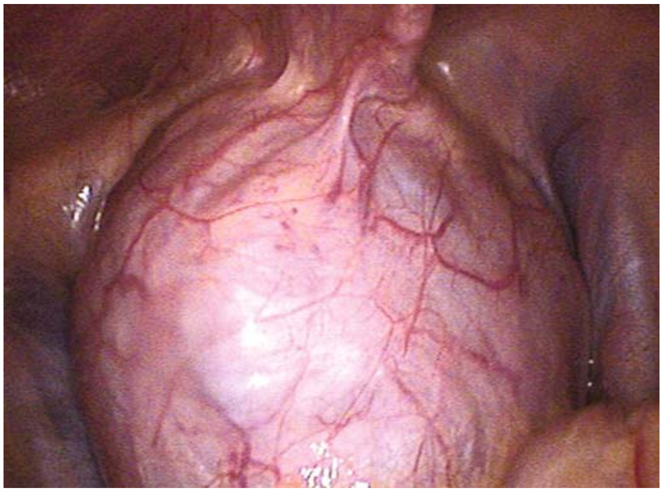

Fig. 23.5. Laparoscopic view of a thick-walled bladder with few diverticulae

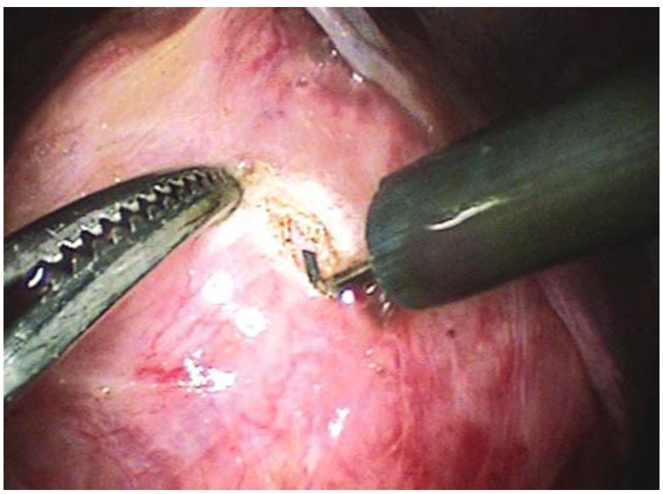

Fig. 23.6. Marking the line of incision with L-hook diathermy

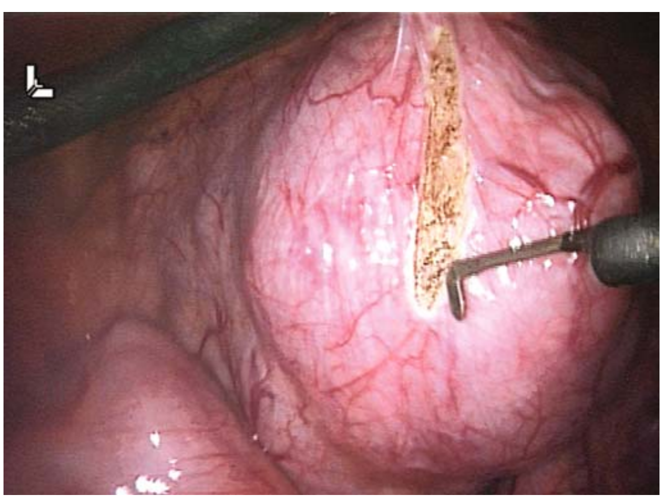

Fig. 23.7.The incision is deepened

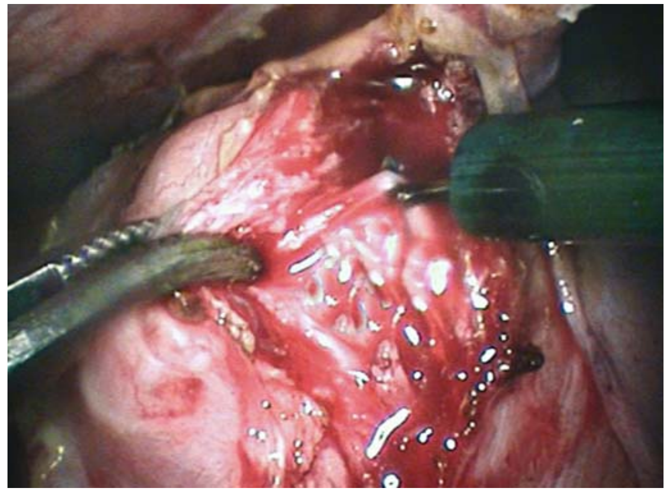

Fig. 23.8. A detrusorotomy exposes the bladder mucosa

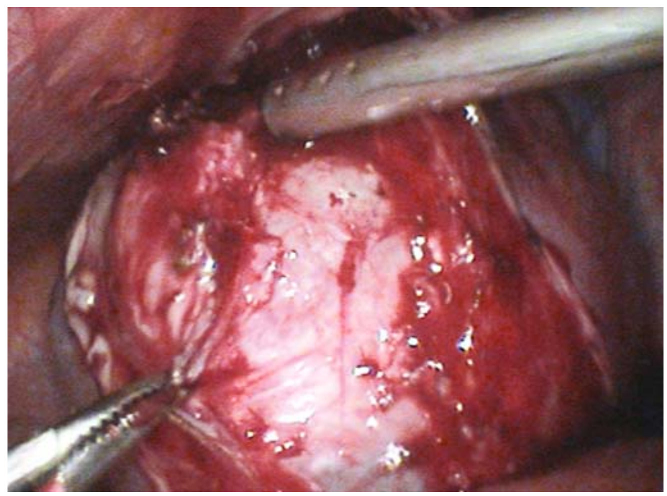

Fig. 23.9. The detrusorotomy in progress

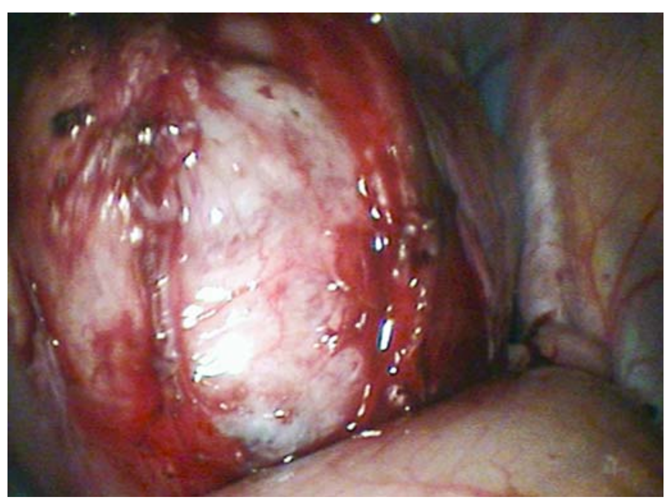

Fig. 23.10. The detrusorotomy is nearly completed and the bladder mucosa is seen bulging out like a huge diverticulum

FIG 23.11. Postoperative cystogram reveals increased bladder capacity

Laparoscopic autoaugmentation is an option before a major procedure such as an ileocystoplasty.

References

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2. Britanishy RG, Poppas DP, Shichman SN et al. (1995) Laparoscopic laser-assisted bladder autoaugmentation. Urology 46:315.
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4. Snow BW, Cartwright PC (1996) Bladder auto augmentation. Urol Clin North Am 23:323–331.

24
Laparoscopic Ileocystoplasty

M. Ramalingam and K. Senthil

Indications

Hyperreflexic poorly compliant neurogenic bladders are a threat to the upper tract. These bladders need to be augmented with bowel. A preliminary micturating cystourethrography (MCU), intravenous urogram (IVU), cystometry, cystoscopy, and urine culture are essential. Bowel needs to be prepared well. Laparoscopic ileocystoplasty is feasible [1–4].

Surgical Technique

Total Laparoscopic Ileocystoplasty

The patient is laced in the supine position. A supraumbilical telescope port and two pararectus hand instrument ports are used to inspect the bladder and bowel segment to be selected. A 12-mm flank port is placed to accommodate an endo–gastrointestinal anastomosis (GIA) stapler. A fifth port from the flank may be needed for suction and irrigation or retraction.

The chosen ileal segment (at least 10 cm away from the ileocecal junction) is isolated using the endo-GIA stapler. The mesenteric vessels can be managed with the endo-GIA stapler or with ultracision. The bowel continuity is restored with the endo-GIA stapler. Bladder is divided horizontally using electrocautery or ultracision. The isolated ileal segment is detubularized and brought in alignment with the cystotomy wound, taking care not to twist the mesentery. The posterior layer is sutured with continuous or interrupted 2-0 Vicryl. An extraperitoneal trocar suprapubic cystostomy catheter (SPC) is preferable. Subsequently the other layer is also closed in the same way. Whenever possible, omental tacking is performed. A tube drain is introduced through the flank port.

Laparoscopy-Assisted Ileocystoplasty

Laparoscopy assisted ileocystoplasty (see Chapter 35) is a hybrid of open and laparoscopic approach, and it facilitates reducing the operating time by about 1 hour. The supraumbilical port can be extended to about 3 cm to bring out the distal ileum for isolation and to restore ileoileal continuity.

Subsequently the bowel segment is pushed into the peritoneal cavity and the rectus is closed tightly around the camera port. The rest of augmentation is done with free-hand suturing intracorporeally.

Laparoscopic ileocystoplasty requires good intracorporeal suturing skills to reduce the operative time. This is an evolving procedure but it entails less morbidity. Laparoscopic-assisted ileocystoplasty probably is a good hybrid with the advantages of being minimally invasive and time saving.

FIG. 24.1. A micturating cystourethrography (MCU) shows a small-capacity bladder (about 100 mL) in a 9-year-old girl

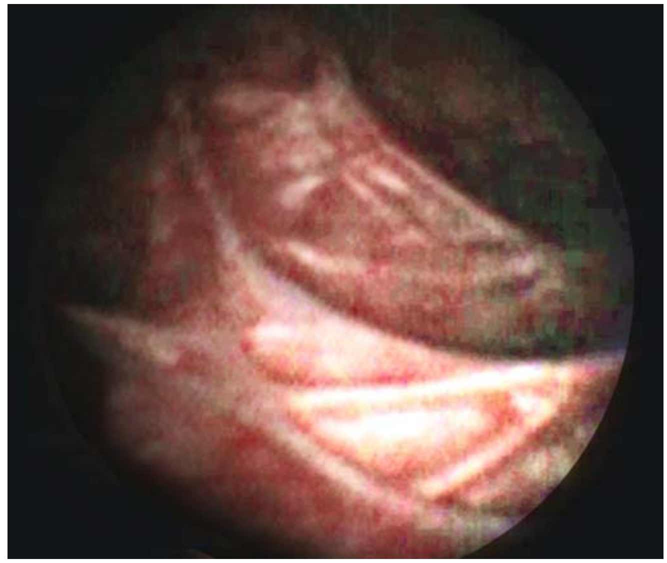


FIG. 24.2. Cystoscopic view shows a trabeculated bladder

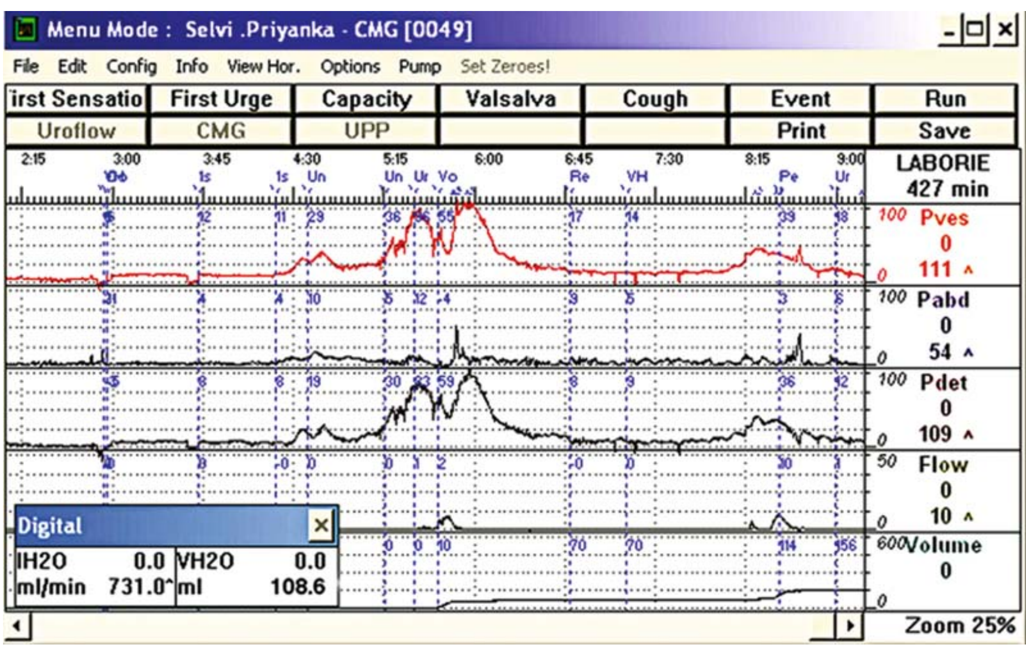


FIG. 24.3. Cystometry shows a grossly unstable bladder

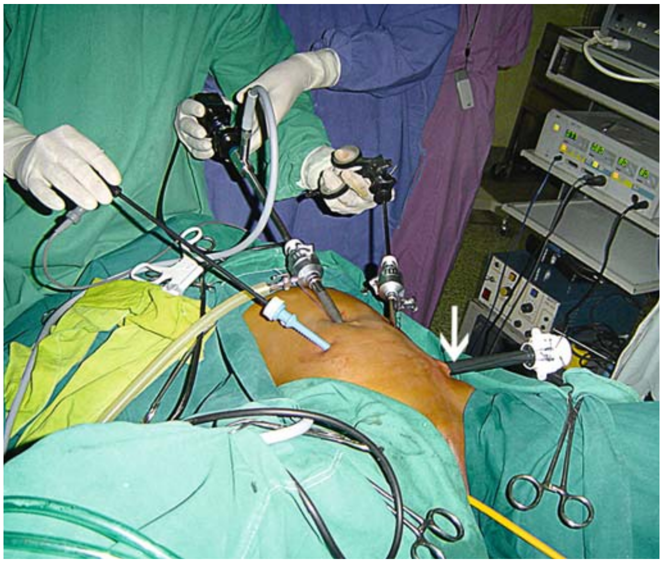


Fig. 24.4. External view of the port positions; note the 12-mm left flank port (arrow) is for the endo-GIA stapler

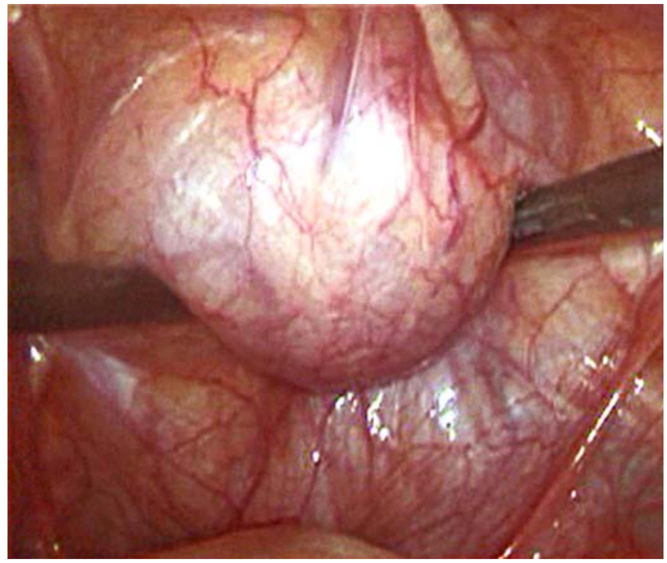


Fig. 24.5. Laparoscopic view shows a distended bladder (approximate volume about 100 mL)

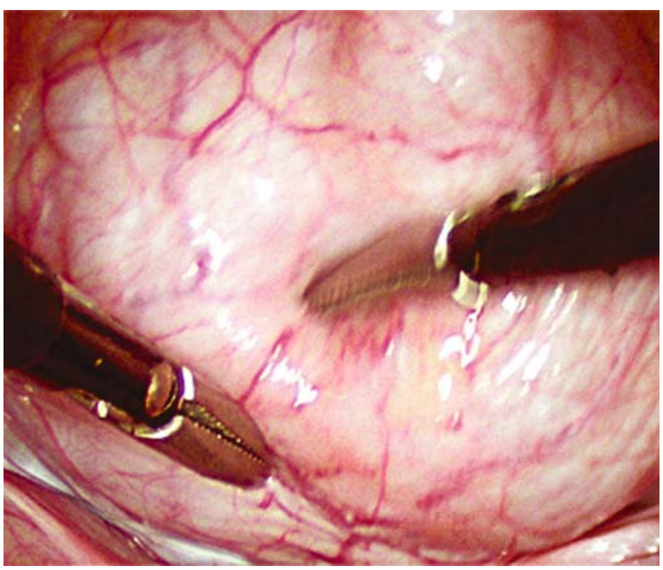


Fig. 24.6. Feeling the bladder wall thickness with two hand instruments

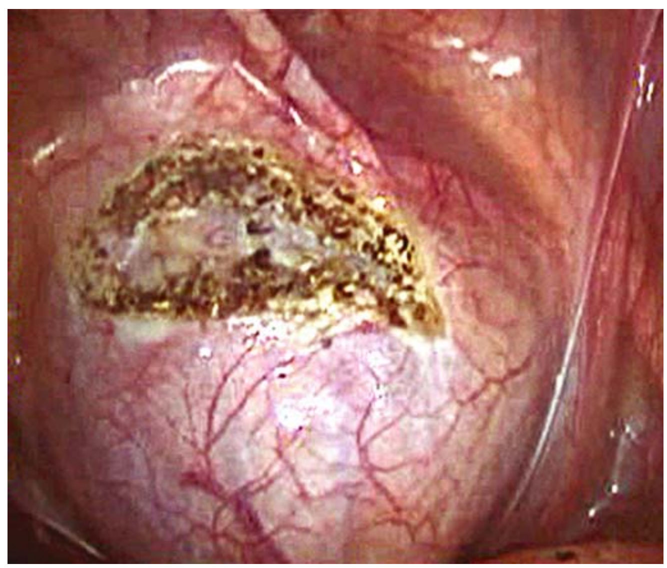


Fig. 24.7. Horizontal cystotomy with L-hook diathermy or ultracision

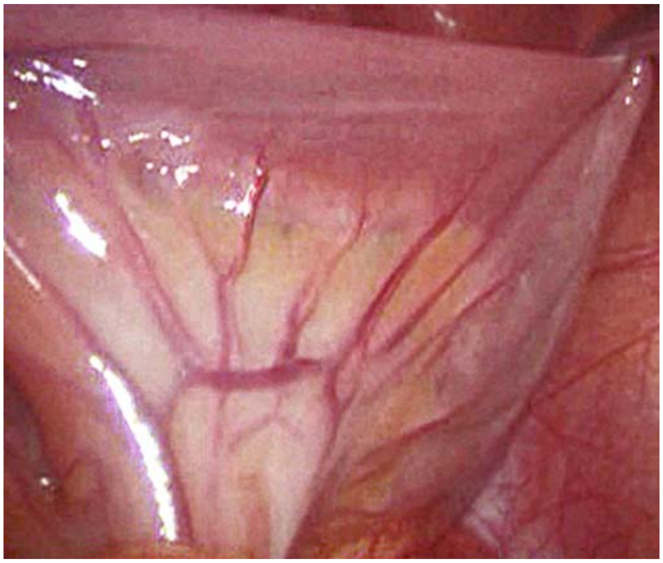


Fig. 24.8. Choosing a 10-cm ileal segment at least 15 cm away from the ileocecal junction

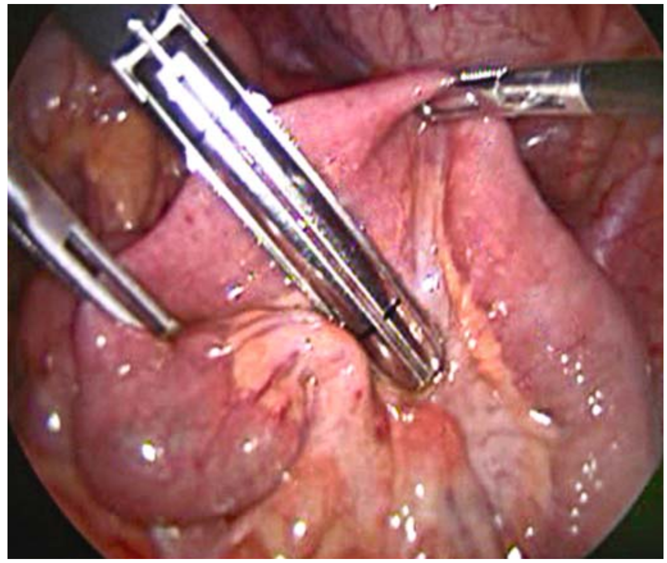


Fig. 24.9. Division of the bowel with the endo-GIA stapler—45 mm (inserted through the left flank port)

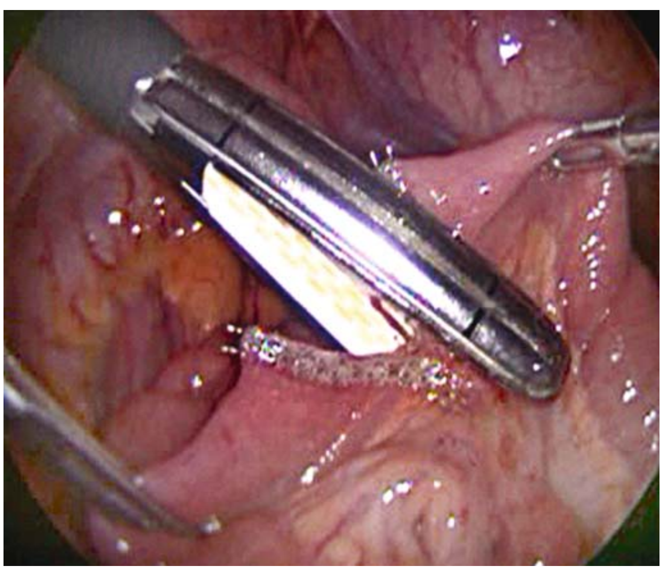


Fig. 24.10. Fairly clean division of the ileum and mesentery

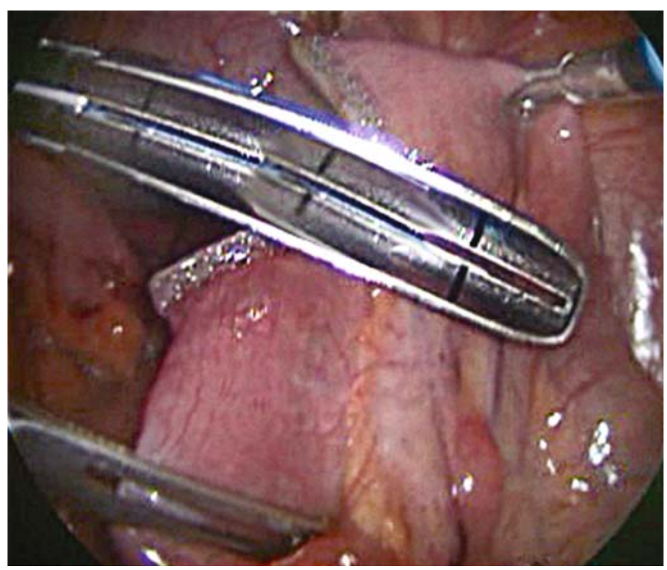


Fig. 24.11. The ileum transected on the other side

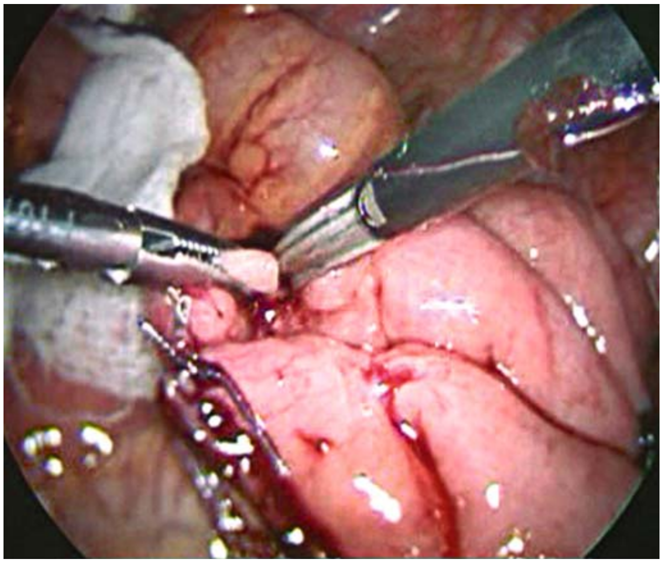


Fig. 24.12. A small rent is made in the ileal ends to engage the endo-GIA stapler in preparation for restoring ileoileal continuity

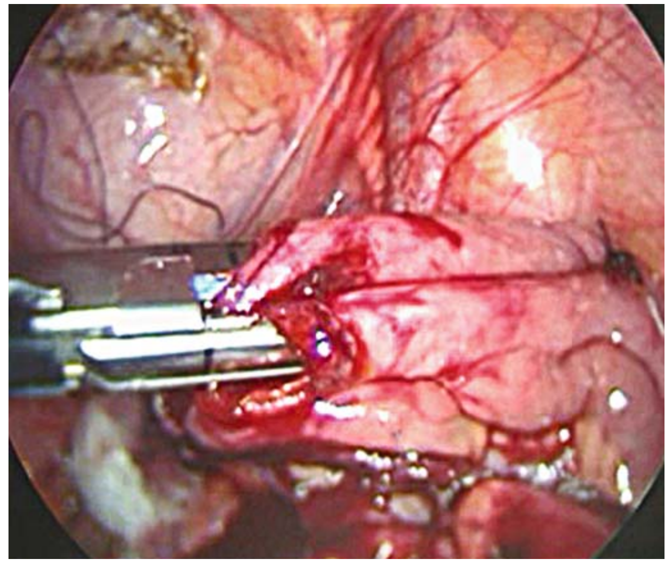


Fig. 24.13. The endo-GIA stapler is engaged for side-to-side anastomosis of the ileal segments

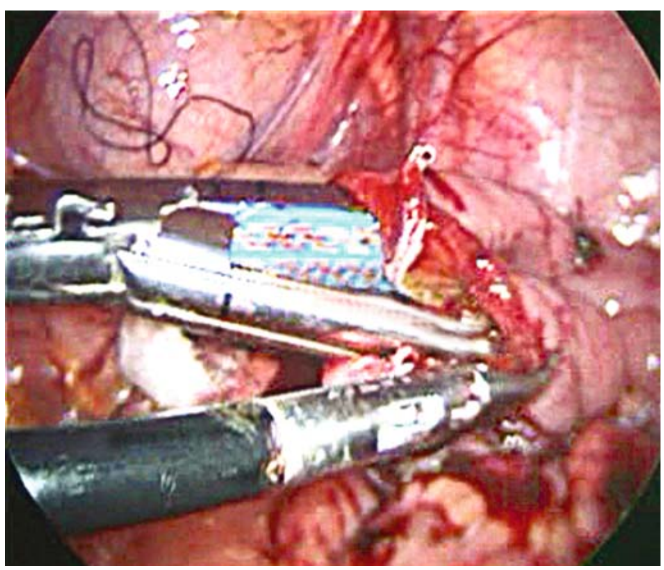


Fig. 24.14. View after establishing intestinal continuity

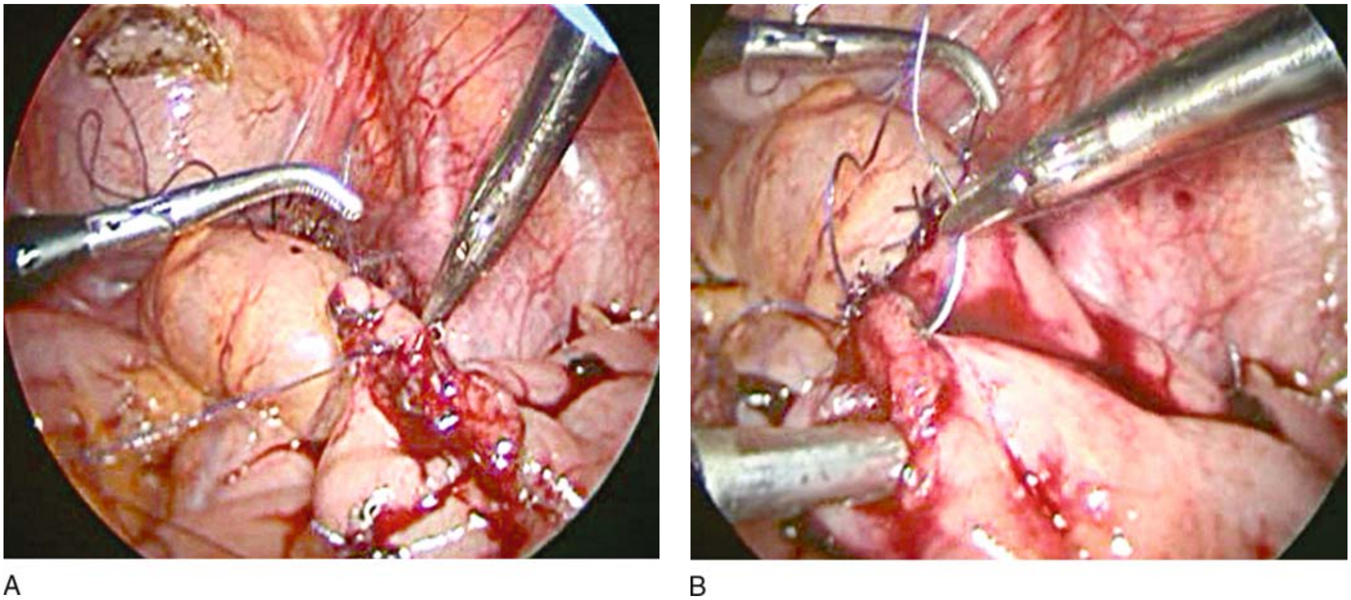


FIG. 24.15. A small rent in the intestine (the one made for inserting the stapler) is closed with a few 3-0 interrupted Vicryl sutures

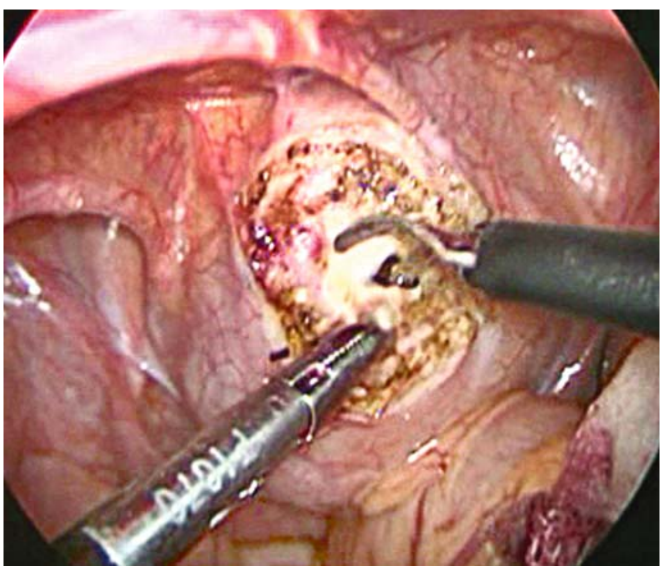


FIG. 24.16. The bladder mucosa is opened

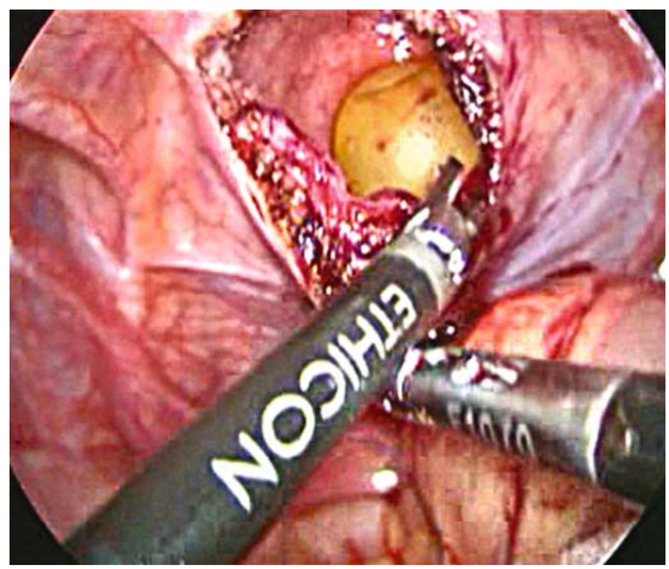


FIG. 24.17. Ultracision is used to extend the cystotomy

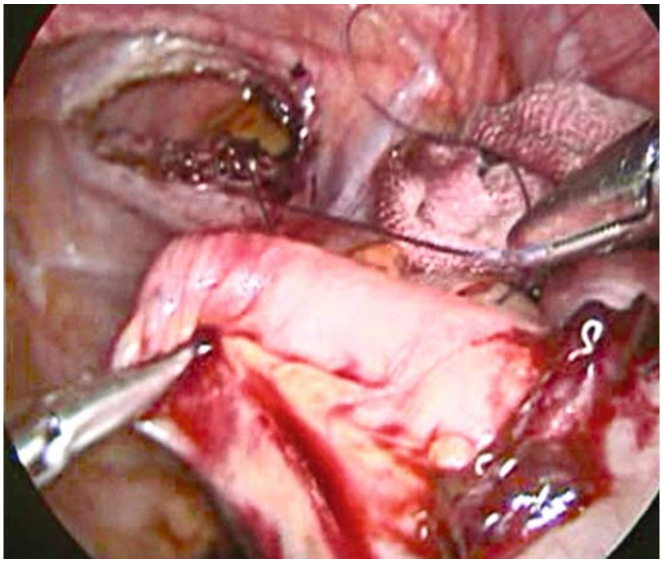


FIG. 24.18. Approximating the isolated ileal segment onto the bladder

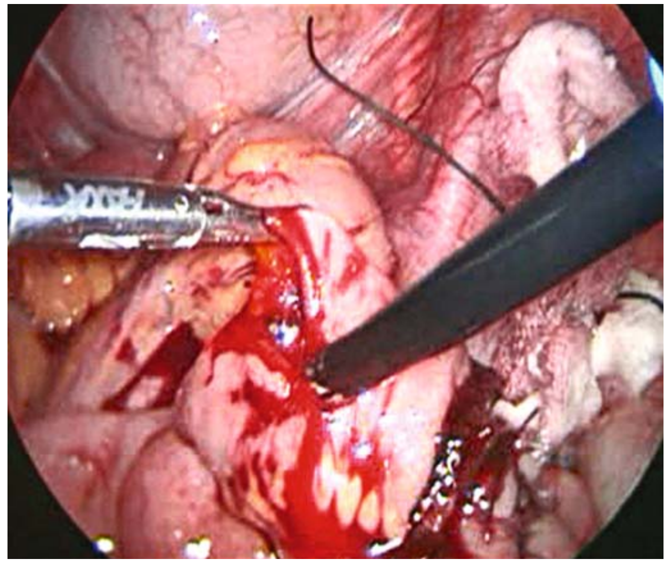


FIG. 24.19. Detubularization of the isolated ileum

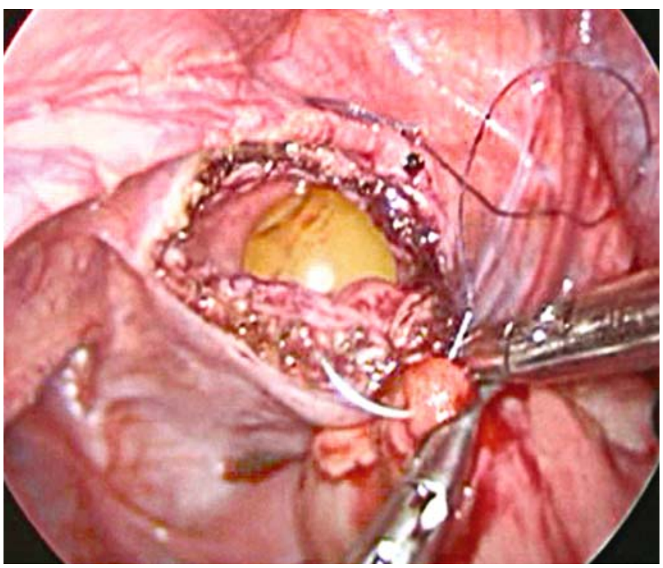


FIG. 24.20. Suturing the ileum to the bladder wall with interrupted 3-0 Vicryl sutures

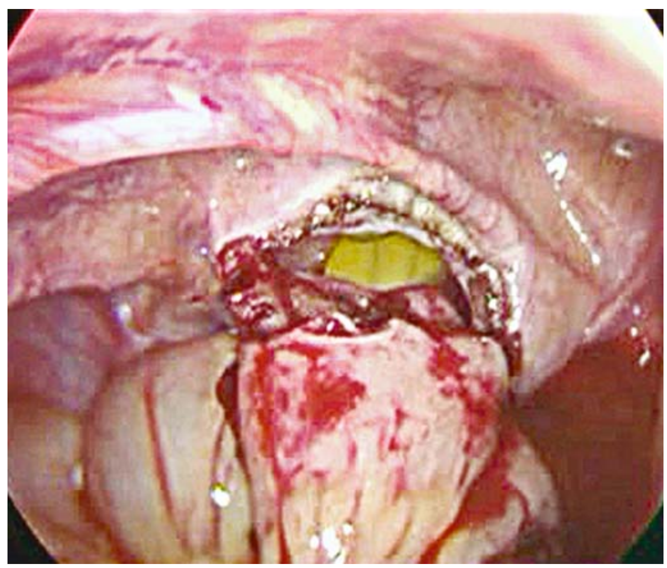


FIG. 24.21. The posterior layer is sutured

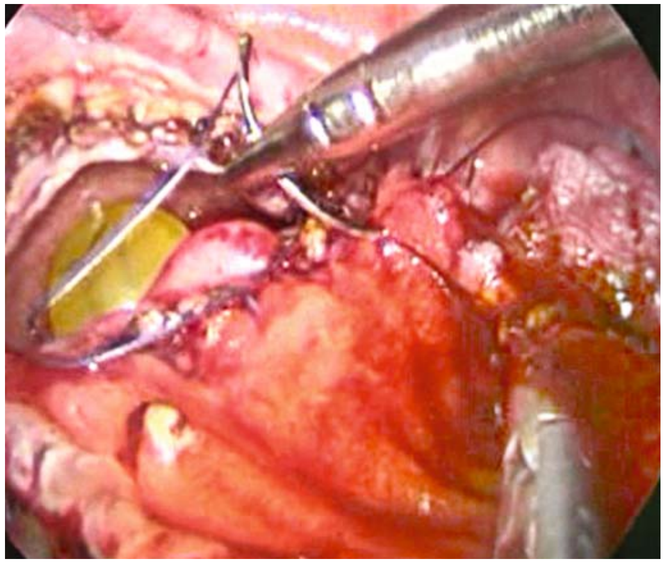
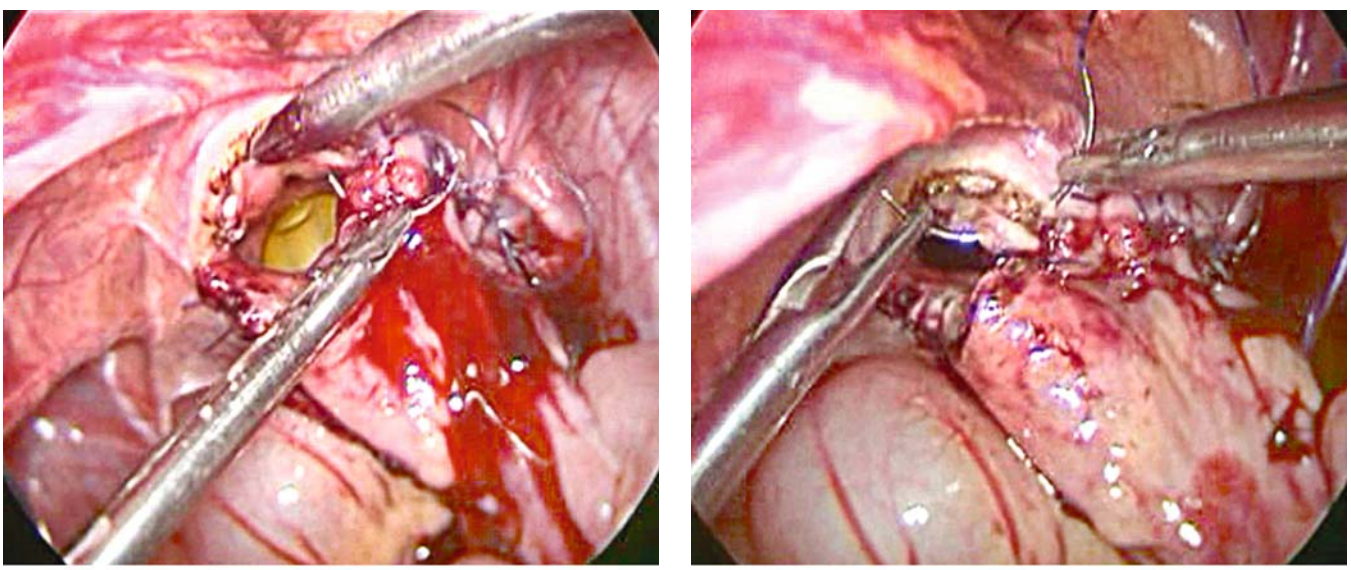


Fig. 24.22. The ileocystoplasty in progress; a corner stitch on the right side



A B

Fig. 24.23. The anterior layer closure is in progress (using 3-0 Vicryl)

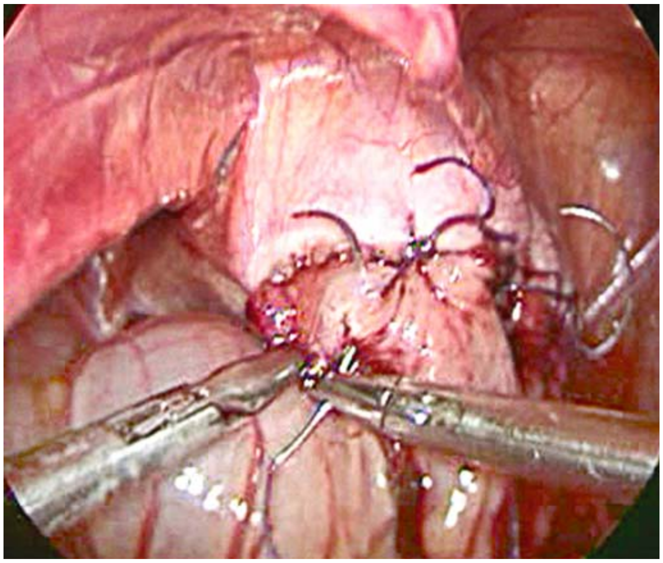


FIG. 24.24. The second layer of sutures with a few interrupted 2-0 Vicryl sutures

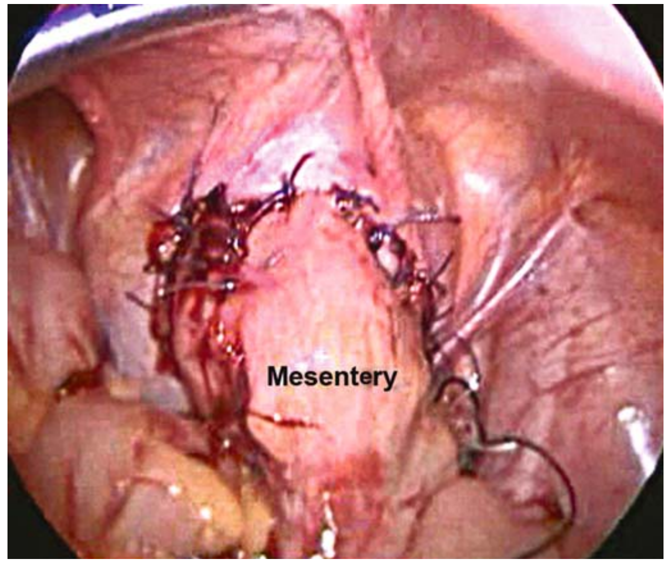


FIG. 24.25. Augmented bladder; also note the mesentery is not twisted or under tension

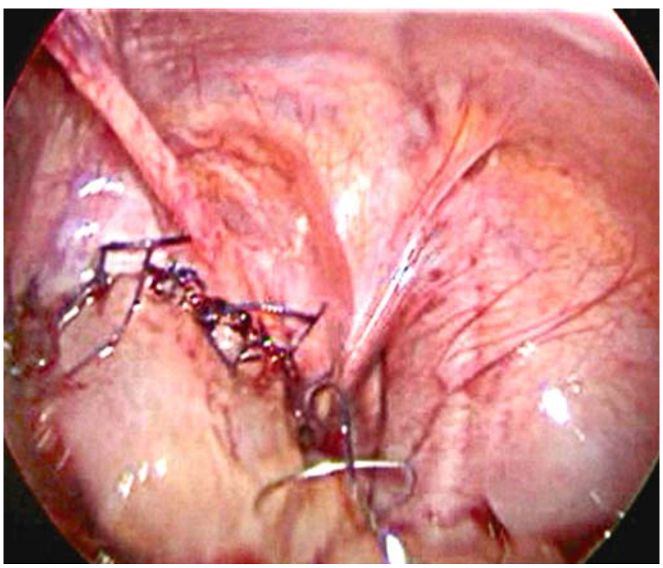


FIG. 24.26. Distending the bladder to rule out any obvious leak

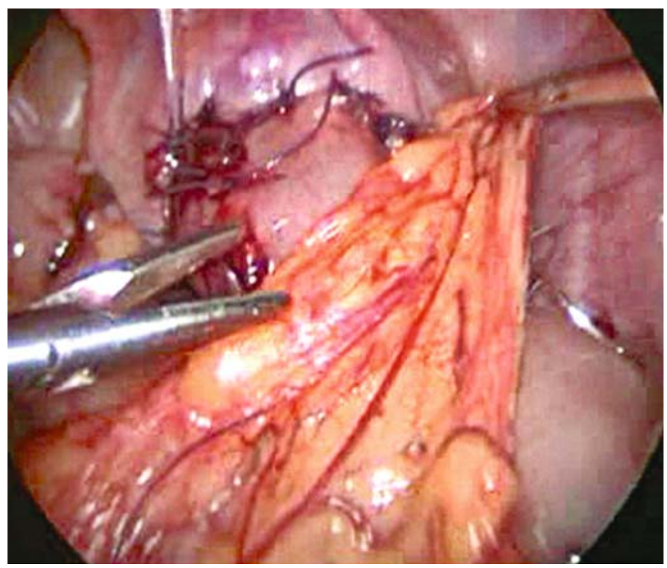


FIG. 24.27. Advancing the free end of the omentum downward

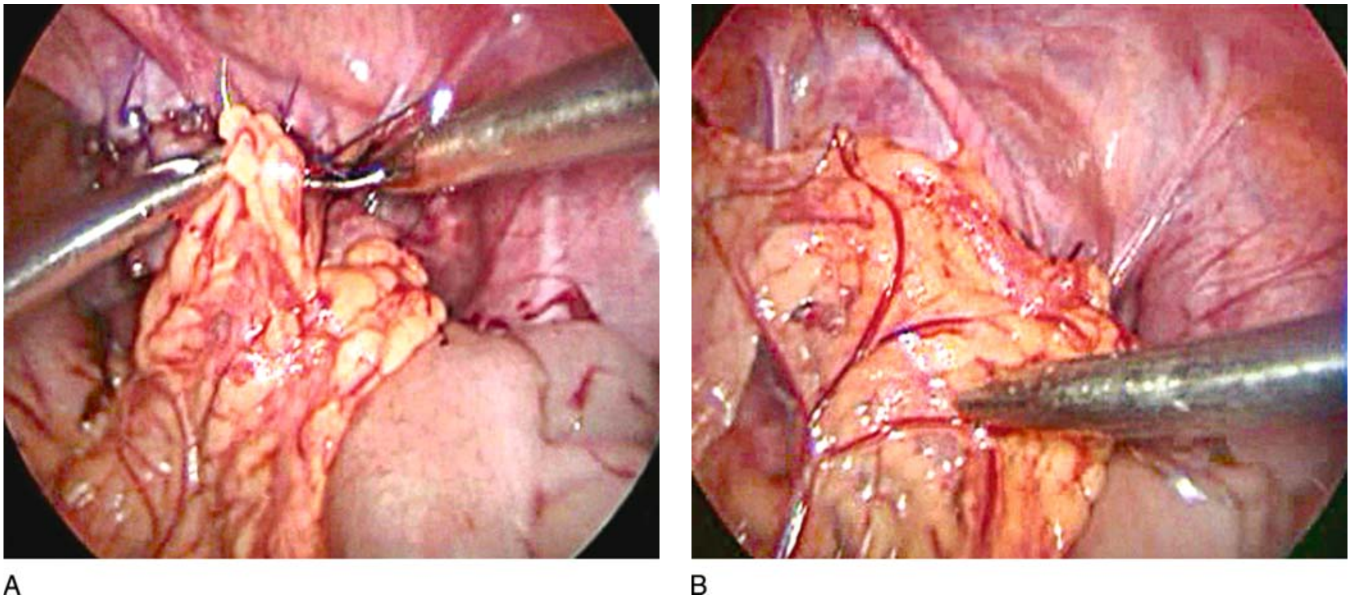


FIG. 24.28. Tacking the omentum to the bladder wall

FIG. 24.29. A trocar SPC is introduced extraperitoneally (as a safety vent in case the urethral catheter gets blocked)

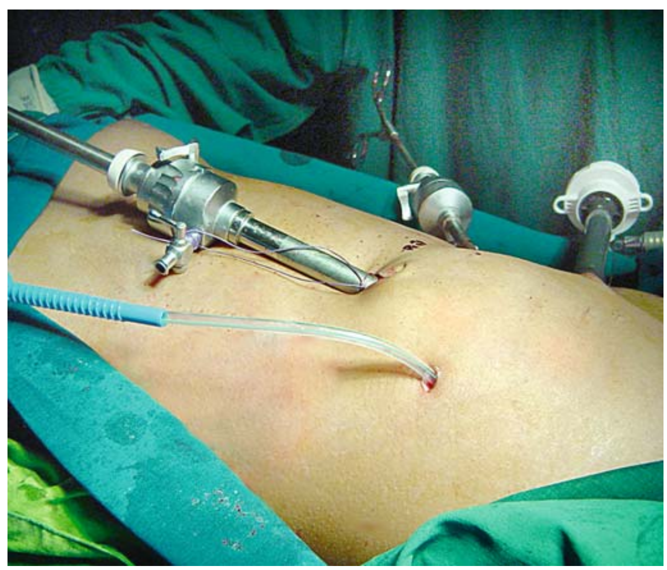


FIG. 24.30. A tube drain is introduced through the flank port

Fig. 24.31. Postoperative cystogram shows improved capacity

References

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2. Iliott SP, Meng MV, Anwar HP, Stoller ML (2002) Complete laparoscopic ileal cystoplasty. Urology 59:939.
3. Ramalingam M, Senthil K, Selvarajan K, and Pai MG (2006) Laparoscopic ileocystoplasty—our experience in 3 patients. J Endo 20(1):A277(abstr).
4. Meng M, Anwar HP, Iliott, Stoller ML (2002) Pure laparoscopic enterocystoplasty. J Urol 167:1386.

25
Laparoscopic Ureterocystoplasty

M. Ramalingam and K. Senthil

Hyperreflexic or noncompliant urinary bladders are a threat to the upper tract. Sometimes these patients are symptomatic. Those who are refractory to medical treatment require augmentation. Conventionally ileum is the commonest segment used for augmentation. But when bowel is used there may be problems such as mucus production and metabolic abnormalities. Hence the best tissue to augment the bladder is urothelial tissue. So whenever a grossly dilated ureter is available, it can be utilized to augment the bladder [1–7].

Indications

Whenever a patient has a neurogenic bladder with a dilated distal ureter, especially if associated with a nonfunctioning kidney, the distal ureter can be utilized to augment the bladder (a kidney with an upper half ureter can be ablated).

Preliminary evaluation includes urine culture, micturating cystourethrography (MCU), intravenous urogram (IVU), isotope renal scan, cystometry, and cystoscopy.

Surgical Technique

Nephrectomy and ureterectomy up to the level of the pelvic brim is performed in a nonfunctioning kidney through the transperitoneal approach, with the patient in a 70-degree lateral tilt. Four ports are used: umbilical camera port, and the subcostal, midclavicular, and flank ports. Subsequently the patient can be repositioned supine and by adding one more pararectus port (on the contralateral side) ureterocystoplasty can be performed.

In a functioning kidney with gross ureteral dilatation, the ureterocystoplasty is done by side-to-side anastomosis [2,6].

The ureter to augment the bladder is detubularized using ultracision or hook diathermy up to the hiatus. A proportionate length of cystotomy is done in a horizontal manner. The opened ureter is anastomosed to the bladder, using 3-0 Vicryl continuous suture, the posterior layer first and the anterior layer subsequently. A single layer suture suffices if it is reasonably watertight (as checked by distending the bladder through a preplaced Foley catheter). If there is any leak, a few more interrupted sutures will be needed. Omental tacking to the sutural line is preferable. A tube drain can be left through the flank port.

Augmentation of bladder with ureter is the most preferable procedure, especially when it is done completely laparoscopically. It is less morbid, as it avoids problems encountered with bowel interposition.

Laparoscopic Ureterocystoplasty in a Nonfunctioning Kidney

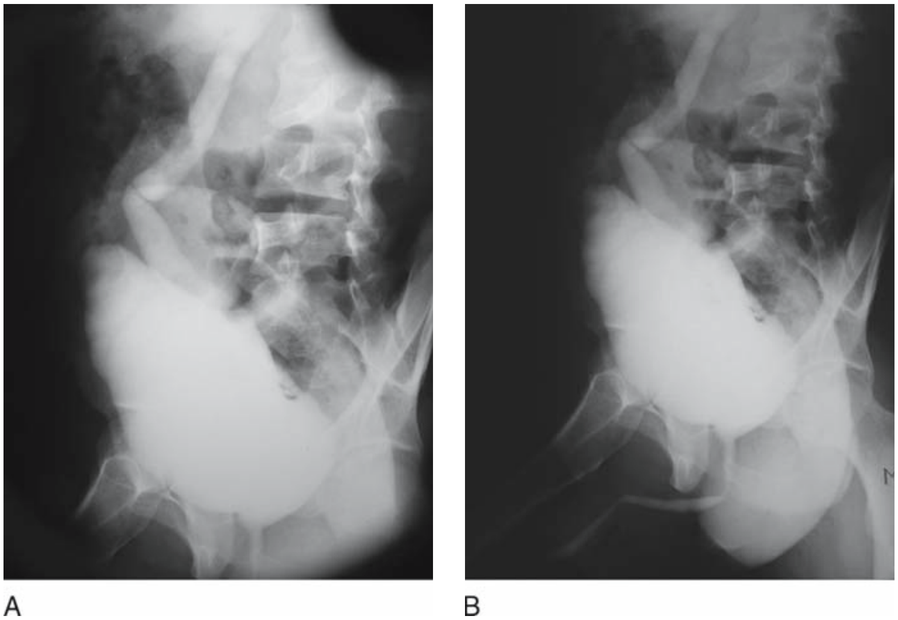


Fig. 25.1. A micturating cystourethrography (MCU) reveals an irregular contoured bladder with grade V vesicoureteric reflux (VUR) on the right side

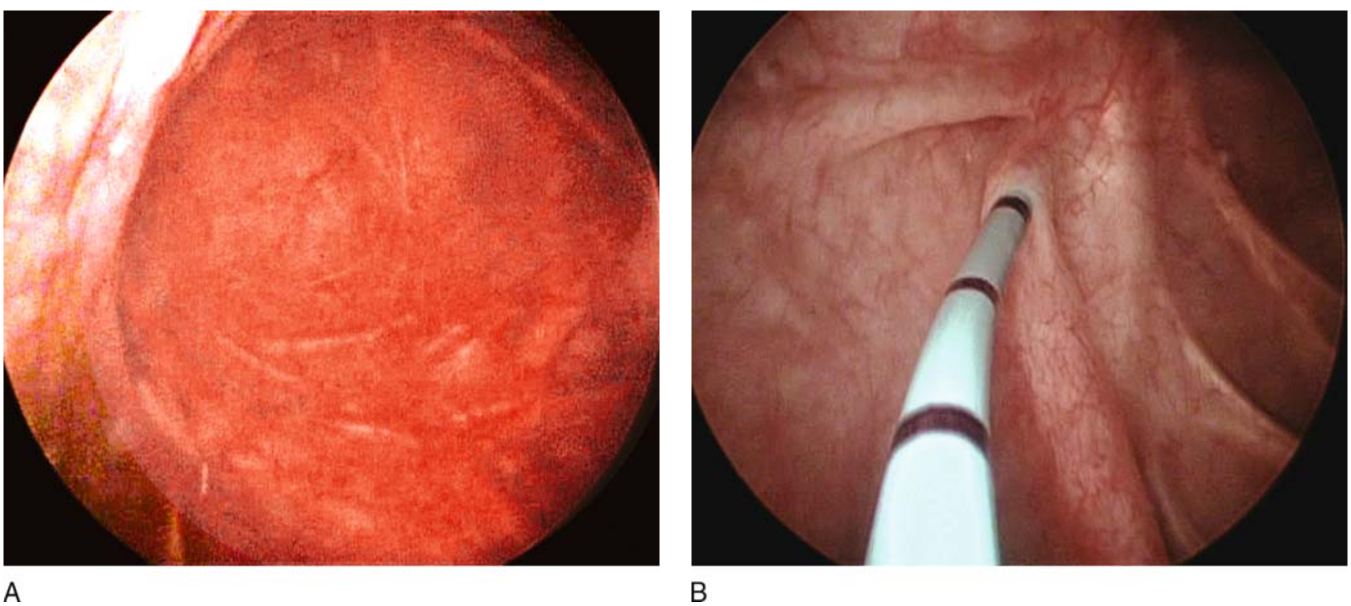


Fig. 25.2. Cystoscopy shows a heavily trabeculated bladder; right ureteric catheterization is done to subsequently guide the procedure

FIG. 25.3. The right-flank-up (45 degrees) position is used to provide access to the right lower ureter, bladder, and kidney; note the scars of bilateral cutaneous ureterostomy, ureterostomy closure, and pyelolithotomy, which were done when the patient was a child (H, head end; F, foot end)

FIG. 25.4. The initial ports (supraumbilical, suprapubic, and midclavicular) for ureterocystoplasty

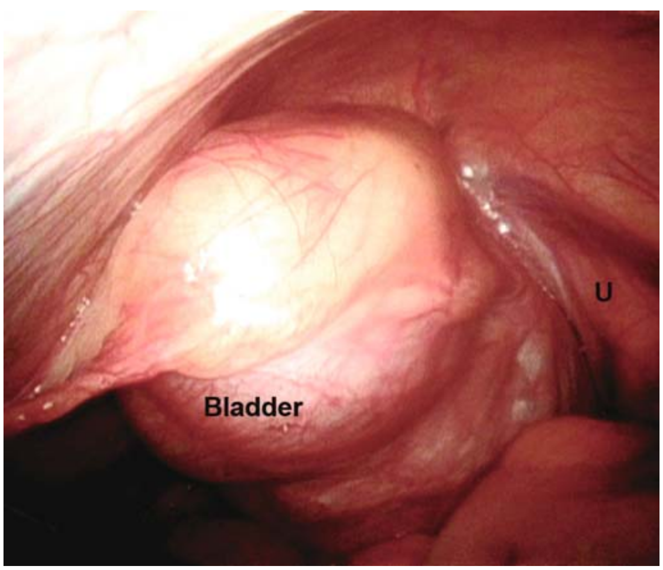


FIG. 25.5. The initial view of the distended bladder (U, right ureter)

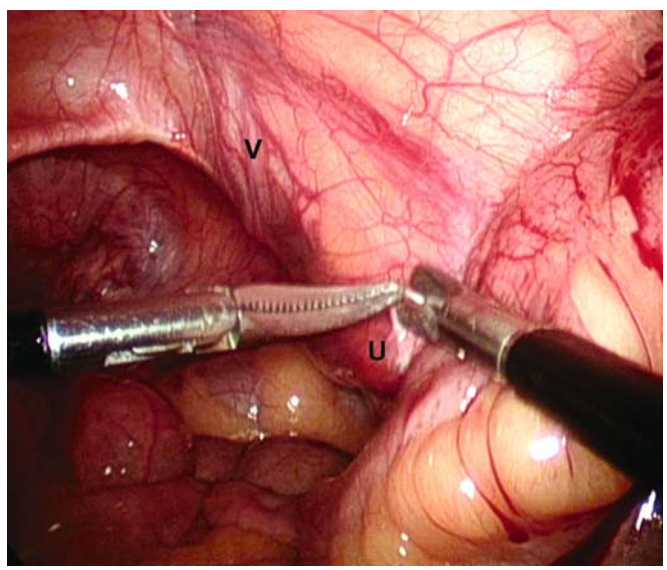
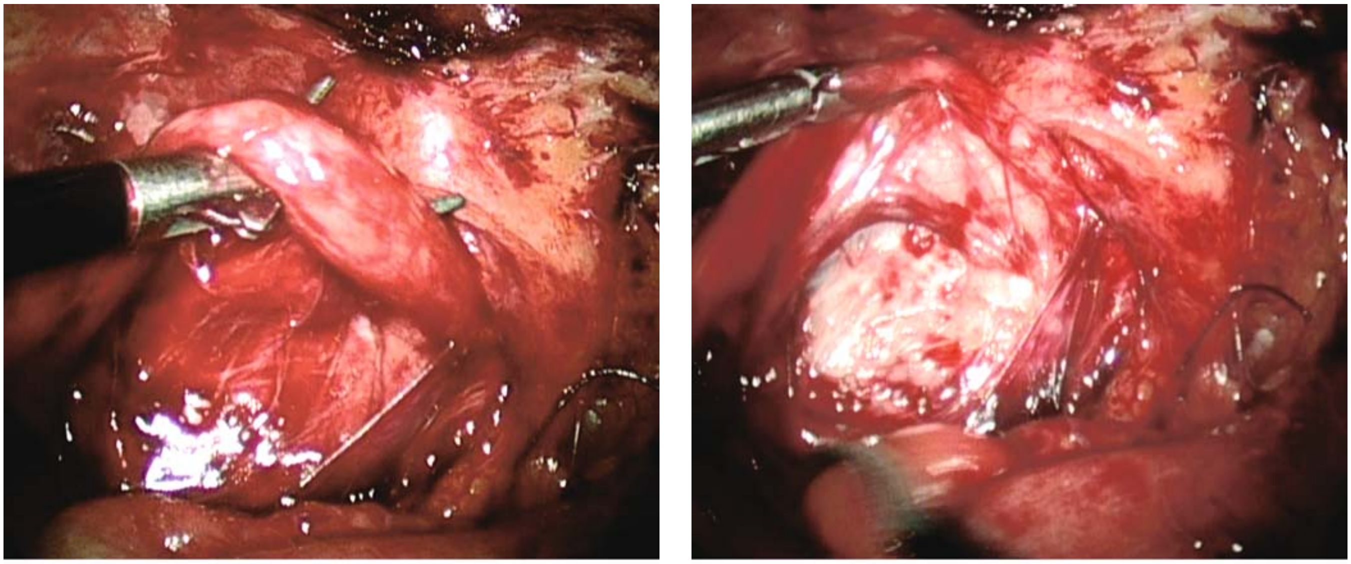
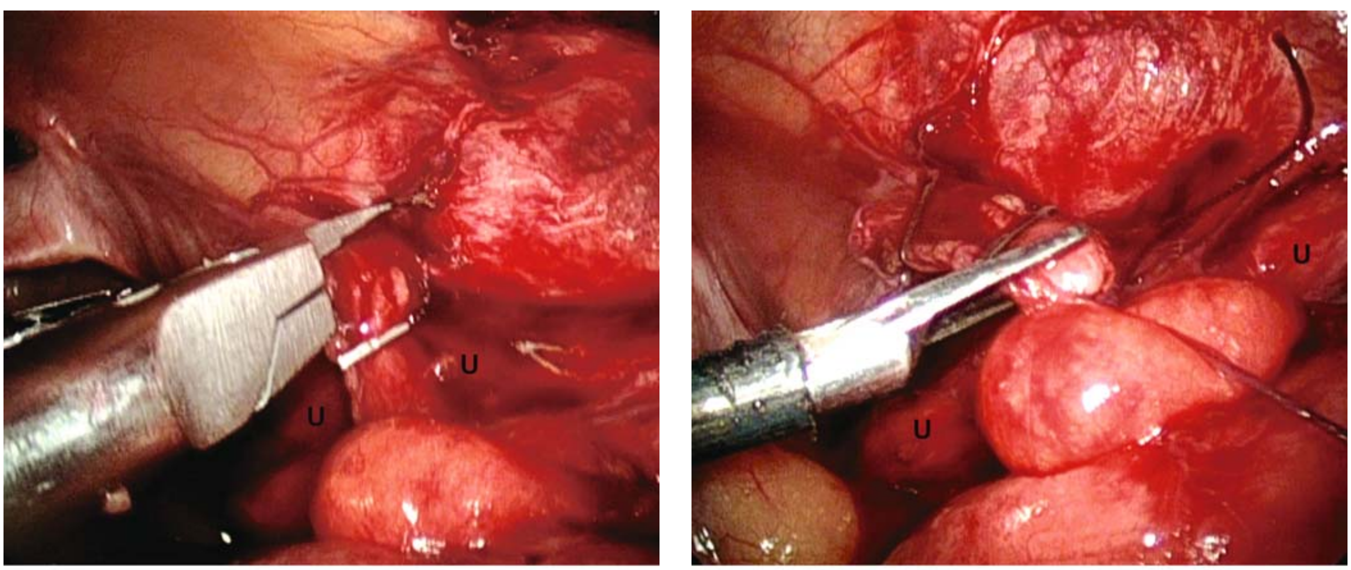


FIG. 25.6. Incision of peritoneum over the pelvic brim to mobilize the ureter (to assess the optimum segment that can be utilized for augmentation) (V, vas; U, ureter)



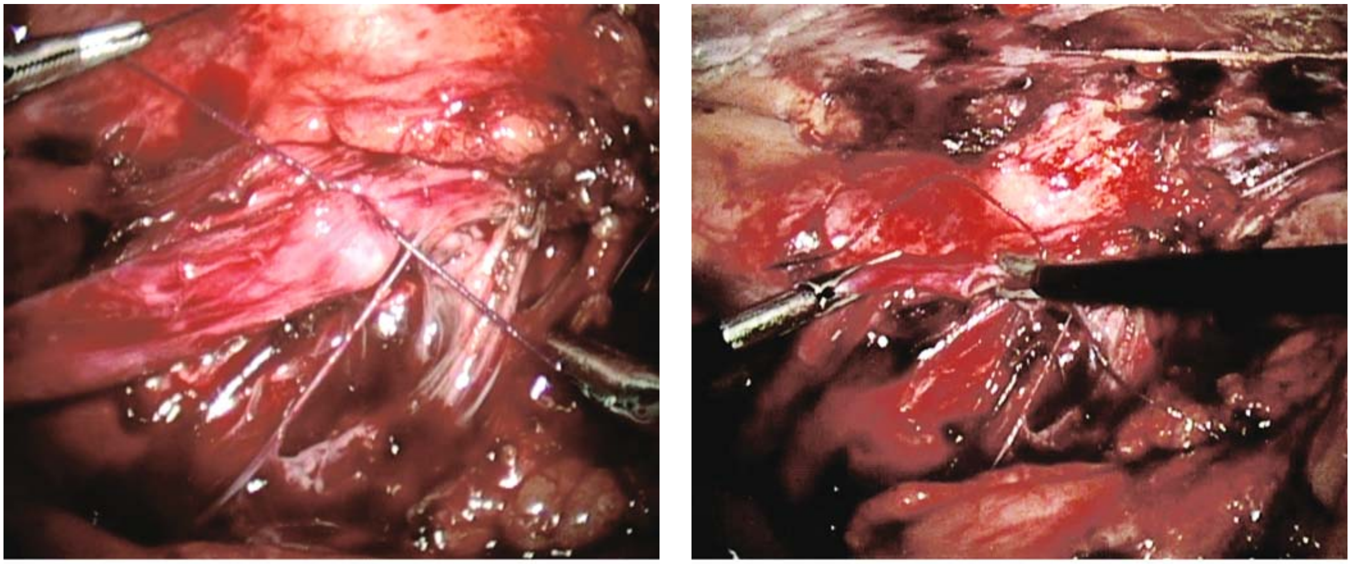
A B

FIG. 25.7. The right ureter is isolated after mobilizing the right colon above the pelvic brim (for adequate length to match the probable cystotomy length to be made)



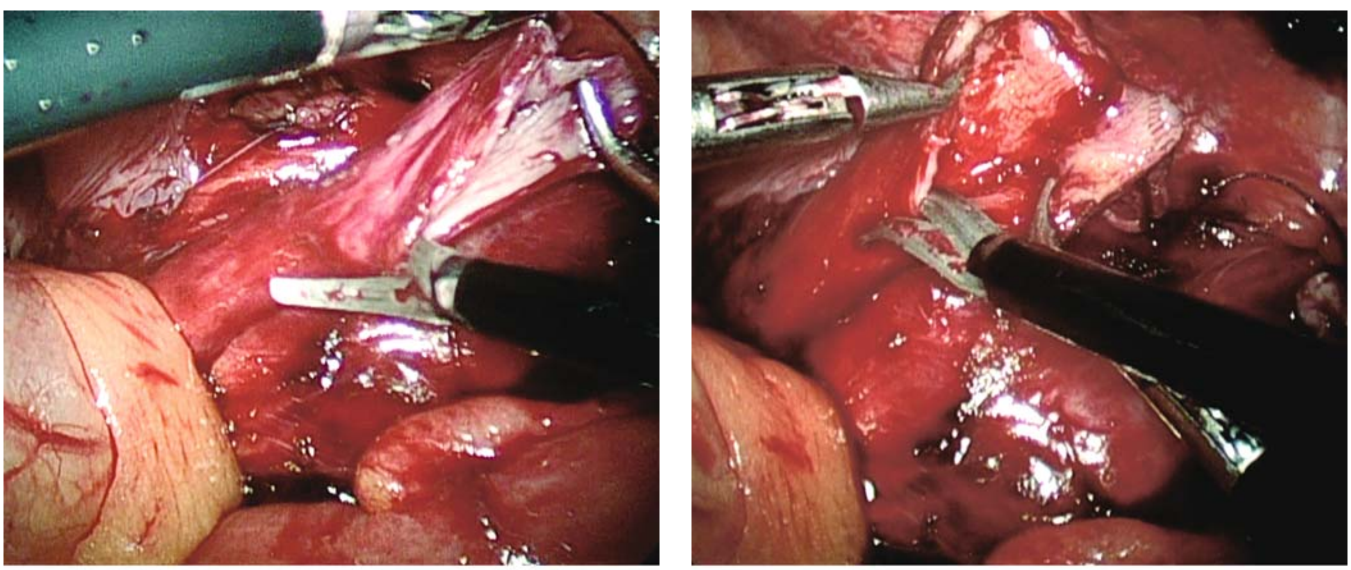
A B

FIG. 25.8. The right gonadal vessel is clipped and divided to enable further mobilization of the lower ureter (to appose the bladder) (U, ureter)



A B

FIG. 25.9. The ureter ligated and divided above the level of the pelvic brim



A B

FIG. 25.10. The ureter is detubularized on the medial aspect (up to the juxtahiatal level)

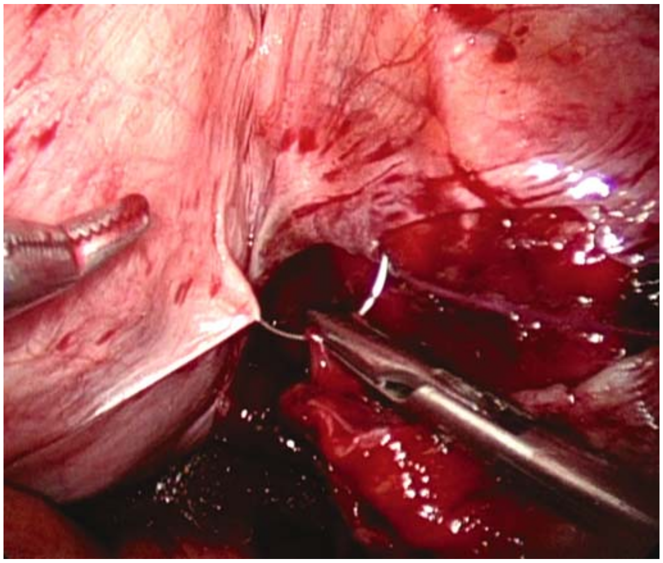


FIG. 25.11. Tacking the juxtahiatal ureter to the adjacent bladder wall

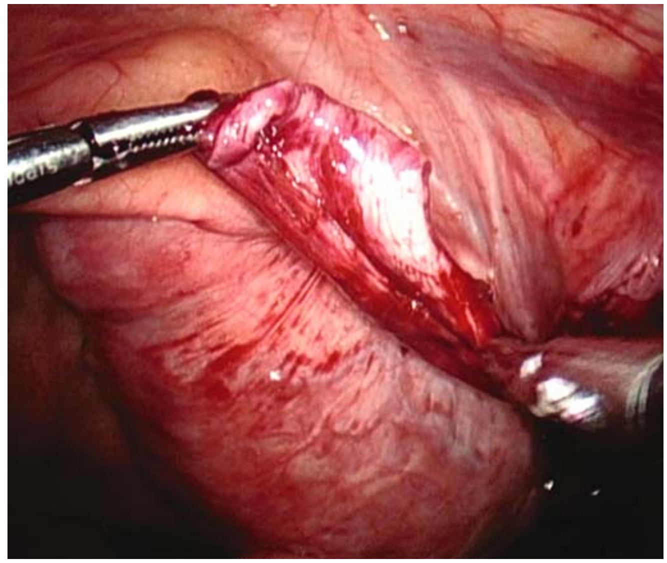


FIG. 25.12. Assessing the probable lie and length of the ureteral flap

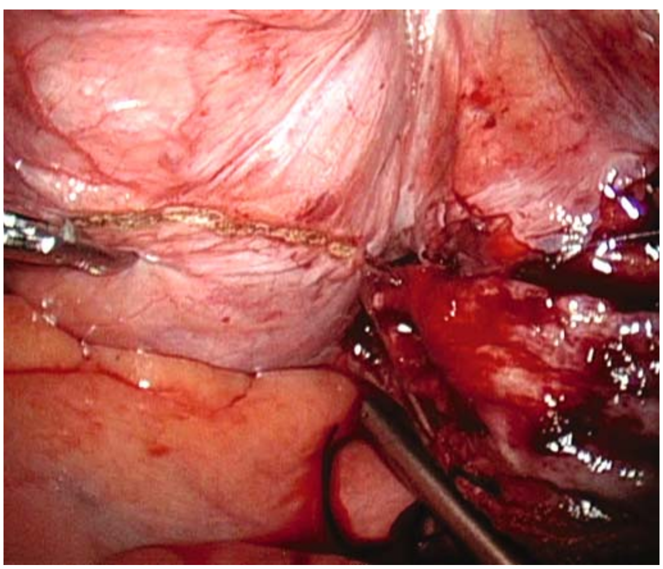


FIG. 25.13. Marking the line of the cystotomy from the right juxtahiatal level in an oblique manner (toward the left juxtahiatal level)

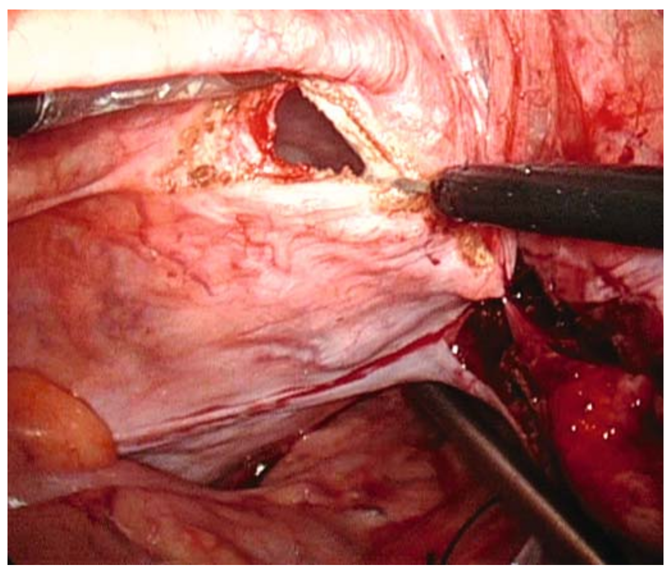
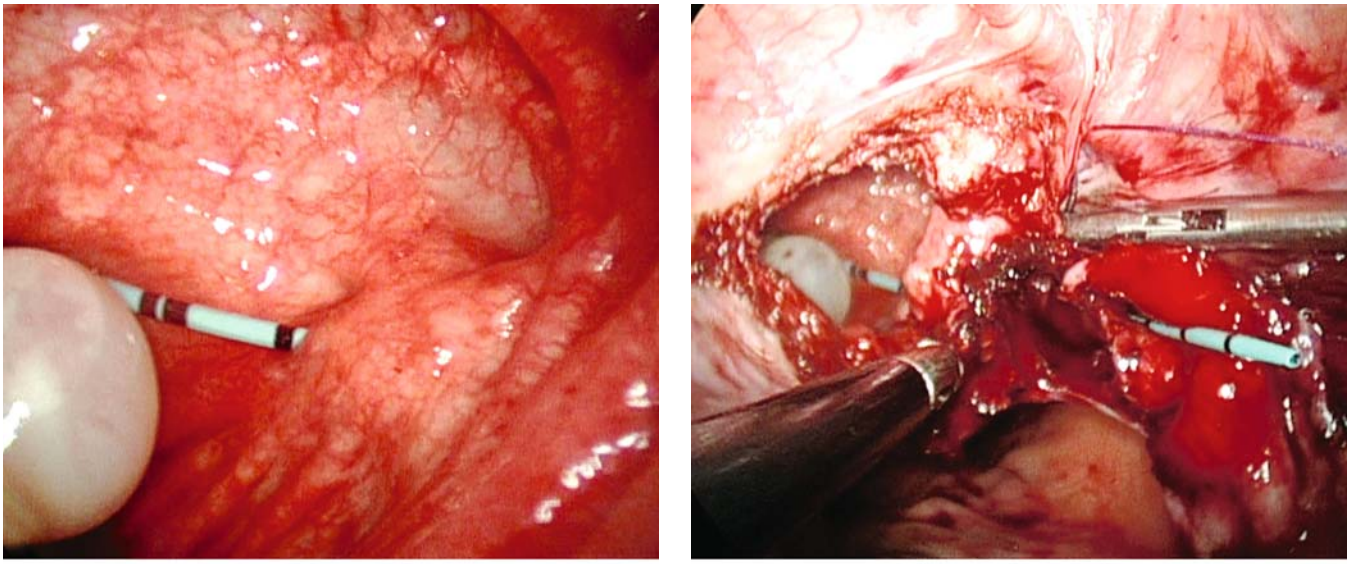
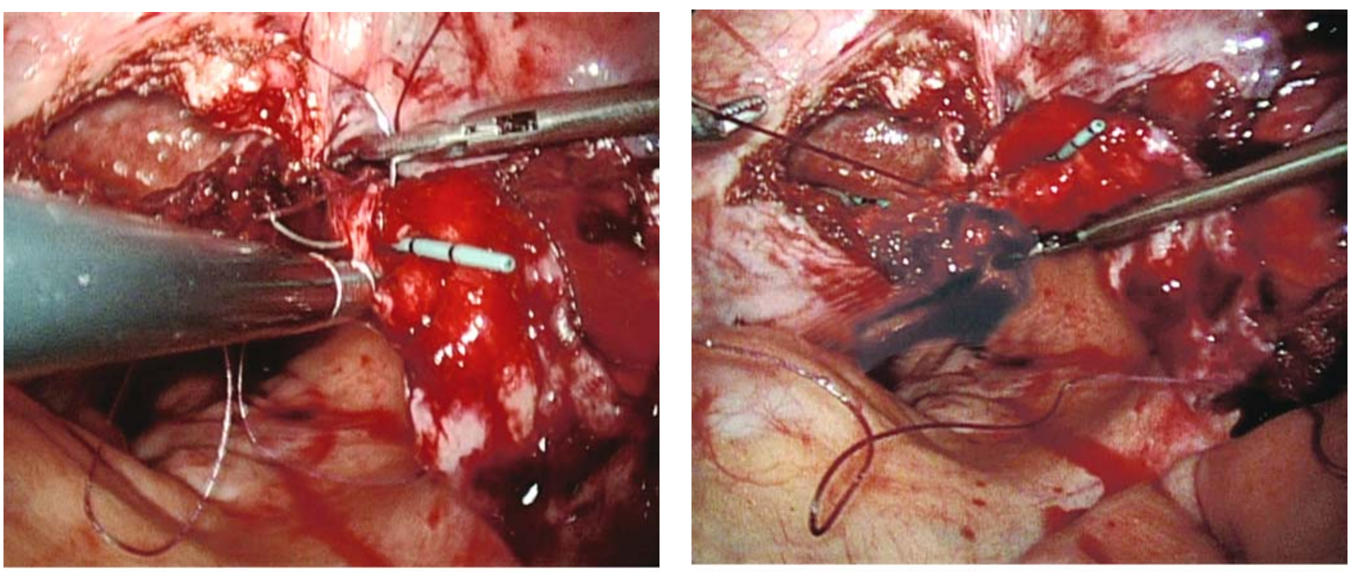


FIG. 25.14. Oblique cystotomy with hook diathermy



A B

Fig. 25.15. Inspecting through the cystotomy to decide how far and in which direction further cystotomy can be carried out



A B

Fig. 25.16. Initial suture with 2-0 Vicryl through the posterior edges of the cystotomy and the detubularized ureter

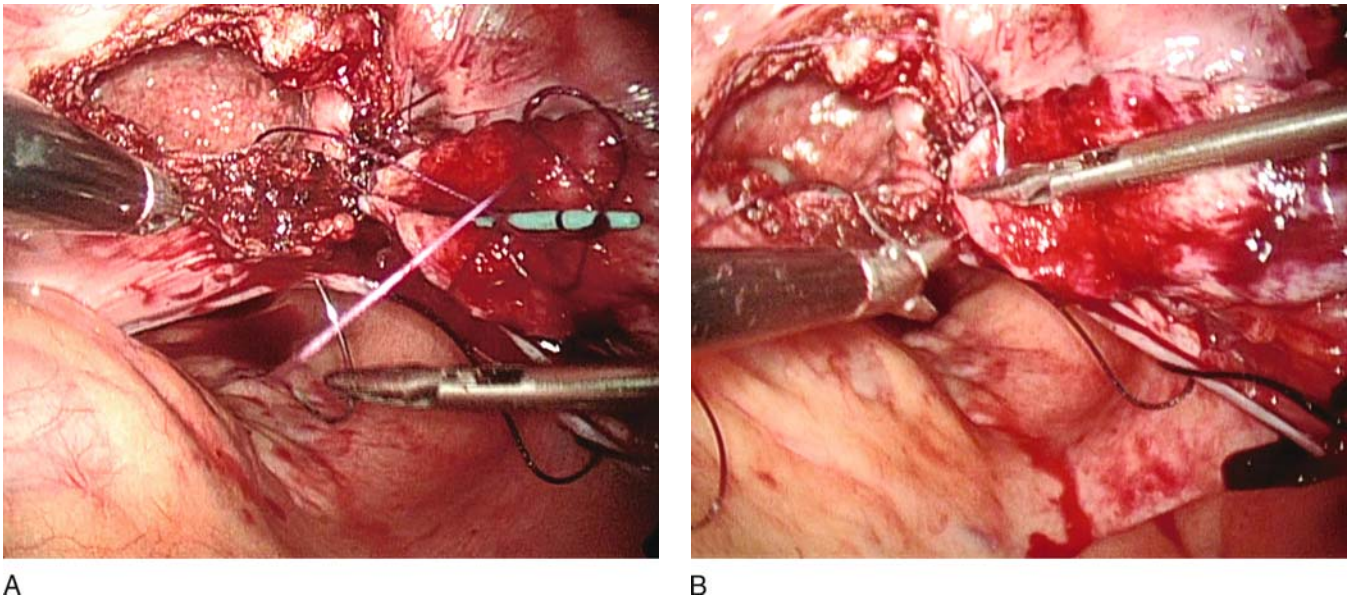


FIG. 25.17. Subsequent continuous suture of posterior edges

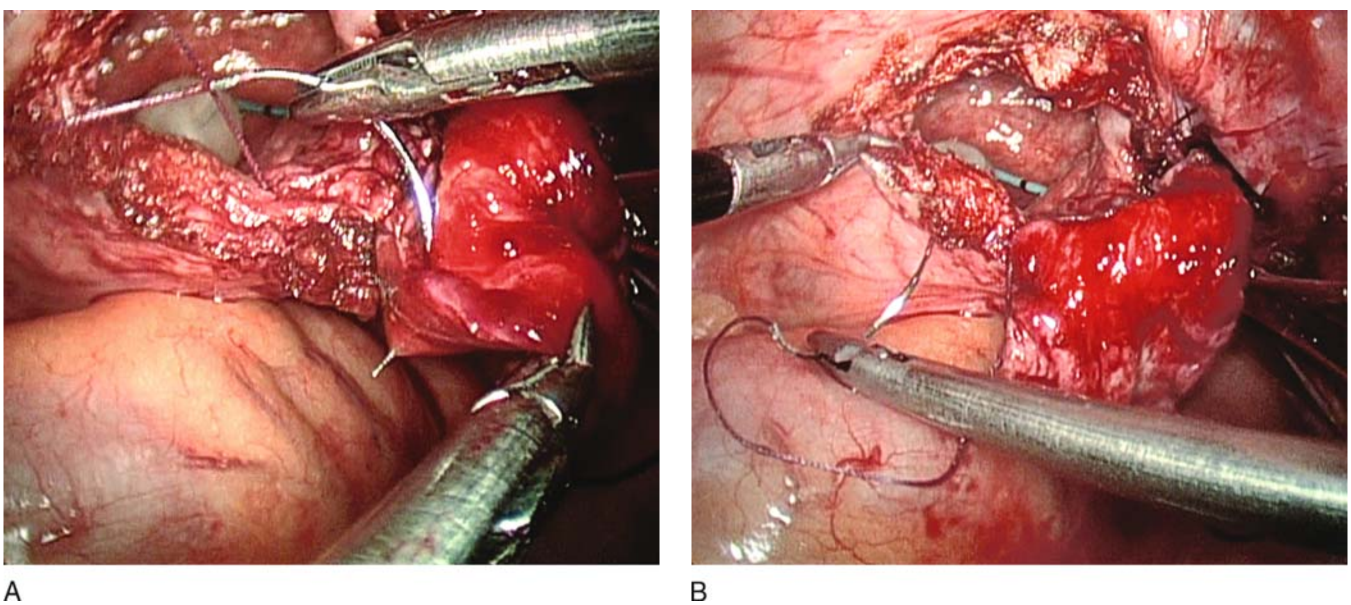
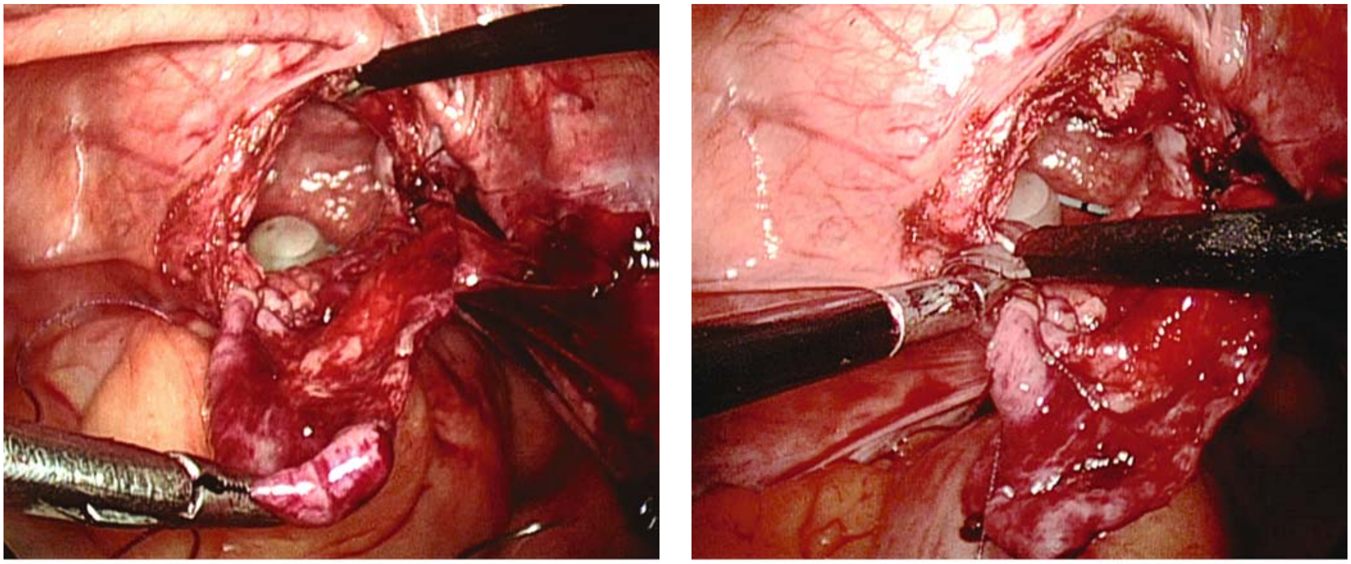
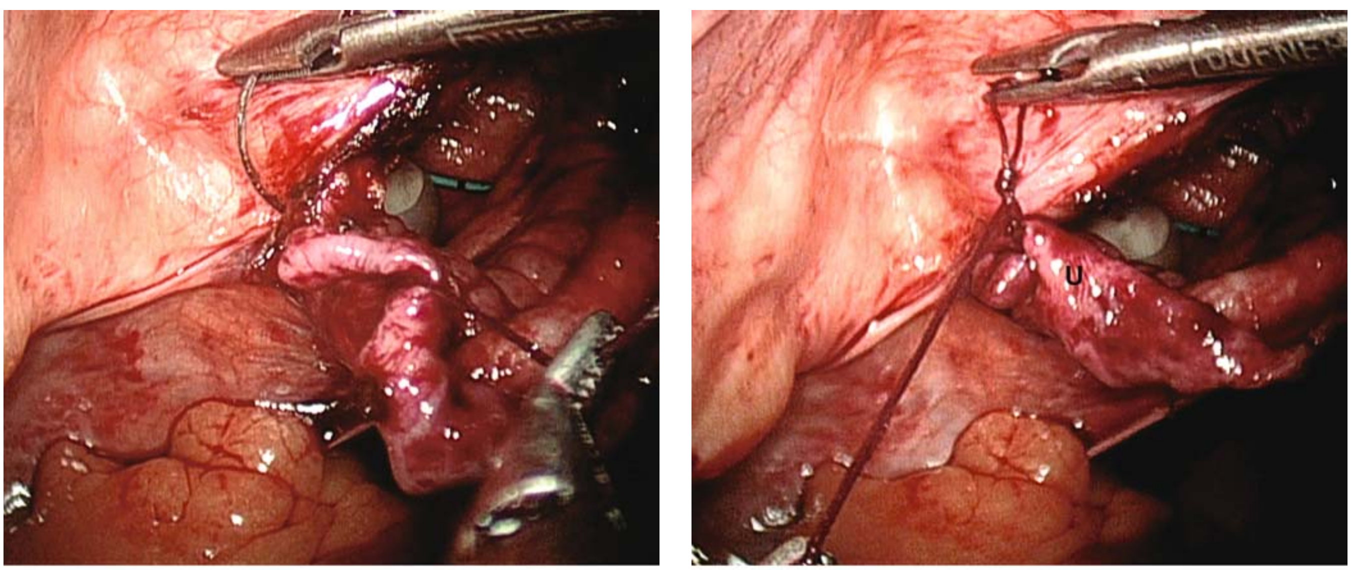


FIG. 25.18. Continuous suture of the posterior edges in progress



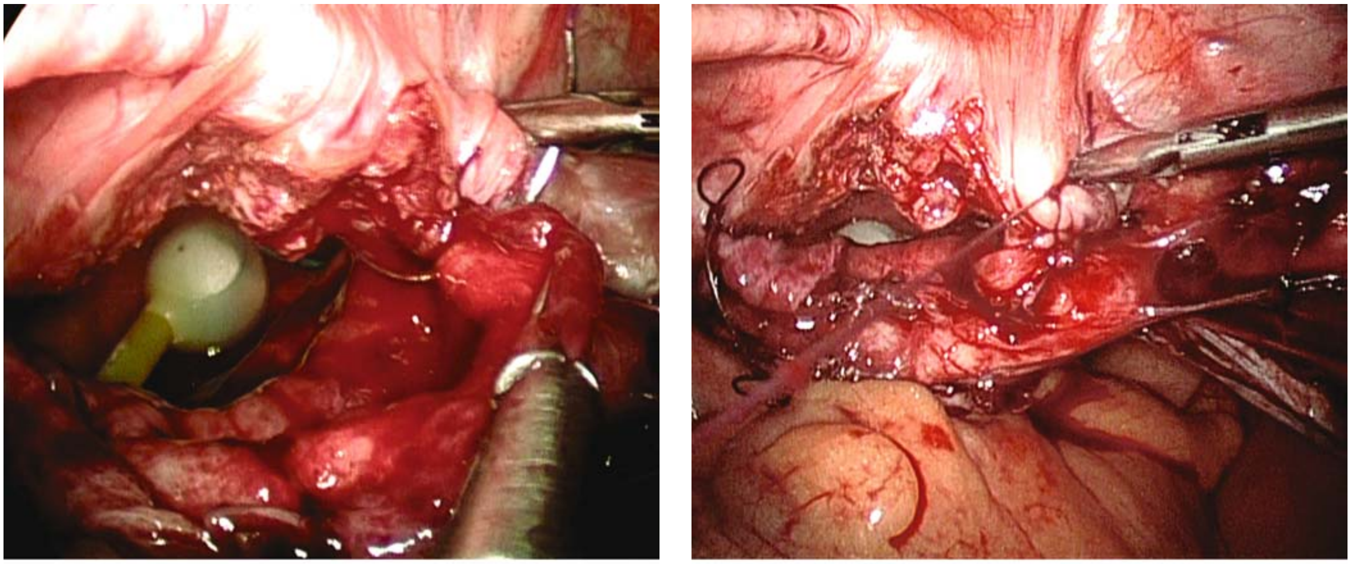
A B

FIG. 25.19. As the ureteric flap is redundant, further cystotomy is done to match the flap, so as to optimize the augmentation



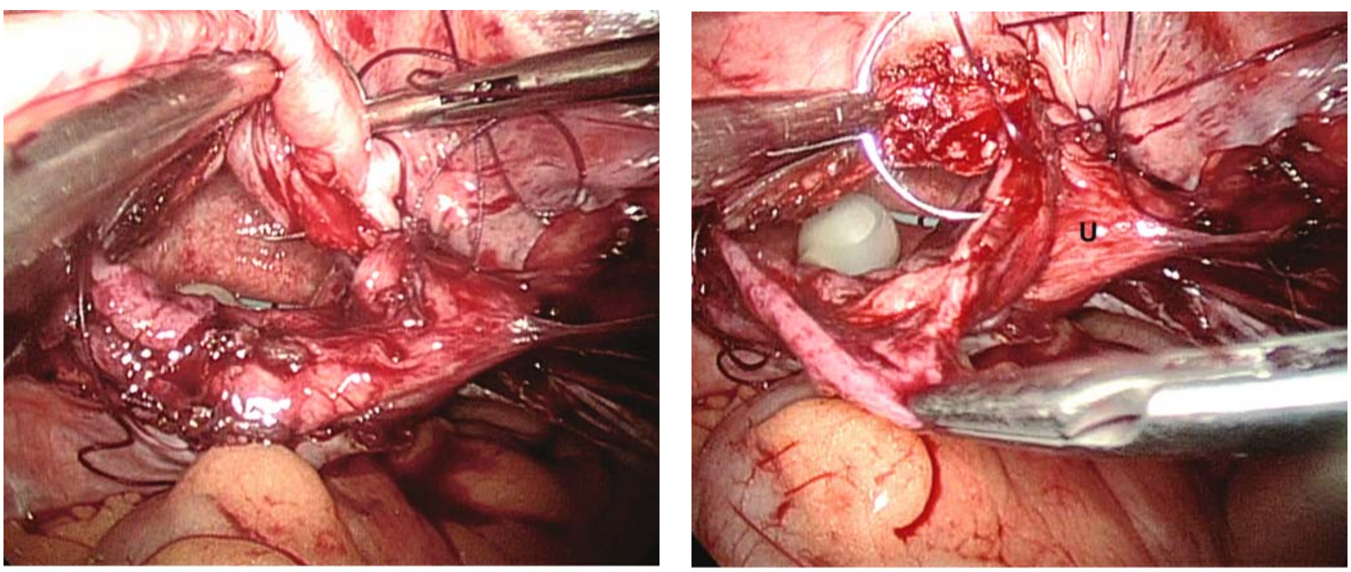
A B

FIG. 25.20. Corner stitch is underway (U, ureteric flap)



A B

FIG. 25.21. Suturing the anterior edges at the right juxtahiatal level



A B

Fig. 25.22. Subsequent continuous suture of the same edges in progress (U, ureteric flap)

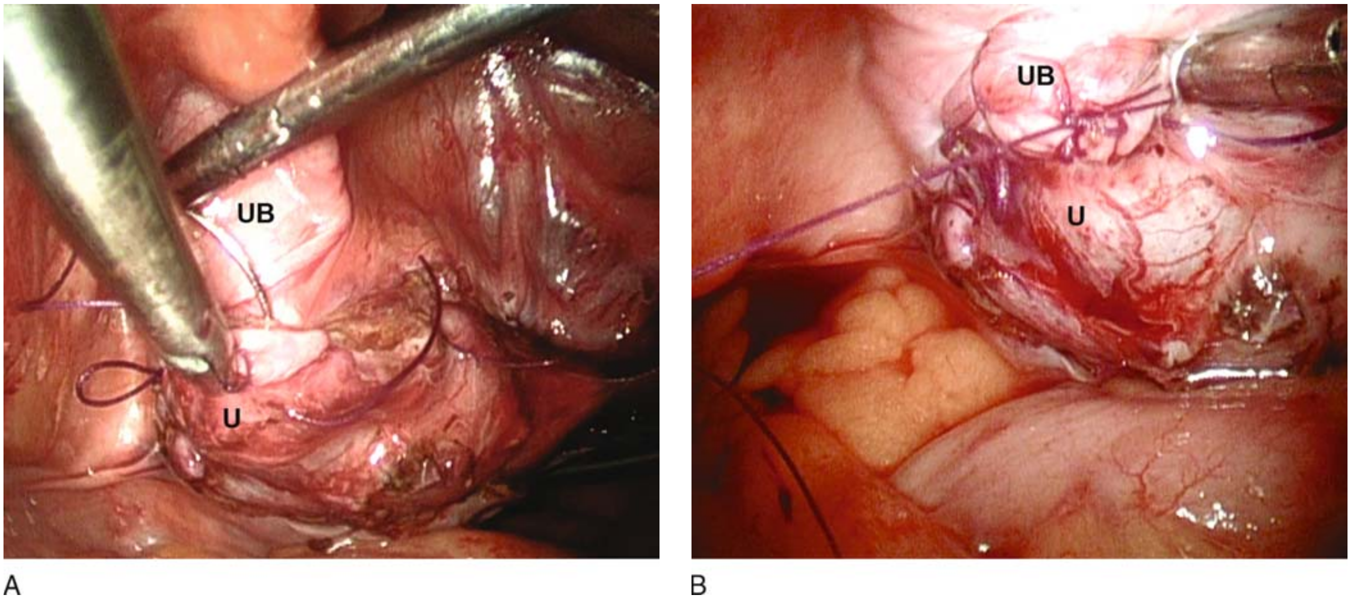


FIG. 25.23. The ureterocystoplasty is nearly completed (UB, urinary bladder; U, ureteric flap)

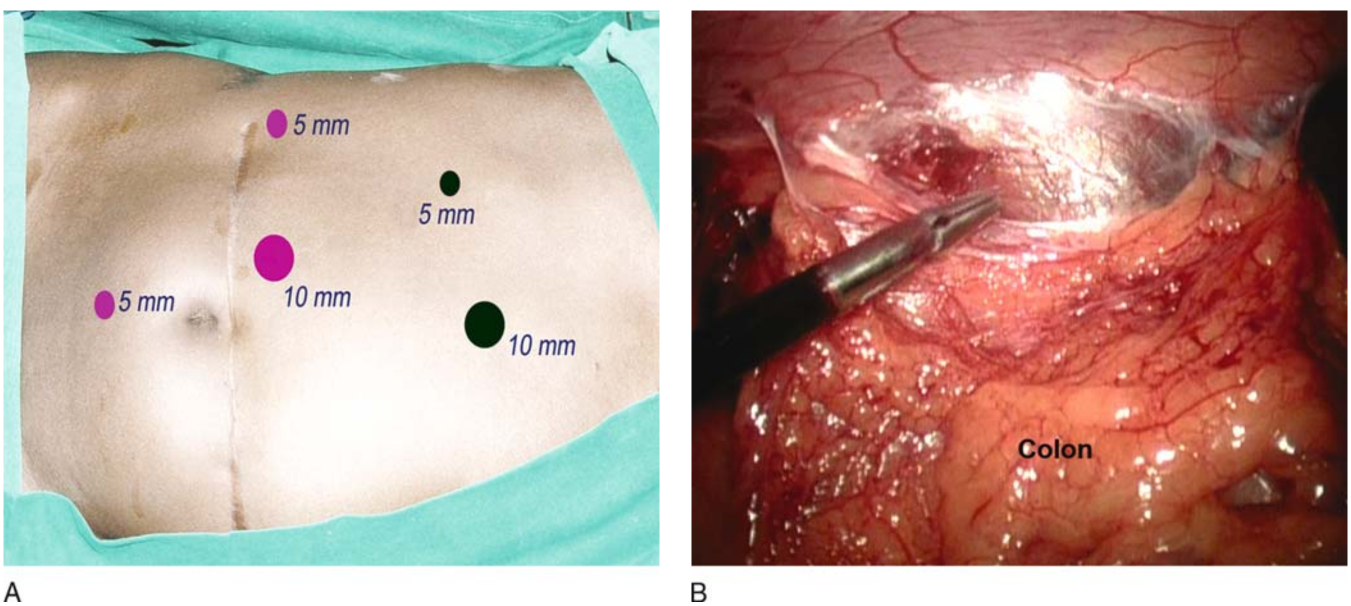
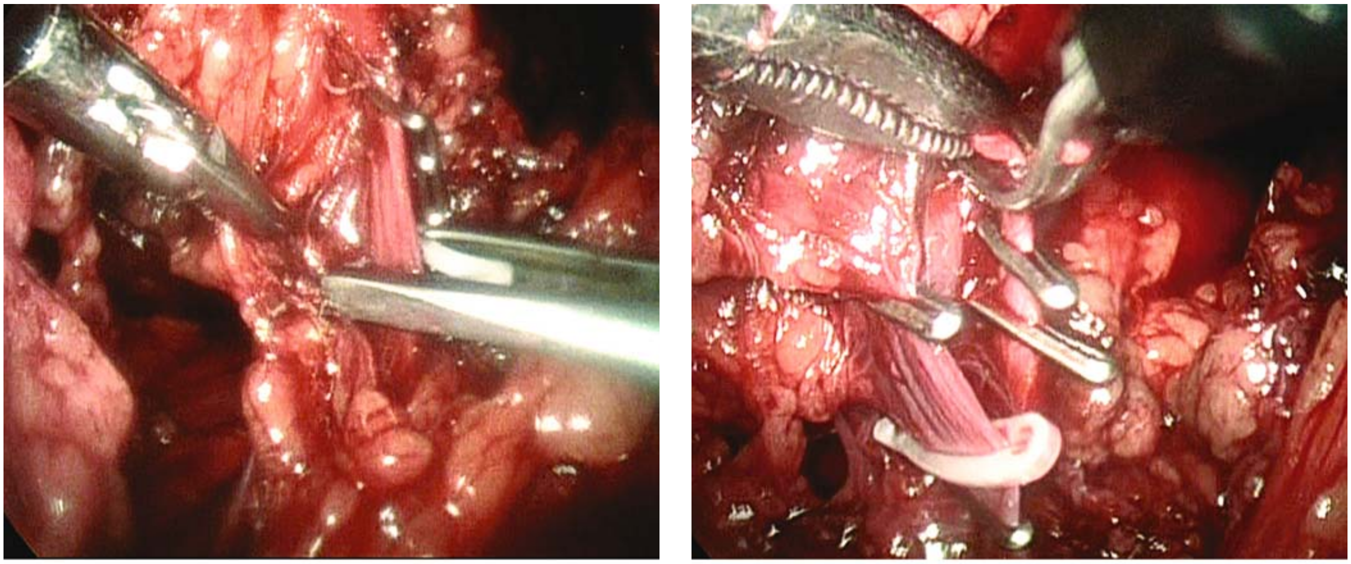


FIG. 25.24. Adding two more ports (right flank and epigastrium), the right colon is mobilized further to proceed with the nephrectomy



A B

FIG. 25.25. The right renal vessels are mobilized, clipped, and divided

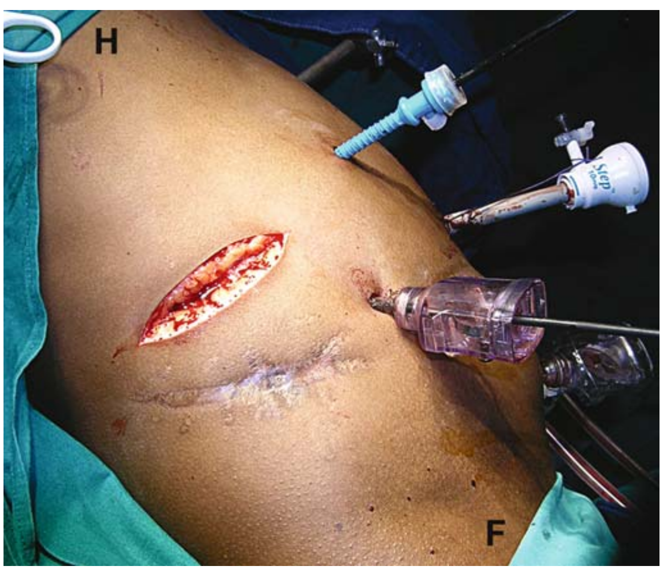


FIG. 25.26. Muscle-splitting incision (4 cm) in the right flank to retrieve the nephroureterectomy specimen

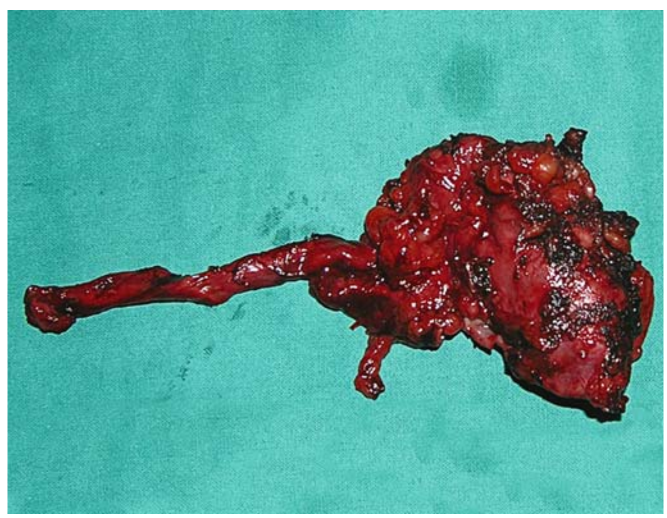


FIG. 25.27. Nephroureterectomy specimen

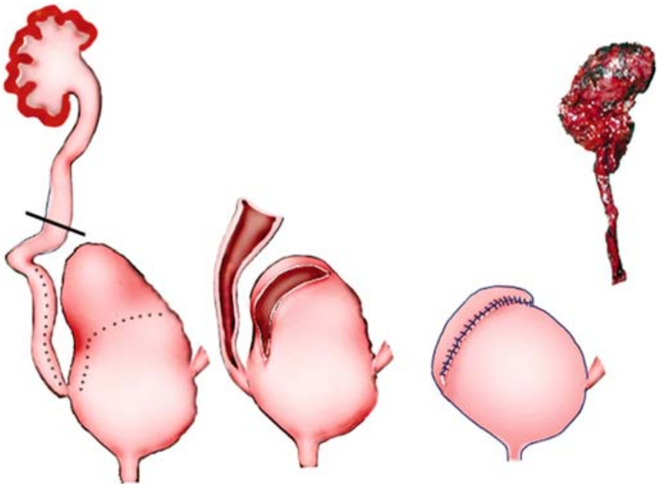


Fig. 25.28. Diagrammatic representation of the executed ureterocystoplasty

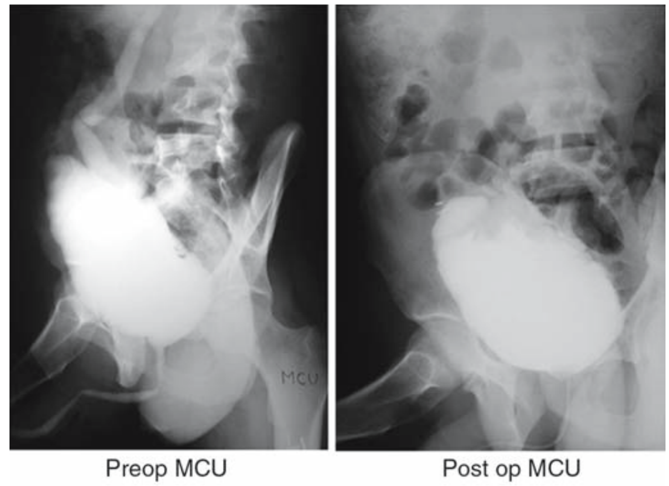


Fig. 25.29. Postoperative cystogram shows the increased capacity of the augmented bladder

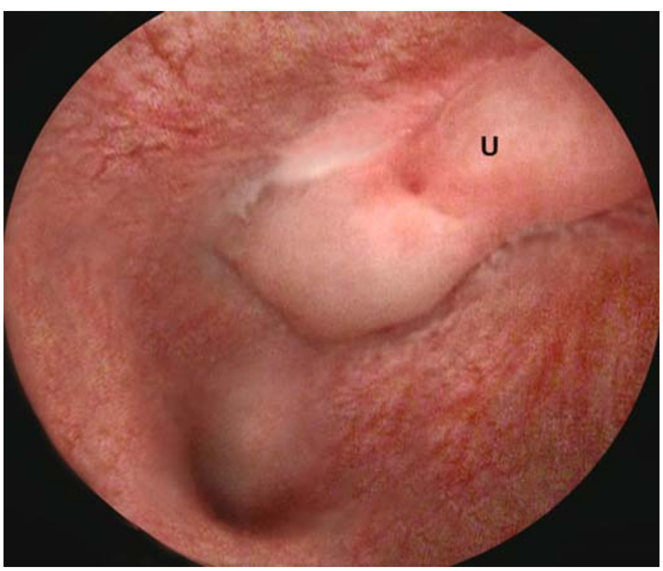


Fig. 25.30. Postoperative cystoscopy shows the ureteral patch (U)

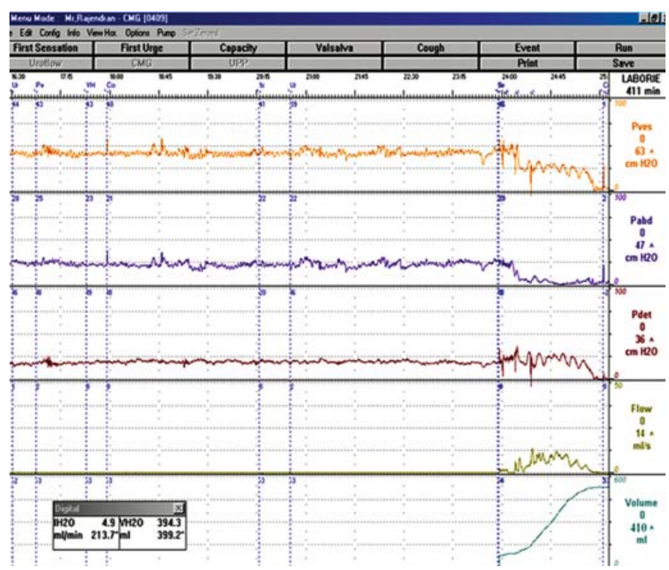


Fig. 25.31. Postoperative cystometry shows a compliant bladder

Laparoscopic Ureterocystoplasty in a Functioning Kidney

Fig. 25.32. An intravenous urogram (IVU) shows a bilateral uretero-pyelocaliectasis in a 9-year-old child

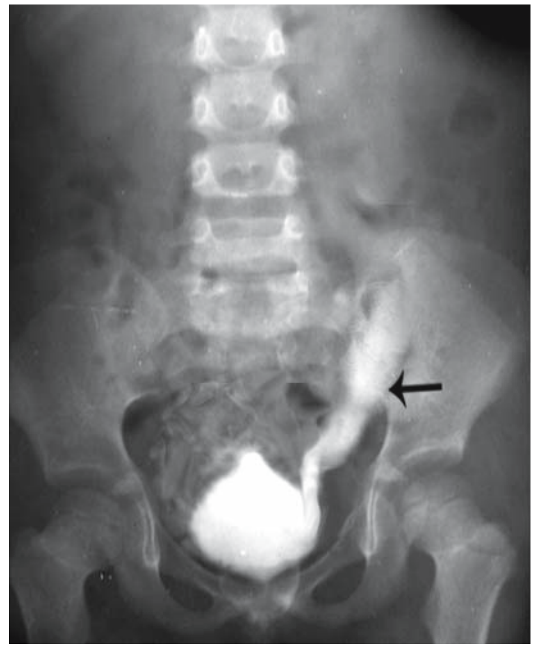


Fig. 25.33. An MCU shows a small-capacity bladder with multiple small diverticulae and left VUR (arrow)

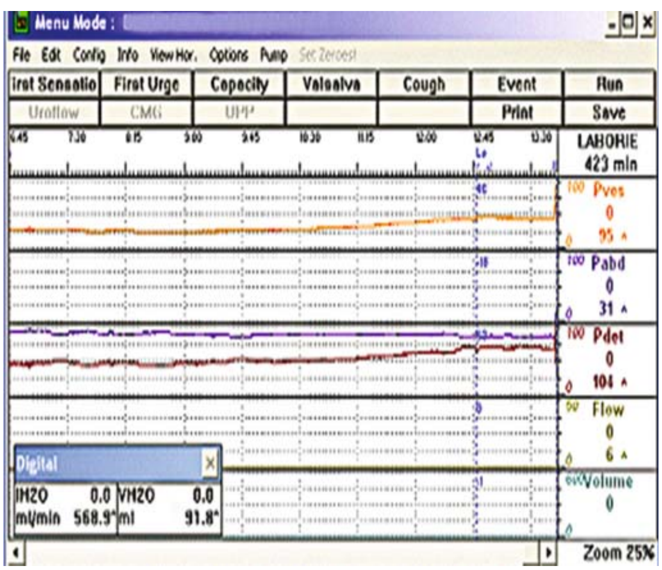


Fig. 25.34. Cystometry shows a poorly compliant bladder

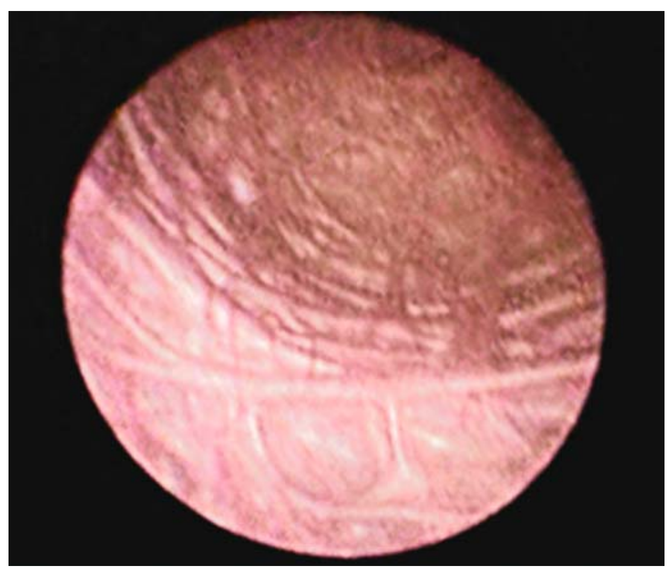


Fig. 25.35. Cystoscopy reveals a heavily trabeculated bladder

Fig. 25.36. External view of the port positions

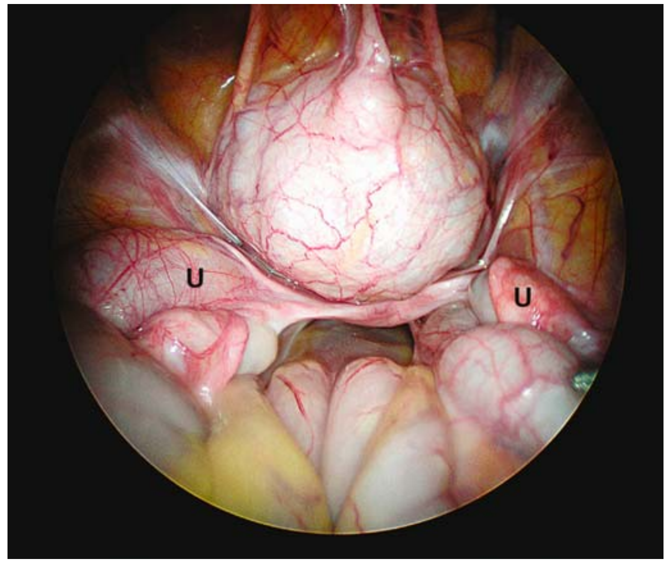


Fig. 25.37. Laparoscopic view of the small-capacity bladder and bilateral grossly dilated ureters; the left ureter was selected as there was reflux and it was more dilated (U, ureter)

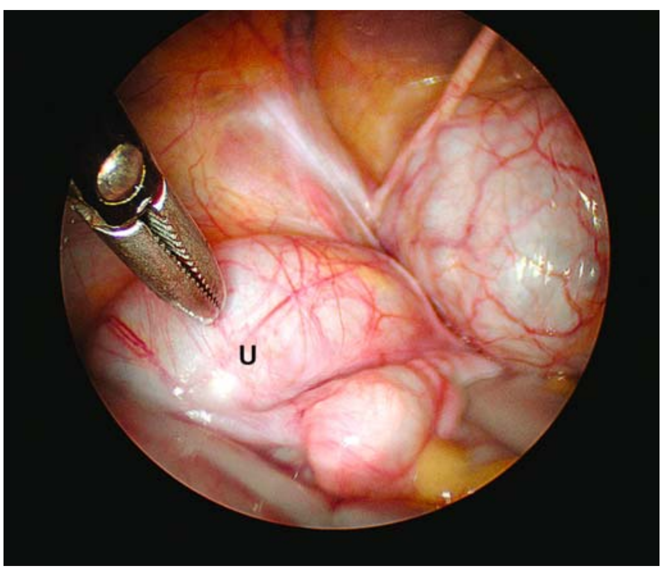


Fig. 25.38. Close-up view of a grossly dilated left lower ureter (U)

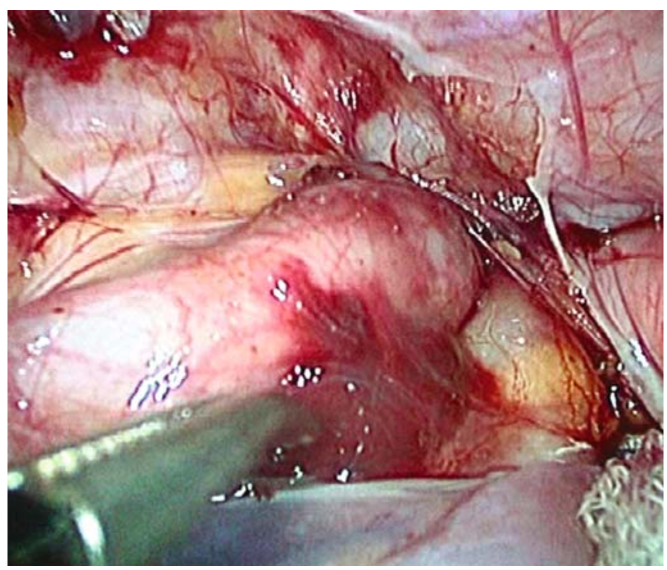


Fig. 25.39. Incision of peritoneum over the left lower ureter

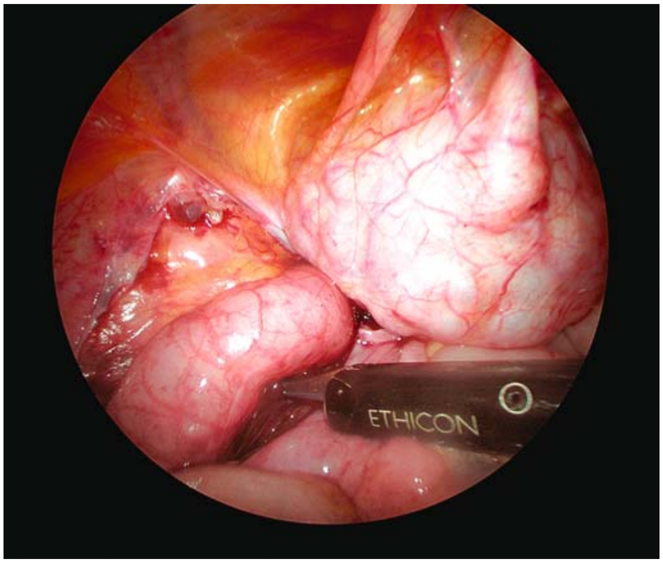


Fig. 25.40. Mobilizing the left lower ureter to oppose the bladder and plan the probable line of cystotomy

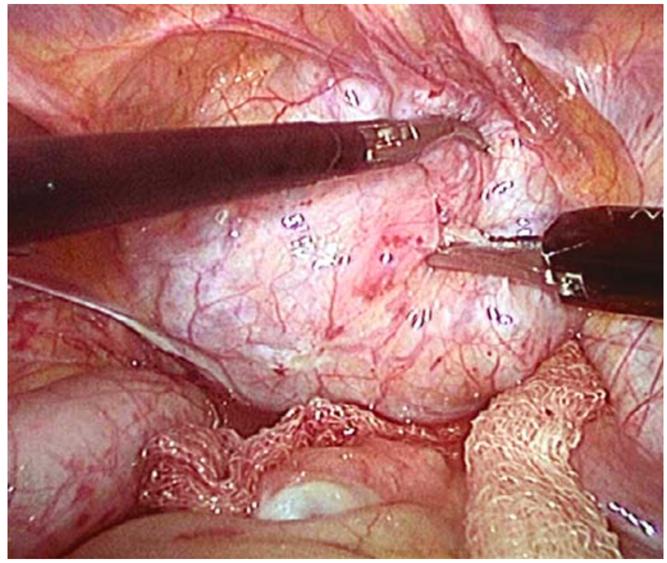


Fig. 25.41. Cystotomy in an oblique manner starting near the midline using ultracision

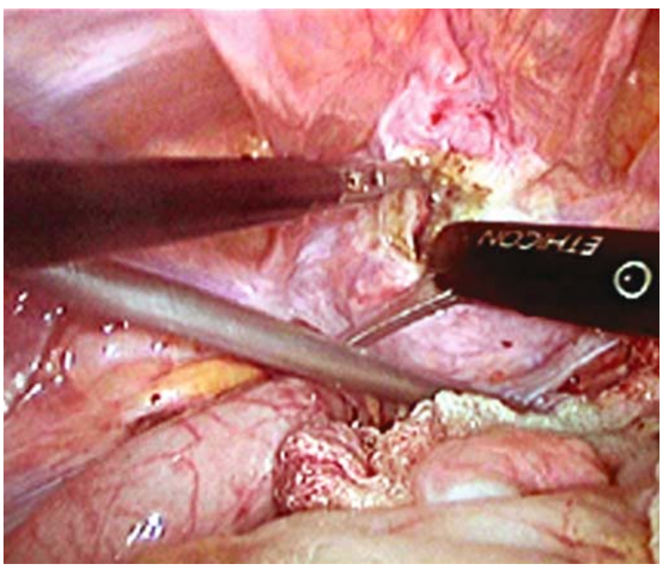


Fig. 25.42. Cystotomy extended toward the ureteric orifice

Fig. 25.43. Cystotomy completed (almost up to the left ureteric orifice)

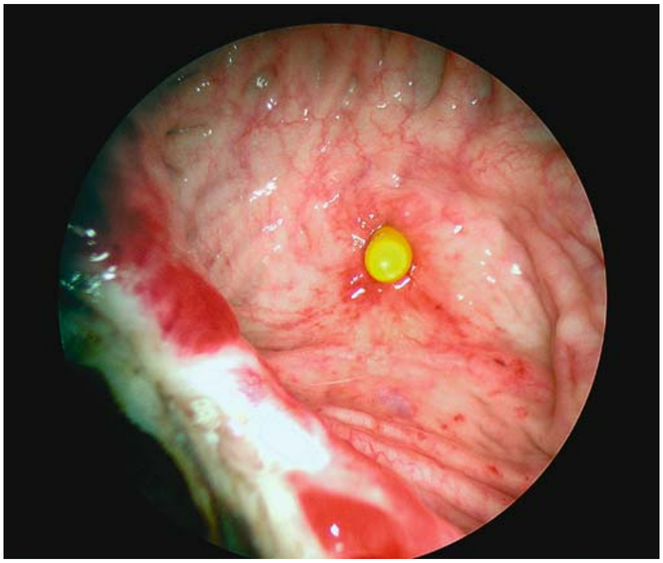


Fig. 25.44. Close-up view of the bladder interior through the cystotomy

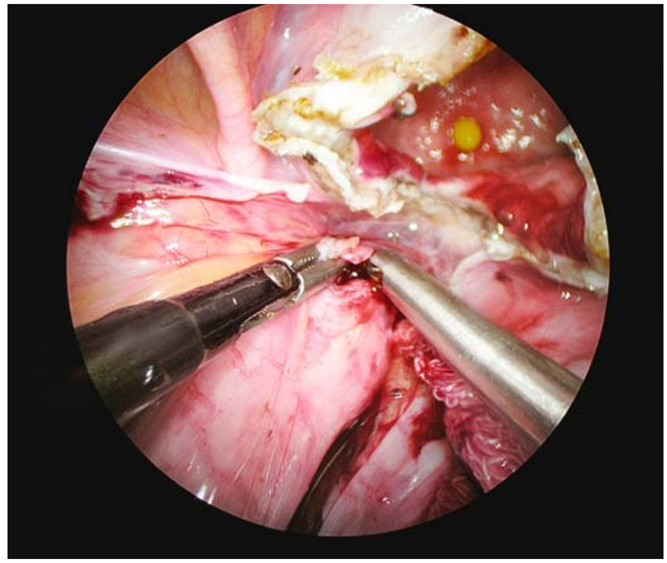


Fig. 25.45. Ureterotomy just opposing the cystotomy line to make the sutural line tension free

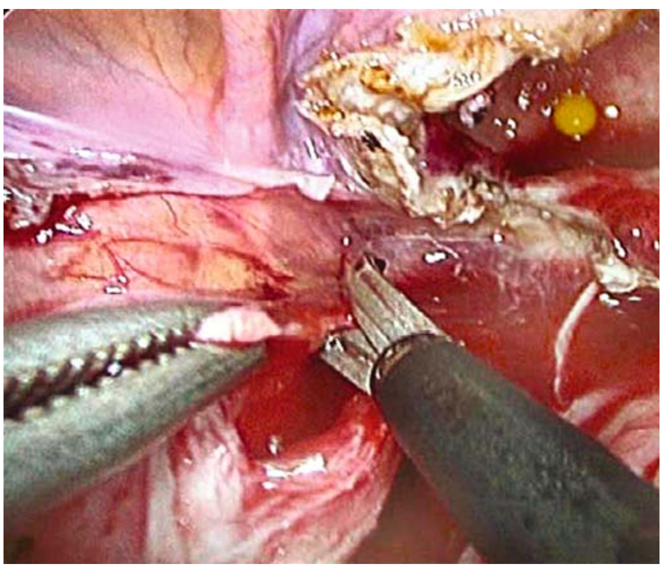


Fig. 25.46. The ureterotomy in progress

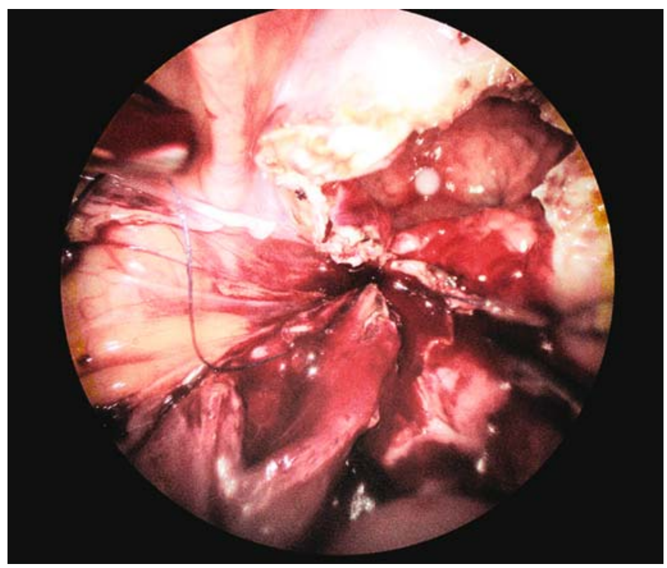


Fig. 25.47. Initial suture with 3-0 Vicryl outside-in of the medial edge of the ureterotomy

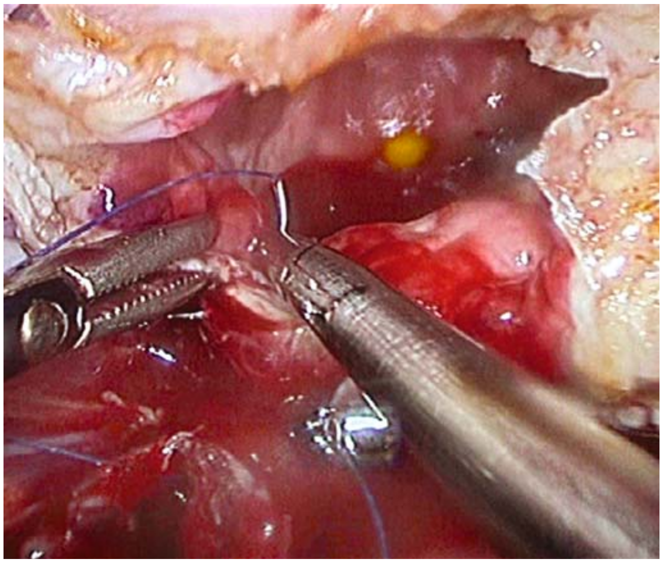


FIG. 25.48. Initial suture taken inside-out at the edge of the cystotomy

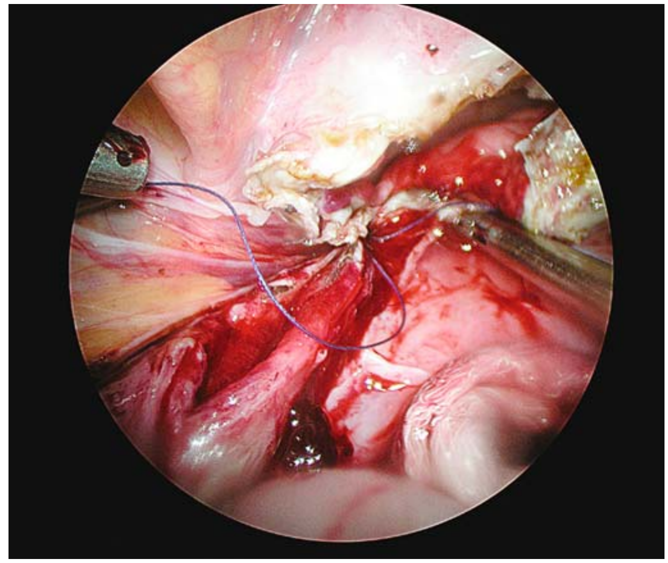


FIG. 25.49. View after the initial knot

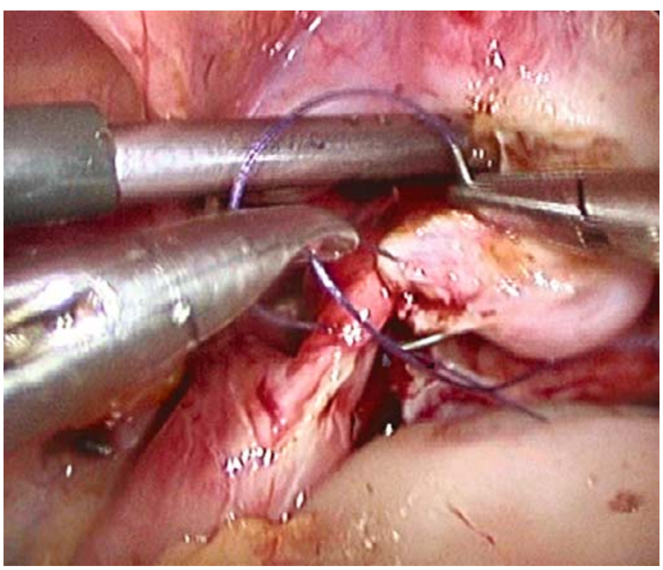


FIG. 25.50. Ureterovesical anastomosis is performed using continuous sutures

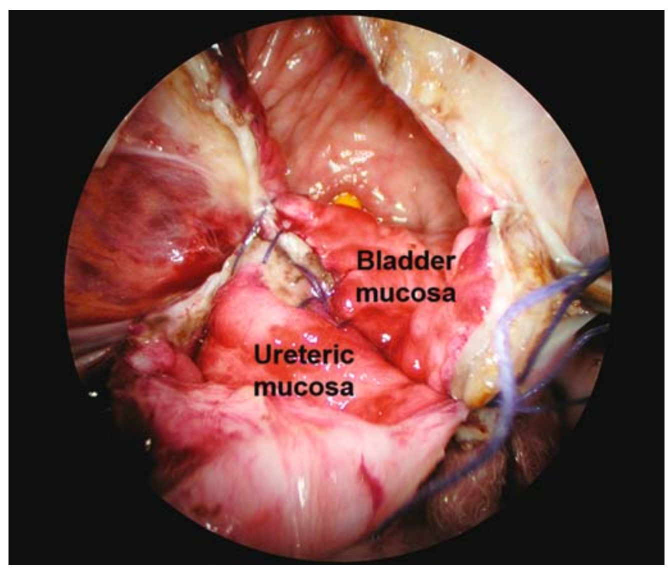


FIG. 25.51. The posterior layer of the suture is nearly completed

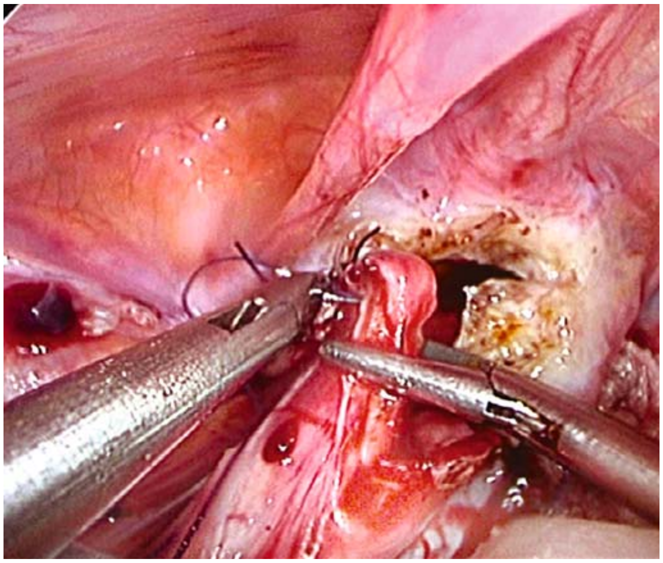


Fig. 25.52. Anterior-layer suturing started at the lower end

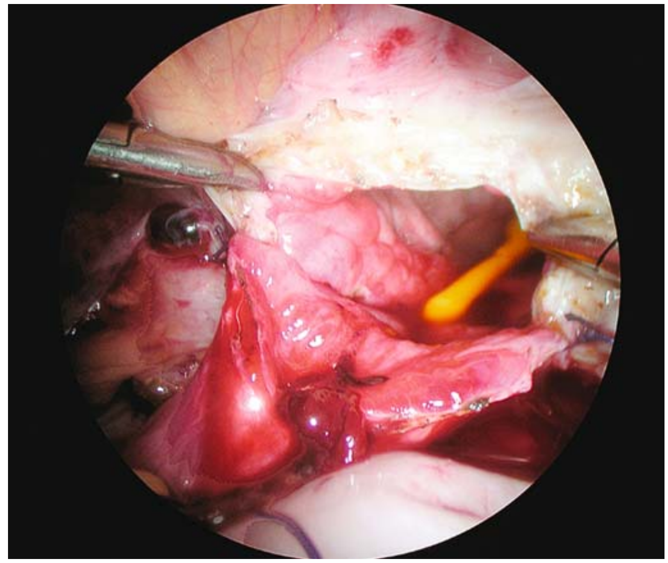


Fig. 25.53. Part of the anterior layer sutured

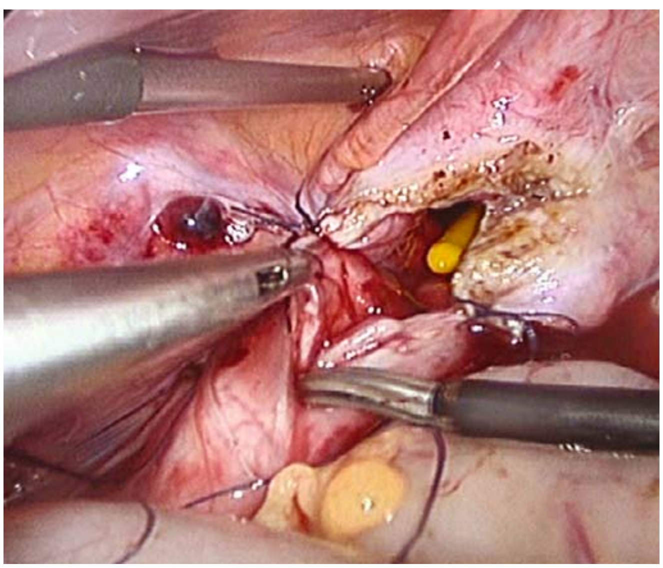


Fig. 25.54. Ureterotomy is extended to match the cystotomy incision

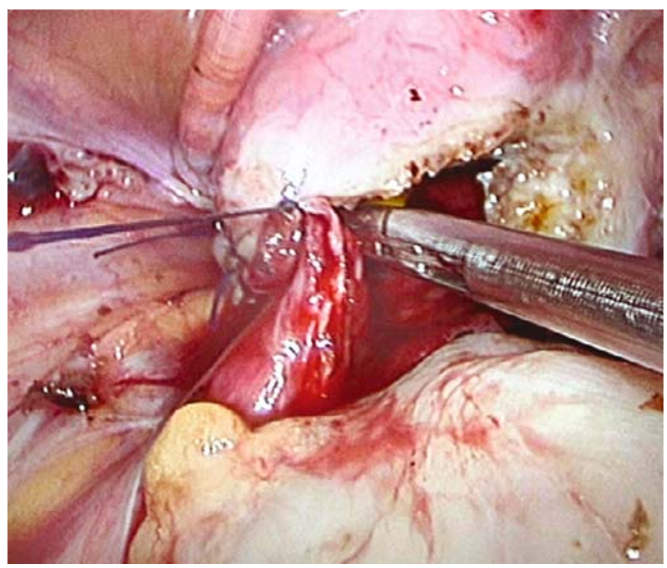


Fig. 25.55. Suturing is carried out using two needle holders (sometimes suturing is easier if done with the left hand)

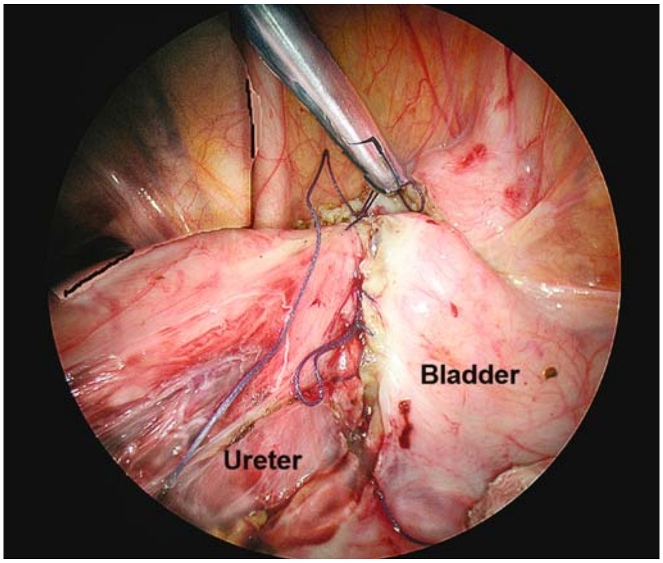


FIG. 25.56. Anterior-layer suturing is nearly completed

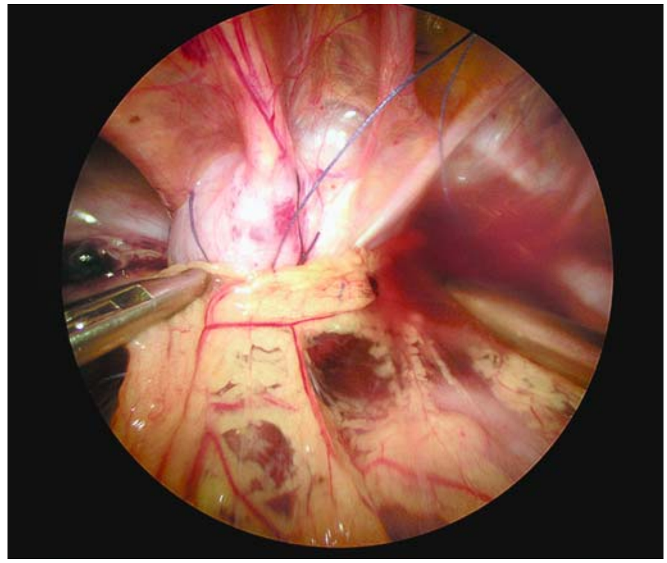


FIG. 25.57. Omental tacking on the anastomotic site

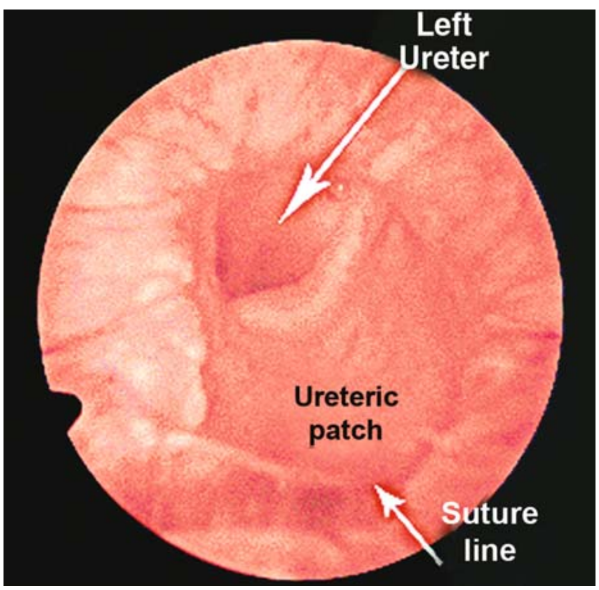


FIG. 25.58. One-month postoperative cystoscopy reveals a well-healed sutured line

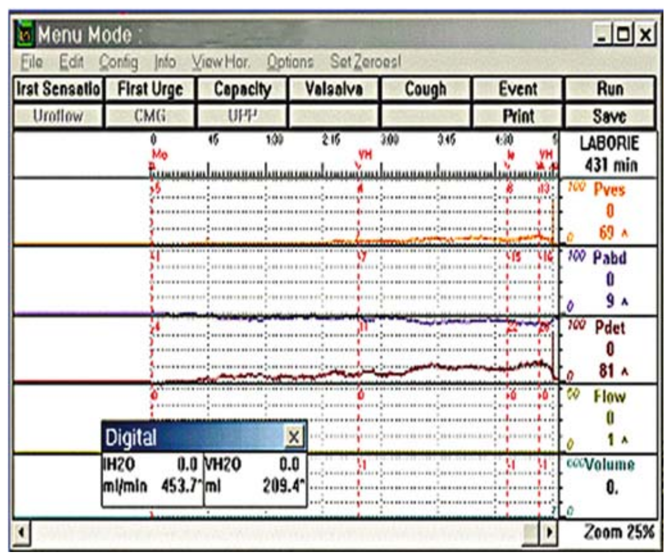


FIG. 25.59. Cystometry done 3 months later shows a more compliant bladder

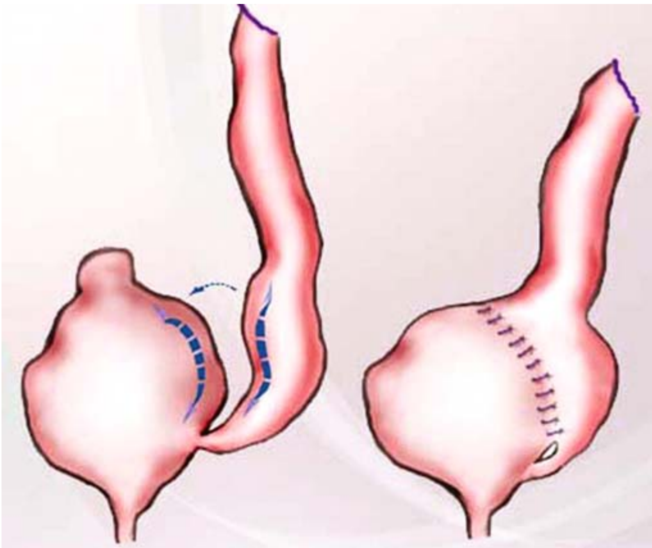


Fig. 25.60. Diagrammatic representation of the ureterocystoplasty executed

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1. Dewan PA, Anderson P (2001) Ureterocystoplasty: the latest developments. BJU Int 8:744–751.
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26 Laparoscopic Repair of a Colovesical Fistula

M. Ramalingam, K. Selvarajan, and K. Senthil

Colovesical fistulas are uncommon complications of complex pelvic surgery, colonic diverticular disease, and malignancy [1]. The clinical presentation usually is irritative lower urinary tract symptoms (LUTS) and pneumaturia. Evaluation includes computed tomography (CT) cystography, cystoscopy, and colonoscopy. Management entails disconnecting the fistula and treating the underlying cause by open surgery or laparoscopy.

Surgical Technique

The patient is placed in the lithotomy position for cystoscopic guidance and for marking the area to be excised. Using four ports (supraumbilical camera port, and two midclavicular ports and a flank port for suction with irrigation), the site of the fistula is inspected. Intraoperative colonoscopy is a useful guide.

The segment of colon adherent to the bladder is disconnected, and the edges of the bowel and bladder defects are trimmed. The defect in the bowel and bladder are closed with 2-0 interrupted Vicryl sutures one after another. The omentum can be tacked over the area of the cystorrhaphy. The ports are closed after leaving a tube drain. The bladder is drained with an optimum-sized Foley catheter for a week.

Laparoscopic repair for benign colovesical fistulas is a safe, effective, and less morbid procedure.

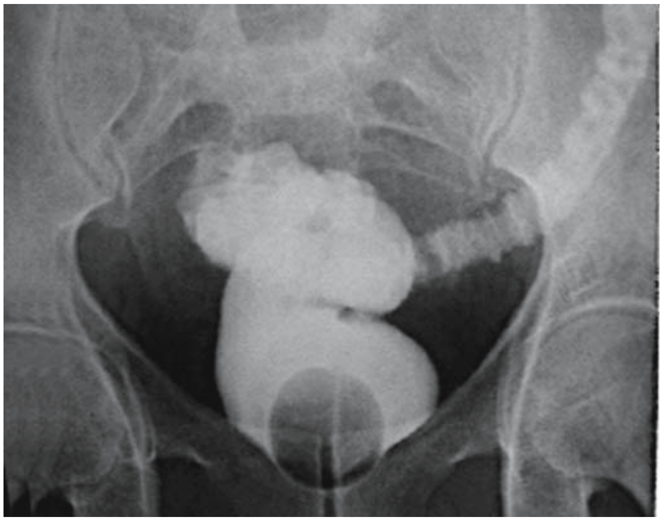


Fig. 26.1. A cystogram reveals communication with the large bowel

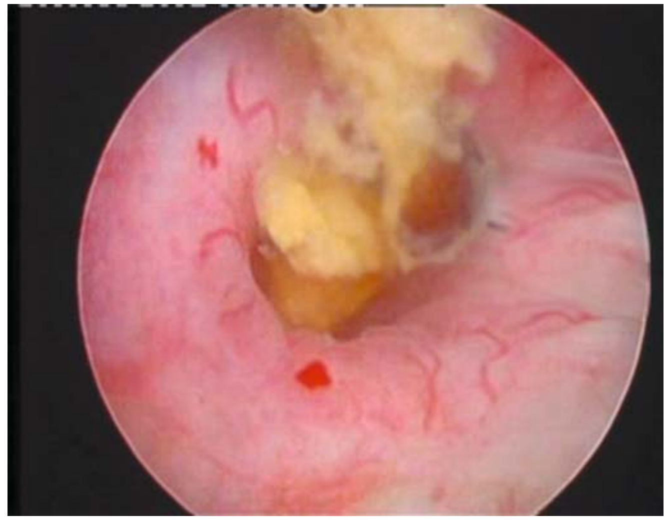


Fig. 26.2. A cystoscopy showing fistulous opening in posterior wall discharging feculant material

Fig. 26.3. Colonoscopy revealing tiny diverticulae in sigmoid colon

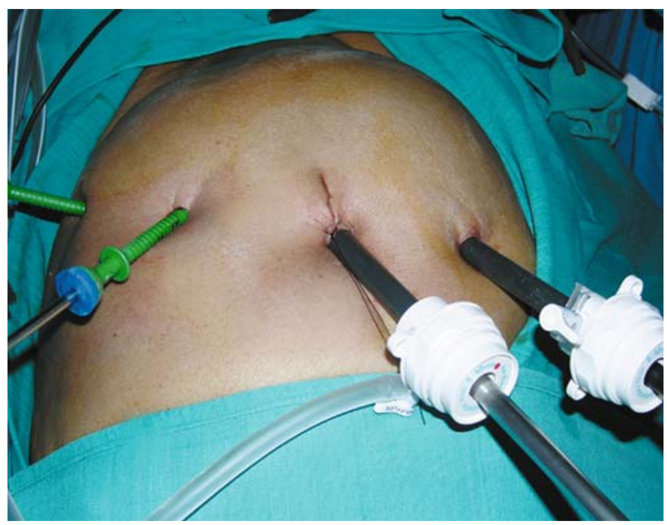


Fig. 26.4. External view of laparoscopic ports

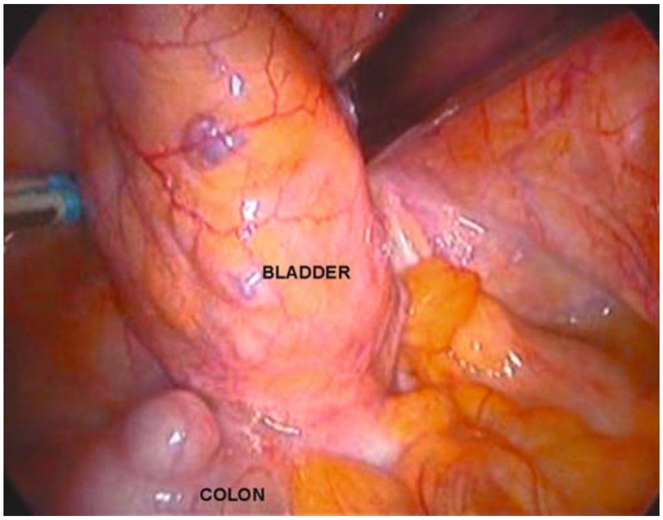


FIG 26.5. Initial laparoscopic view showing bowel adhesion to the bladder

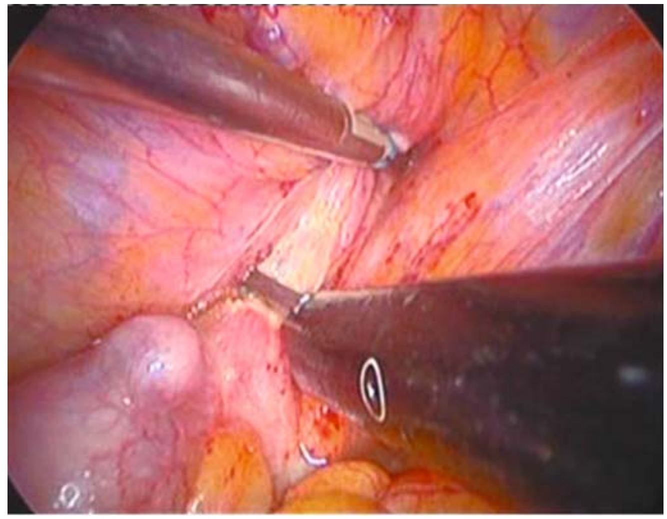


FIG 26.6. Dissection between bladder and bowel

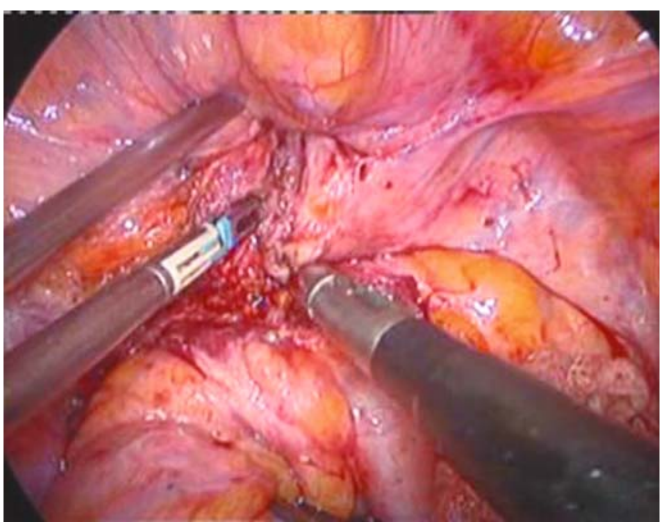


FIG 26.7. Isolating the colovesical fistula

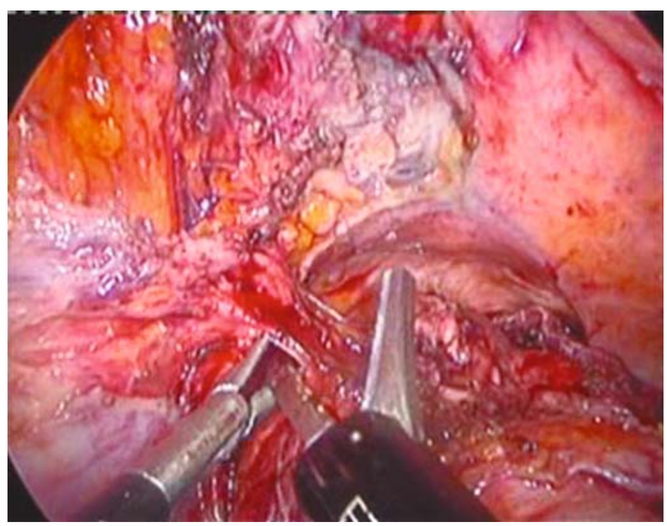


FIG 26.8. Disconnection of the fistula

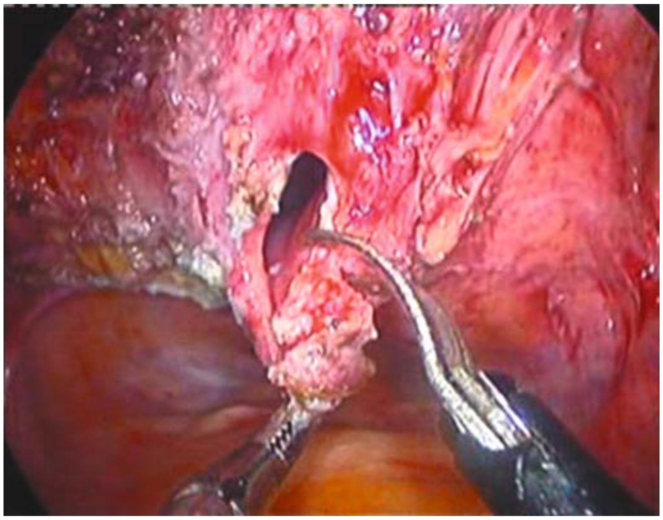


Fig 26.9. Excision of the fistula

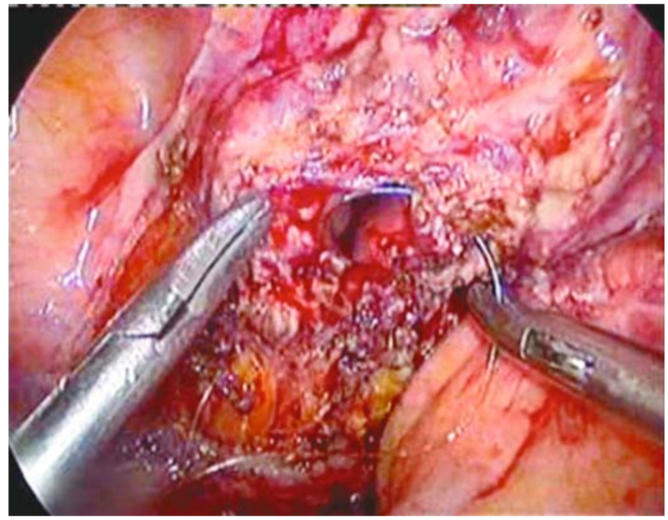


Fig 26.10. Bladder defect closure with interrupted 2.0 vicryl

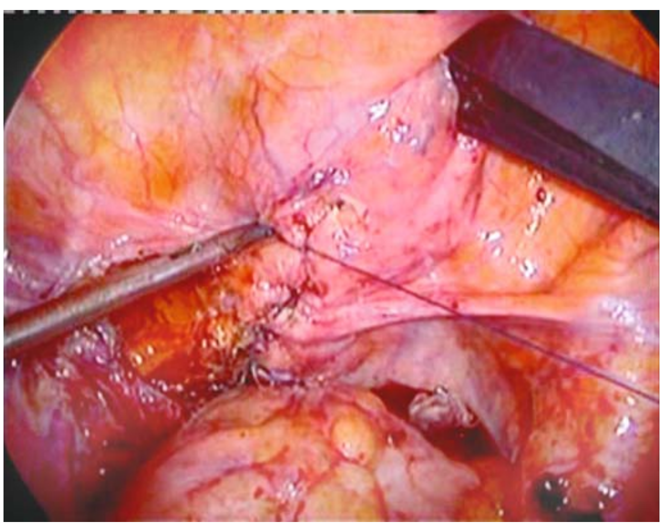


Fig. 26.11. Bladder view after second layer closure

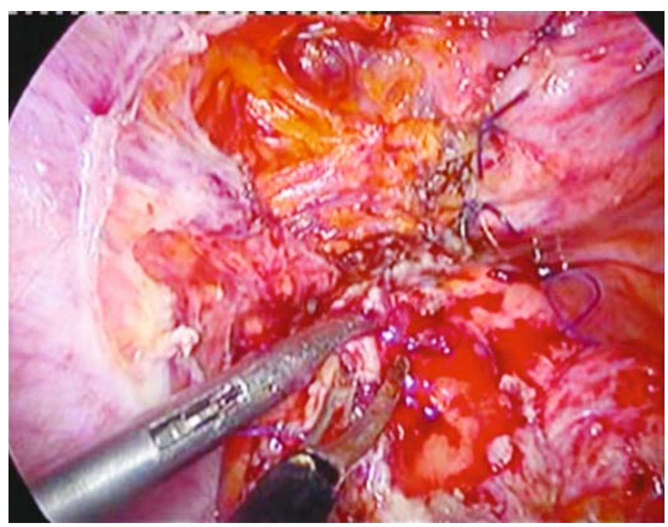
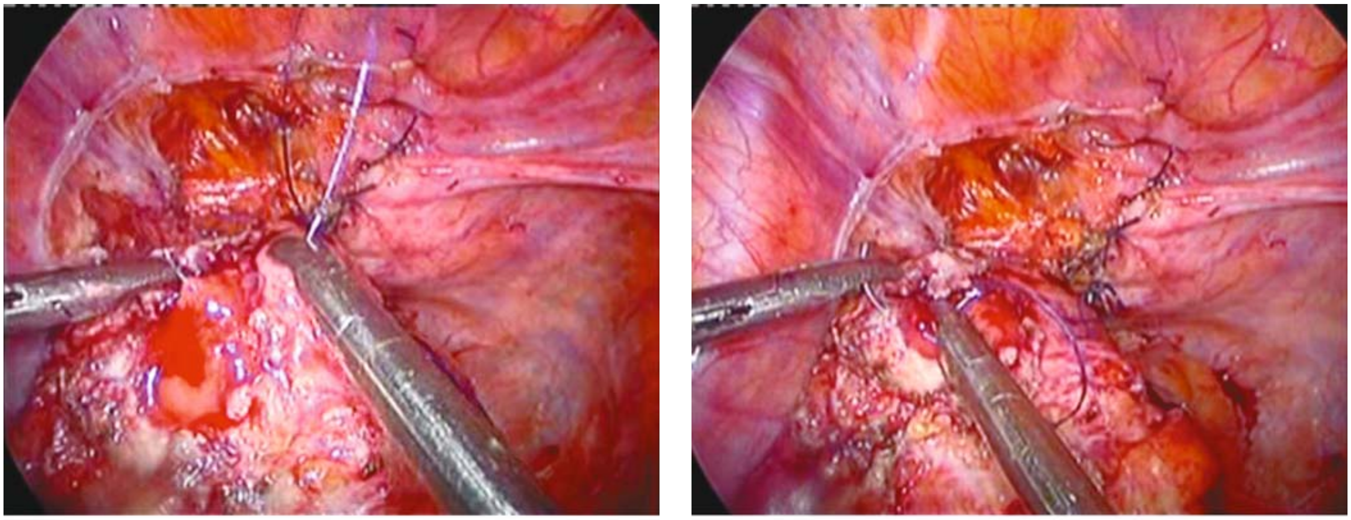


Fig. 26.12. Trimming the edges of fistulous opening in sigmoid colon



A B

Fig. 26.13. A. B. Closure of colonic defect with interrupted 2.0 vicryl suture

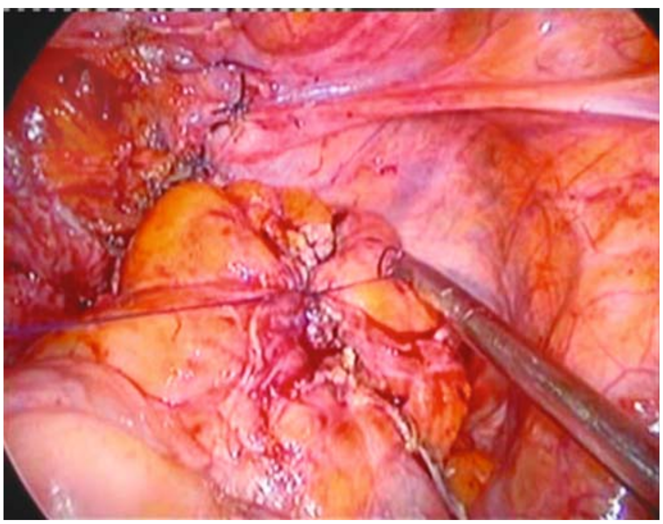


Fig. 26.14. View after closure of colonic defect

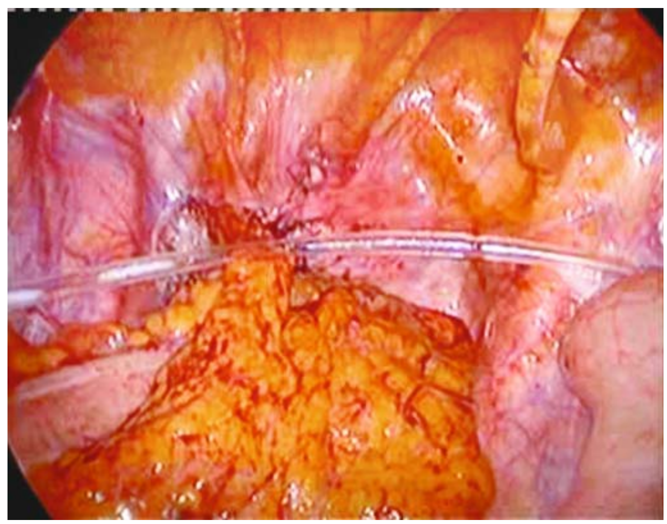


Fig. 26.15. View after omental interposition. Tube drain is left in

Reference

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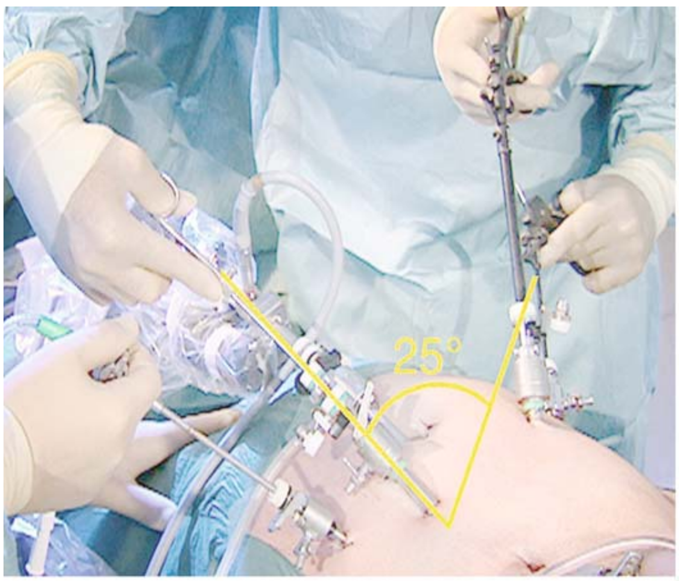
Section V
Reconstructive Procedures on Prostate



27
Transperitoneal Ascending Laparoscopic Radical Prostatectomy: The Heilbronn Technique

Gabriel Anghel, Dogu Teber, Ali S. Gözen, Firas Al-Hammouri, and Jens Rassweiler

In 1999, Jens Rassweiler developed a different laparoscopic technique similar to the classic open anatomic radical prostatectomy. Most importantly, this technique included an ascending part, with early division of the urethra, followed by a descending part, with incision of the bladder neck and dissection of the cranial pedicles, seminal vesicles, and vasa deferentia.

Since March 1999, more than 1200 laparoscopic radical prostatectomies (LRPs) were performed in our department using the Heilbronn technique.

Indications

The indications for the laparoscopic radical prostatectomy are the same as those for the open procedure: men with localized prostate carcinoma and a life expectancy of 10 years or more.

Contraindications

There is no specific contraindication for the laparoscopic surgical approach for localized prostate cancer apart from open surgery. There are four absolute contraindications for all laparoscopic surgical approaches: abdominal wall infection, generalized peritonitis, bowel obstruction, and uncorrected coagulopathy.

Positioning of the Patient

The patient is positioned in the deflected supine position with his arms parallel to the body, the legs adducted, and the table placed in a 30-degree Trendelenburg decline (Fig. 27.1A).

The rectal balloon catheter is placed and inflated with 50 cc of air. Before port placement a 16-French (F) Foley catheter is inserted under sterile conditions and filled with 15 cc of saline.

Heilbronn Technique: A Step-by-Step Description

Trocar Placement

We use a W-shaped arrangement (Fig. 27.1B) of the ports with insertion of the first port (12 mm) through a periumbilical minilaparotomy (Hasson technique). This port is used for the laparoscope and later for retrieving of the specimen. The other four ports (two 10-mm and two 5-mm ports) are placed under endoscopic control after establishing the pneumoperitoneum (maximum pressure 15 mm Hg, maximum gas flow 30 mL).

Exposure of the Extraperitoneal Space (Retzius Space)

1. Incise the urachus, lateral umbilical ligaments, and the parietal peritoneum at two-thirds the distance from the pubic bone to the umbilicus up to the internal inguinal rings, using a unipolar scissors (right hand, 10-mm left medial port) and bipolar endo-dissector (left hand, 5-mm left lateral port) (Fig. 27.2A).
2. Reach the Retzius space by blunt and sharp dissection of the peritoneum, using a unipolar scissors (right hand, 10-mm left medial port) and bipolar endo-dissector (left hand, 5-mm left lateral port).
3. Reach the bony pelvis, up to the external iliac vein, at each side (Fig. 27.2B).
4. Place the sixth port (5 mm) in the right lower abdomen through which a grasping forceps is used to pull the urachus and dome of the bladder cranially (Fig. 27.2C).

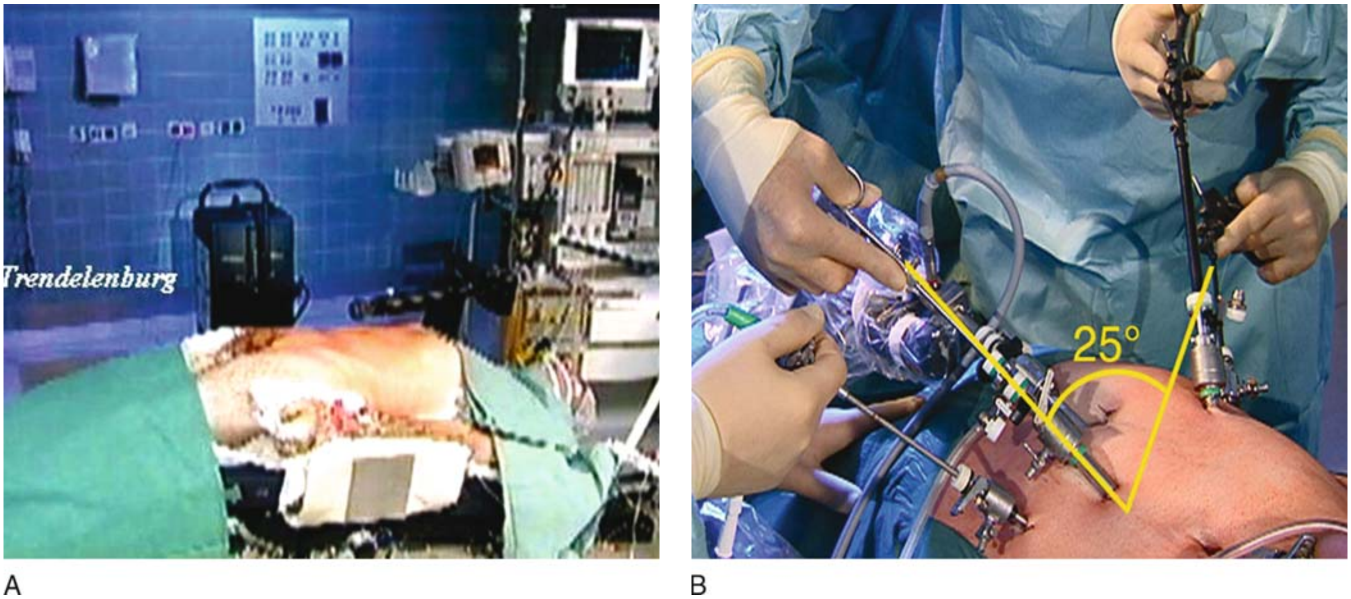


FIG. 27.1. **(A)** Positioning of the patient. **(B)** Arrangement of trocars

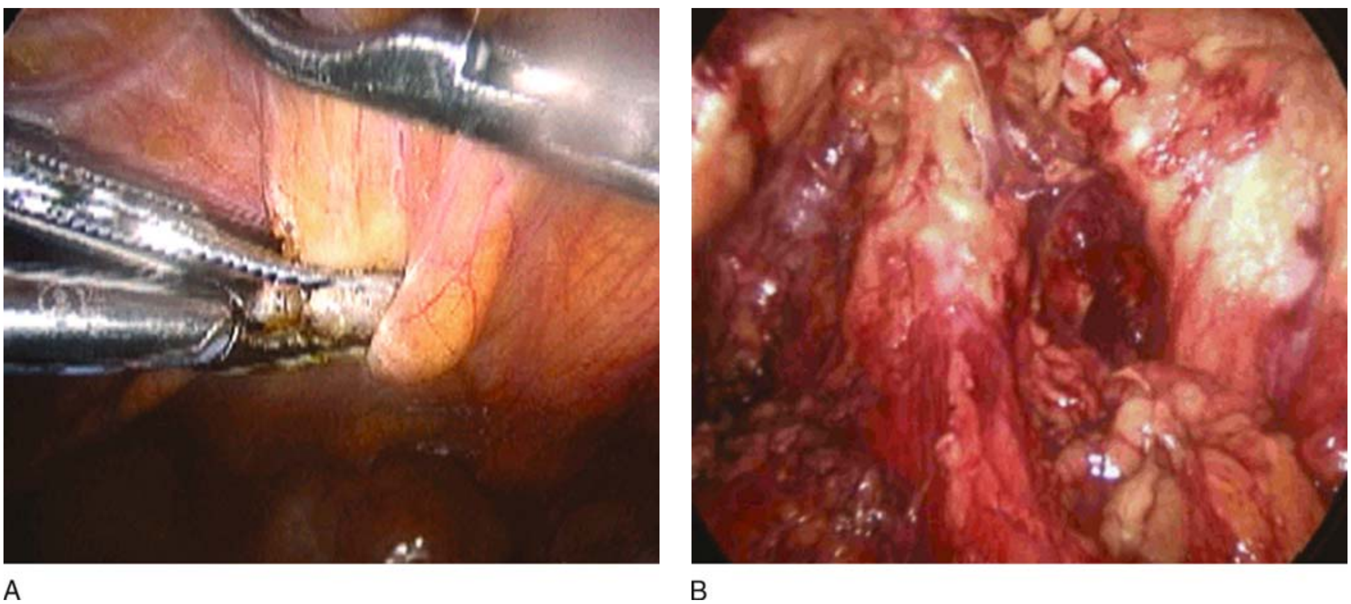


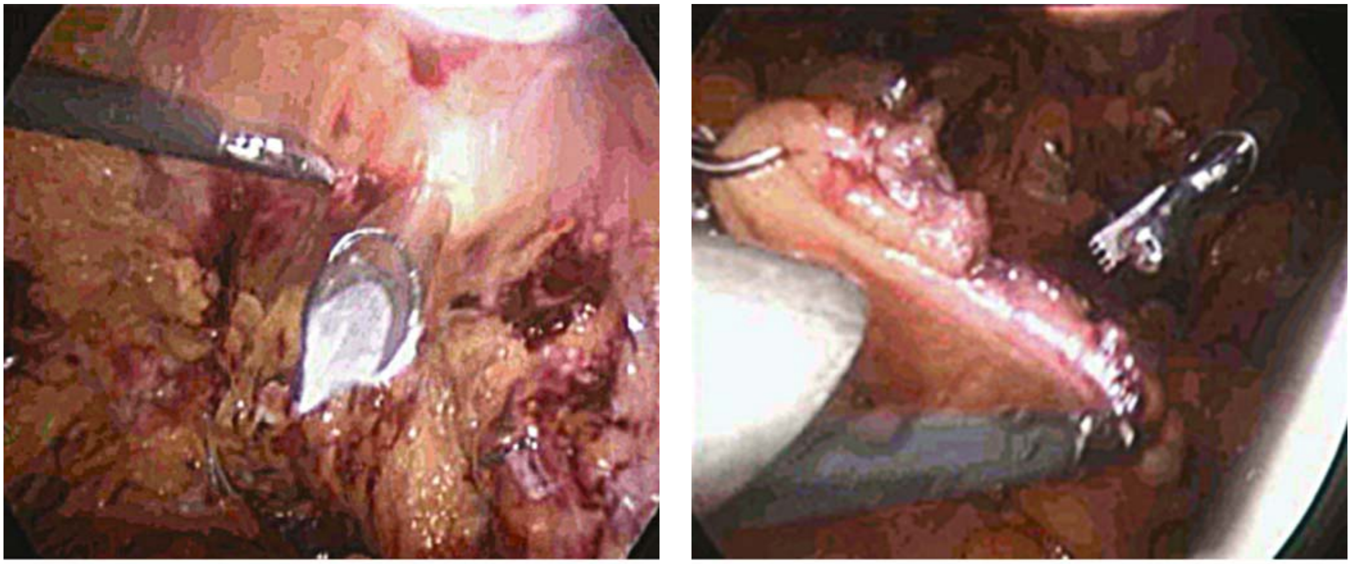
FIG. 27.2. **(A)** Incise the urachus, umbilical ligaments, and the parietal peritoneum. **(B)** Reach the bony pelvis, up to the external iliac vein, on each side

5. Grasp the incised peritoneum and retract it cephalad using the mechanical articulated arm (Fig. 27.2D).

Pelvic Lymphadenectomy (Fig. 27.3)

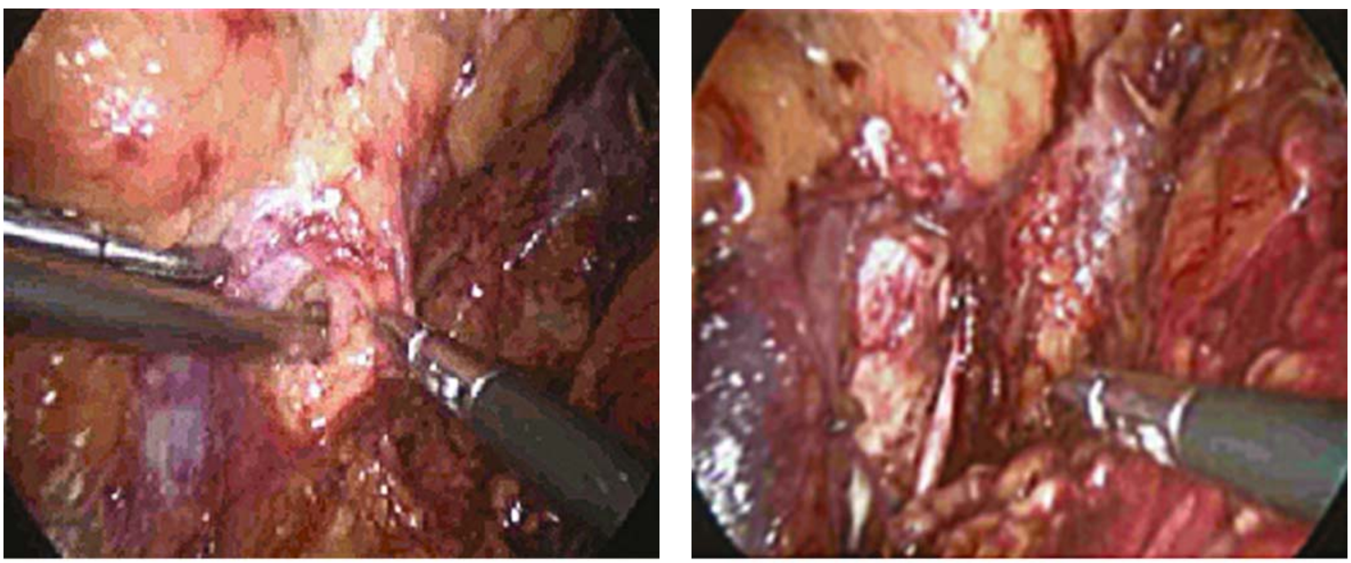
Incision of the Endopelvic Fascia and Control of the Dorsal Vein Complex

1. Remove the fatty tissue at the Retzius space exposing the prostate and the endopelvic fascia, and retract the bladder cranially with a forceps grasping at the urachus (via port IV).
2. Open the endopelvic fascia starting from where the fascia is transparent, revealing the underlying levator ani musculature lateral to the arcus tendineus fascia pelvis, and extend the incision of the endopelvic fascia in an anteromedial direction toward the prostatic ligaments (Fig. 27.4A,B).
3. Incise the puboprostatic ligaments; if necessary, the small veins around the puboprostatic ligaments may be safely cauterized with bipolar forceps.
4. Expose the prostatic apex with gentle cranial traction of the prostate, using a 10-mm 120-degree endo-dissector over



C D

FIG. 27.2. **(C)** Place the sixth port (5 mm) in the right lower abdomen. **(D)** Grasp the incised peritoneum and retract it cephalad using the mechanical articulated arm



A B

FIG. 27.3. **(A)** Pelvic lymphadenectomy starting at the pubic bone. **(B)** Dissection around the obturator nerve

the prostatovesical junction with the tip up to avoid bladder injuries (left medial 10-mm port).

5. Place the proximal suture at the prostate base controlling back flow using the endoscopic suturing technique (17-cm Vicryl suture with MH needle) (Fig. 27.4C).
6. Place two sutures around the dorsal vein complex using a 17-cm Vicryl 2-0 MH needle, passing the needle from the right to the left side to encircle the dorsal venous plexus (the needle is positioned parallel to the curve of the symphysis pubis, and the angle between the needle and the needle holder is 100 degrees) (Fig. 27.4D).

Ascending Part: Apical Dissection, Preservation of the Neurovascular Bundles, Transection of the Urethra, Posterior Dissection of the Prostate

The approach to the apex of the prostate is determined by the decision of proceeding with a nerve-sparing or non–nerve-sparing technique.

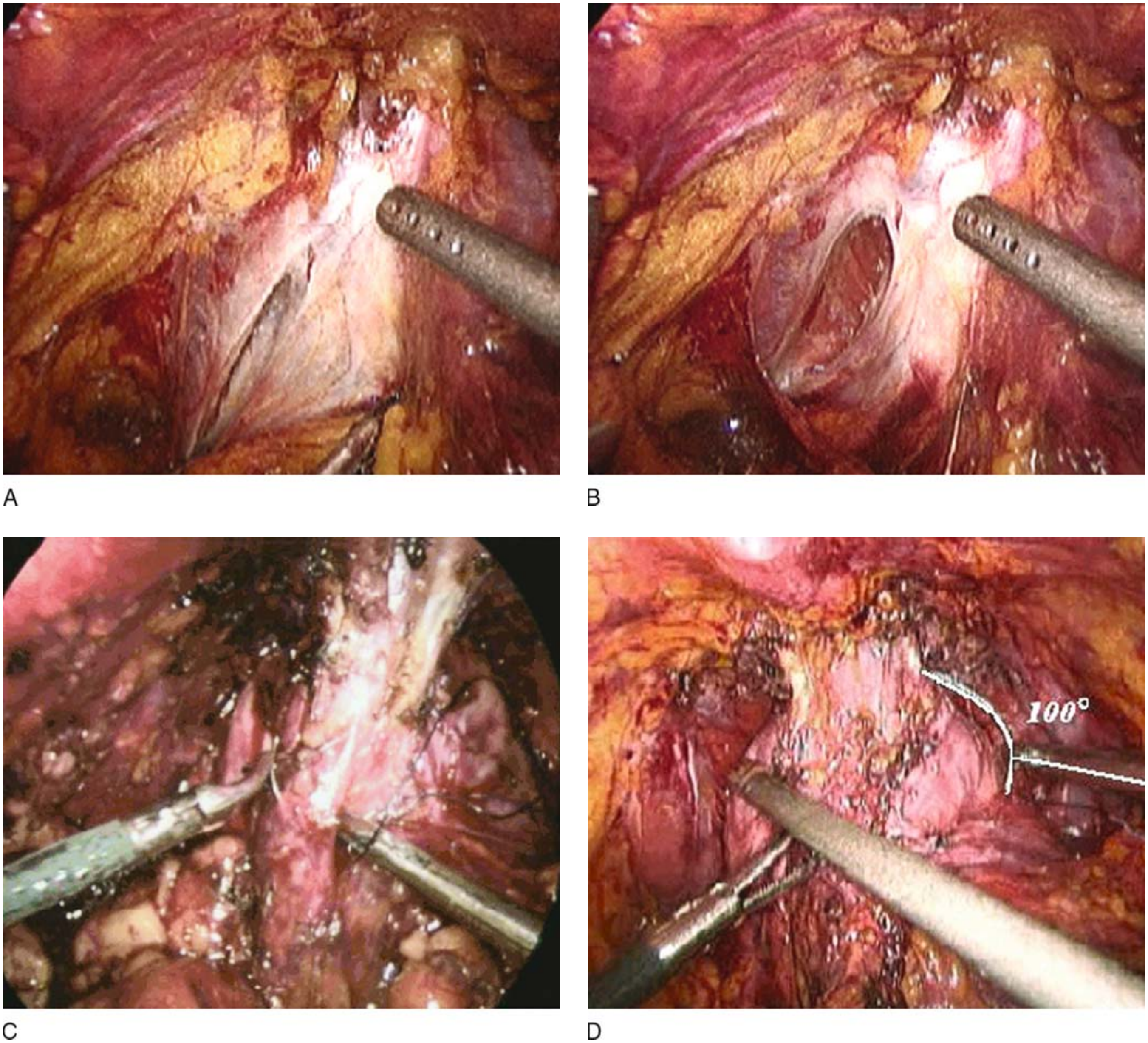


FIG. 27.4. **(A)** Incision of the endopelvic fascia. **(B)** Demonstration of levator muscle. **(C)** Place proximal suture at the prostate base, controlling the backflow. **(D)** Place two sutures around the dorsal vein complex

Non–Nerve-Sparing Technique

1. After transection of the dorsal vein complex (Fig. 27.5A), the anterior striated sphincteric urethral complex is demonstrated. The fibers of this complex at the apex are horseshoe shaped and form a tubular, striated sphincter surrounding the membranous urethra.
2. Incise the urethral sphincter using bipolar forceps and an endoscissors exposing the smooth muscle of the urethra (Fig. 27.5B).
3. Incise the anterior and posterior wall of the urethra sharply (no electrocoagulation) at the level of the prostatic apex (i.e., veru montanum), trying to preserve a maximal length of the stump (Fig. 27.5C,D).

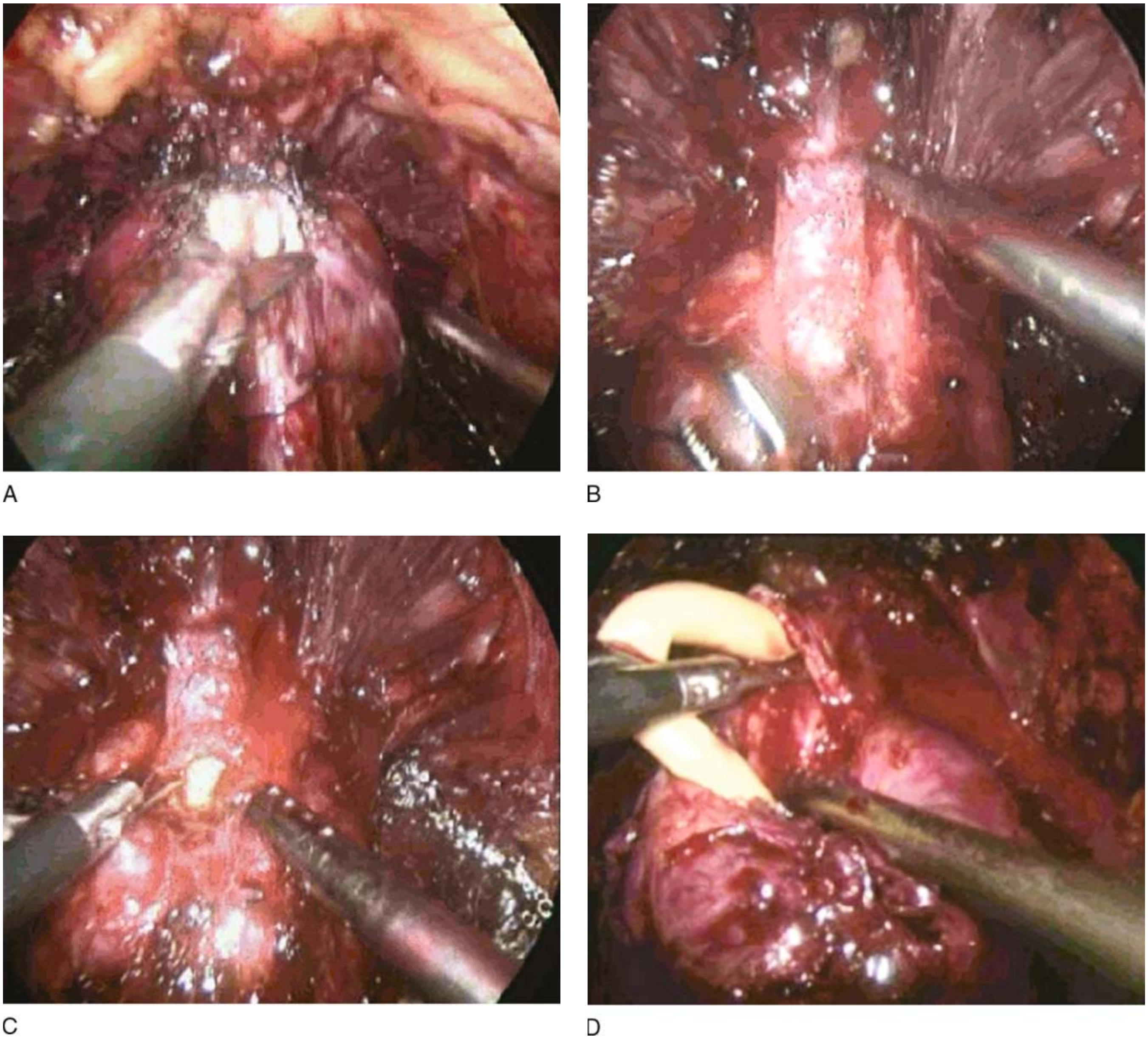


Fig. 27. 5. **(A)** Transection of the dorsal vein complex. **(B)** Incise the urethral sphincter. **(C)** Incise the anterior wall of urethra. **(D)** Incise the posterior wall of urethra

4. Ligate the Foley catheter at the urethral meatus, cut it, and pull it inside the abdomen to achieve retraction of the gland cranially, using a grasping forceps (Fig. 27.5E).
5. Grasp the catheter and retract it cranially using the mechanical articulated arm (second assistant job using the sixth trocar).
6. Place the 20F bougie to assist in the division of the posterior urethral wall.
7. Dissect gently the apex of the prostate from the rectum using the right-angle forceps and the suction device.
8. Clip the neurovascular bundle (NVB) areas using 10-mm Hem-o-Lok clips, and incise and release the posterolateral attachments of the prostate, while the midline is dissected bluntly (Fig. 27.5F).

The Nerve-Sparing Technique

1. Remember that the NVB is located on the posterolateral side of the prostate, inside a triangle formed by the levator fascia (lateral wall), prostatic fascia (medial wall), and

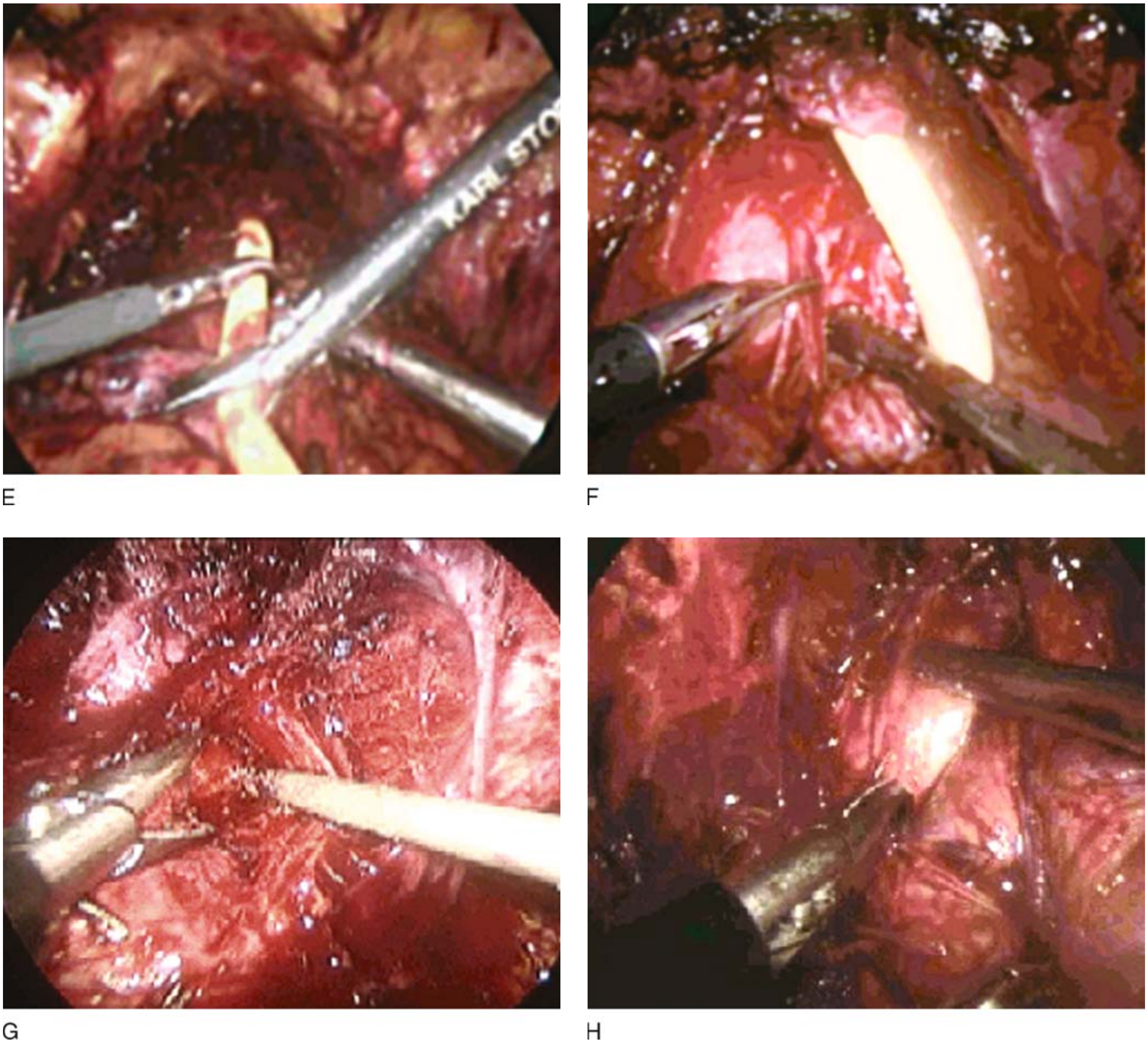


FIG. 27.5. **(E)** Grasp the catheter and retract it cranially. **(F)** Release the posterolateral attachments of the prostate. **(G)** The neurovascular bundle (NVB) preservation. **(H)** Blunt dissection of neurovascular bundle

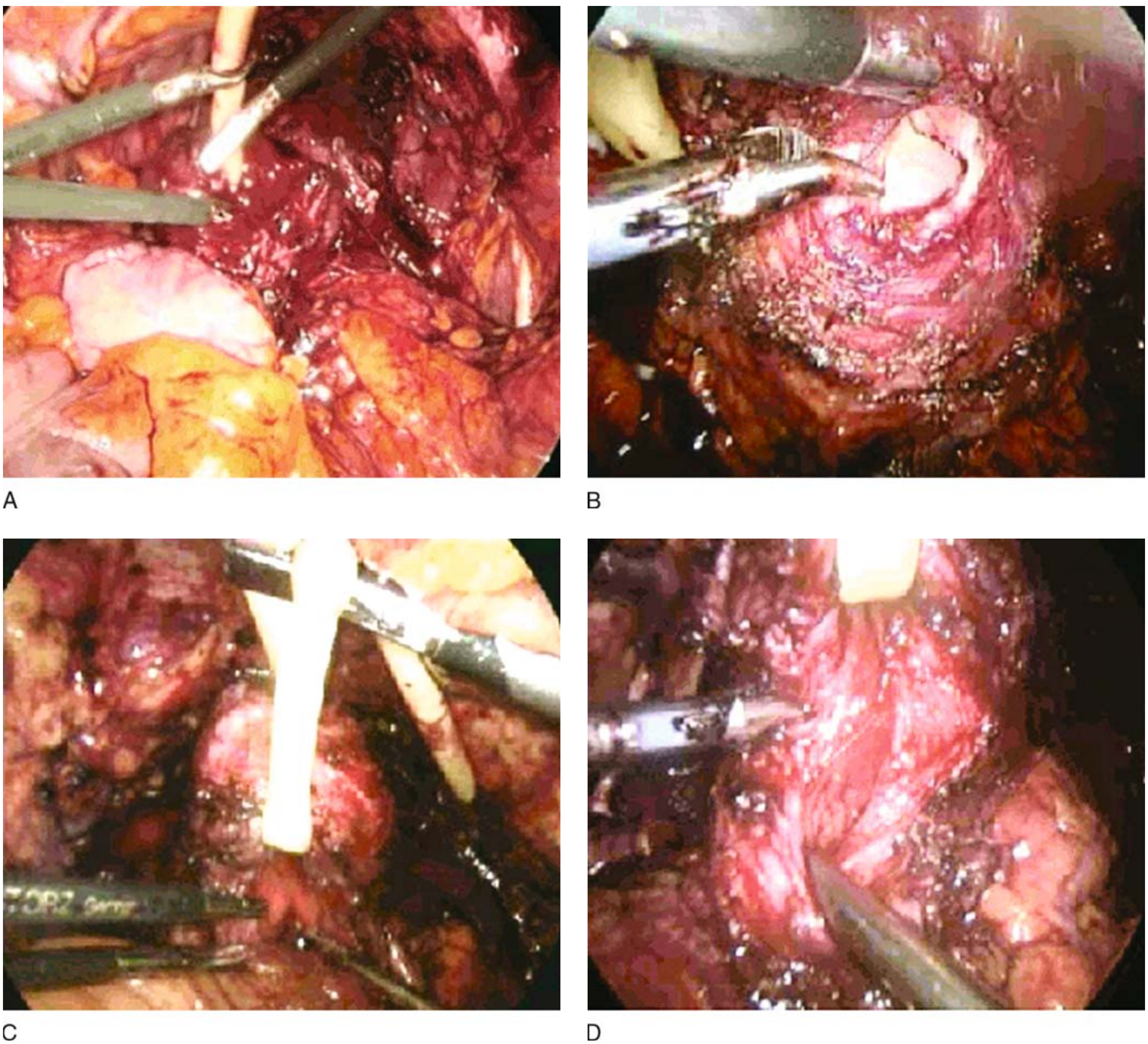
the anterior layer of Denonvillier's fascia (base). Near the apex, the NVB travels at the 5 and 7 o'clock positions (Fig. 27.5G,H).

2. Incise the lateral pelvic fascia prior to the incision of the urethra (separation of levator fascia from prostatic fascia).
3. Displace the prostate on its side and expose the lateral surface of the prostate.
4. Insert a right-angle clamp under the lateral pelvic fascia beginning at the bladder neck extending distal toward the apex of the prostate detaching the area of NVB from the posterolateral border of the prostate and dissected gently from the apical part of the prostate.
5. All the prostatic branches from the NVB are controlled step by step using 5-mm titanium clips. Avoid the use of bipolar or monopolar coagulation in the bundles area. The urethra is incised as in the nonsparing technique, but when the striated sphincter is divided closer to the apex of the prostate there is a risk that the neurovascular bundle may be damaged.

Descending Part: Incision of the Bladder Neck and Transection of Cranial Pedicles, Exposure of the Vas Deferens and Seminal Vesicles

Incision of the Bladder Neck/Bladder Neck Sparing

1. Pull the apex of the prostate ventrally using the cut Foley catheter as retractor and using the mechanical articulated arm (Fig. 27.6A).
2. In the non—bladder neck—sparing technique, starting at the prostate–vesical junction incise the anterior wall of the bladder neck over the blocked balloon, using bipolar coagulation and an endoscissors until the balloon becomes visible (Fig. 27.6B).
3. In the bladder neck—sparing technique, before the division of the bladder neck, incise the attachments between the bladder and the prostate anteriorly and laterally, thus opening the retrovesical space and exposing the cranial pedicles, vasa deferentia, and seminal vesicles. Following transection of these structures between the clips, the only part attaching the bladder with the prostate is the bladder neck, which is finally divided.



A B C D

Fig. 27.6. **(A)** Pull the apex of the prostate ventrally using the cut Foley catheter as retractor. **(B)** Incise the anterior wall of the bladder neck over the blocked balloon. **(C)** Grasp the two ends of the catheter and retract the catheter caudally and ventrally. **(D)** Identify the ureteral orifices

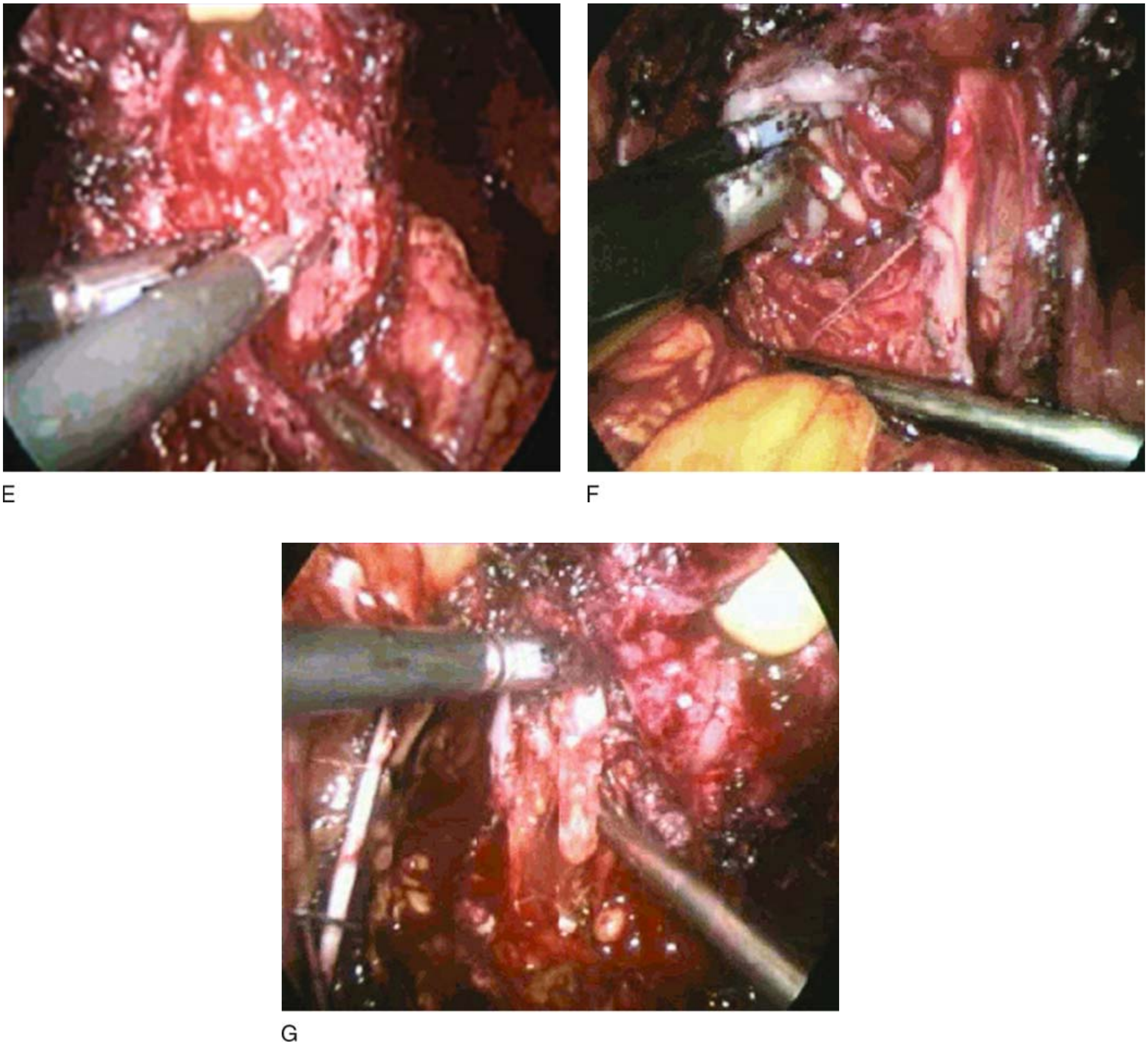


FIG. 27.6. **(E)** Incise the posterior bladder-neck wall. **(F)** Clip and transect the cranial pedicles of the prostate. **(G)** Dissect, clip, and transect the left and right vas deferens

Transection of the Cranial Pedicles, Exposure of the Vas Deferens and Seminal Vesicles

1. Cut the catheter distal to the ligature and deflate the balloon.
2. Grasp the two ends of the catheter and retract the catheter caudally and ventrally using the mechanical articulated arm (Fig. 27.6C).
3. Identify the ureteral orifices (Fig. 27.6D).
4. Incise the posterior bladder-neck wall and via the retrovesical access both of the vasa deferentia, and the seminal vesicles are dissected following by the incision of the overlying Denonvilliers' fascia (Fig. 27.6E).
5. Clip and transect the cranial pedicles of the prostate, dividing both lateral pedicles stepwise, starting with the superficial portions of pedicles and then the deeper portions using

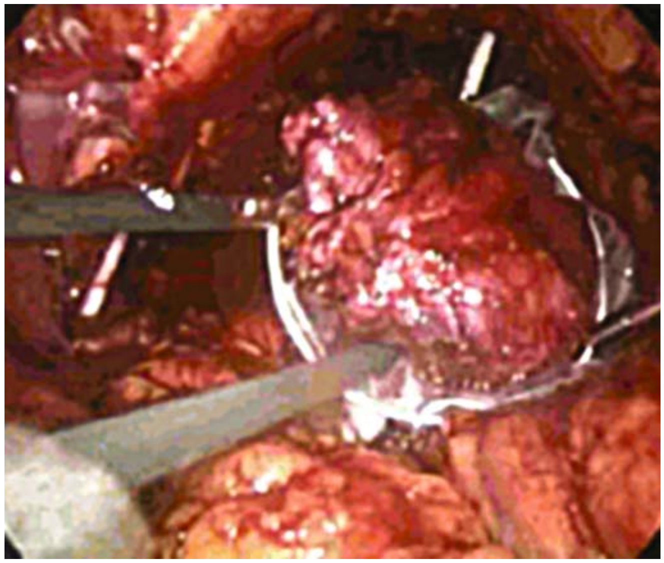


Fig. 27.7. Put the prostate in the endo-bag

two or three lockable 10-mm Hem-o-Lok clips to secure it (Fig. 27.6F).
6. Dissect, clip, and transect the left and right vas deferens (Fig. 27.6G).
7. Isolate and divide the seminal vesicles after clipping the seminal vesicle artery with two endoclips.
8. Be careful with the dissection of the tips of the seminal vesicles in the nerve-sparing technique in order to avoid injuries to the neurovascular bundles.

Organ Entrapment

Put the prostate in the endo-bag, leaving it at the level of the right deep inguinal ring (Fig. 27.7).

Anastomosis: The Van Velthoven Technique

1. Insert a metal bougie into the urethra for exposure of the urethral stump.
2. Use for the anastomosis two 19-cm PDS 3-0 with RB1 needles tied together at their tail ends.
3. Use port four for needle holder and port three for the endo-dissect to achieve an optimal angle between the instruments (25 to 35 degrees).
4. Initiate the running sutures by placing both needles outside-in through the bladder neck and inside-out on the urethra, one needle at the 5:30 o'clock position and the other needle at the 6:30 o'clock position (Fig. 27.8A).
5. Complete the running suture from the 6:30 to the 12:00 o'clock position and from the 5:30 to the 12:00 o'clock position and at the end of which a single intracorporeal tie is completed (Fig. 27.8B–D).

Retrieval of the Specimen

1. Place the drainage tube via the right medial 10-mm port under vision and fix it to the skin (Fig. 27.9).
2. Extract the prostate within the organ bag via the periumbilical incision (site of the telescope port). For this purpose, the rectus fascia is incised longitudinally according to the size of the gland.
3. Send the entire specimen to the pathologist for the staging of the disease.

Closure of the Port Wounds

Close the fascia of the umbilical port with interrupted sutures followed by closure of the subcutaneous and the skin. All other skin incisions are sutured.

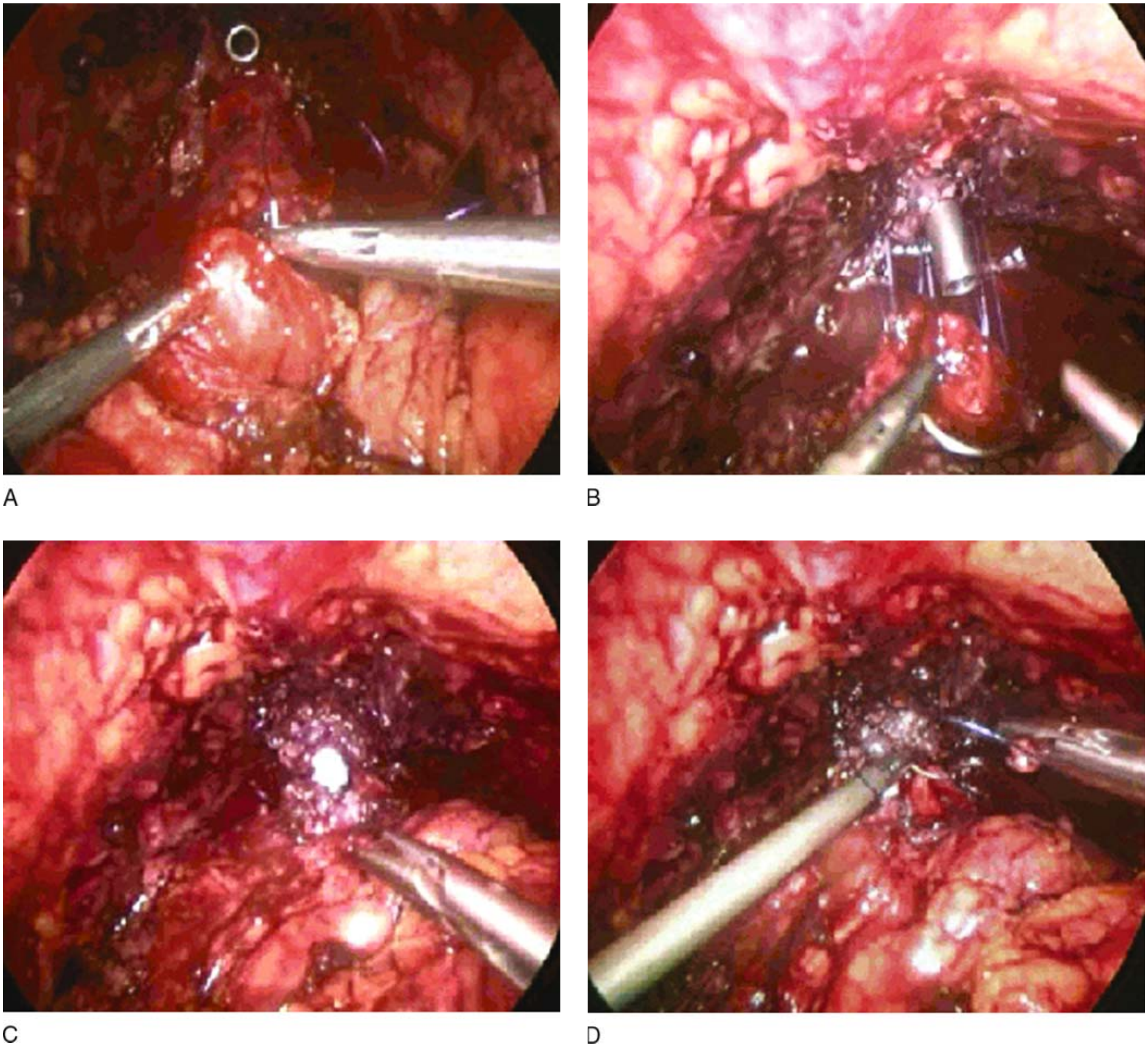


FIG. 27.8. **(A)** Initiate the running sutures by placing both needles outside-in through the bladder neck. **(B)** Approximation of bladder and urethra. **(C)** Complete the running suture from the 6:30 to the 12:00 o'clock position and from the 5:30 to the 12:00 o'clock position. **(D)** Single knot at the end of anastomosis

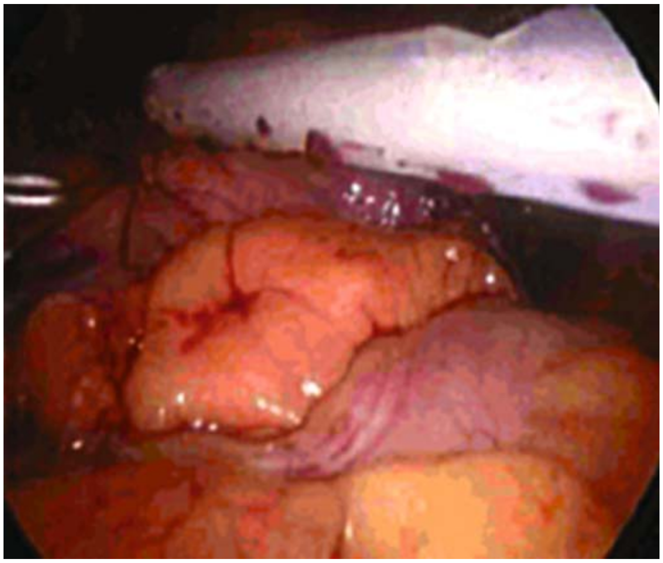


Fig. 27.9. Place the drainage tube via the right medial 10-mm port

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28

Laparoscopic Extraperitoneal Radical Prostatectomy: The Descending Technique (Clinique Saint Augustine)

Jean Luc Hoepffner, Richard Gaston, Thierry Piechaud, and Vaikundam Srinivasan

Laparoscopic extraperitoneal radical prostatectomy has become well established [1–4]. Essentially we approach the bladder neck first, control the pedicle, divide the bladder neck, and proceed in a descending manner toward the apex of the prostate.

Indications and Contraindications

The indications and contraindications are the same as for any open radical prostatectomy.

Surgical Technique

Access

A 10-mm subumbilical incision is made in the skin and rectus sheath. A 10-mm trocar is inserted in an oblique manner extraperitoneally, and pneumoinsufflation is started. Subsequently the potential space is enlarged using a telescope tip.

Port Placement

Two ports are inserted just lateral to the inferior epigastric vessels, and one more port is inserted midway between the pubic bone and the umbilicus.

Descending Technique (Saint Augustine Technique)

1. The pubic arch and bladder neck are identified. The dissection starts at the bladder neck and is continued on either side posteriorly until the vas or seminal vesicle is identified. The vascular pedicle is dissected away from bladder neck and controlled with either bipolar cautery or titanium clips. Then the bladder neck is divided.
2. Now the vasa and seminal vesicle can be seen. The vas deferens is divided, and the seminal vesicles dissected off the rectum. Retracting the vasa, the dissection continues in a plane anterior to the rectum downward until the apex of the prostate is reached.
3. The fat around the dorsal vein complex (DVC) is cleared. The DVC is subsequently controlled with bipolar cautery, and if needed by transfixation with 2-0 Vicryl. The apex of the prostate is dissected and the urethra is divided with a reasonable margin.
4. The prostate is completely mobilized and entrapped in an endocatch bag.
5. The vesicourethral anastomosis is done using 3-0 Monocryl preferably with a continuous nonlocking suture. Once the posterior layer is completed the catheter is placed and the rest of the suture completed.
6. A tube drain is left in through one of the flank ports. By extending the subumbilical incision (about 4 cm) the specimen is retrieved. Ports and subumbilical wound are closed.

Conclusion

Extraperitoneal laparoscopic radical prostatectomy by the descending technique is our preferred option.

FIG. 28.1. Modified lithotomy position for a laparoscopic radical prostatectomy

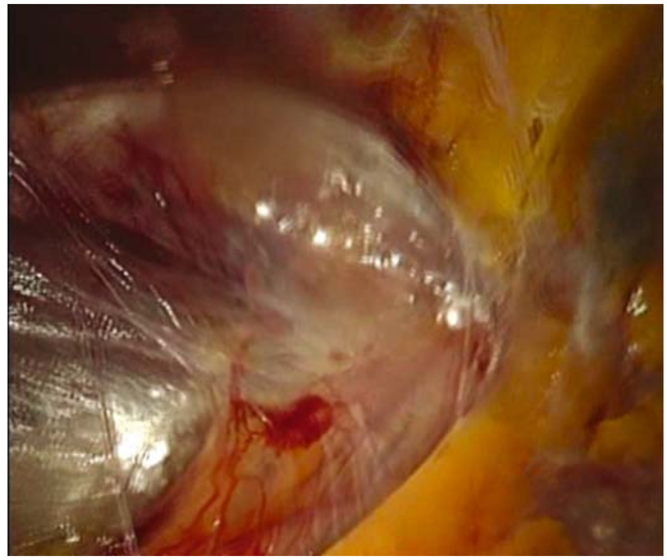


FIG. 28.2. Creation of the extraperitoneal space with the telescope tip or balloon

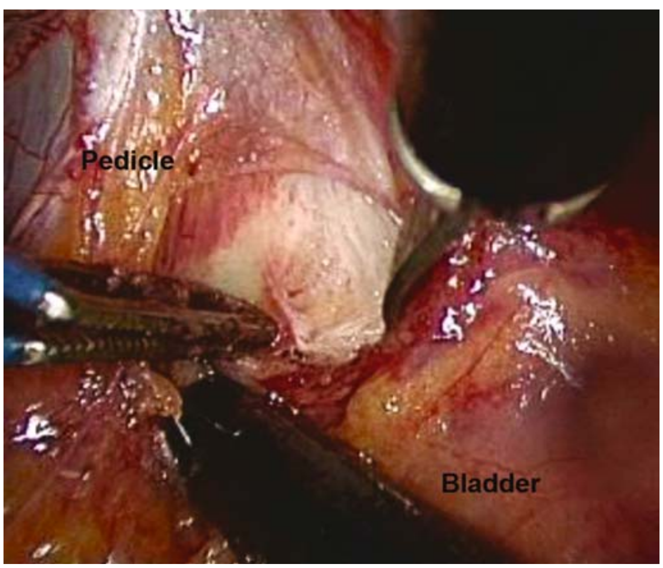


FIG. 28.3. Bladder neck dissection started on the left side

FIG. 28.4. Similar dissection on the right side

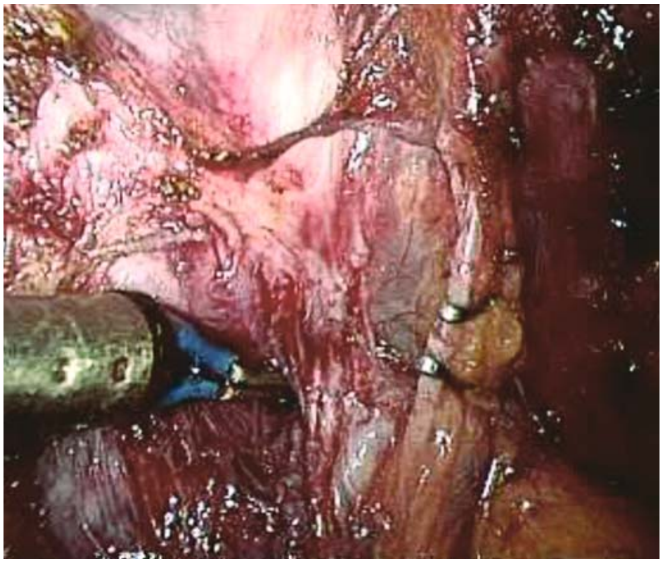


FIG. 28.5. Controlling the pedicle with titanium clips

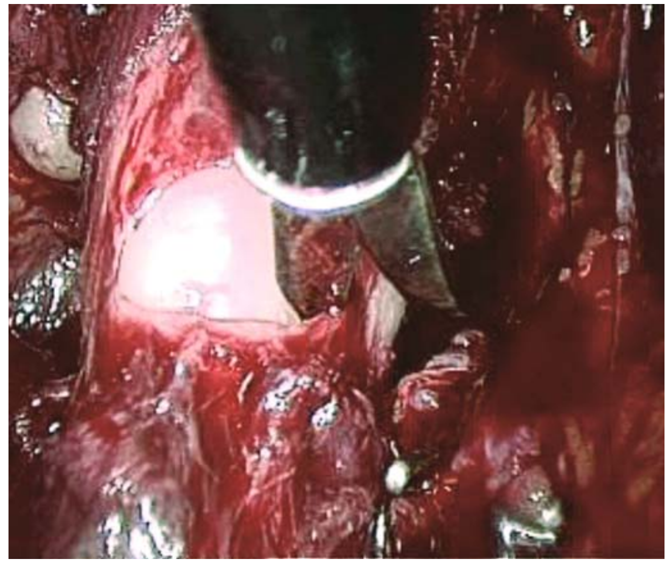
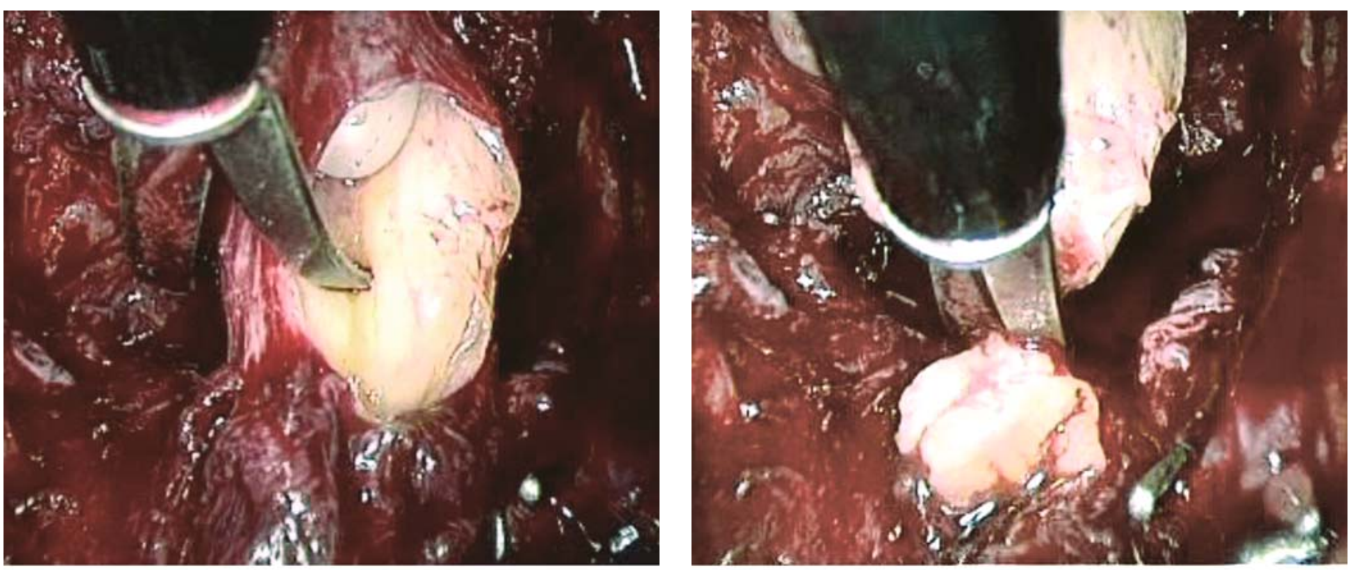
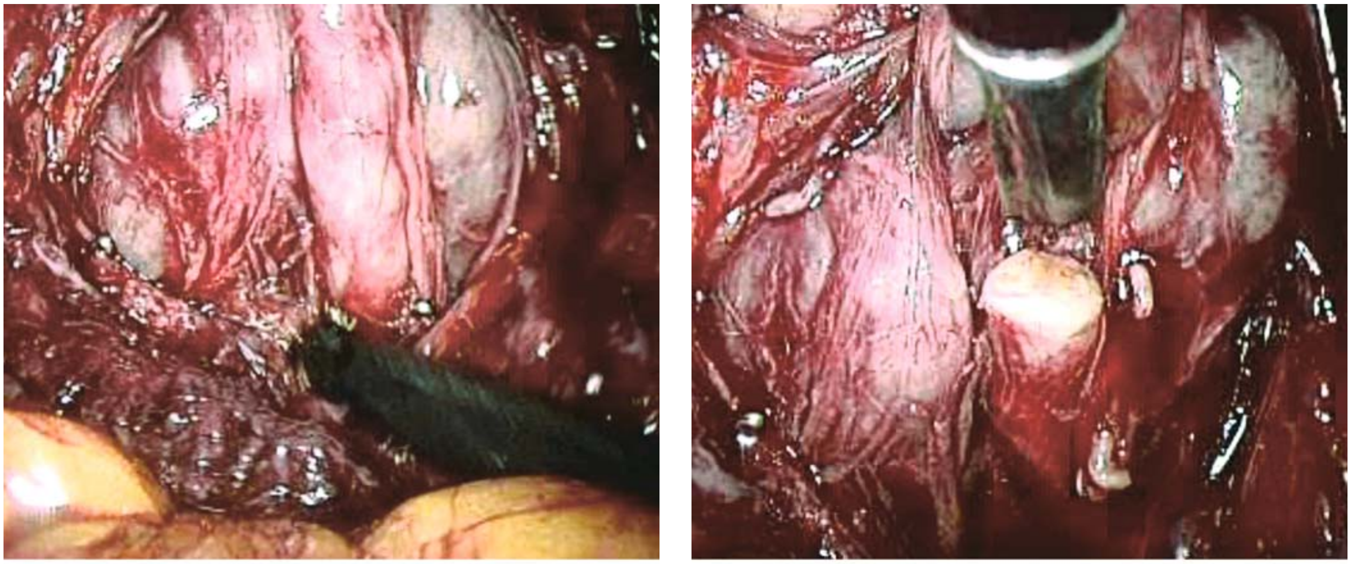


FIG. 28.6. Division of the bladder neck exposes the Foley catheter



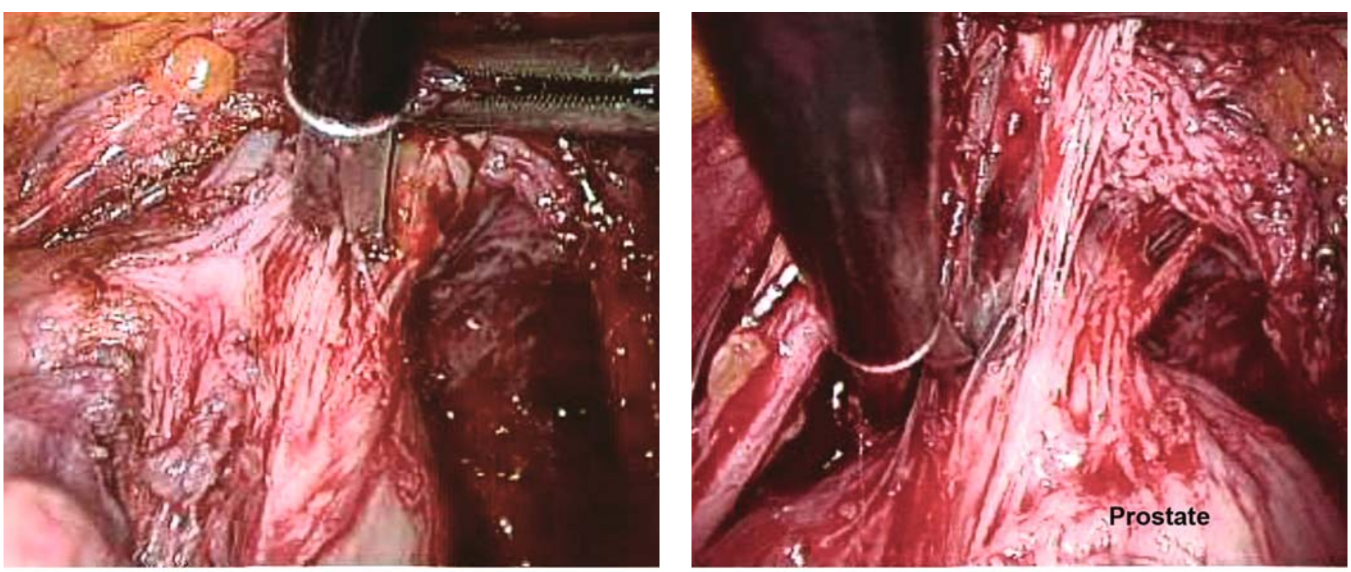
A B

FIG. 28.7. Division of the bladder neck



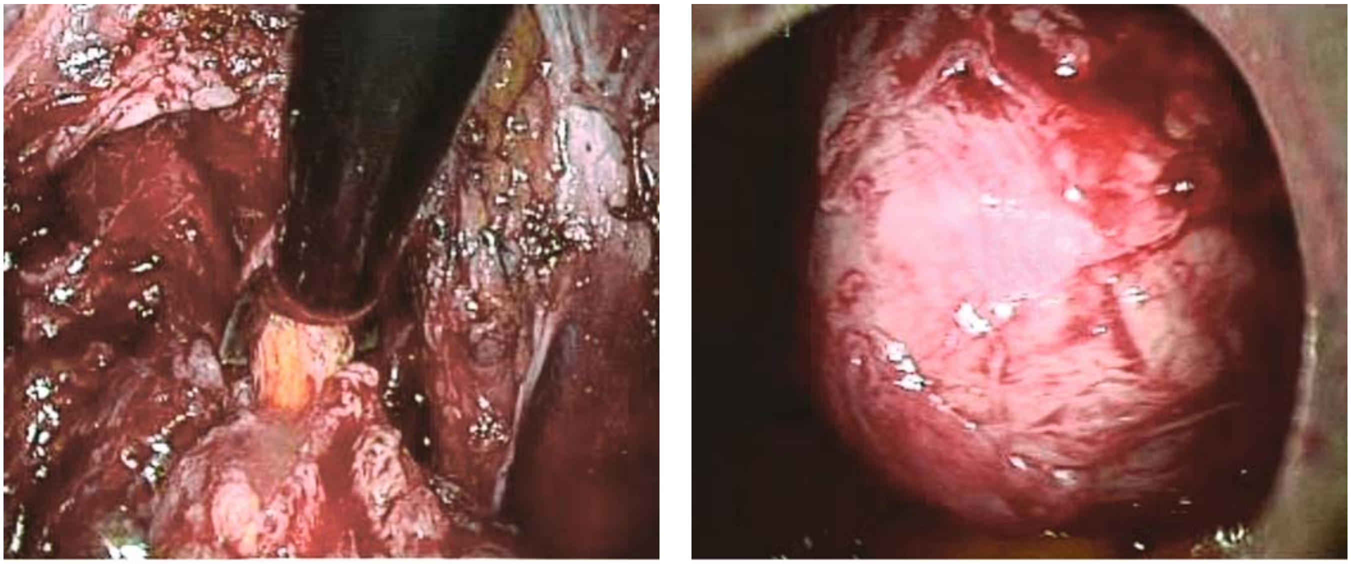
A B

Fig. 28.8. Dissection of the vasa and seminal vesicles and division of the vasa



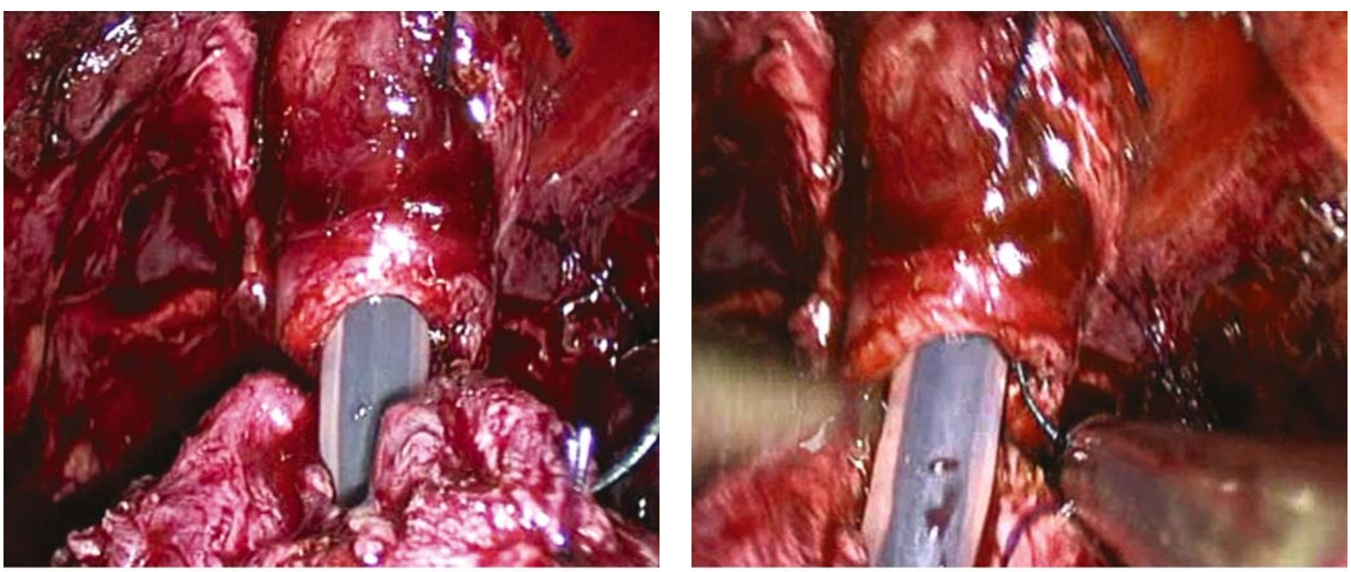
A B

Fig. 28.9. Dissection on the apex of the prostate



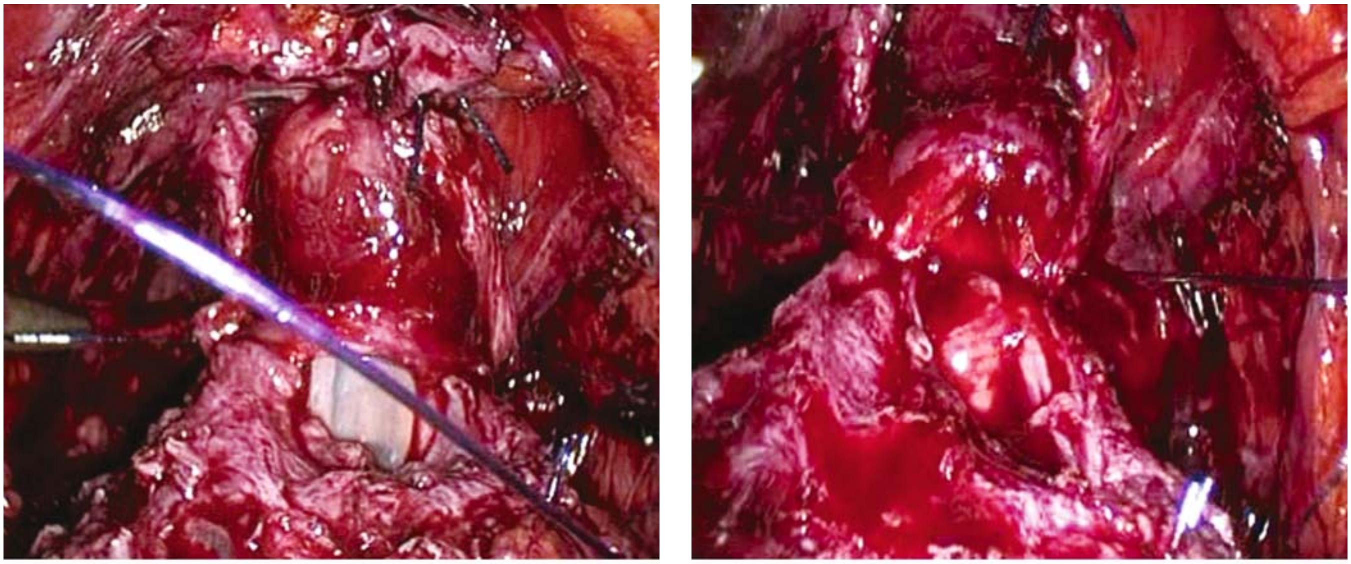
A B

Fig. 28.10. Division of the urethra and removal of the specimen



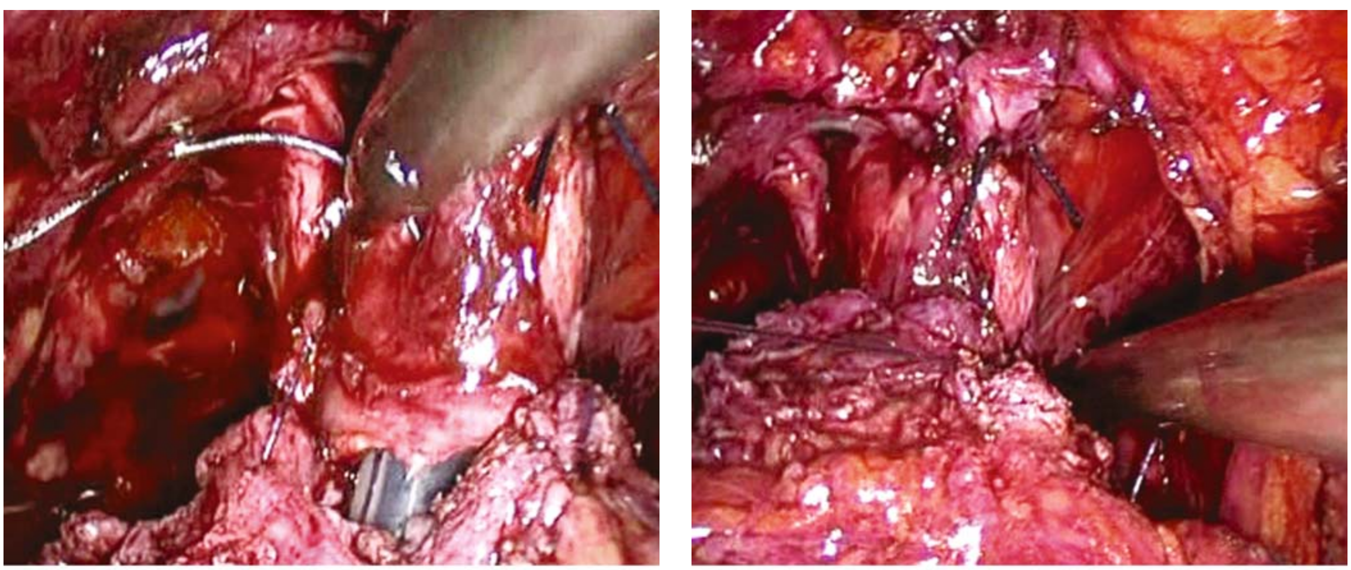
A B

Fig. 28.11. **(A)** Urethrovesical anastomosis started with 3-0 monofilament polyglactin outside-in through the bladder **(B)** Corresponding suture inside-out of urethra at the 3 o'clock position



A B

Fig. 28.12. Posterior urethrovesical anastomosis as a continuous suture



A B

Fig. 28.13. Anterior urethrovesical anastomosis

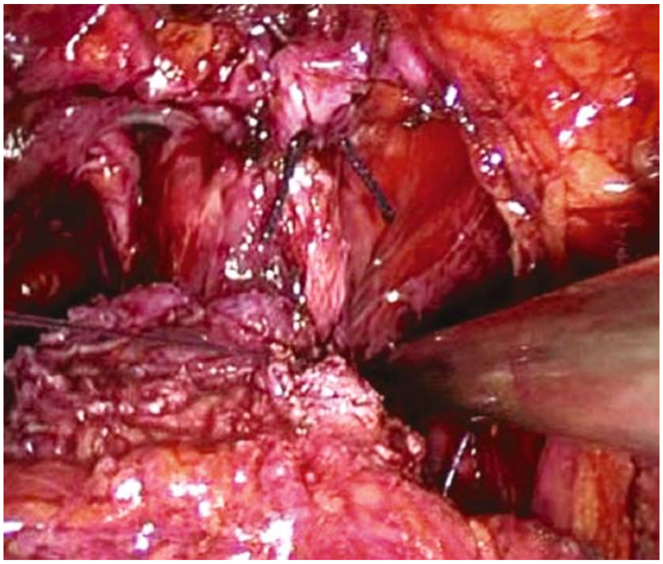


Fig. 28.14. Urethrovesical anastomosis is completed

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29

Robotic Radical Prostatectomy

Vipul R. Patel and Mario F. Chammas, Jr.

The concept of a laparoscopic approach to the treatment of prostate cancer is not new. In the early 1990s Schuessler et al described the laparoscopic pelvic lymph node dissection. Later, in 1992, Kavoussi and Clayman joined this group to describe their first successful laparoscopic radical prostatectomy (LRP) [9]. The early results were less than promising, with prolonged operative times and no major advantages over conventional surgery [8].

However, in the late 1990s the procedure was revived as European surgeons reevaluated LRP and reported its feasibility, with results comparable to the open surgical approach [2,4–7,10]. Despite this, a lack of widespread acceptance and utilization of LRP has been observed, partly due to the steep learning curve of this procedure. Even in the hands of experienced laparoscopic surgeons the technical challenges imposed by the limitations of conventional laparoscopic instrumentation are formidable. Potential difficulties include lack of depth perception with a two-dimensional laparoscopic view, counterintuitive motion, and non-wristed instrumentation limited to only four degrees of surgical freedom.

The introduction of robotic technology into modern-day operating rooms has revolutionized the laparoscopic approach to surgical procedures. The most commonly used surgical system is the Da Vinci robot (Intuitive Surgical, Sunnyvale, CA) (Fig. 29.1). The system provides magnified three-dimensional visual capabilities, tremor filtration, motion scaling, and wristed instrumentation with six degrees of surgical freedom (Fig. 29.2). The addition of the advantages provided by robotic technology to the urologist's armamentarium has the potential to reduce the learning curve and improve upon patient outcomes.

Menon, Guillonneau, and Vallancien developed the robotic prostatectomy at Henry Ford Hospital (Detroit, MI) in 2000. These authors compared their open and robotic radical prostatectomy experience, with results favoring the robotic approach [1]. Our experience with robotic radical prostatectomy currently stands at over 800 cases. Recently, our data on the first 200 patients were published in the *Journal of Urology*. Average operating room time was 141 minutes, with an estimated blood loss of 75 cc. The intraoperative complication rate was 1% with no mortality, reexploration, or transfusion; 95% of the patients were discharged on postoperative day 1 (range 1 to 3) with hematocrits averaging 34.5 (range 25 to 45). The average difference in pre- and postoperative hematocrit was 3 points (range −2 to 15). Average catheter time was 7.2 days (range 5 to 15). Positive margin rate was 10.5% for the entire series, 5.7% (for T2 tumors), 28.5% (T3a), 20% (T3b), and 33% (T4a). Ninety-five percent of patients have undetectable prostate-specific antigen (PSA) (<less than>0.1) at average follow up of 9.7 months. Continence at 1, 3, 6, 9, and 12 months was 47%, 82%, 89%, 92%, and 98%, respectively [3]. Robotic utilization is increasing quickly, with the main constraints being the lack of trained surgeons and the high capital and operational costs of the system.

Surgical Indications

Robotic radical prostatectomy can be performed for the same indications as open surgery: patients with suspected organ-confined disease and a realistic life expectancy of over 5 years.

Contraindications

Absolute contraindications include the following:
Urinary tract infection
Uncorrected bleeding disorders
Severe comorbid conditions
Incurable disease
Relative contraindications during the learning curve include the following:
Prostate size <greater than>200 g
Patient body mass index <greater than>50
Prior pelvic radiation

Surgical Technique

Preoperative Preparation

One hour prior to incision, cephalexin 1 g IV is infused. The patient is also given sequential compression devices on the lower extremities prior to induction of general anesthesia. The patient is then positioned in the low lithotomy position.

FIG. 29.1. The Da Vinci robot

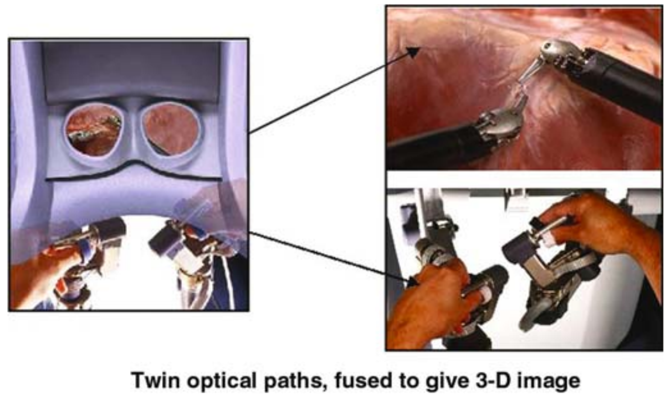


FIG. 29.2. Stereoscopic view with hand–eye alignment

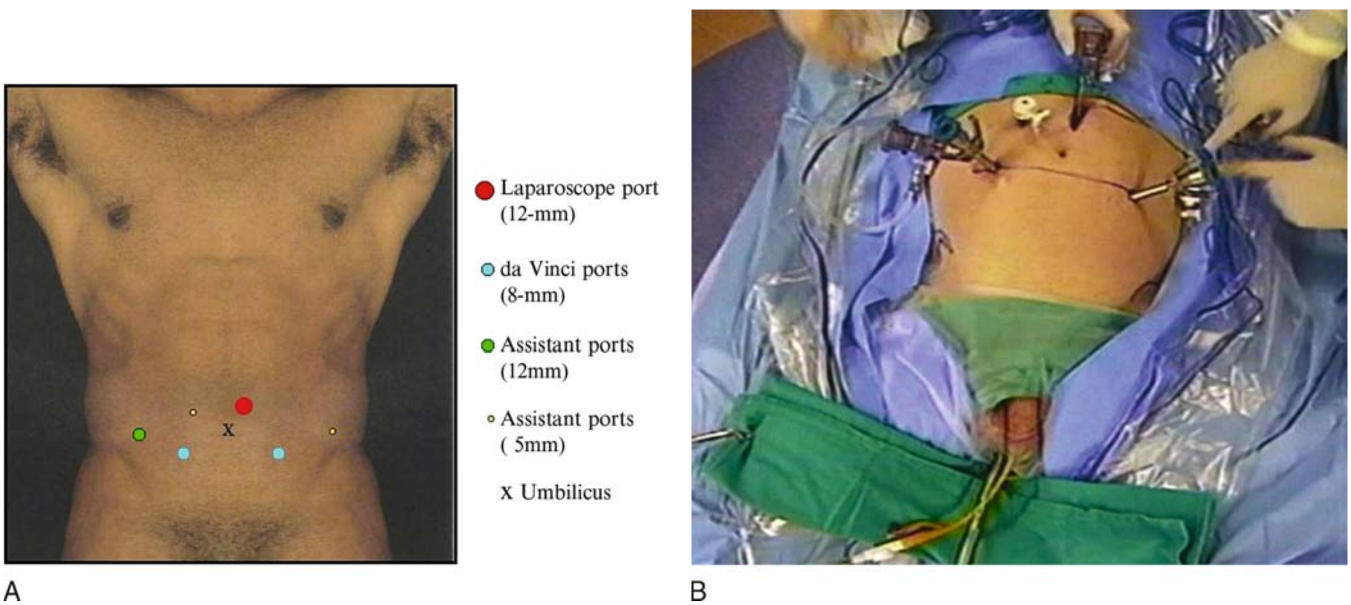


FIG. 29.3. **(A)** The port positions. **(B)** External view of the port positions

Intraabdominal Access and Trocar Placement

A transperitoneal approach was performed in all cases. The intraabdominal access is obtained 1 cm above and to the left of the umbilicus by either a Veress needle (95%) or a Hasson (5%) technique. Once access is obtained, the abdomen is insufflated with CO_2 to 15 mm Hg. Under direct vision the peripheral trocars are placed as shown in Figure 3.3B. The patient is then placed in a steep 30-degree Trendelenburg position, and the robot is brought inferiorly between the legs (Fig. 29.4).

Surgical Procedure

Step 1: Incision of the Peritoneum .and Entry into the Retropubic Space (Fig. 29.5)

The procedure is begun by using a 0-degree binocular lens. The four-armed robotic system is used with a Cardiere grasper, monopolar scissor, and bipolar Maryland in the three working arms. The peritoneum is incised to enter the retropubic space of Retzius, the boundaries being the pubic bone superiorly, the median umbilical ligaments laterally, and the vas deferens inferolaterally.

A B

Fig. 29.4. **(A)** The robot is brought inferiorly between the patient's legs; note the 30-degree Trendelenburg position. **(B)** Docking the robotic arms

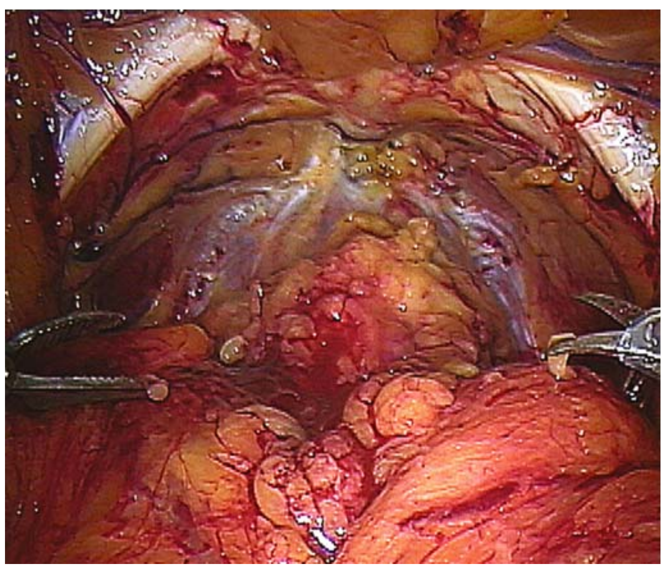


Fig. 29.5. Incision in the peritoneum and entry into the retropubic space

Step 2: Incision of the Endopelvic Fascia and Ligation of the Dorsal Venous Complex (Figs. 29.6 to 29.8)

The endopelvic fascia is then opened bilaterally and the levator fibers are pushed off the prostate until the perirectal fat is visualized. The dorsal vein is then suture ligated with a 0 Vicryl on a CT1 needle using the robotic needle drivers.

Step 3: Anterior Bladder Neck Dissection (Fig. 29.9A,B)

The laparoscope is then changed to a 30-degree down lens for the bladder neck dissection. Visual cues are of supreme importance and are used to guide the plane of dissection. The bladder is dissected off the prostate from lateral to medial

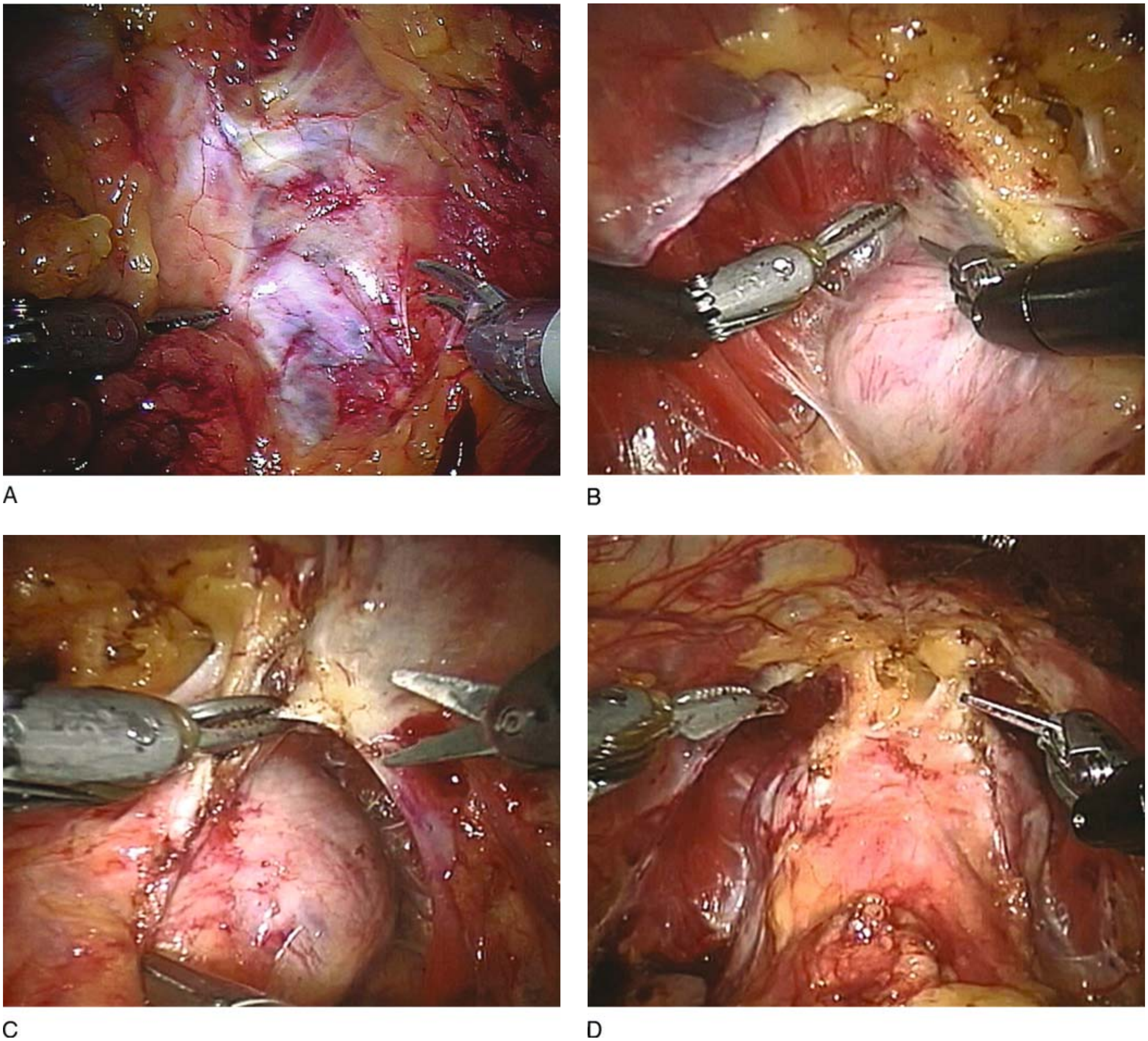


Fig. 29.6. **(A)** Incision in the endopelvic fascia. **(B)** Further dissection pushing away the levator ani muscle. **(C and D)** Puboprostatic ligaments coming into view

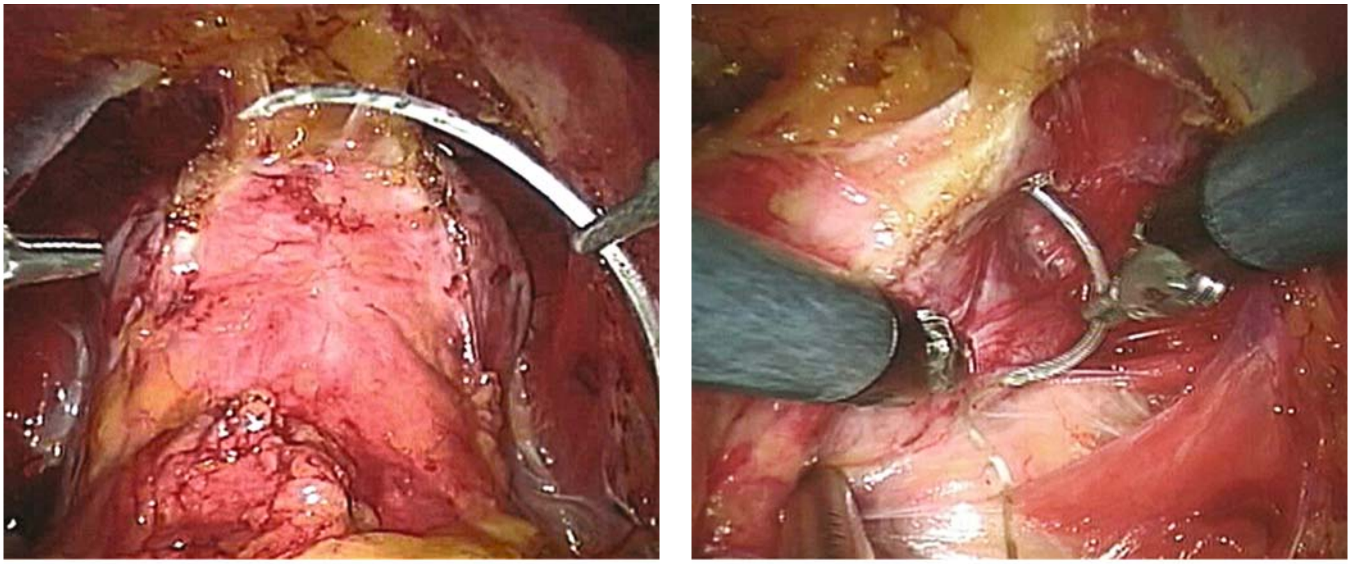
using the sweeping motion of the monopolar scissors. Once the anterior urethra is divided the Foley catheter is retracted out of the bladder and upward traction is applied.

Step 4: Posterior Bladder Neck (Fig. 29.9C)

The posterior bladder neck is then incised full thickness at the precise junction between the prostate and the bladder. Once this is performed, the lip of the posterior bladder neck is grasped with the bipolar Maryland and used for gentle traction to visualize the natural plane between the prostate and bladder inferiorly. The dissection is directly downward to visualize the seminal vesicles.

Step 5: Seminal Vesicle Dissection (Fig. 29.10)

The thin fascial layer over the seminal vesicles and vasa is opened. Both vasa are then incised, and the inferior portion of



A B

FIG. 29.7. **(A)** Dorsal vein complex (DVC) control with 0 Vicryl using a CT1 needle. **(B)** Dorsal vein complex (DVC) control with 0 Vicryl using a CT1 needle

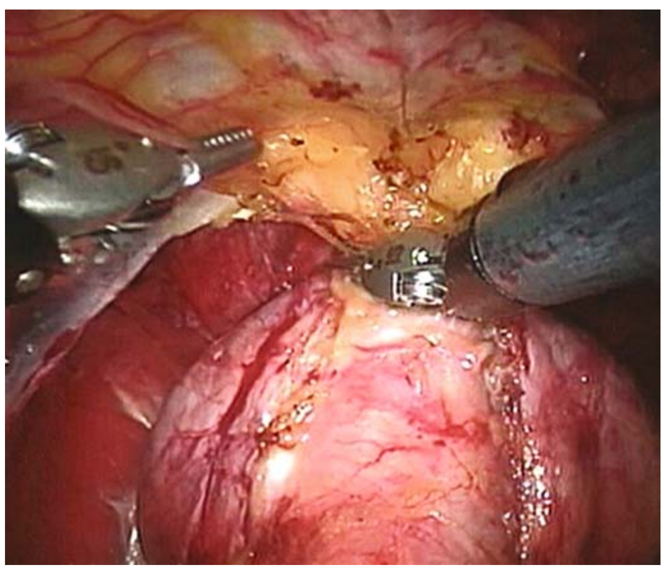


FIG. 29.8. Ligation of the dorsal vein complex (DVC)

the vas is retracted by the fourth arm. The vas is then followed to expose the tip of the seminal vesicle. Small perforating vessels are cauterized with the bipolar instrument. Both seminal vesicles are delivered in a similar manner.

Step 6: Denonvilliers' Fascia and Posterior Dissection (Fig. 29.11)

The bipolar and the cold scissors are used for the remaining dissection to prevent injury to the neurovascular bundle.

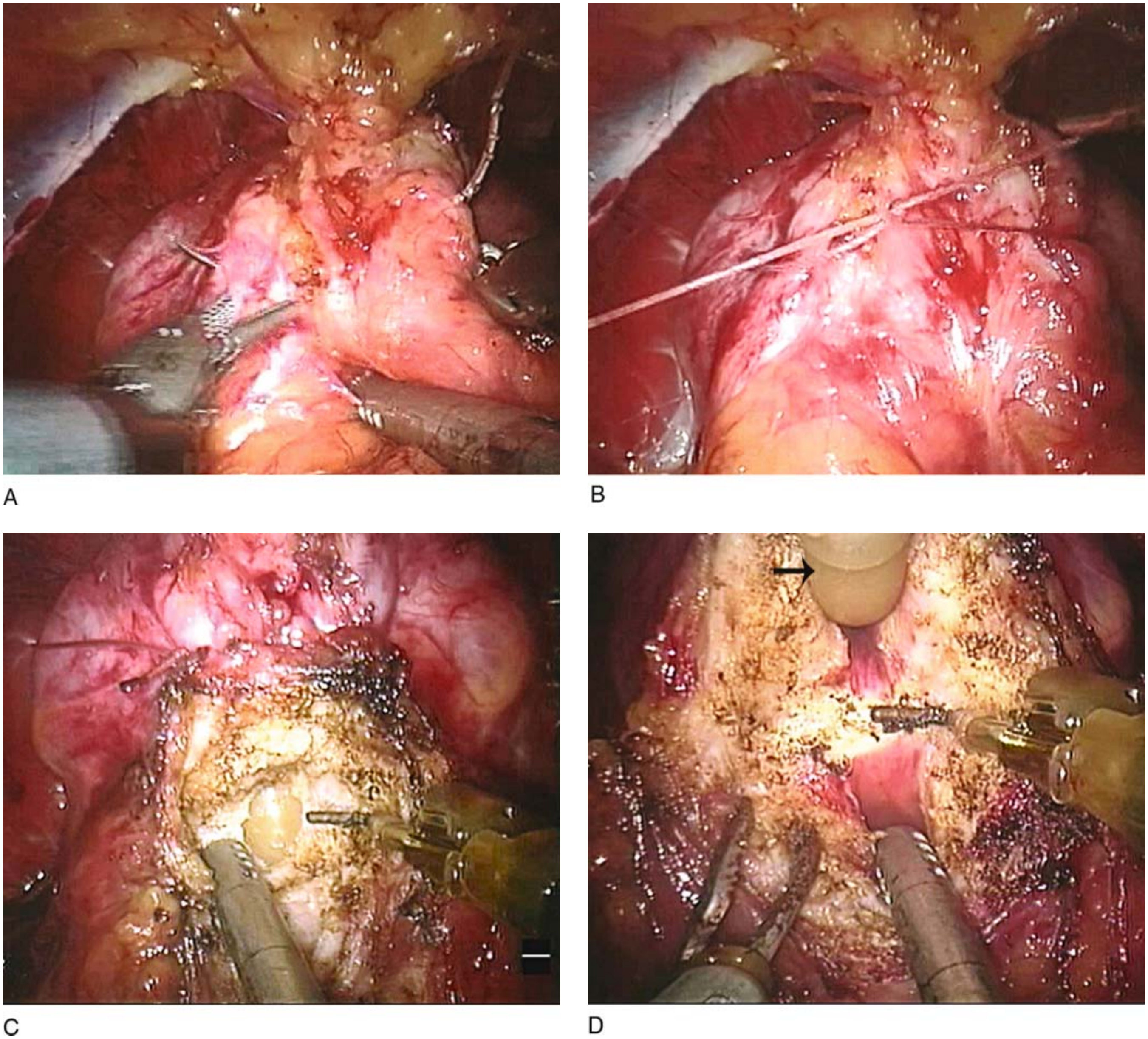


FIG. 29.9. **(A and B)** Suture ligature over bladder neck to reduce back bleeding. **(C)** Division of anterior aspect of bladder neck. **(D)** Division of posterior aspect of bladder neck (Foley)

Denonvilliers' fascia is incised and the posterior rectal plane dissected, leaving the prostate hanging by its pedicle and lateral attachments.

Step 7: Nerve Sparing (Figs. 29.12 and 29.13)

If nerve sparing is indicated, it is performed in an antegrade manner from the prostatic pedicle to the apex. The procedure is begun by visualizing the lateral borders of the prostate. The assistant provides contralateral traction in order to provide exposure. The lateral prostatic fascia is then divided with a clean incision of the cold scissors. The neurovascular bundle is then swept down. Once the apex is reached the neurovascular bundle can be seen in close proximity to the urethra, it must be released from the periurethral tissue using cold scissors.

Step 8: Apical Dissection

The apical dissection is performed with the 0-degree lens to allow better visualization of the apex and urethra. Cold scissors are used to divide the dorsal venous complex (Fig. 29.14A) and urethra, liberating the prostate fully (Figs. 29.14B,C and 29.15).

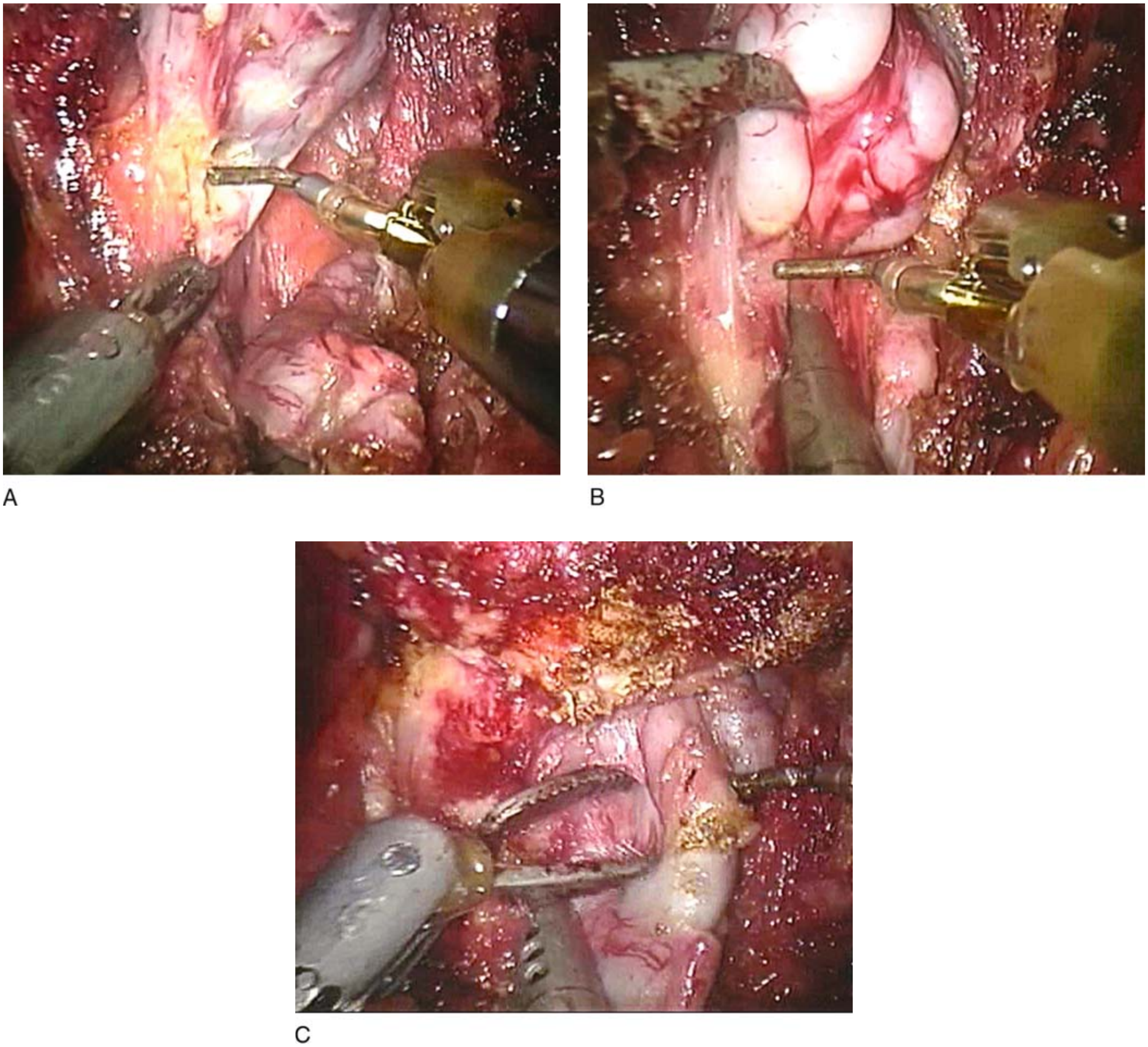


Fig. 29.10. **(A and B)** On dividing the bladder neck, the vasa and seminal vesicle come into view. **(C)** Isolation and division of the vas

Step 9: Urethrovesical Anastomosis (Figs. 29.16 and 29.17)

The anastomosis between the bladder neck and urethra is performed using a continuous suture as described by Van Velthoven et al [10]. The urethra and bladder are then reapproximated using a continuous stitch of two 3-0 Monocryl sutures of different colors on an RB1 needle that are tied together, with each individual length being 17 cm. First, the posterior urethral anastomosis is performed with one arm of the suture in a clockwise direction. This is followed by completion of the anterior anastomosis with the second arm of the suture in an counterclockwise direction. The sutures are then tied together and a Foley catheter placed.

Conclusion

Robotic radical prostatectomy is a feasible and safe alternative for the treatment of prostate cancer. The procedure allows technical precision in a relatively bloodless field. Our short-term results have shown excellent functional and oncologic outcomes.

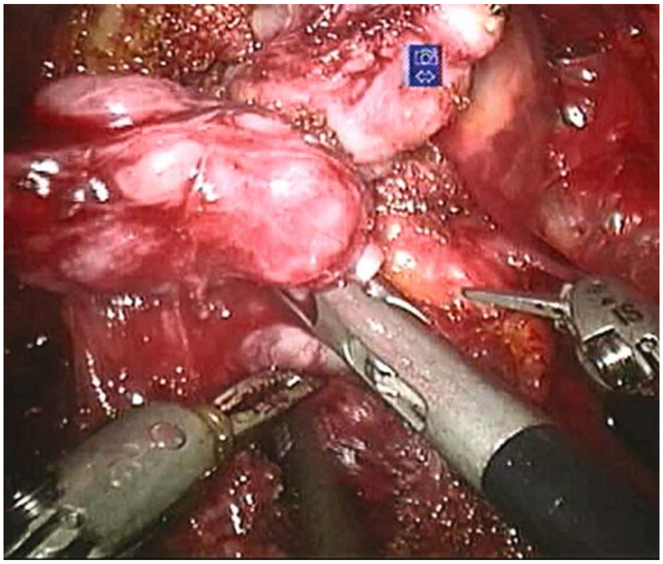


FIG. 29.11. Dissection of the seminal vesicle off the anterior wall of rectum

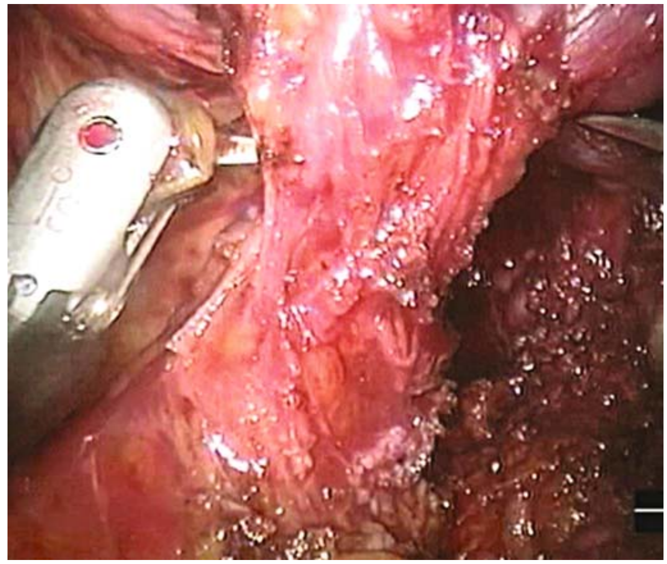
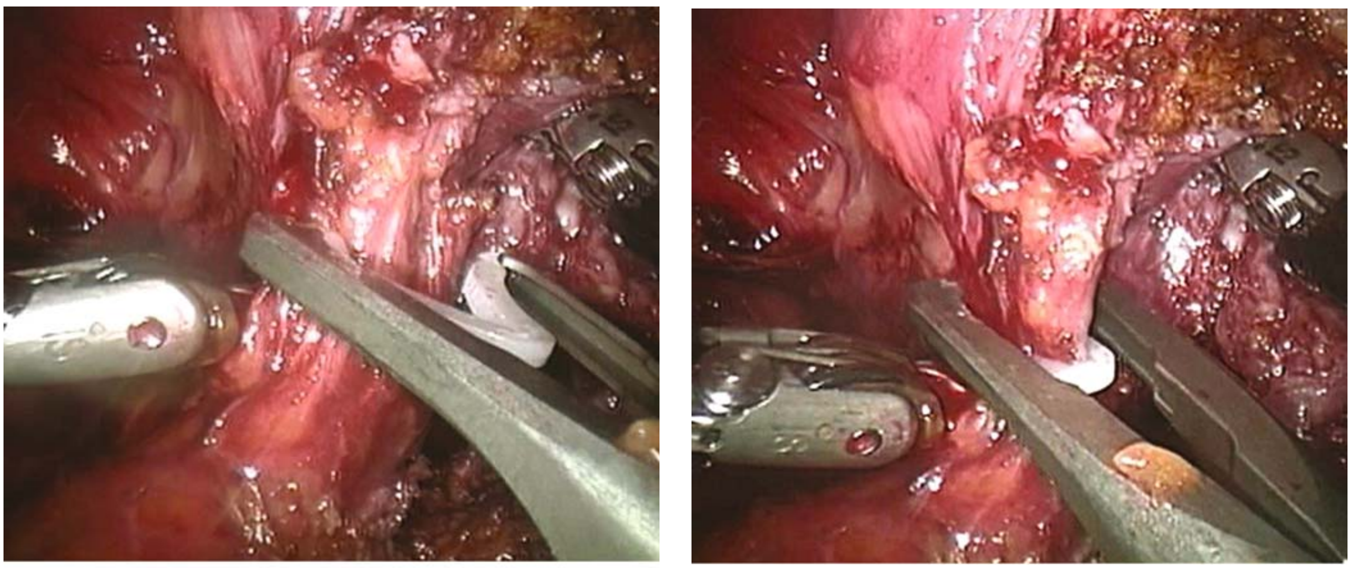
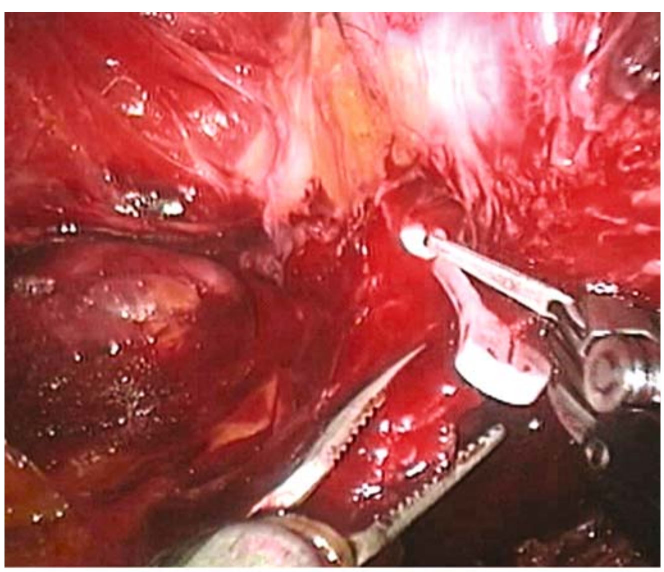


FIG. 29.12. Dissection of the neurovascular bundle



A



B

FIG. 29.13. **(A)** Controlling the prostatic pedicle with a Weck clip. **(B)** Division of the prostatic pedicle on the other side

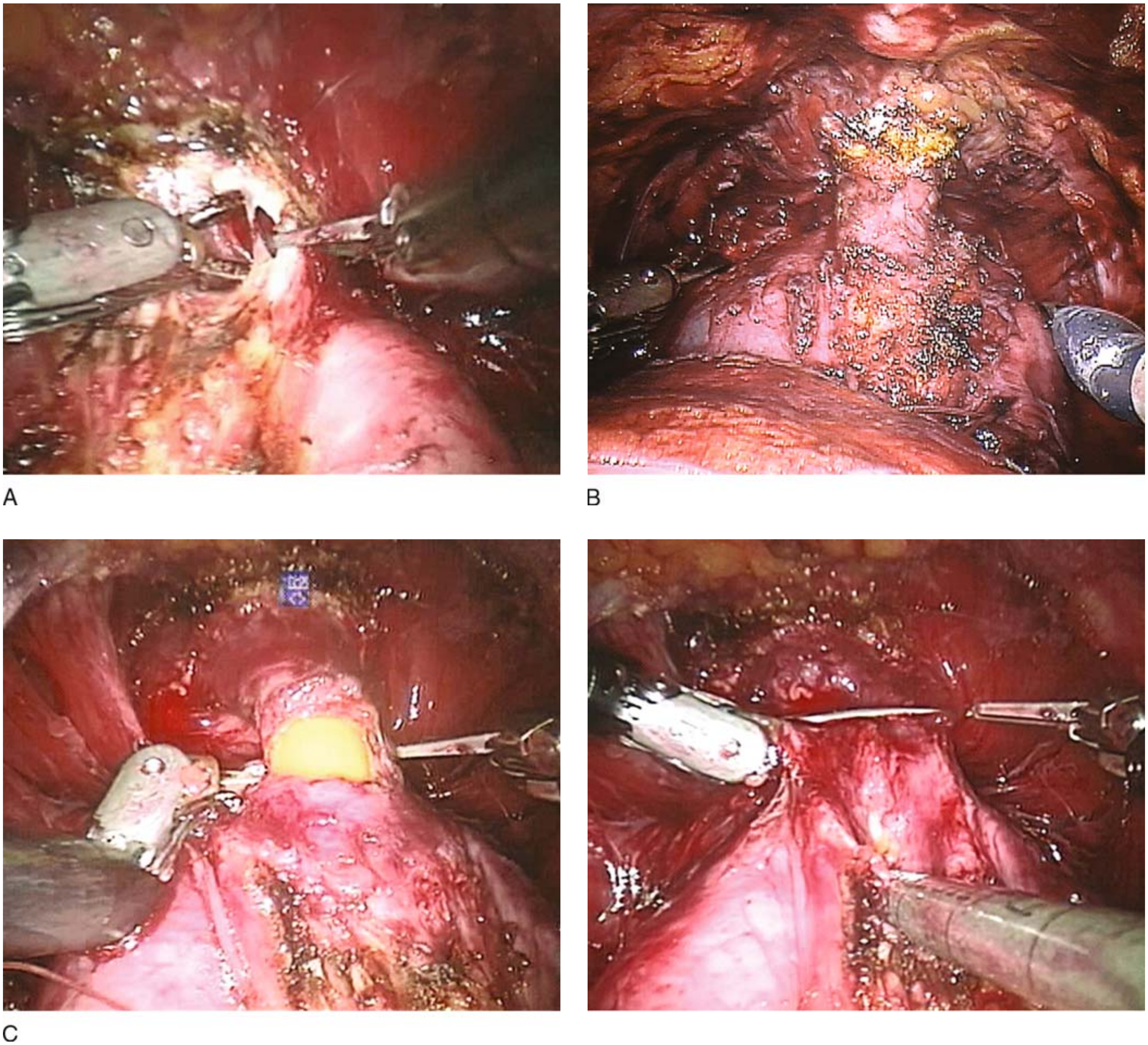


FIG. 29.14. **(A and B)** Division of the dorsal vein complex (DVC). **(C)** Apical dissection. **(D)** Division of urethra with cold scissors

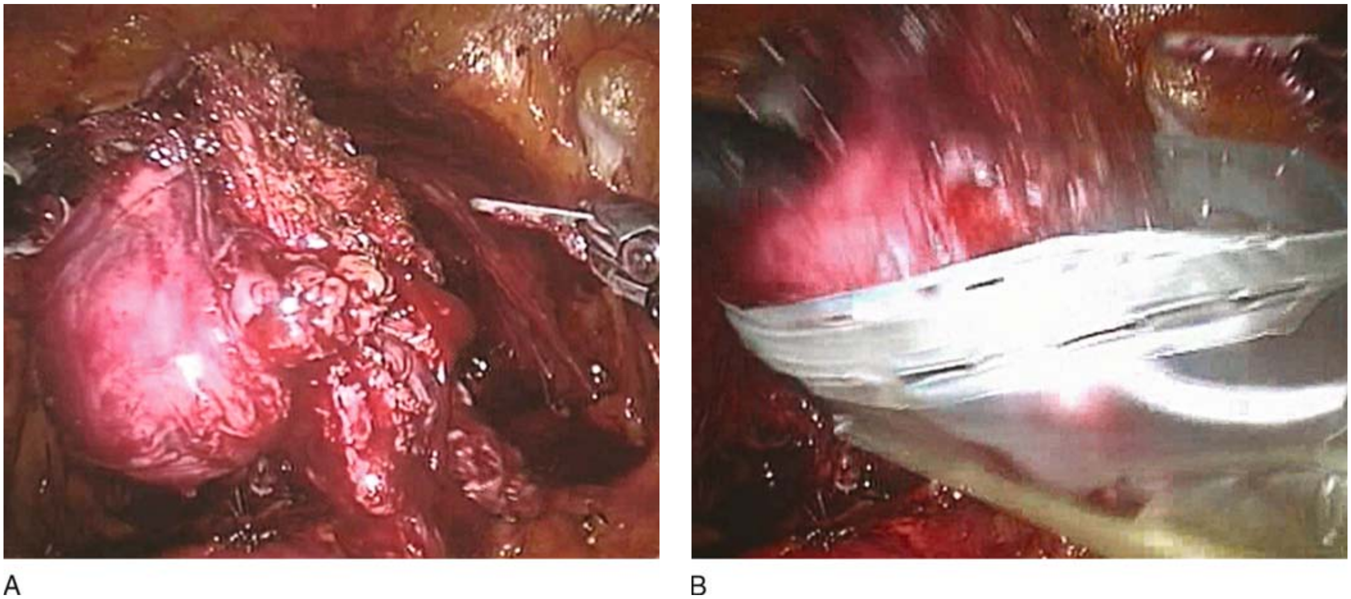


Fig. 29.15. **(A)** Specimen is completely detached. **(B)** Specimen is entrapped and placed aside to be retrieved at the end

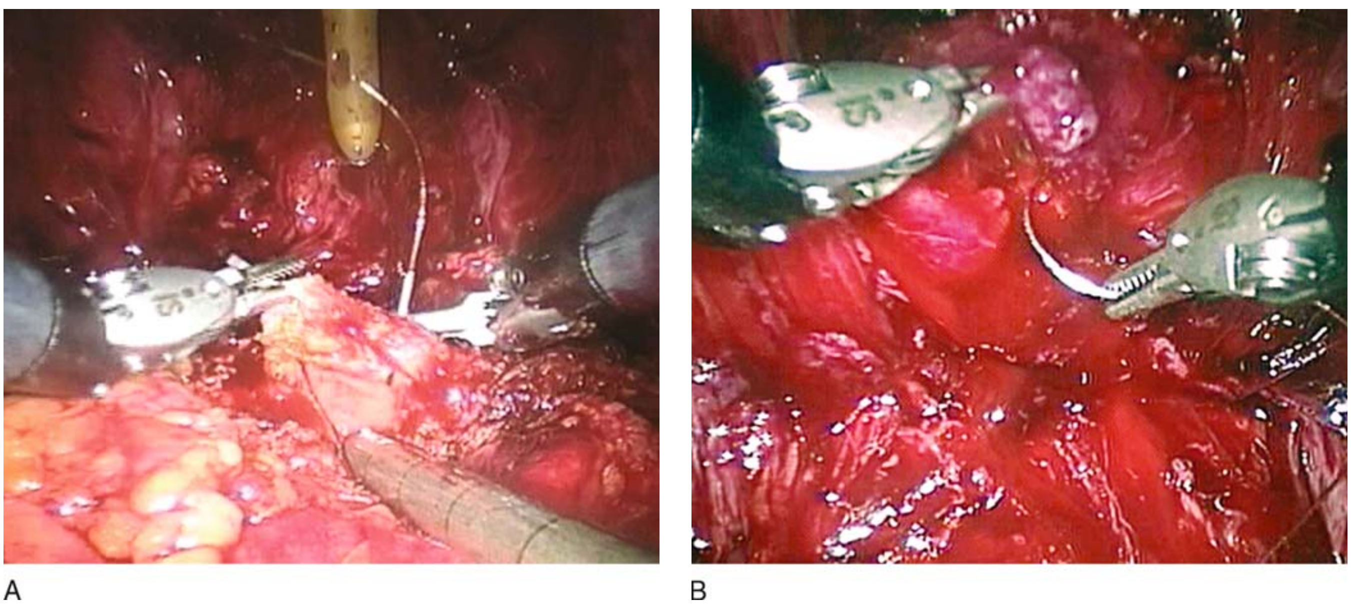


Fig. 29.16. **(A)** Initial suture of the vesicourethral anastomosis is started with 3-0 Monocryl (RB1 needle) outside-in through the posterior wall of the bladder. **(B)** A corresponding suture taken inside-out through the divided urethra at the 6 o'clock position. **(C)** After a few running sutures, the cut ends of the bladder and urethra can be seen apposed without much tension

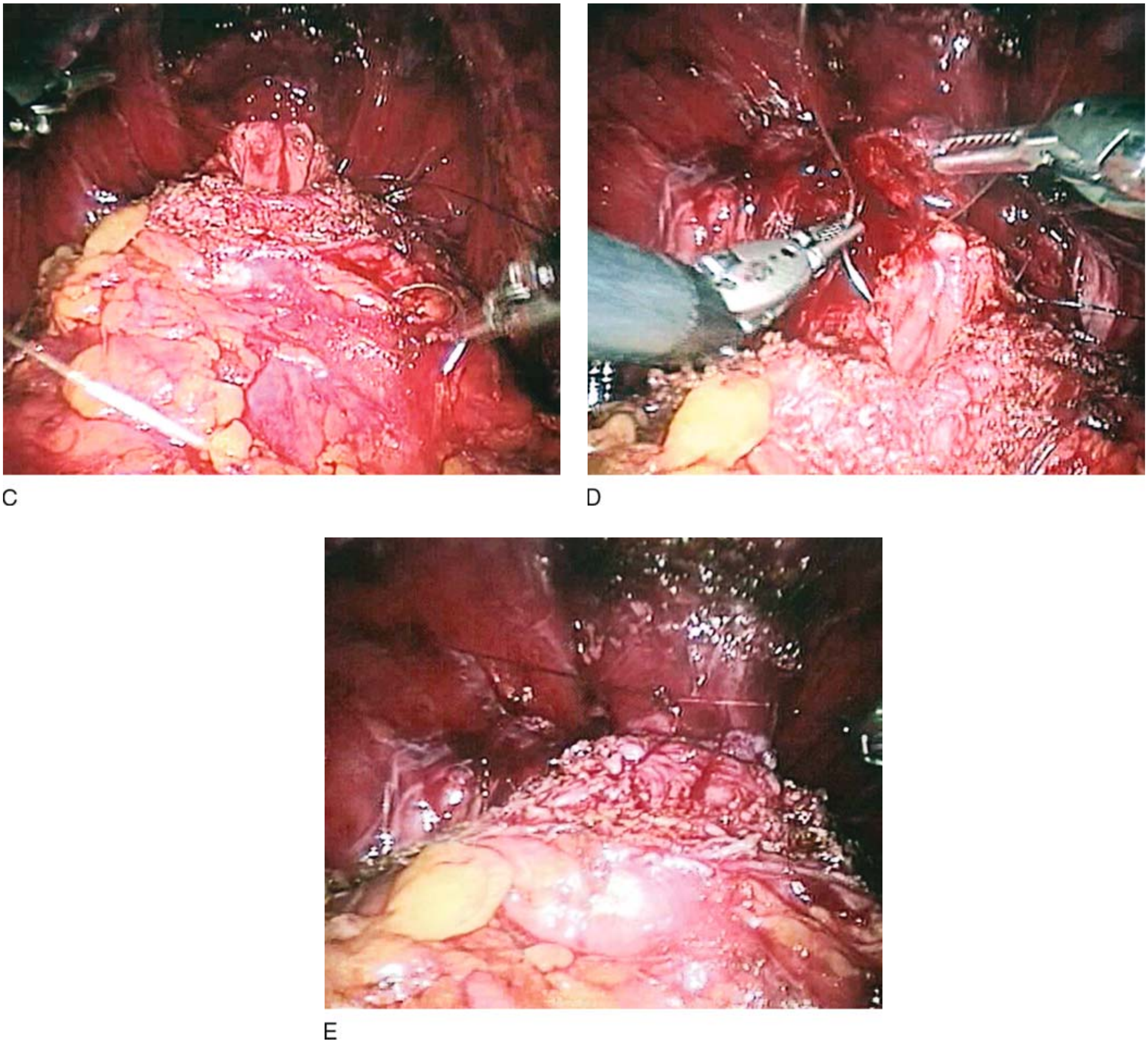


FIG. 29.16. **(D)** Subsequent suturing continues. **(E)** View of the completed vesicourethral anastomosis

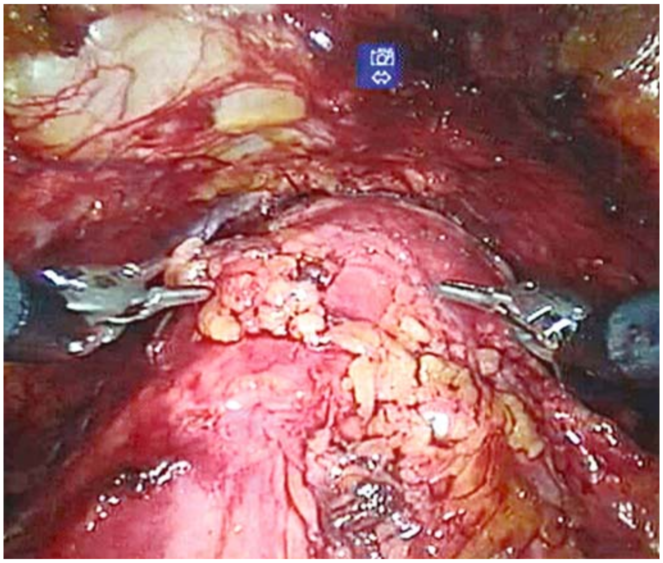


FIG. 29.17. Distending the bladder to make sure there is no obvious leak

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30
Laparoscopic Excision of a Seminal Vesicle Cyst

M. Ramalingam and K. Senthil

Symptomatic benign conditions of seminal vesicle (lesions such as cysts that need intervention) can be managed laparoscopically because the visualization is better and the access is easier than in open surgery [1,2].

Indications

Large seminal vesical cyst with voiding difficulty.

Contraindications

Malignancy of the seminal vesicles.

Surgical Technique

Patient Preparation

Bowel preparation is mandatory. Preliminary cystoscopy and ureteric catheterization are useful in cases of large seminal vesicle cyst to help avoid injury to the ureter. The seminal vesicle is approached transperitoneally.

A supraumbilical camera port, two ports in the midclavicular line at the level of umbilicus for hand instruments, and a flank port for retraction/suction are used. The bulge of the seminal vesicle cyst is easily seen through the peritoneum. The first step is to incise the peritoneum over the rectovesical pouch. The flank port can be used to retract the bowel cephalad. The ipsilateral vas is a good guide to locate the seminal vesicle. A blunt dissection of the seminal vesicle cyst is done, and a few small vessels can be tackled with either ultracision or bipolar cautery. If the cyst is very large, it can be aspirated for an easier dissection. The cyst is disconnected from the ejaculatory duct and is retrieved using an endocatch bag.

Thorough irrigation and suction are performed at the end.

Conclusion

Nonmalignant seminal vesicle conditions can be dealt by laparoscopy with minimal morbidity.

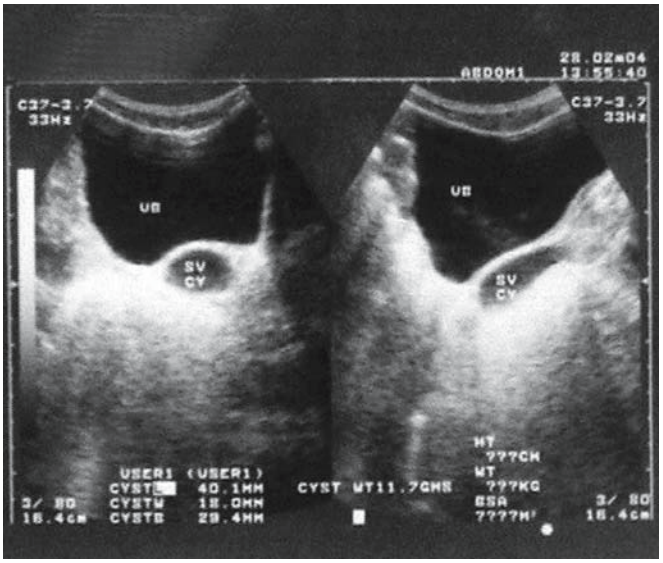

FIG. 30.1. Ultrasound scan shows the left seminal vesical cyst

FIG. 30.2. A computed tomography (CT) scan shows the left seminal vesical cyst with a Hounsfield value not suggestive of tumor

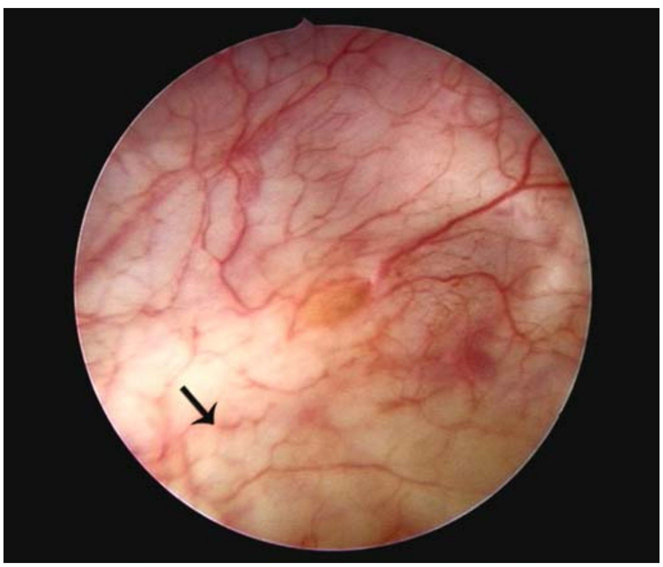

FIG. 30.3. Cystoscopy showing smooth bulge in the left hemitrigone (arrow)

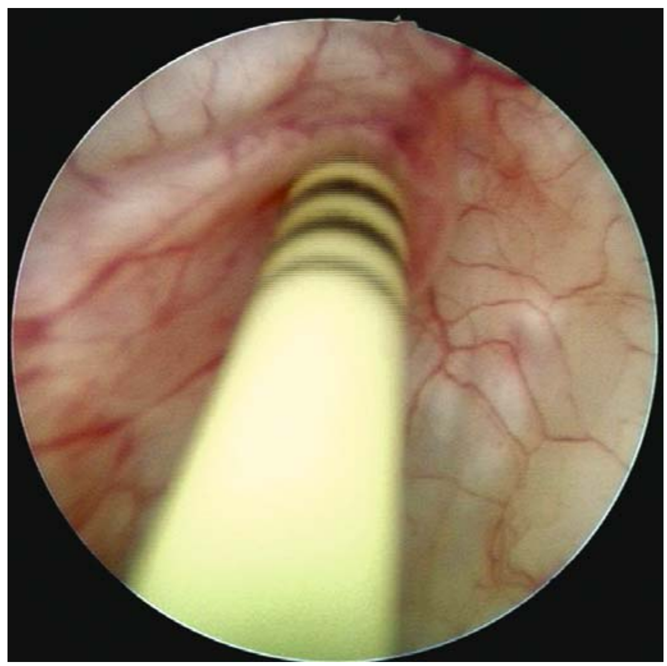

FIG. 30.4. Ureteric stent left in for any guidance, which may be needed during laparoscopy

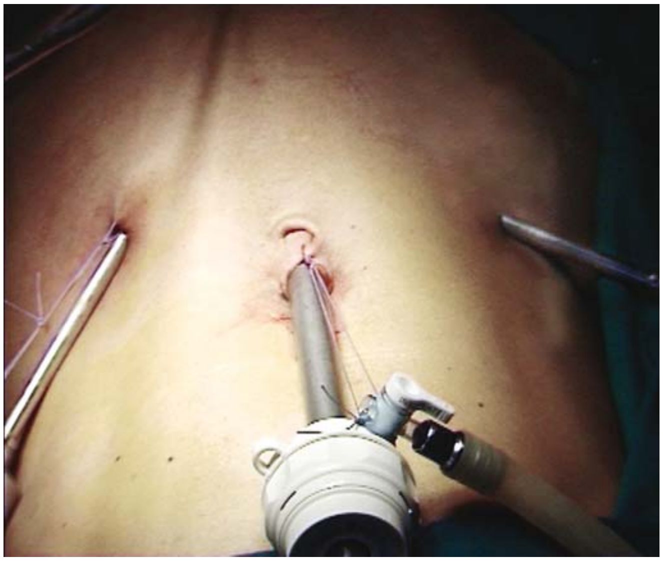

FIG. 30.5. The port positions; patient is in a modified lithotomy position

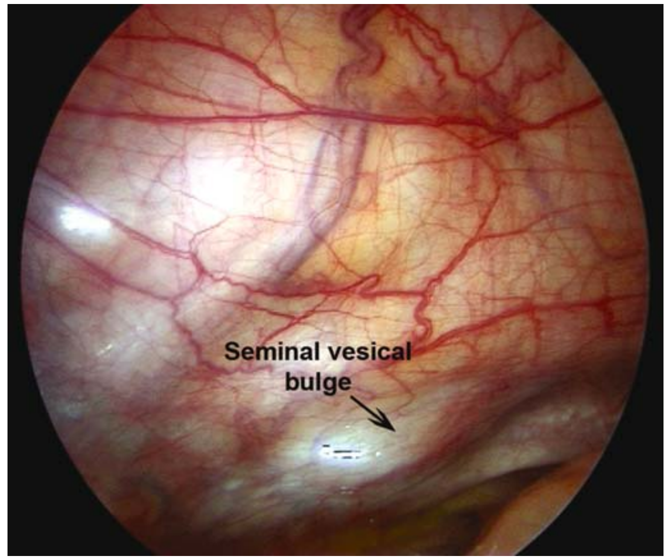

FIG. 30.6. Initial laparoscopic view shows smooth bulge in the recto-vesical pouch

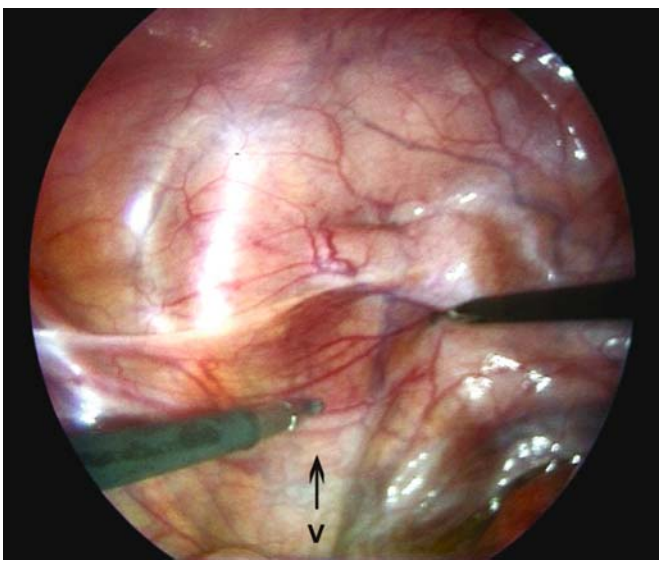

FIG. 30.7. Vas (v) as a guide leading to the area of the cyst (bulging area)

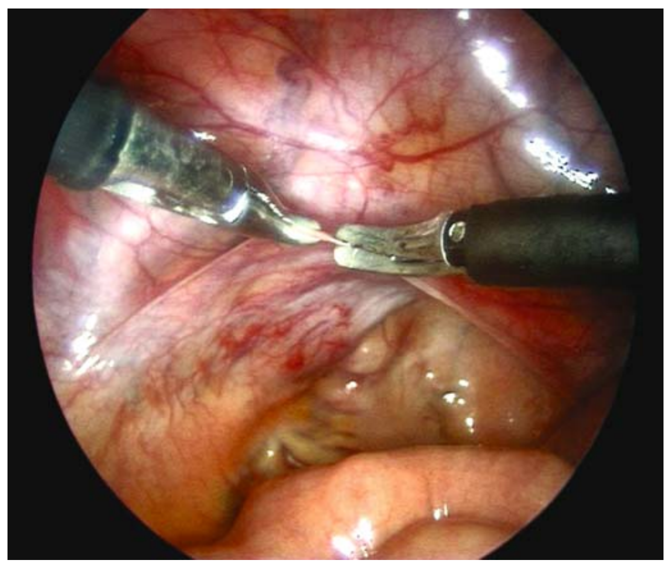

FIG. 30.8. Incision of the peritoneum in the rectovesical pouch

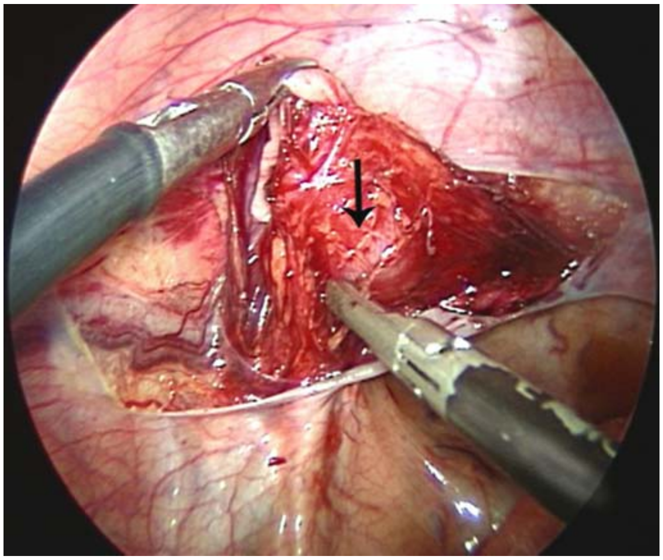

FIG. 30.9. Tracing the vas and reflecting the peritoneum exposes the cyst (arrow)

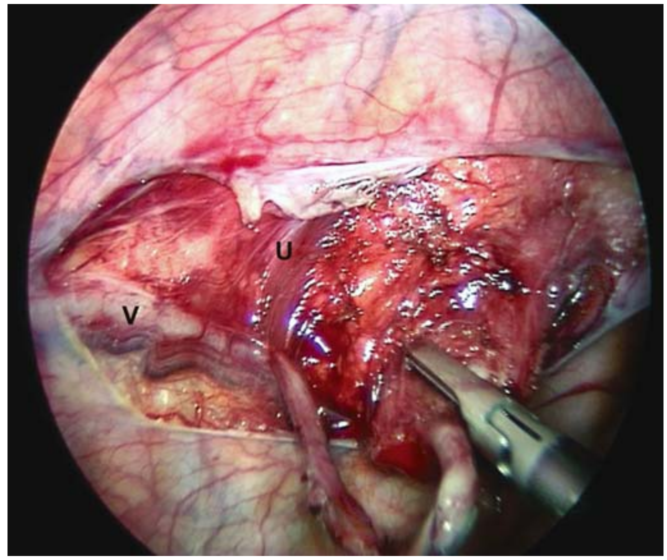

FIG. 30.10. Bipolar coagulation or ultracision is safer for hemostasis (U, ureter; v, vas deferens)

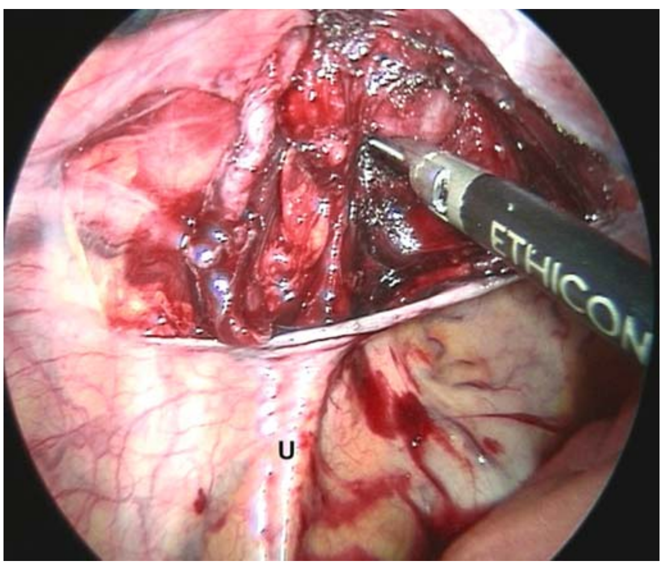

FIG. 30.11. Vessels to the seminal vesicle managed with ultracision; the ureter (U) is identified by the bulge due to the preplaced ureteric stent

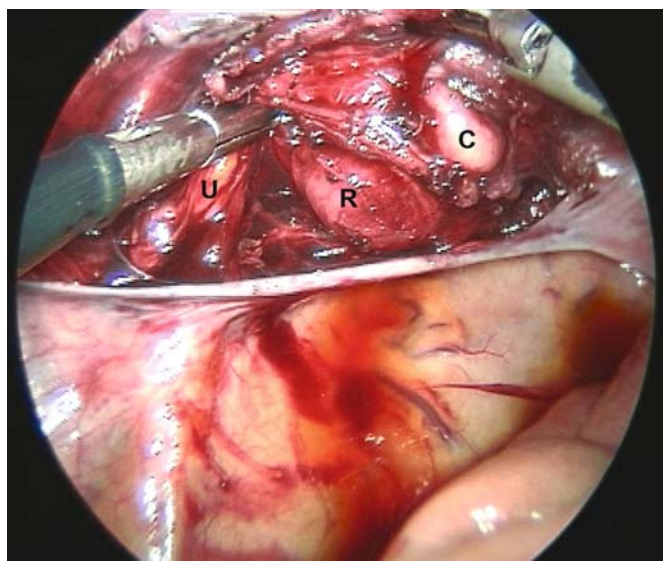

FIG. 30.12. A rectal finger guides the dissection of the cyst from the rectal wall (U, ureter; R, rectum; C, cyst)

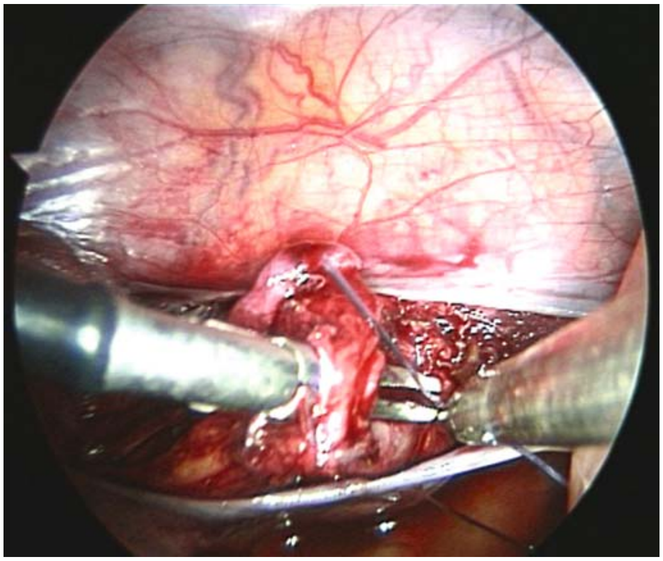

FIG. 30.13. The pedicle to the seminal vesical is better ligated or clipped than managed with electrocautery

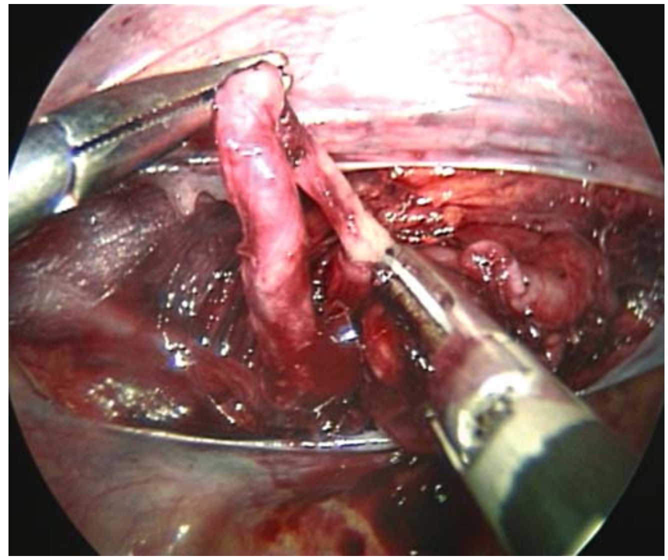

FIG. 30.14. Division of the vas

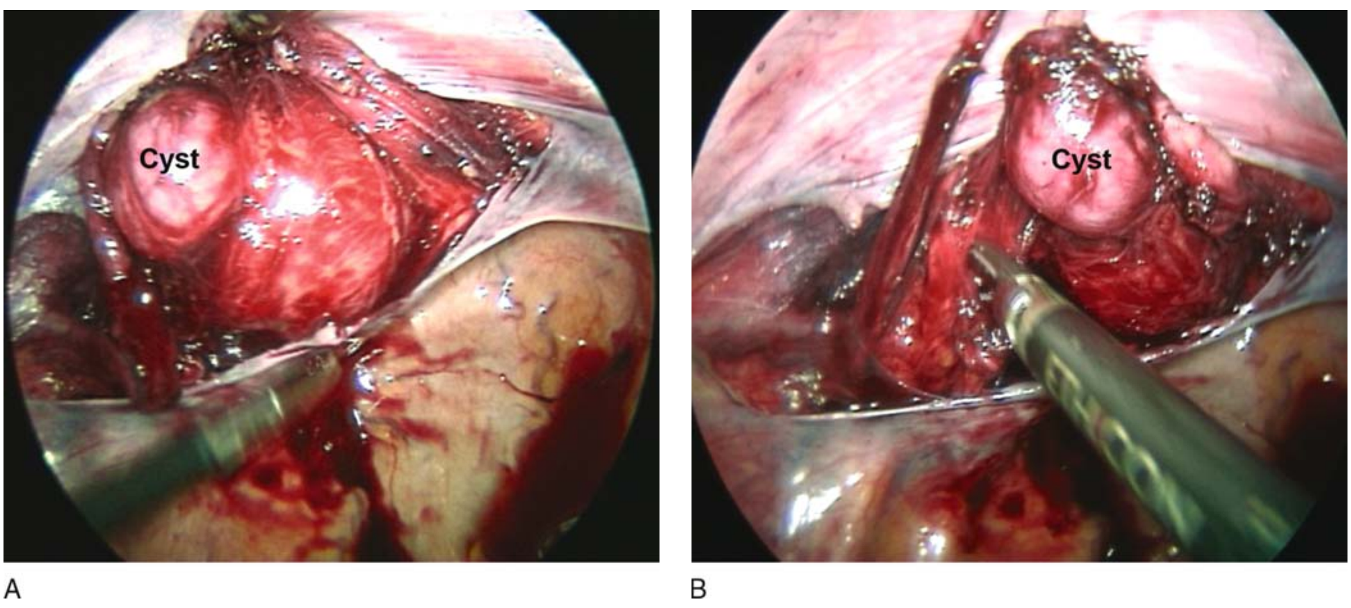

FIG. 30.15. Further dissection of the cyst is in progress

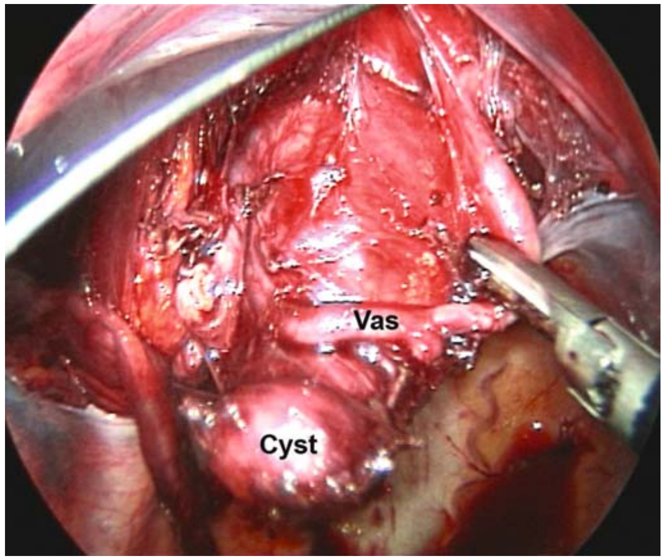

FIG. 30.16. The vas of the right side and the prostate coming into view

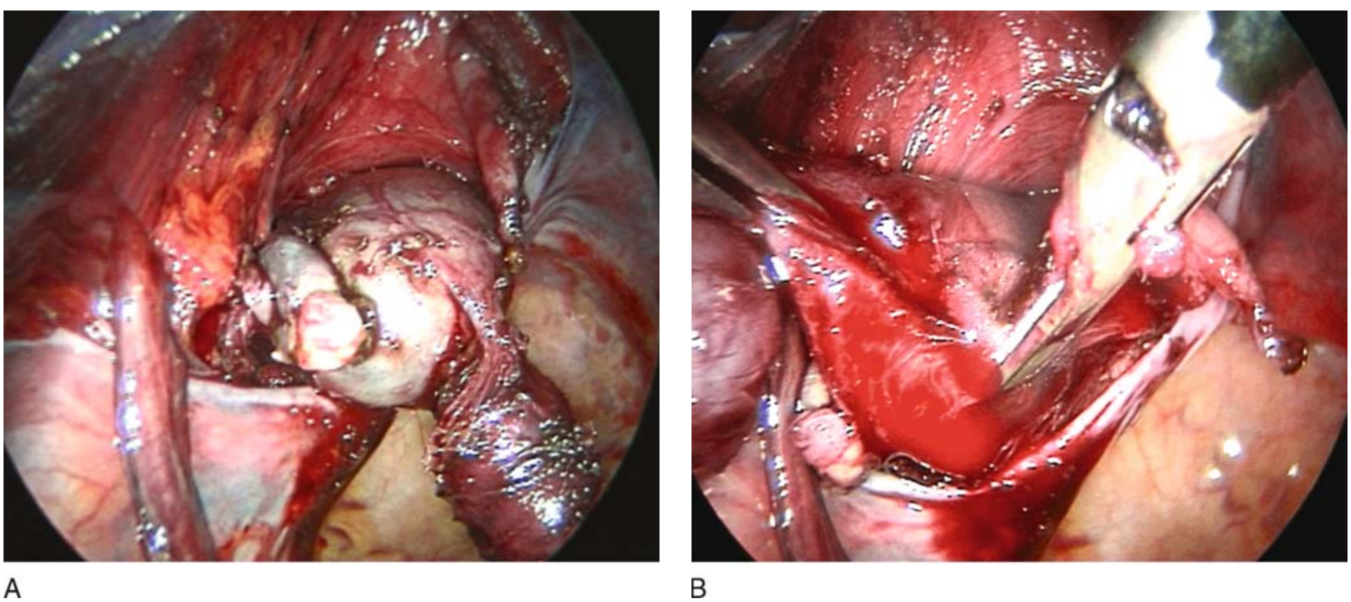

FIG. 30.17. Dissection is nearly completed

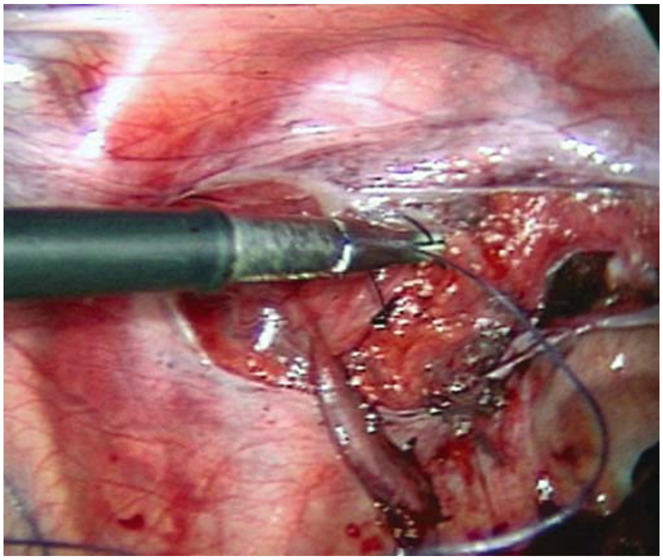

FIG. 30.18. Further hemostasis by suture ligation

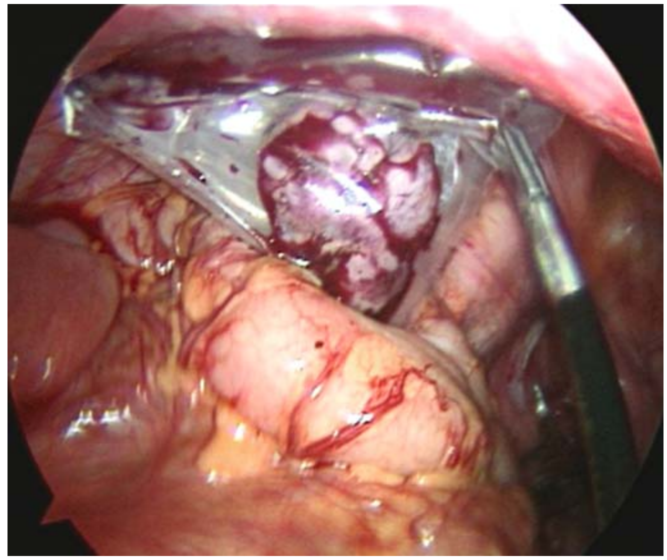

FIG. 30.19. Specimen entrapment in a plastic bag

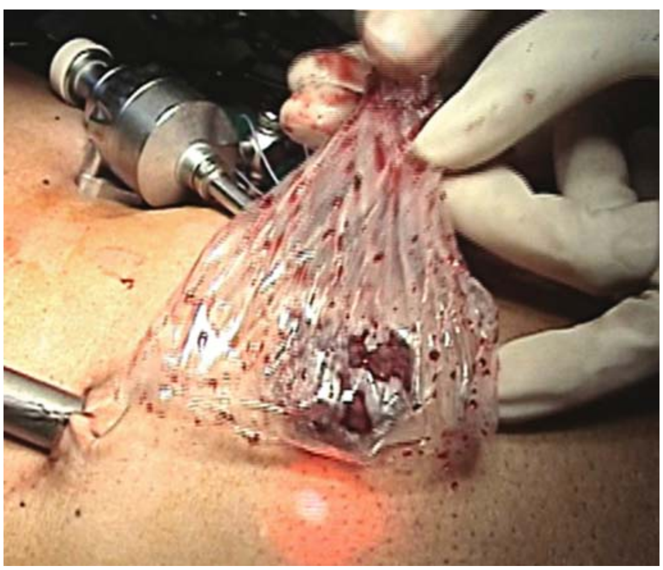

FIG. 30.20. Specimen retrieved by an enlarging umbilical port

FIG. 30.21. Retrieved specimen shows only inflammatory changes

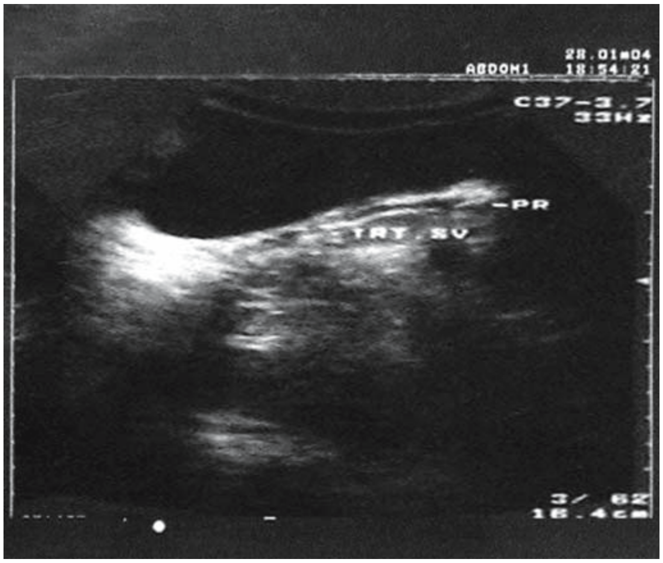

Fig. 30.22. Postoperative ultrasound does not reveal any residual cyst

References

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Section VI
Procedures for an Undescended Testis

31
Laparoscopic Surgery for an Undescended Testis

K. Selvarajan

In a patient with an undescended testis, a thorough clinical examination will reveal that the testis is either palpable or impalpable. In all cases of clinically palpable testis, open orchiopexy is the best choice. When testis is clinically impalpable, the choice of investigation is diagnostic laparoscopy [1,2,4]. The accuracy of laparoscopy in determining the site of the intraabdominal testis is very good. Further, it helps determine how to proceed. The decision is made based on the findings on laparoscopy [3,5,6].

Surgical Technique

For a low intraabdominal testis, the technique is a single-stage orchiopexy with mobilization of vas and gonadal vessels. For a high intraabdominal testis, the technique is a single-stage orchiopexy with ligation and division of gonadal vessels and mobilization of vas and its artery, or a two-stage orchiopexy, in which the first stage is ligation of the gonadal vessels, and the second stage (8 to 12 weeks later) is division of the gonadal vessels and mobilization based on the artery to the vas.

Excision of the testis is performed if it is very small. Exploration of the inguinal canal is performed if the gonadal vessels and vas are entering into internal ring. For an inguinal testis, either exploration of inguinal canal or laparoscopic mobilization can be done.

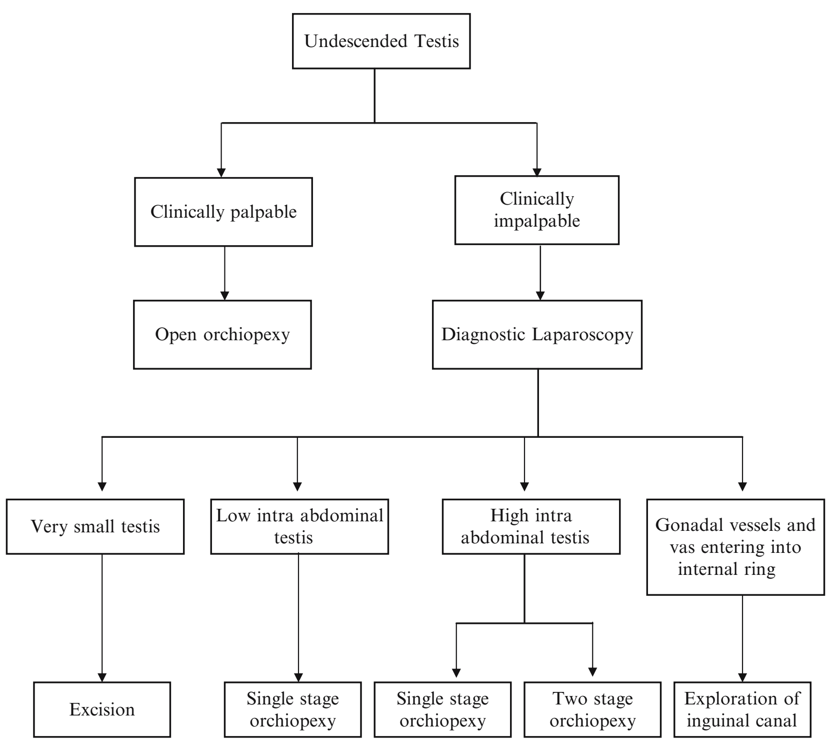


FIG. 31.1. The algorithm outlines the management for an undescended testis. The patient is placed in the head-down position, and general anesthesia is administered.

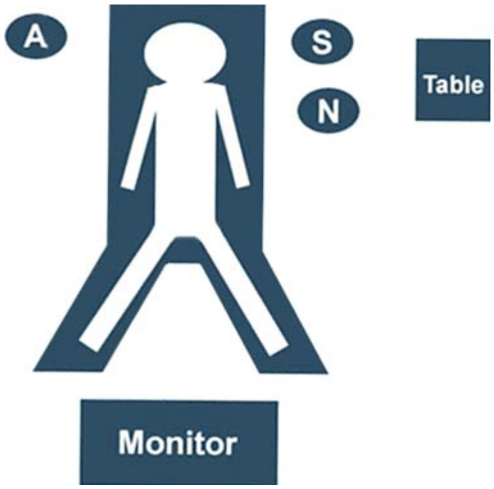


Fig. 31.2. Operation room setup (S, surgeon; A, assistant with the camera; N, nurse; M, monitor)

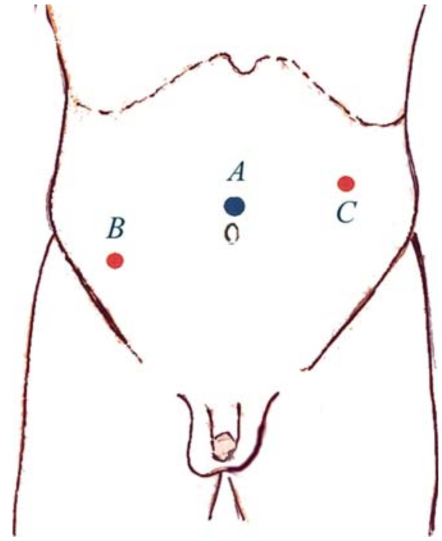


Fig. 31.3. Left-side orchiopexy (A, camera port; B and C, working ports)

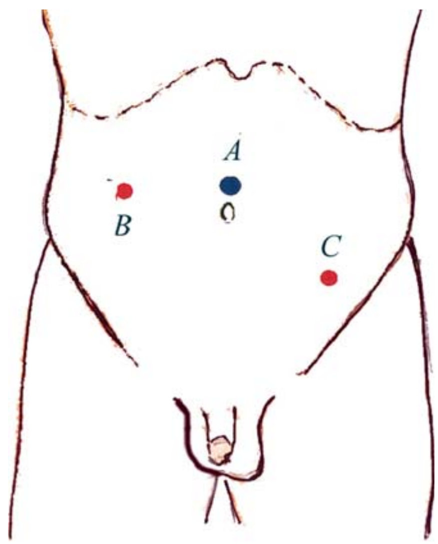


Fig. 31.4. Right-side orchiopexy

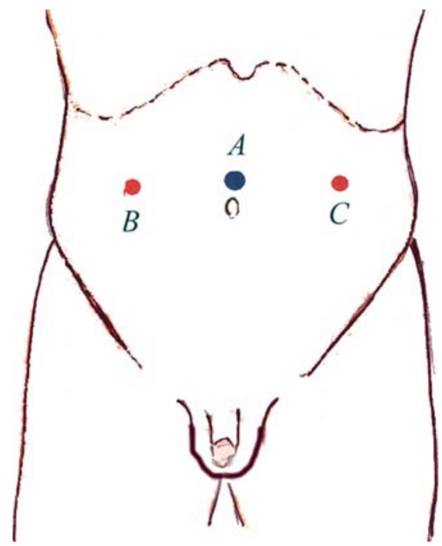


Fig. 31.5. Bilateral orchiopexy

Management

Port Positions

The mobilized testis is brought down through a tract that is created by different methods.

Methods

1. Through the scrotal incision a trocar (10 or 12 mm) is introduced and manipulated into the inguinal canal.
2. Through the scrotal incision a hemostat inserted.
   c. Under the guidance of the laparoscope, an instrument is introduced through the inguinal canal into the scrotum. An incision is made in the scrotum over the instrument. This instrument guides a hemostat from below into the peritoneum to bring down the testis.

Conclusion

Laparoscopy is the first step in localizing a nonpalpable testis or proving its absence. A testis found in the inguinal canal on laparoscopic examination needs inguinal exploration or laparoscopic mobilization based on the surgeon's choice. Single-stage orchiopexy for a low intraabdominal testis and two-stage orchiopexy for a high intraabdominal testis give good results. Bilateral undescended testes are also managed laparoscopically on the same principles as an unilateral undescended testis with the distinct advantages of no additional incision or ports.

Laparoscopic Single-Stage Orchiopexy

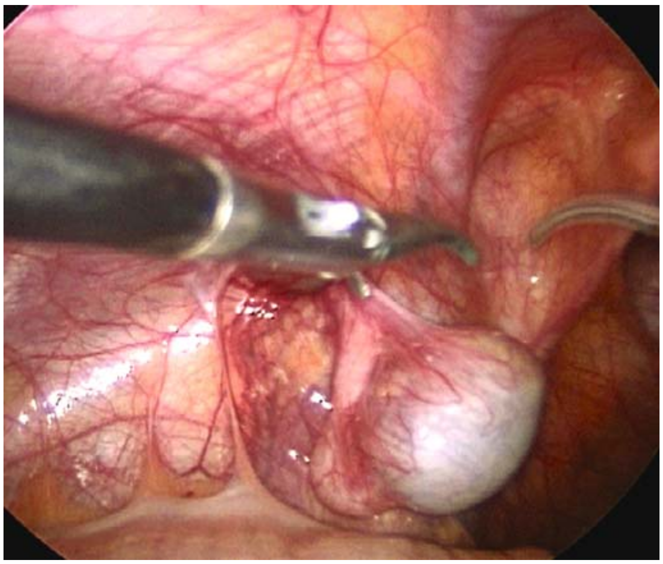


FIG. 31.6. Initial view shows the testis at the internal ring level

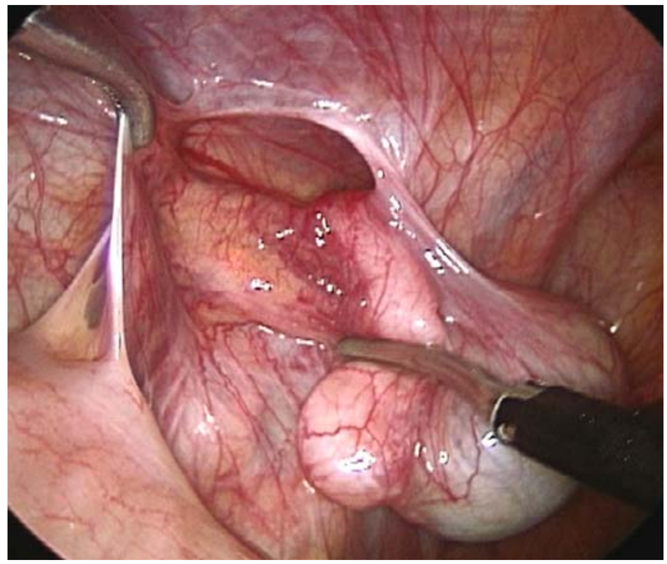
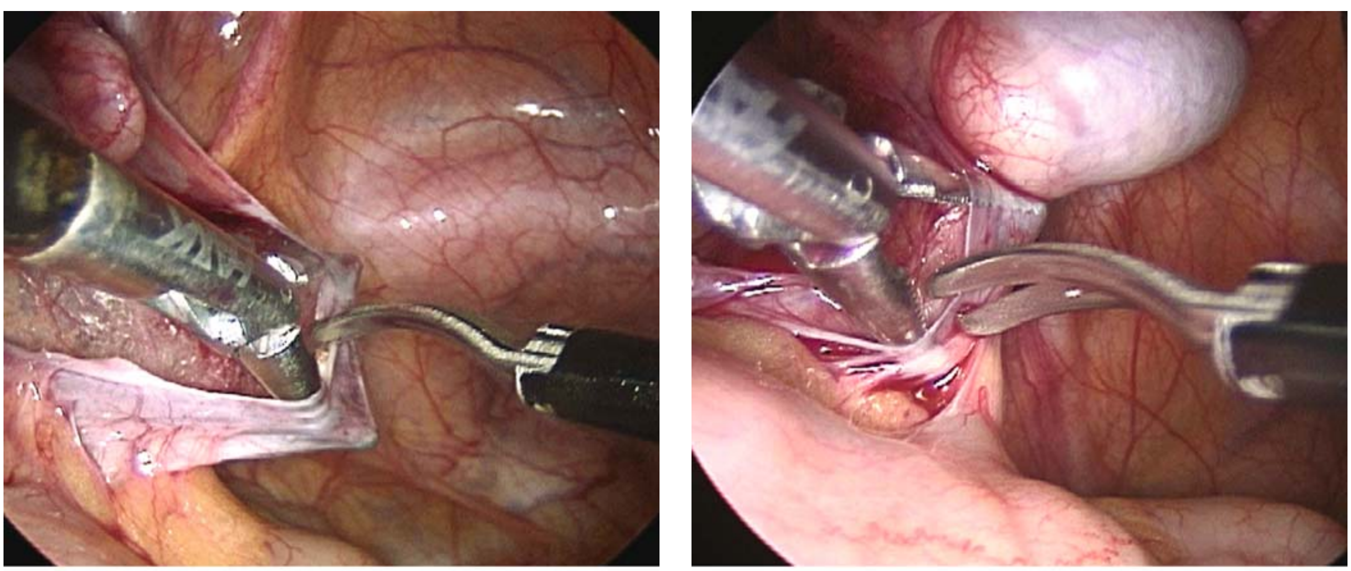


FIG. 31.7. Inspecting the gonadal vessels



A B

FIG. 31.8. Gonadal vessels mobilization by incision of the overlying peritoneum

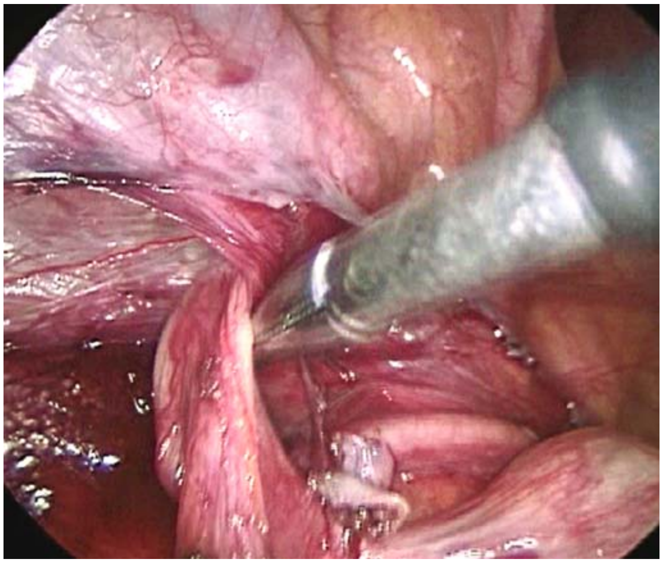


FIG. 31.9. Dissection of the gubernaculum

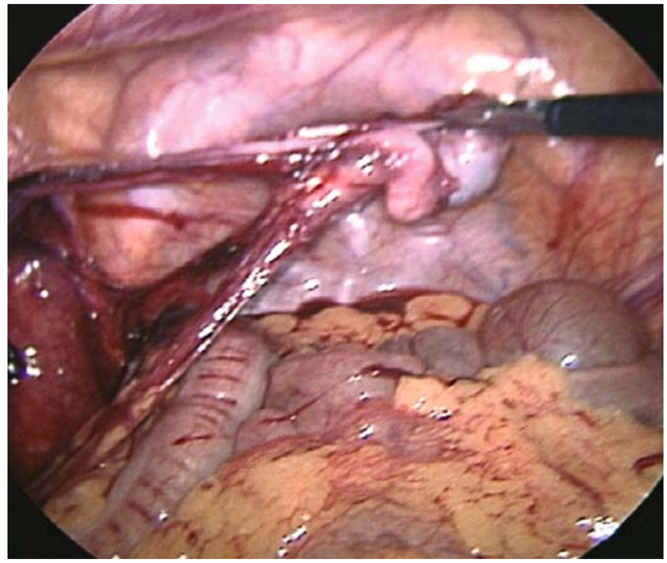


FIG. 31.10. Testis along with mobilized gonadal vessels drawn toward the opposite internal ring to judge the adequacy of mobilization

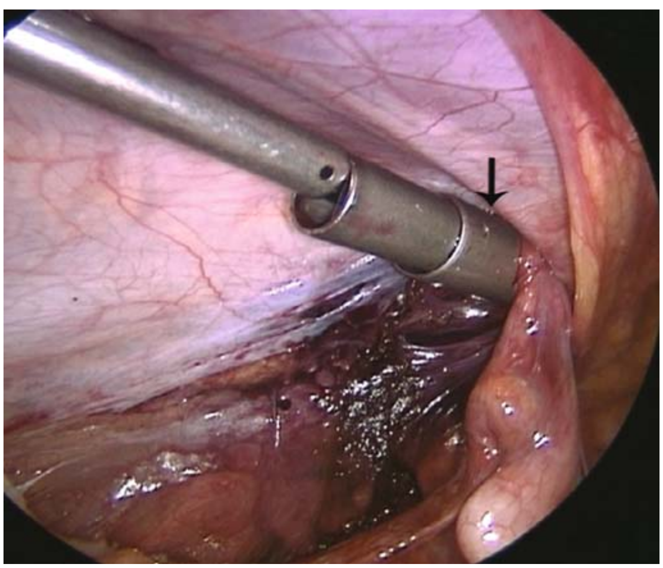


FIG. 31.11. Track creation by trocar insertion from the scrotal end; the arrow points to the inferior epigastric vessels

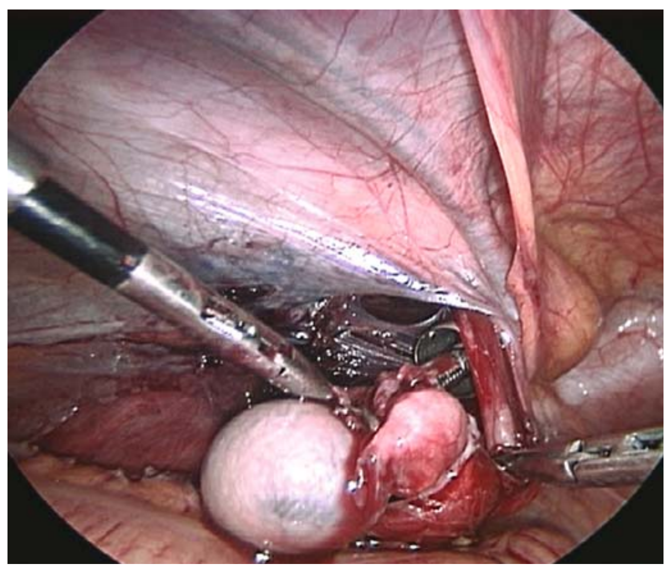


FIG. 31.12. Testis is drawn toward the internal ring and into the track

Laparoscopic Two-Stage Orchiopexy

First Stage: Gonadal Vessels Ligation

FIG. 31.13. High intraabdominal testis

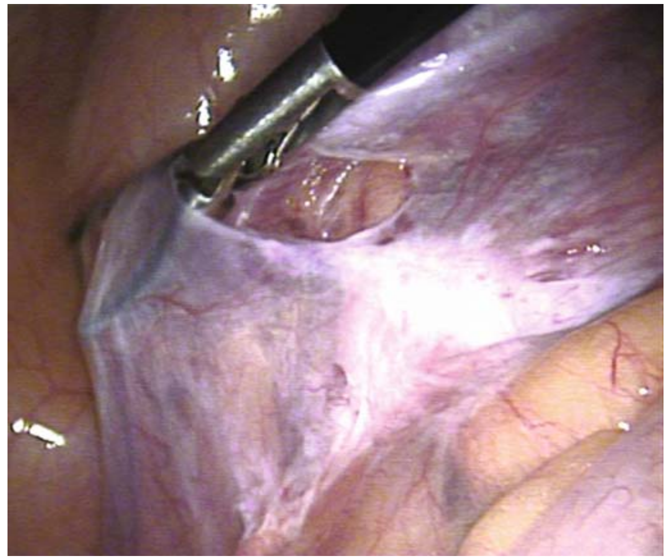
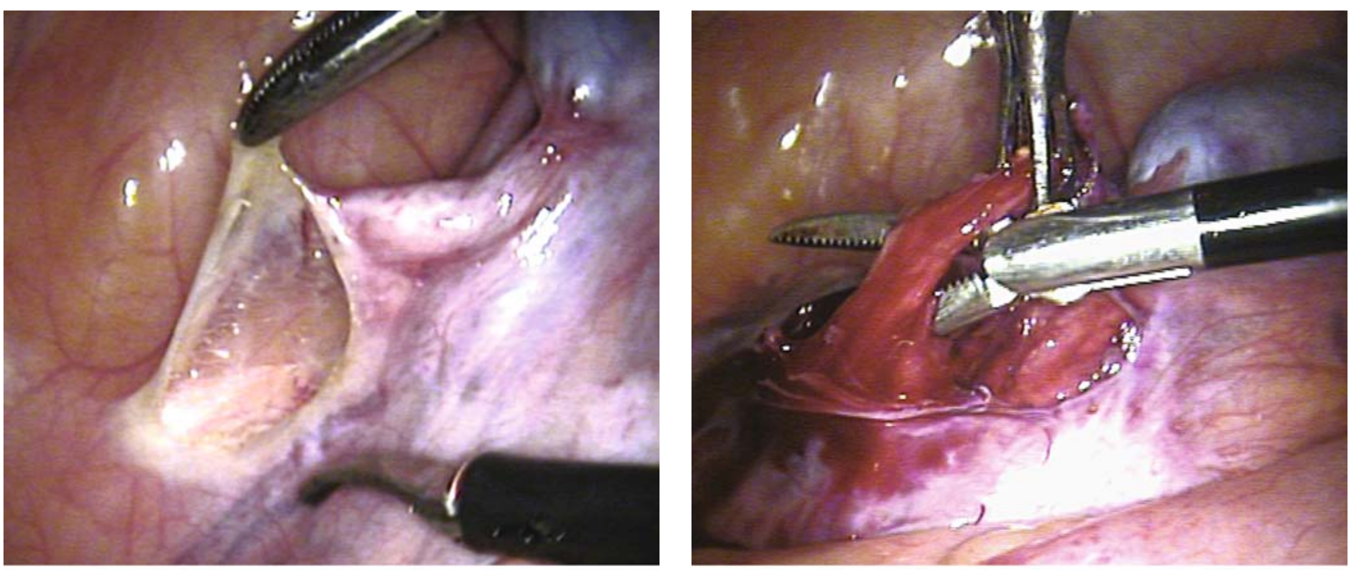
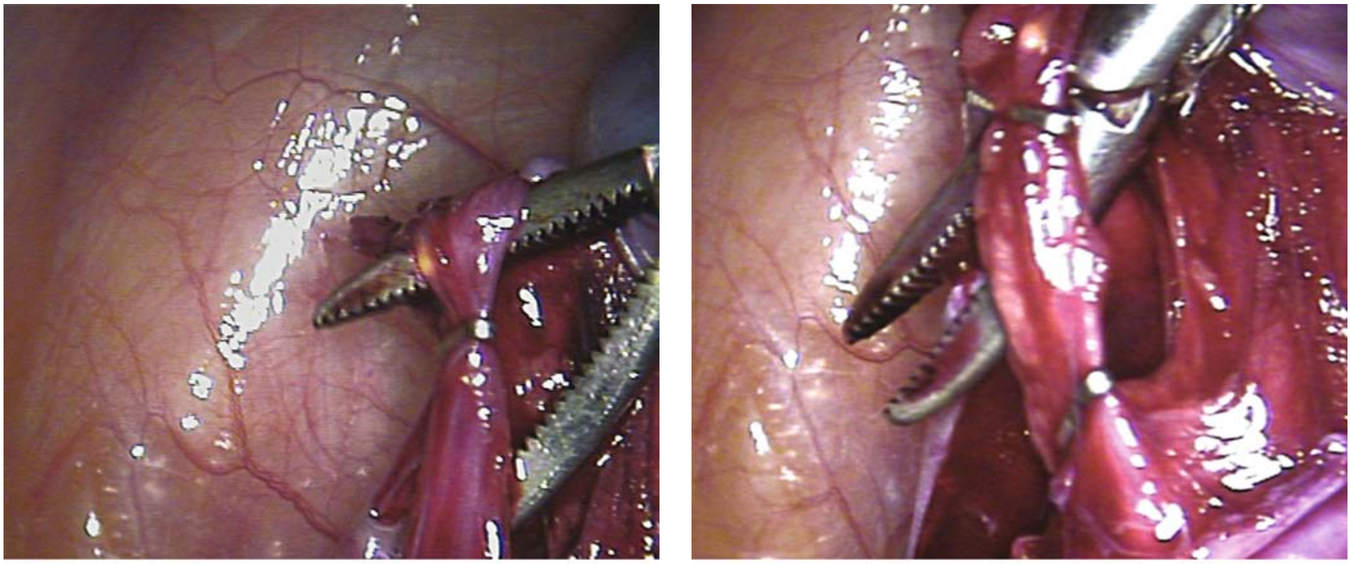


FIG. 31.14. Peritoneotomy over the gonadal vessels



A B

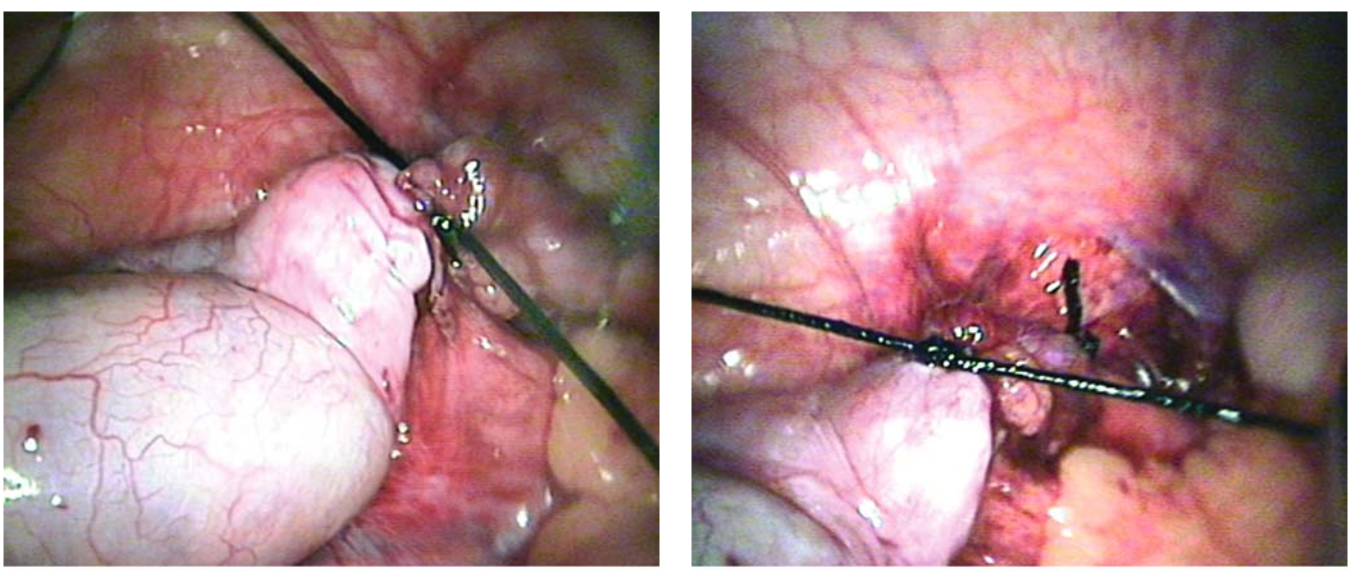
FIG. 31.15. Gonadal vessels in isolation



A B

FIG. 31.16. Occlusion of gonadal vessels (clipping)

Second Stage: Orchiopexy



A B

FIG. 31.17. Isolation and ligation of the gonadal vessels

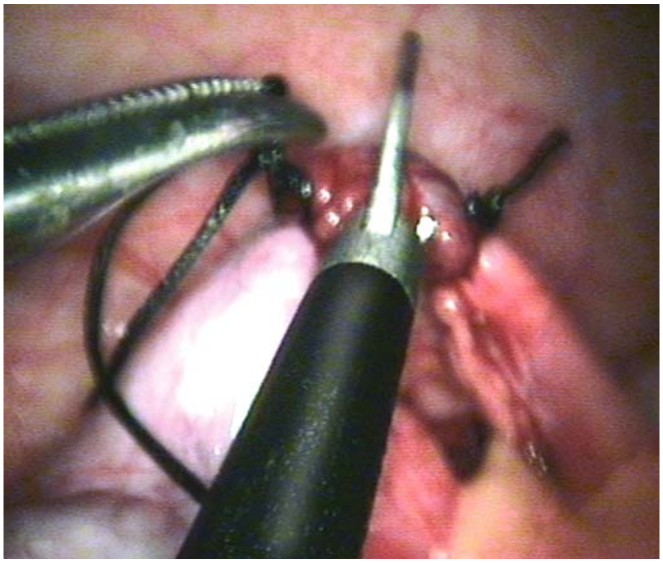


FIG. 31.18. Division of the gonadal vessels

FIG. 31.19. Gubernaculum at the internal ring

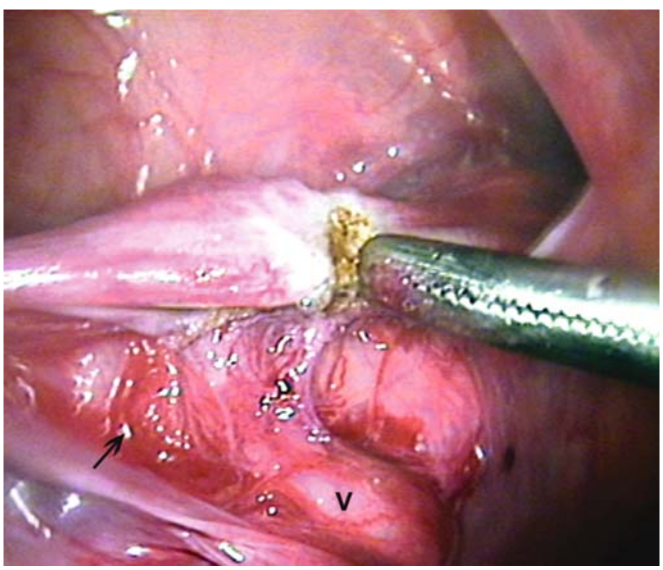


FIG. 31.20. Division of the gubernaculum (V, vas with collateral vessels [arrow])

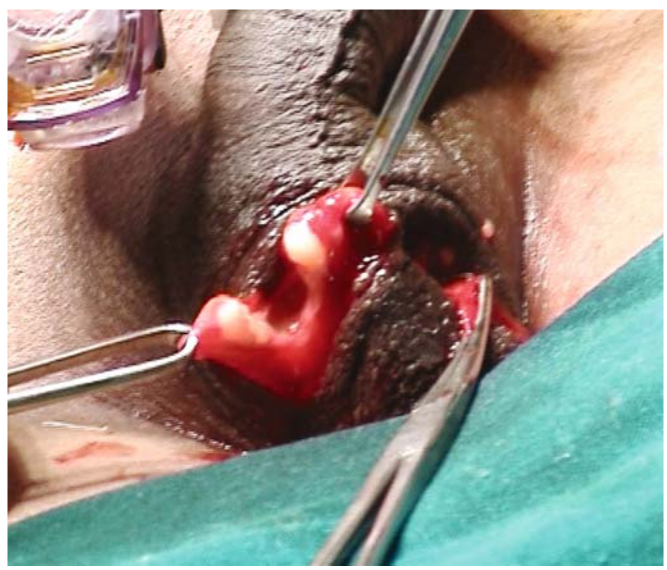


FIG. 31.21. Scrotal incision for creating the track and the orchiopexy

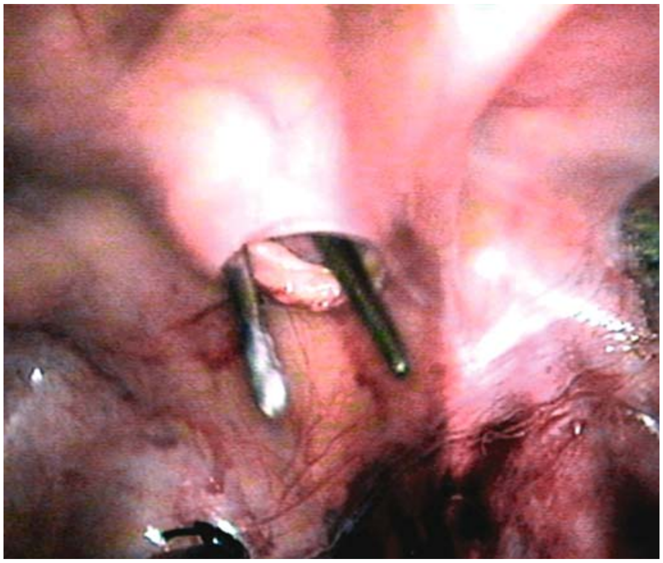


FIG. 31.22. Track creation; the hemostat is inserted from the scrotal end and is seen inside the abdomen

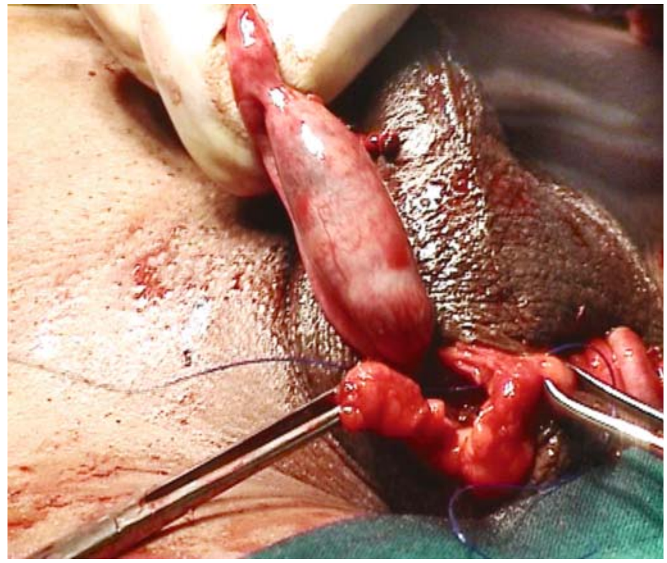


FIG. 31.23. Mobilized testis seen as pink and tension free

Laparoscopic Bilateral Orchiopexy

FIG. 31.24. Empty scrotum

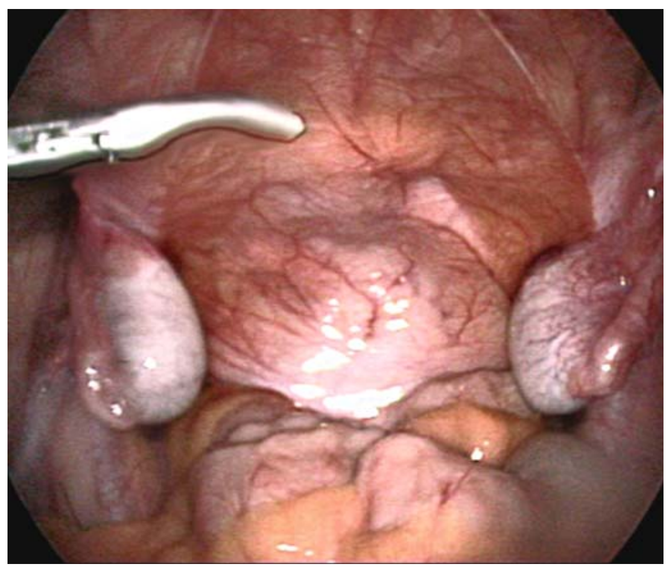


FIG. 31.25. Low intraabdominal testes (bilateral)

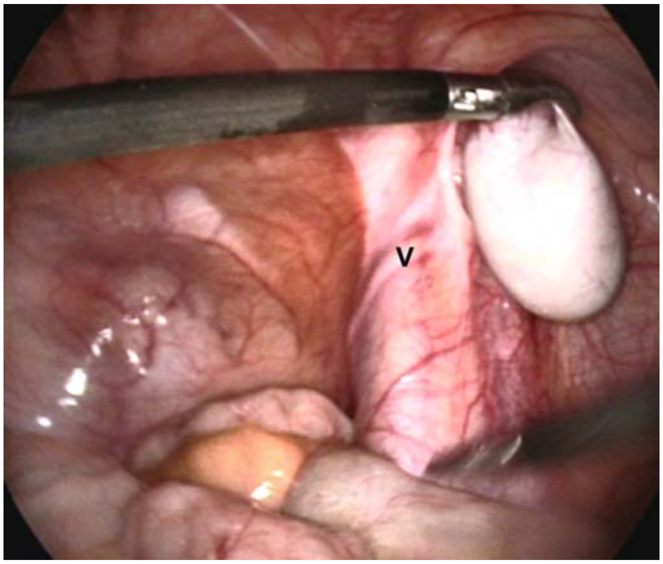


FIG. 31.26. Testis seen near the internal ring (v, vas)

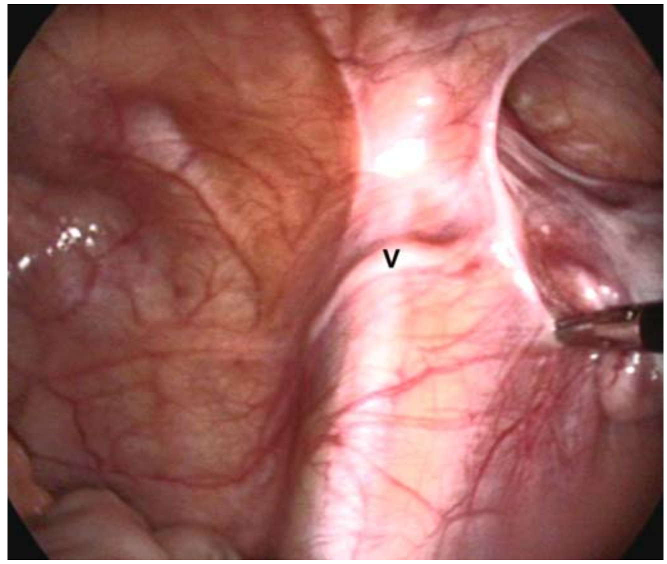
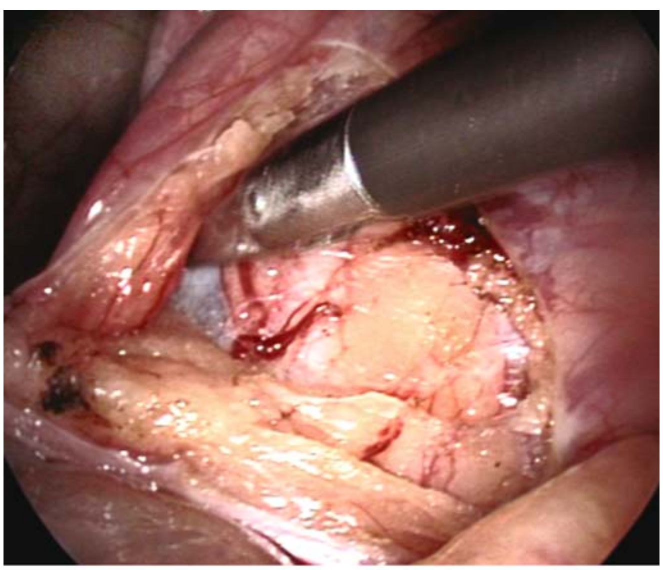
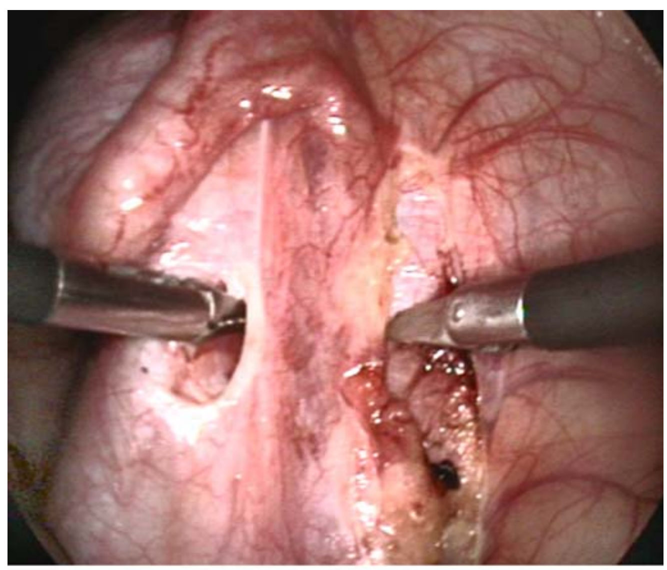


FIG. 31.27. A peritoneal incision is about to be made on the medial side of the right gonadal vessels (v, vas deferens)



A

FIG. 31.28. Mobilization of the gonadal vessel



B

FIG. 31.29. Mobilization of gonadal vessel, continued

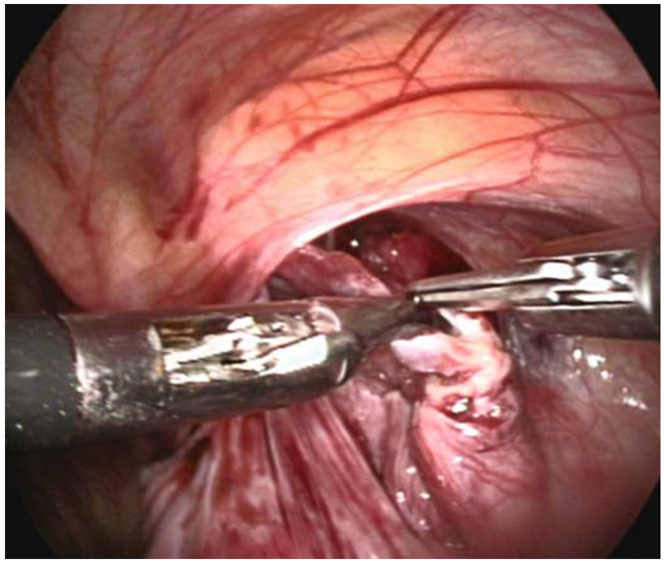
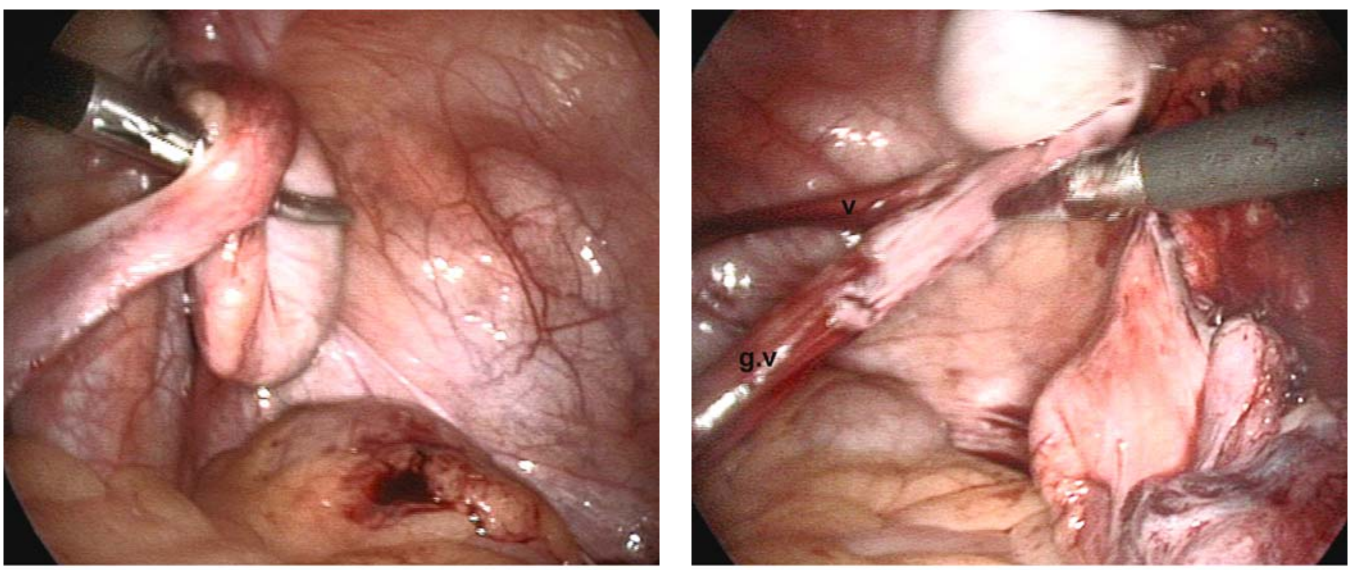


Fig. 31.30. Division of the right gubernaculum



A B

Fig. 31.31. Similarly the left vas and gonadal vessels are mobilized (v, vas; g.v, gonadal vessel)

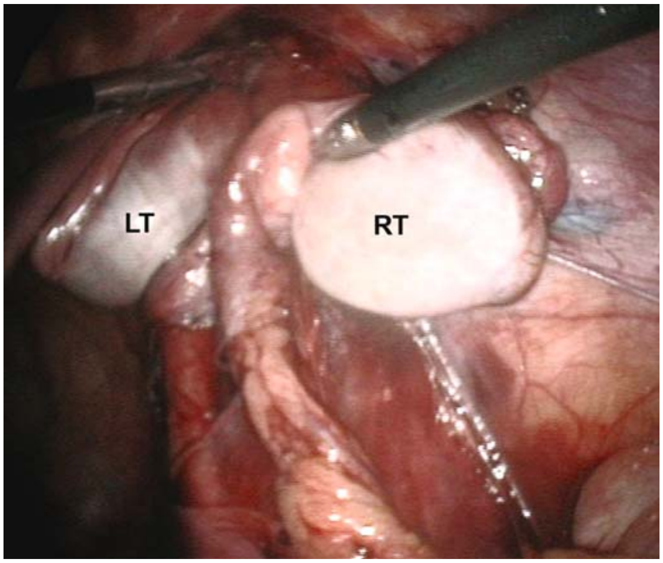


FIG. 31.32. View after mobilizing both cord structures (LT, left testis; RT, right testis)

FIG. 31.33. Both testes are seen tension free in the scrotum

Intracanalicular Testis

FIG. 31.34. Initial view showing empty right hemiscrotum

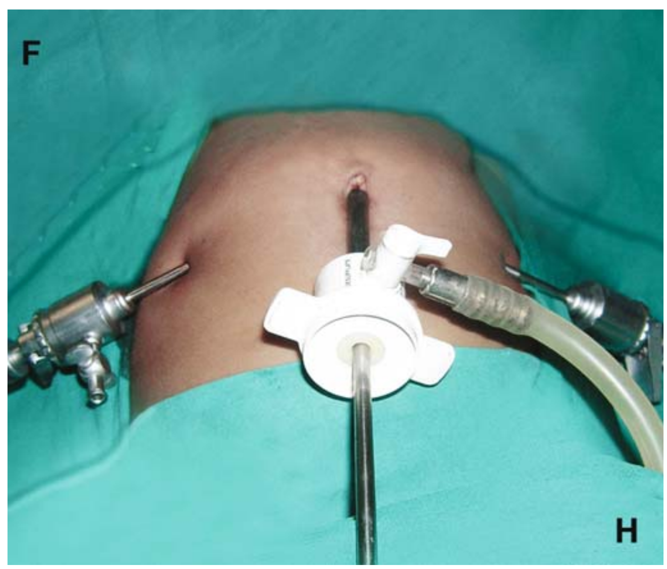


FIG. 31.35. Port position for right orchiopexy (H, head end; F, foot end)

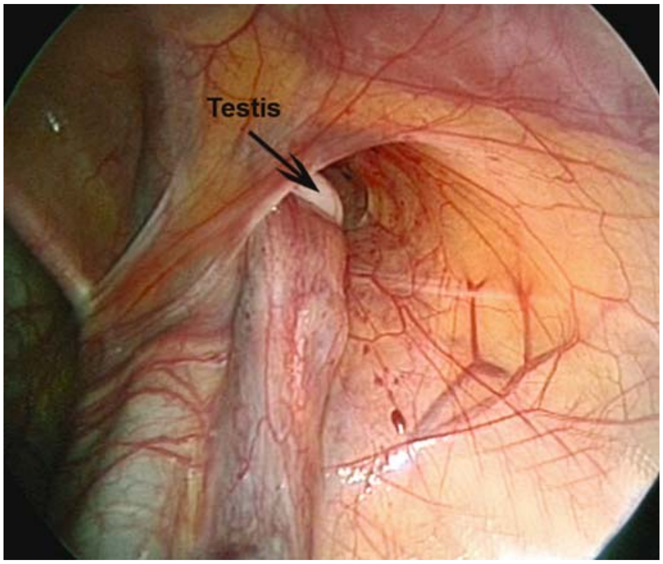


FIG. 31.36. Gonadal vessels and vas entering into internal ring. A part of the testis is seen inside the canal

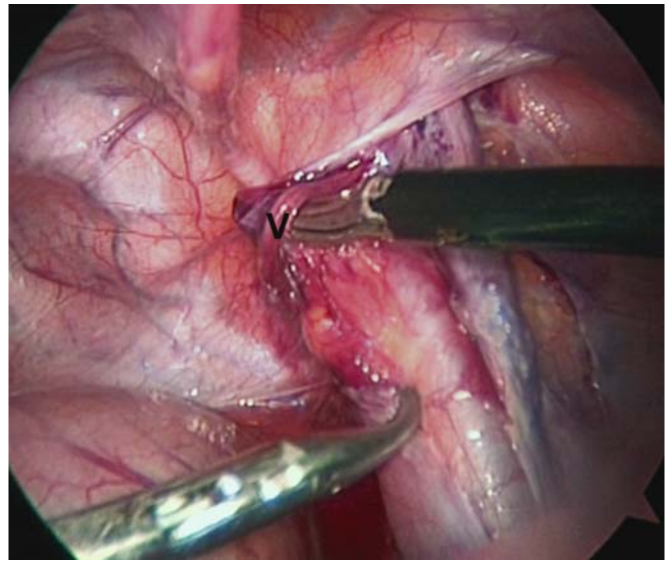
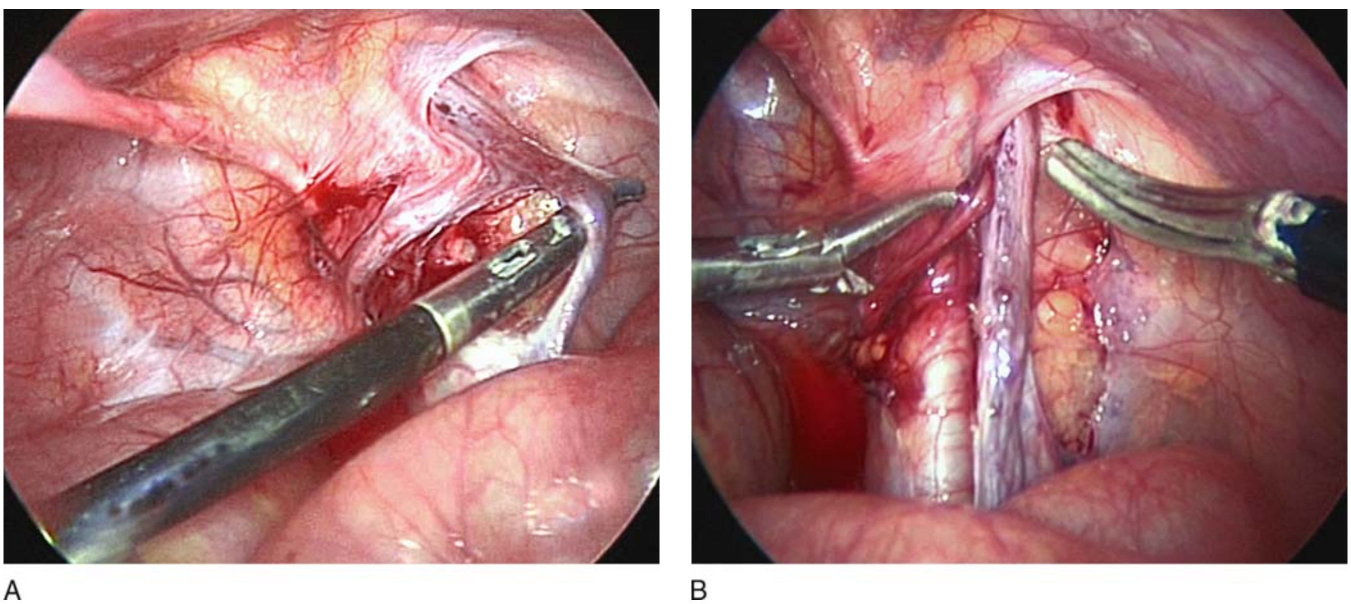


FIG. 31.37. Mobilization of vas (V)



A

B

FIG. 31.38. Gonadal vessel mobilization

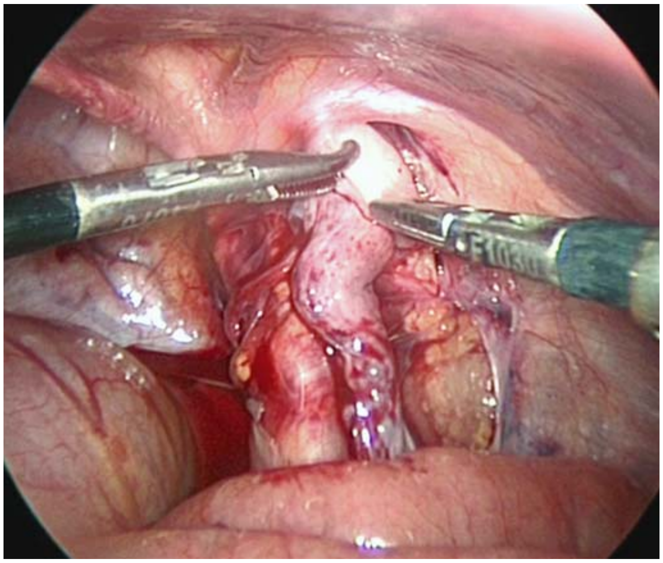


Fig. 31.39. Testis pulled into the abdomen

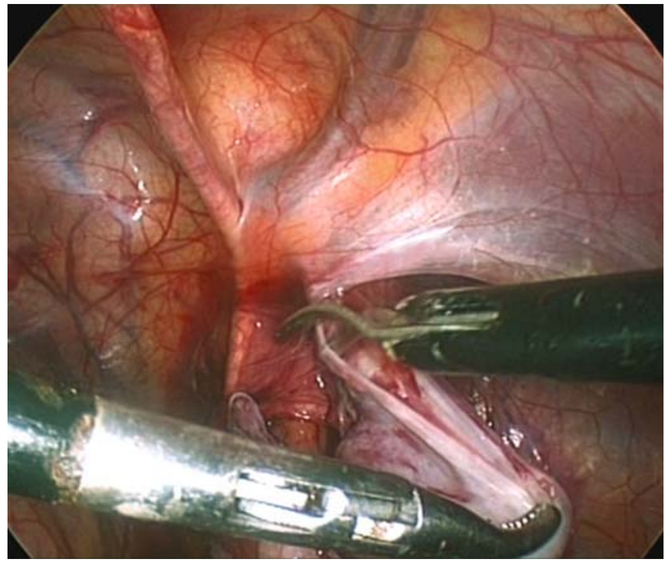


Fig. 31.40. Division of the gubernaculum

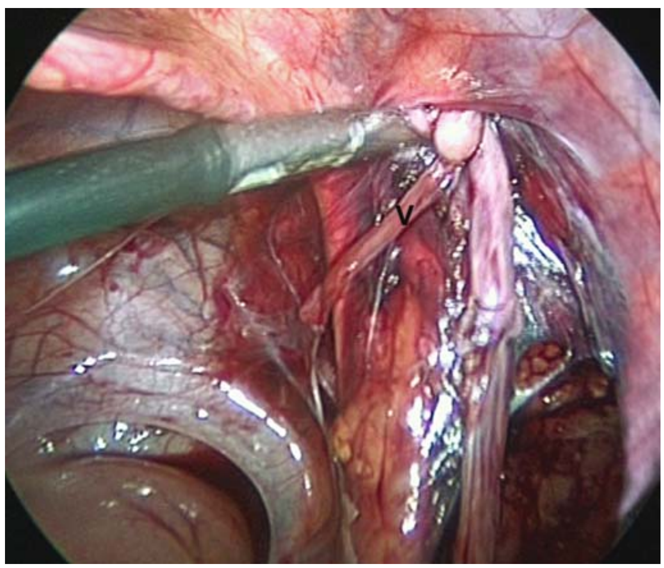


Fig. 31.41. Completely mobilized gonadal vessels and vas (V)

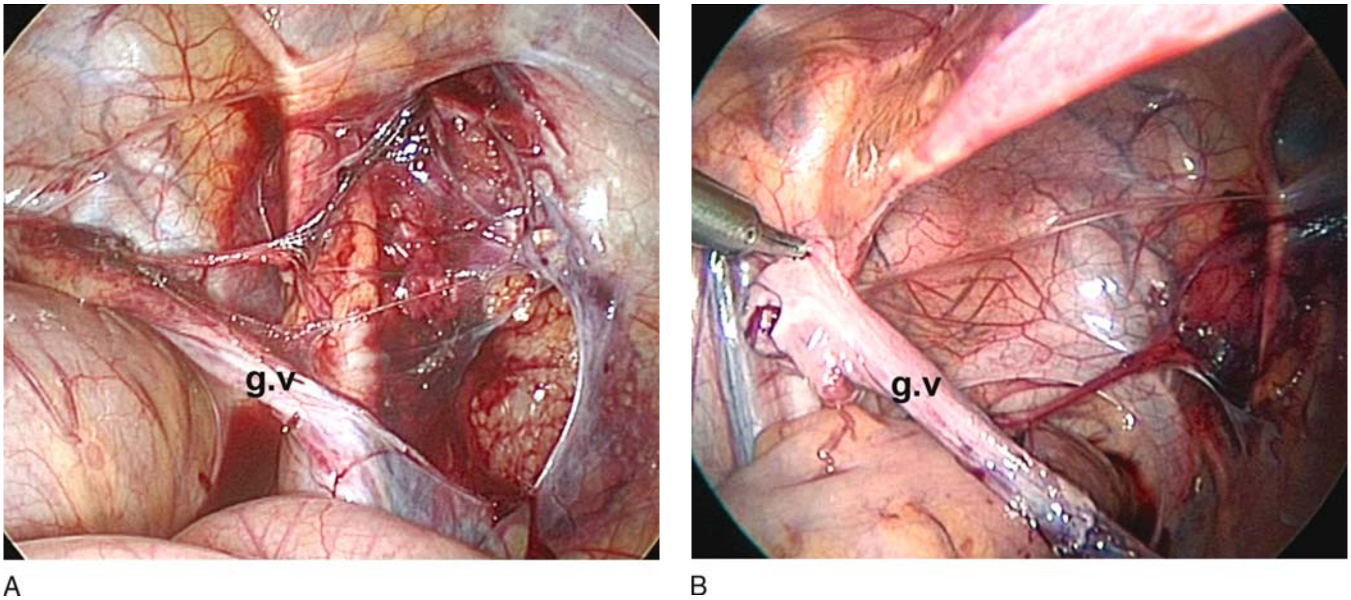


FIG. 31.42. Checking the adequacy of mobilization (rough guidance being the testis reaching the opposite internal ring) (g.v, gonadal vessel)

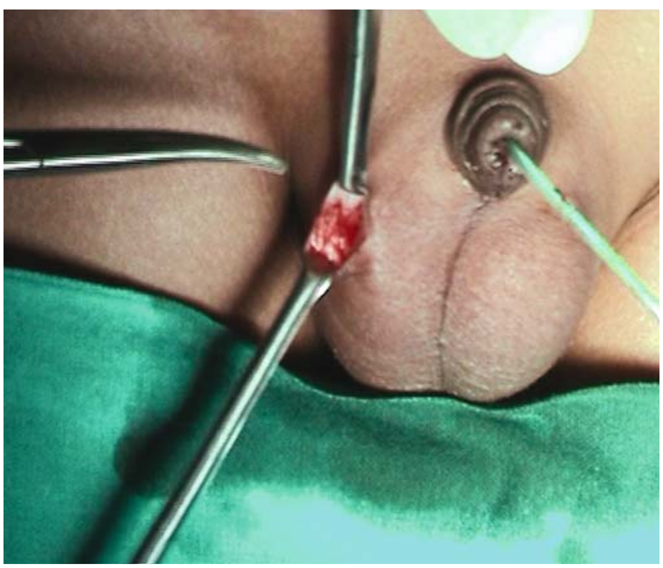


FIG. 31.43. Scrotal incision through which a dissector can be introduced toward the internal ring

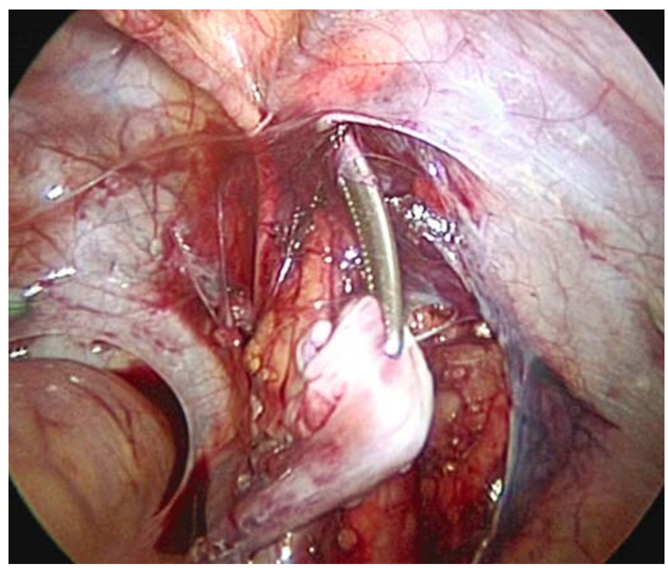


FIG. 31.44. A dissector is introduced through the inguinal canal into the abdomen to pick up the gubernaculum to be brought down to the scrotum

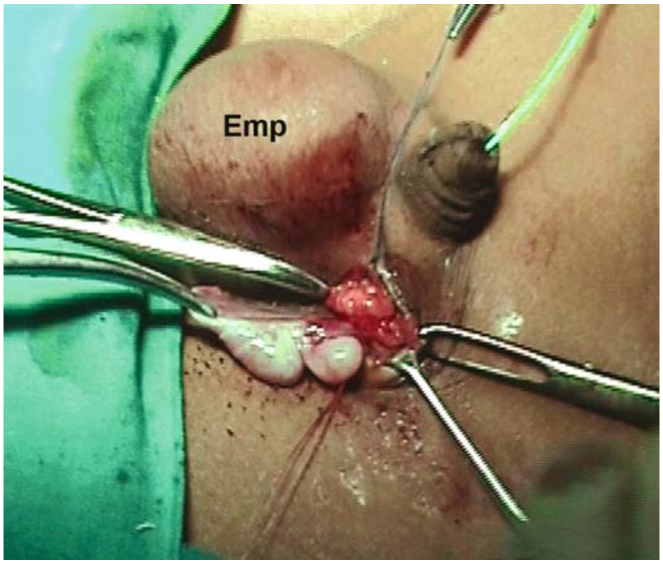


Fig. 31.45. Testis is seen in scrotum (Emp, emphysema due to pneumo-leak along the track created)

References

1. Ettayebi F, Benhammou M (2001) The non-palpable testis: review of 35 cases. Pediatr Endosurg Innovative Tech 5(3):335–338.
2. Wang KS, Shaul DB (2004) Two stage laparoscopic orchiopexy with gubernacular preservations: preliminary approach report of a new approach to the intra abdominal testis. Pediatr Endosurg Innovative Tech 8(3):250–253.
3. Stroedter L, Hoffmann K, Doede T, Waldschmidt J (1997) Laparoscopic findings in children with cryptorchidism. J Laparoendosc Adv Surg Tech 1(2):117–126.
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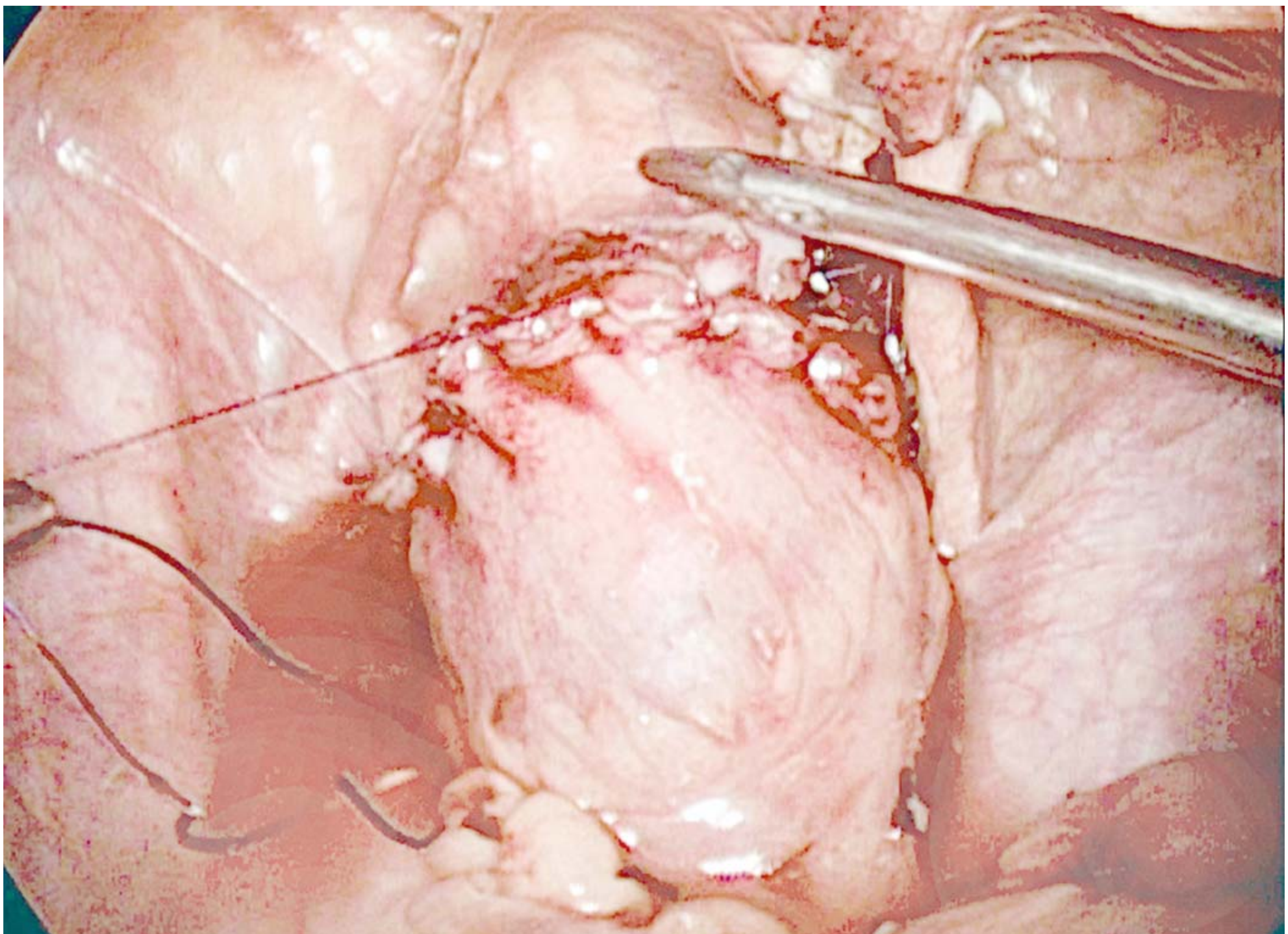
5. Ramalingam M, Selvarajan K, Senthil K (2002) Cryptorchidism: facts and recent advances. In: Contemporary Trends in Laparoscopic Urology Surgery, 1st ed., pp. 217–227. New York: Churchill-Livingstone.
6. Rozanski TA, Bloom DA (1995) The undescended testis: theory and management. Urol Clin North Am 22(1):107–118.

Section VII
Laparoscopically Assisted Procedures



32 Laparoscopically Assisted Ileal Ureter

Nagesh Kamat, P. Khanderwal, and M. Ramalingam

Indications

In extensive disease or injury to the ureter, the options are autotransplantation or ileal ureteral substitution [1]. The metabolic and physiologic effects of an ileal ureter must be kept in mind prior to embarking on the procedure.

Contraindications

The general contraindications are serum creatinine greater than 2 mg/dL, bladder dysfunction, bladder outlet obstruction, inflammatory bowel disease, and radiation enteritis.

Surgical Technique

An intraoperative retrograde pyelogram (RGP) helps determine the length of the stricture. With a transperitoneal approach using four ports and with the patient in the 70-degree kidney position, the colon is mobilized. The ureter is isolated and dissected up to the renal pelvis. The feasibility of using the pelvis for anastomosis is ascertained. A suitable segment of the ileum is selected and brought out through a 5-cm incision in the midline or through extension of one of the port wounds. The mesentery is divided more extensively than for an ileal conduit to allow mobility. Ileoileal continuity is completed, and the isolated ileal segment is thoroughly washed before putting it back inside the abdomen. The wound is closed to prevent air leakage. The loop is oriented in an isoperistaltic fashion. It is preferable to bring the isolated ileum retroperitoneally. The proximal end is anastomosed to the pelvis with 2-0 Vicryl sutures starting with the posterior layer first. The distal end of the loop is anastomosed to the bladder with 2-0 Vicryl sutures. A drain is placed through the flank port. A cystogram is done on the 14th day to confirm the absence of extravasation, and the urethral catheter is removed.

Special Situations

If the pelvis is intrarenal or scarred, then a ileocalycostomy may be performed.

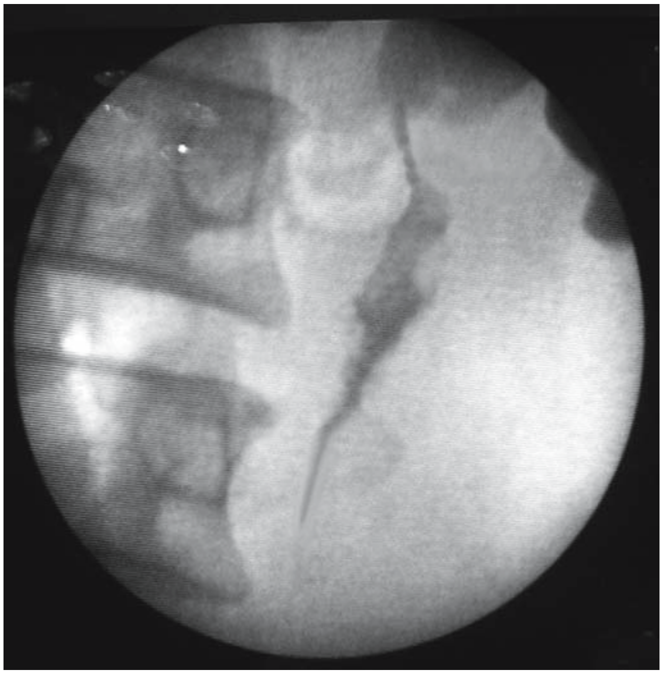


FIG. 32.1. A left retrograde pyelogram (RGP) shows multiple upper ureteric strictures

FIG. 32.2. The port positions for the ileal ureter (H, head end; F, foot end)

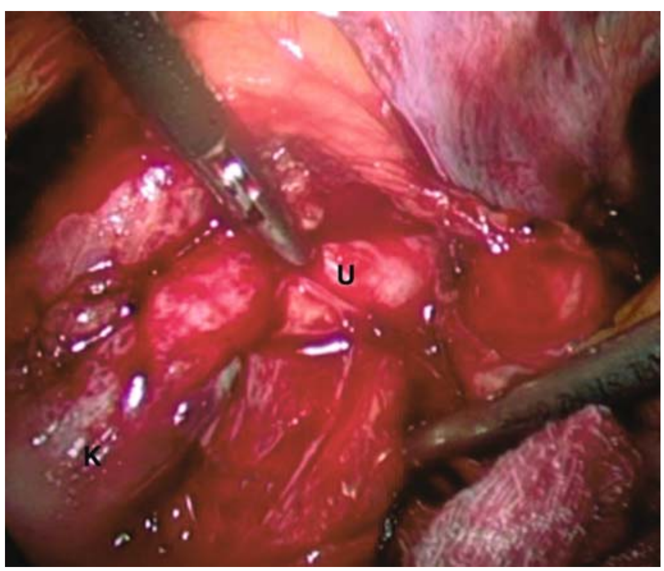


FIG. 32.3. Colonic mobilization reveals a thickened hyperemic ureter (K, kidney; U, ureter)

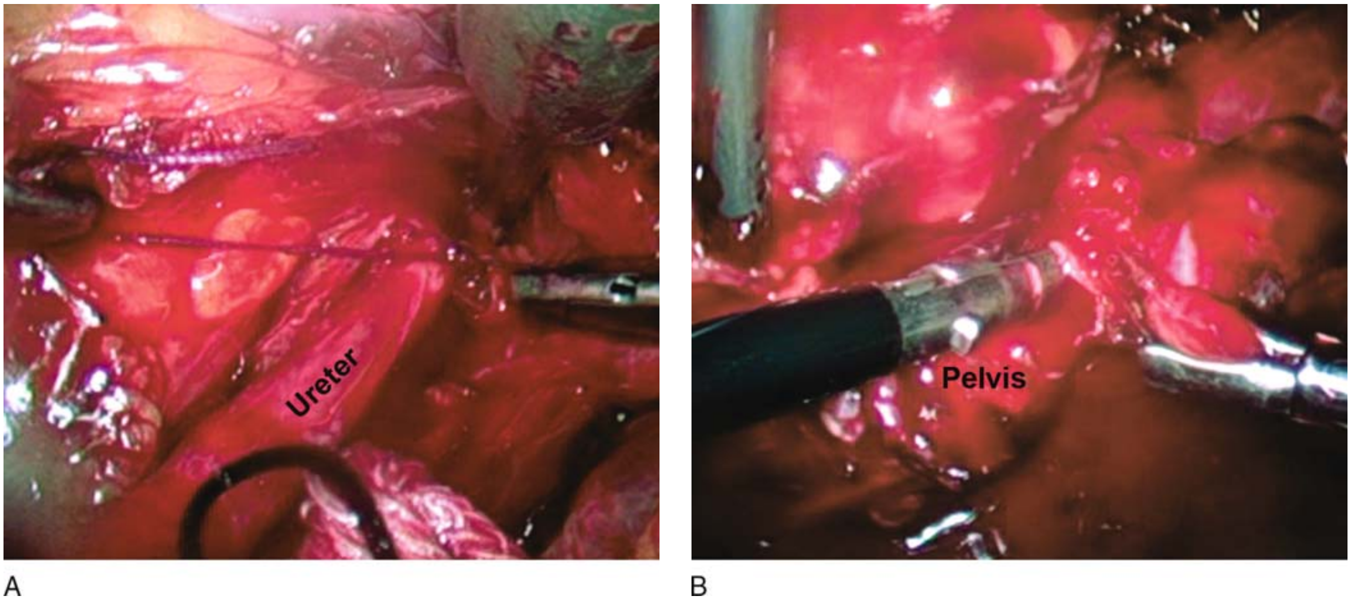


FIG. 32.4. Ligation and excision of the strictured segment of ureter

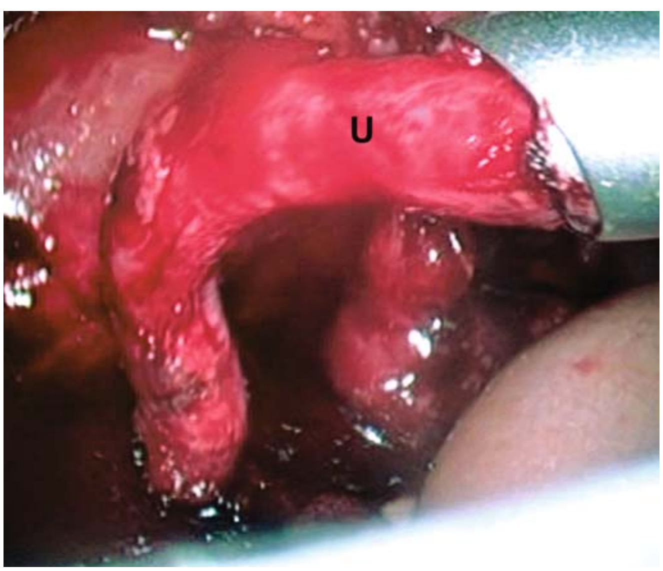


FIG. 32.5. Removal of excised ureter (U)

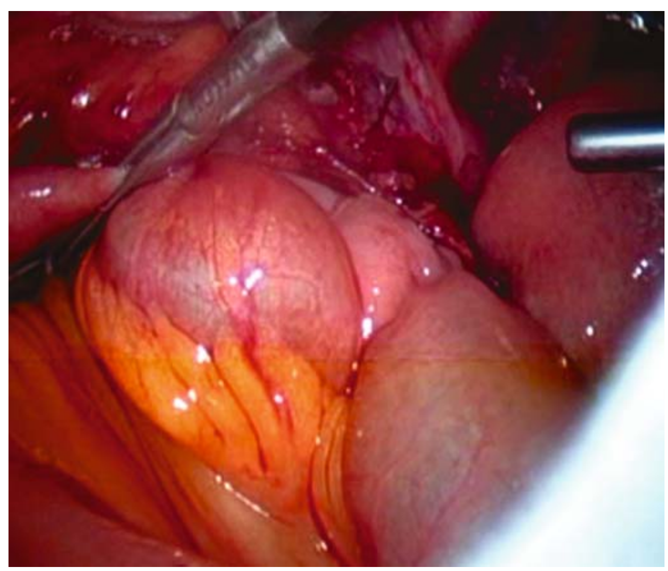


FIG. 32.6. Extending the pyelotomy on the lateral aspect for about 2 cm

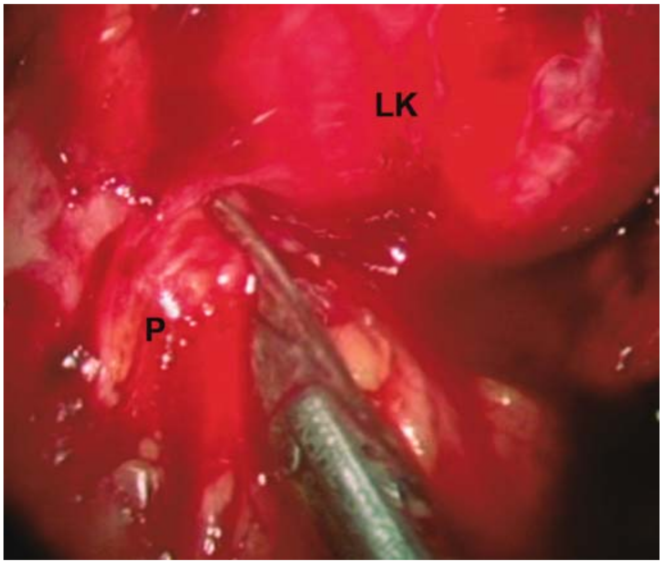


FIG. 32.7. Choosing an ileal segment (LK, left kidney; P, pelvis)

FIG. 32.8. Extension of a 10-mm port to exteriorize the bowel

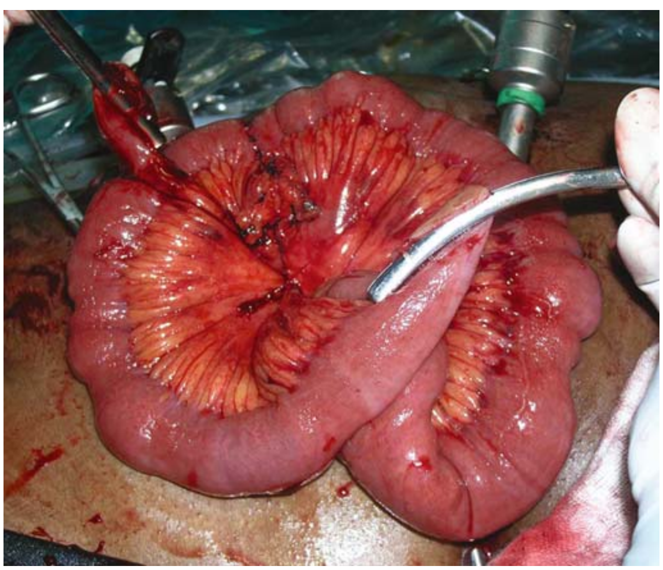


FIG. 32.9. Isolation of ileal segment

FIG. 32.10. Preparing the isolated ileum

FIG. 32.11. Returning the ileal segment

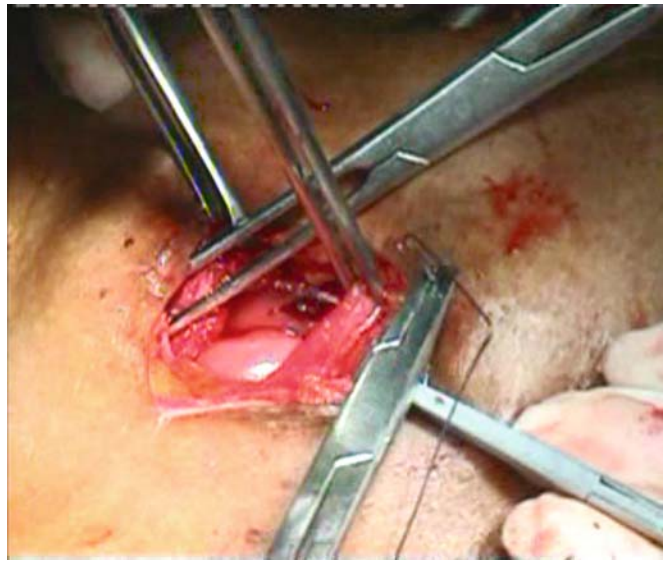


FIG. 32.12. Closure of the abdominal wound

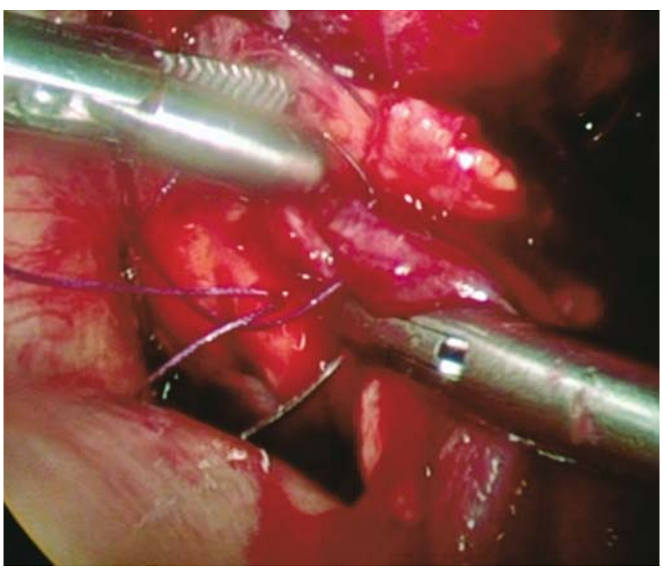


FIG. 32.13. Initial suture with 2-0 Vicryl through the ileum (outside-in) through the antimesenteric margin

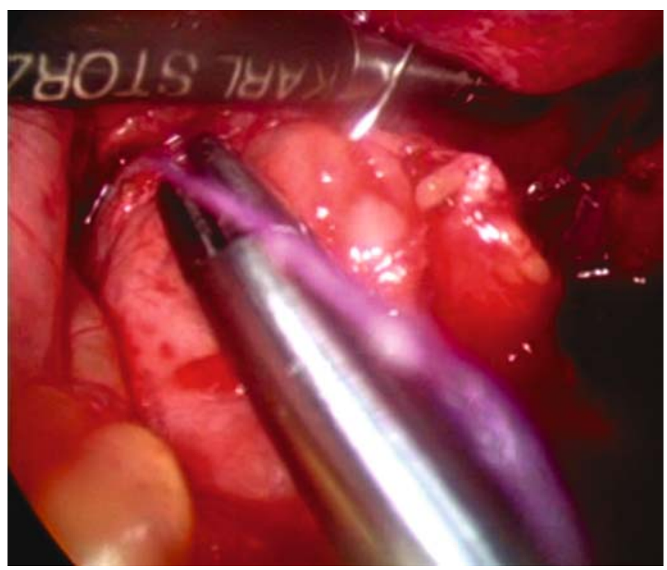
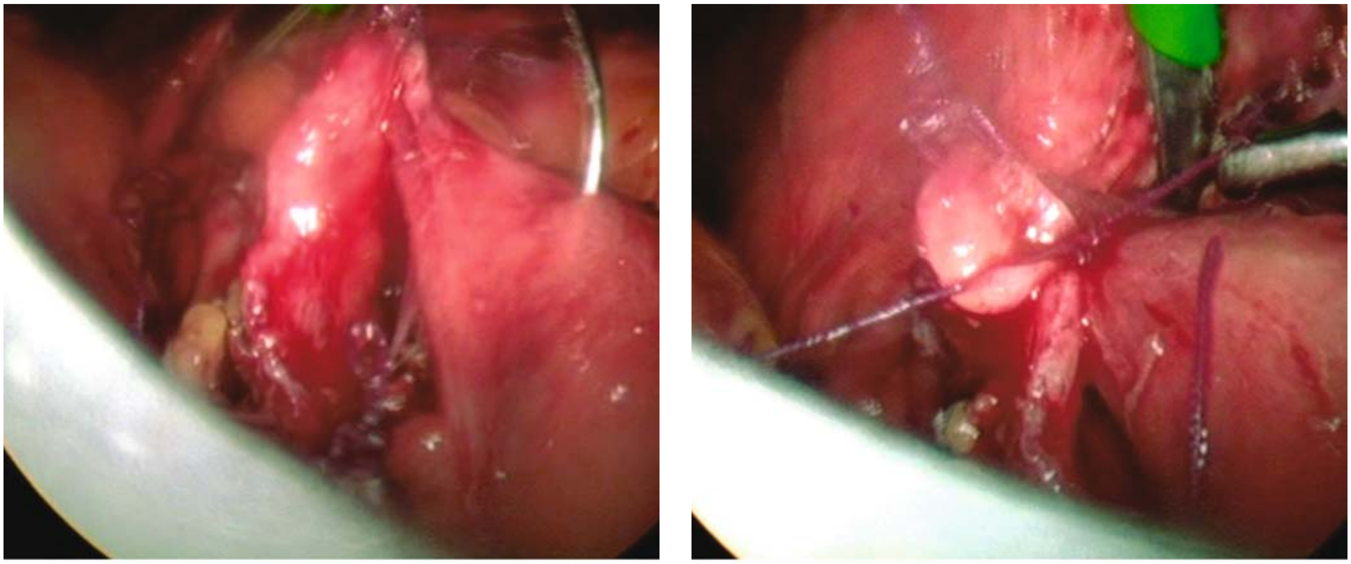
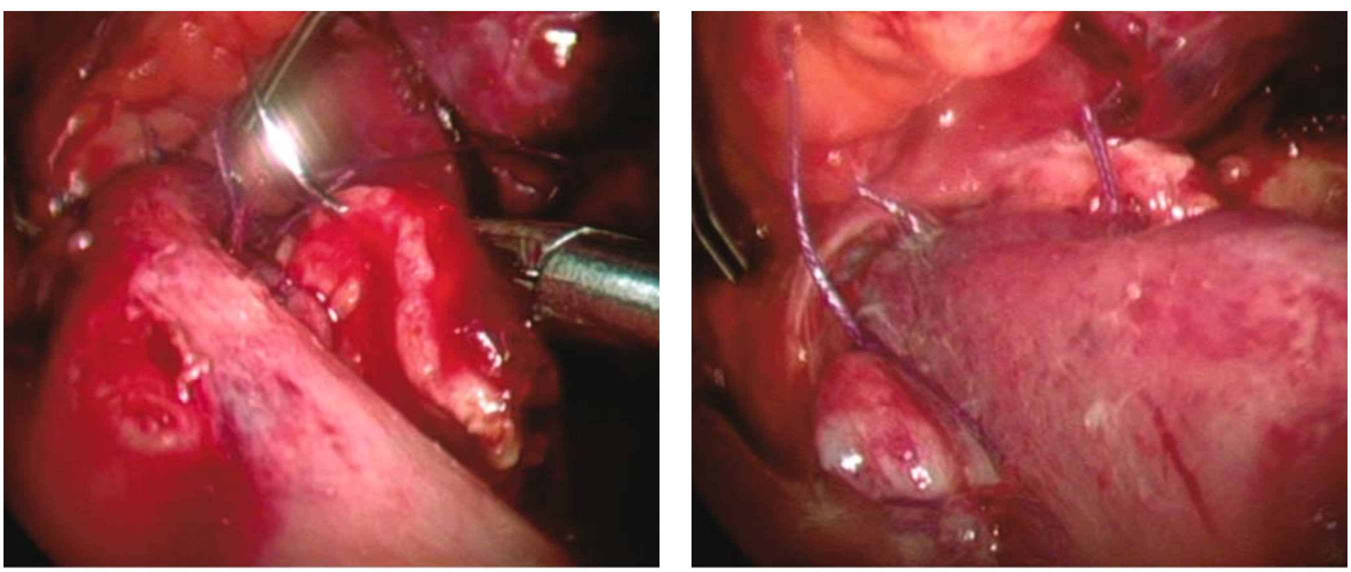


FIG. 32.14. Corresponding suture through the posterior lip of pyelotomy (inside-out)



A B

FIG. 32.15. Suturing the anterior layer



A B

FIG. 32.16. Completion of pyeloileal anastomosis

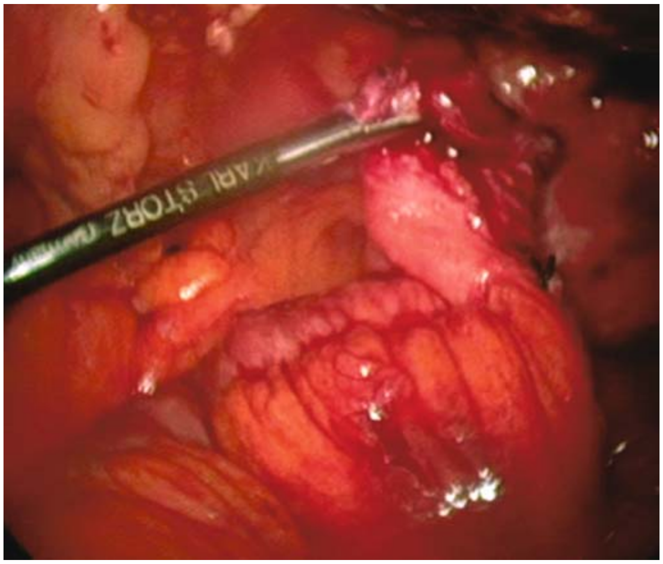


Fig. 32.17. Assessing the alignment and length of the ileal ureter

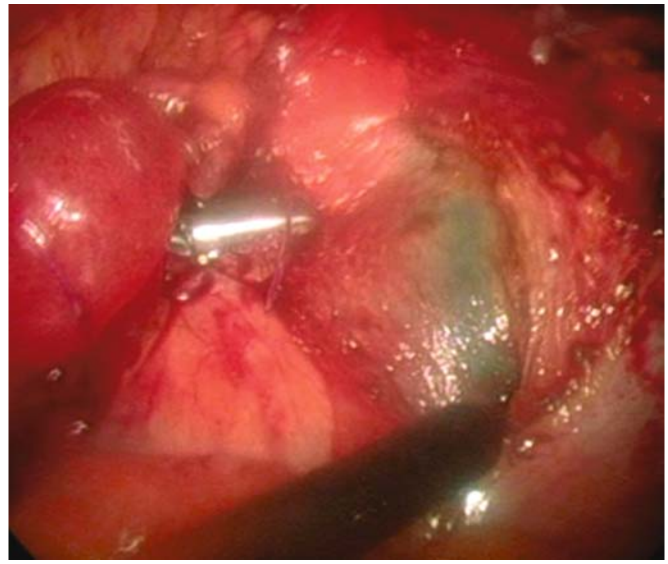


Fig. 32.18 The detrusorotomy in progress

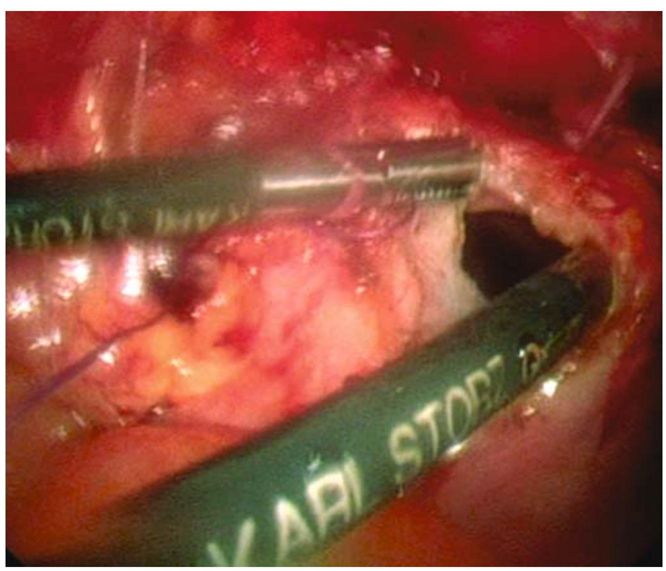


Fig. 32.19. Cystotomy is completed

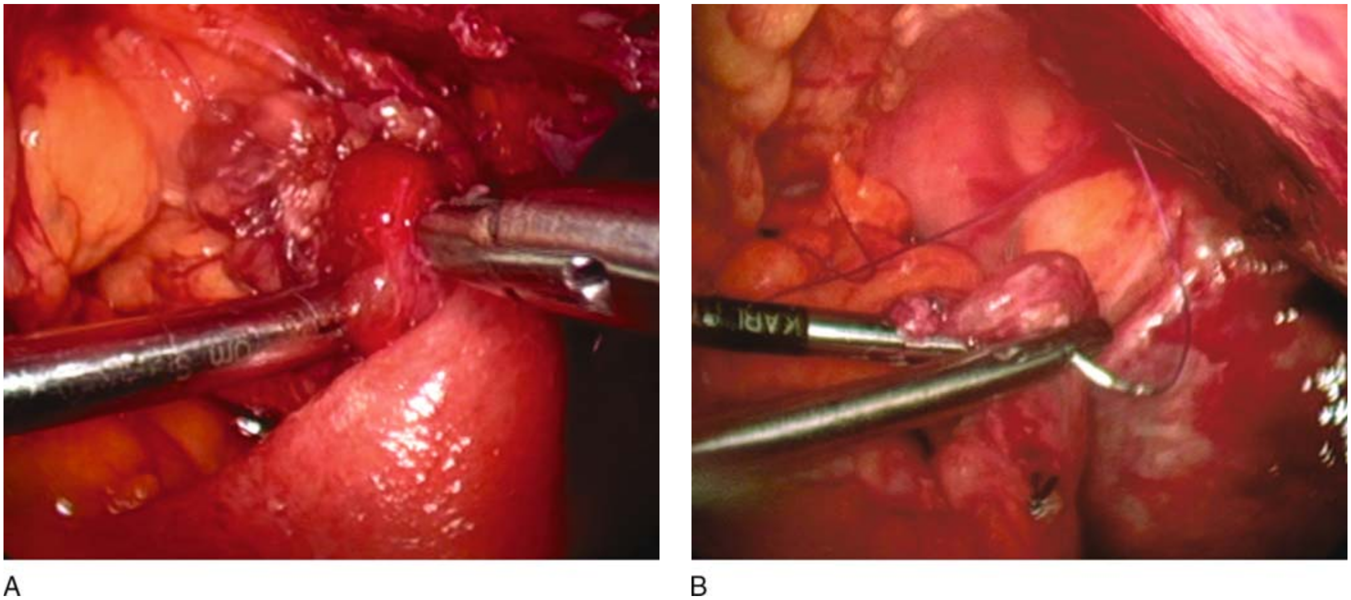


FIG. 32.20. Ileovesical suturing in progress (lateral wall)

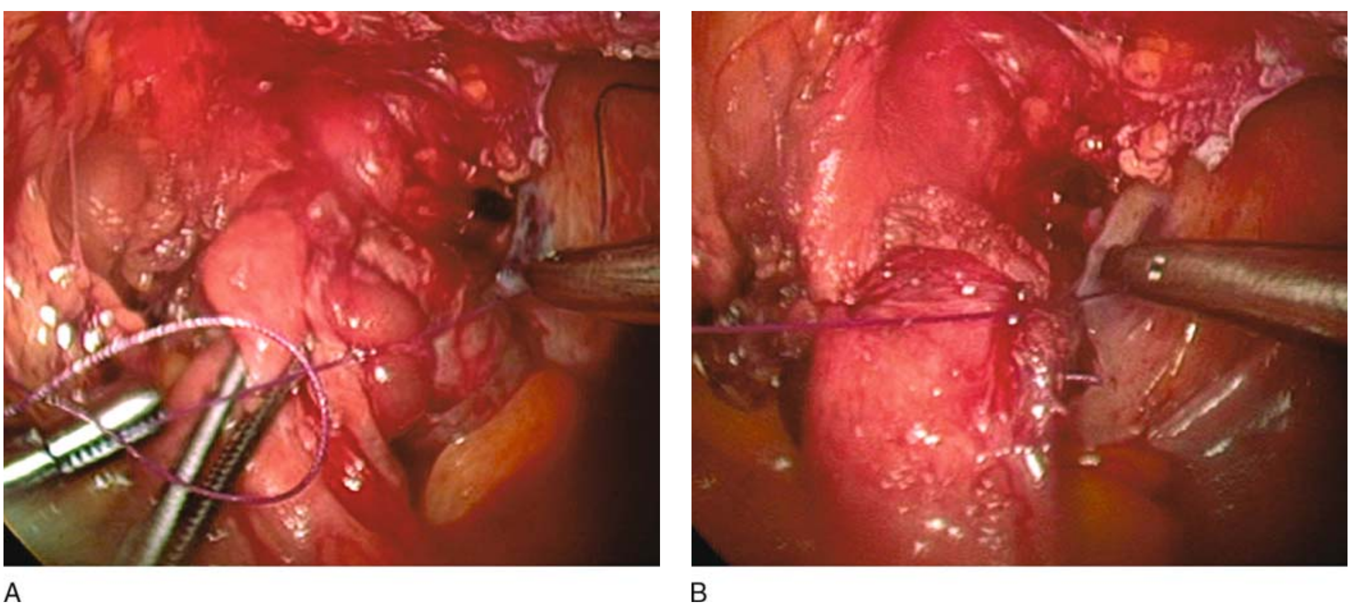
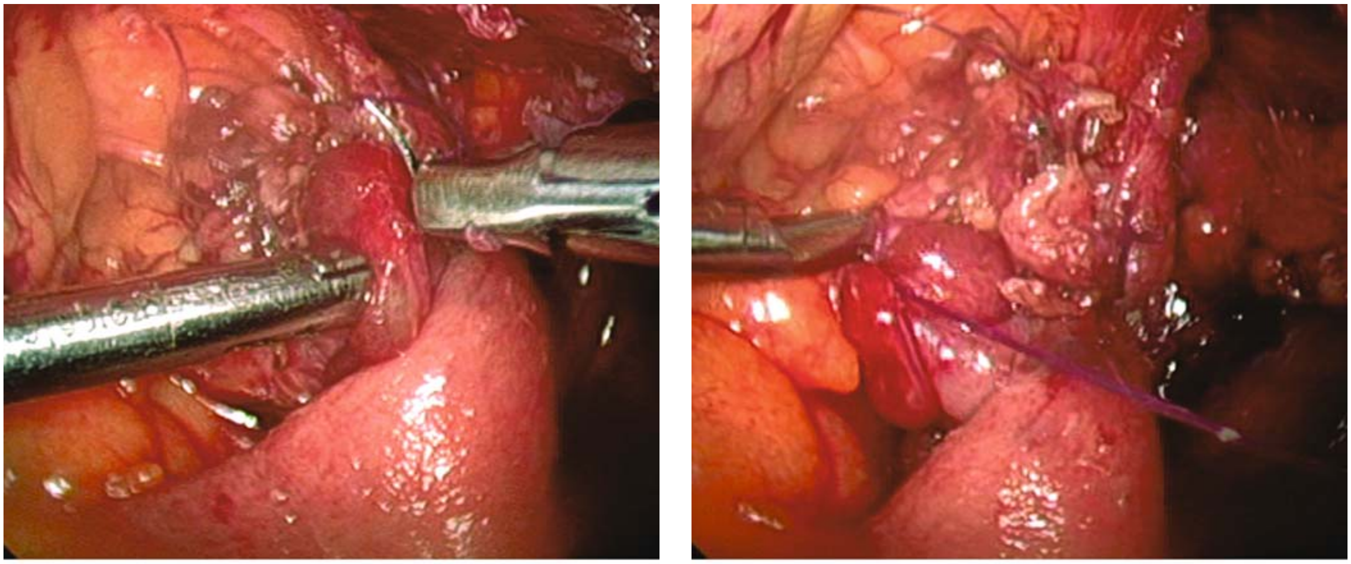


FIG. 32.21. Ileovesical anastomosis is nearly completed



A B

Fig. 32.22. Leak in the ileovesical anastomosis is reinforced

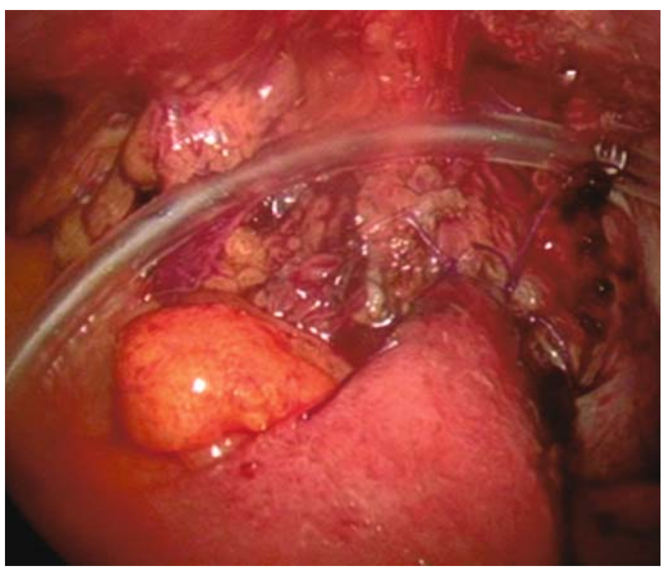


Fig. 32.23. A drain is introduced

Special Situation: Ileocalicostomy in Ileal Ureter

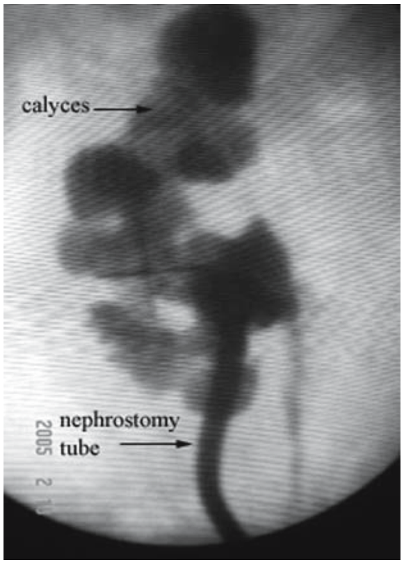


FIG. 32.24 Nephrostogram showing long upper ureteric stricture

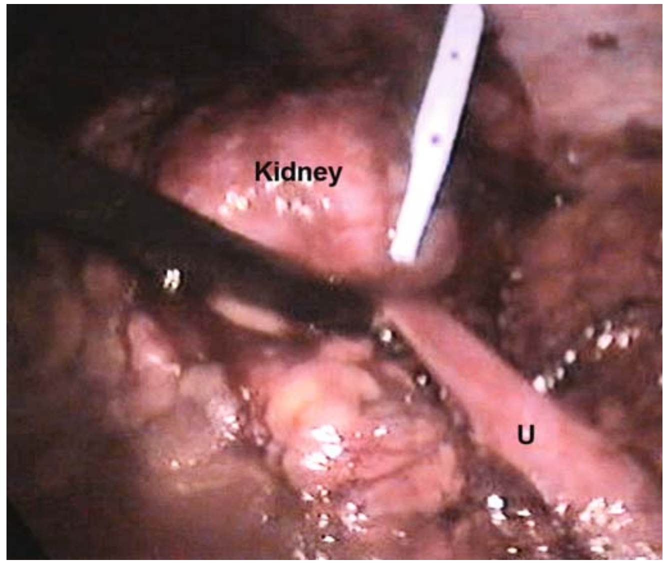


FIG. 32.25 Mobilization of ureter toward the pelvis (intrarenal) (U, ureter)

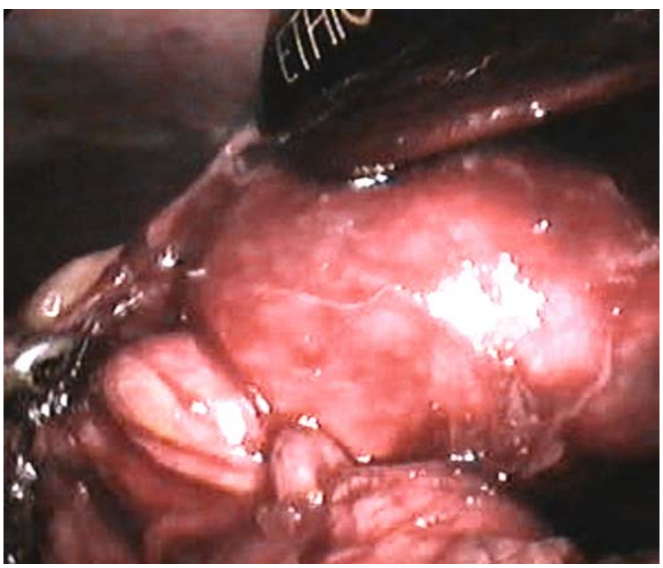


FIG. 32.26 Clearing the perirenal fat in preparation for anastomosing the ileum to the lower calyx

FIG. 32.27 Calicotomy in progress

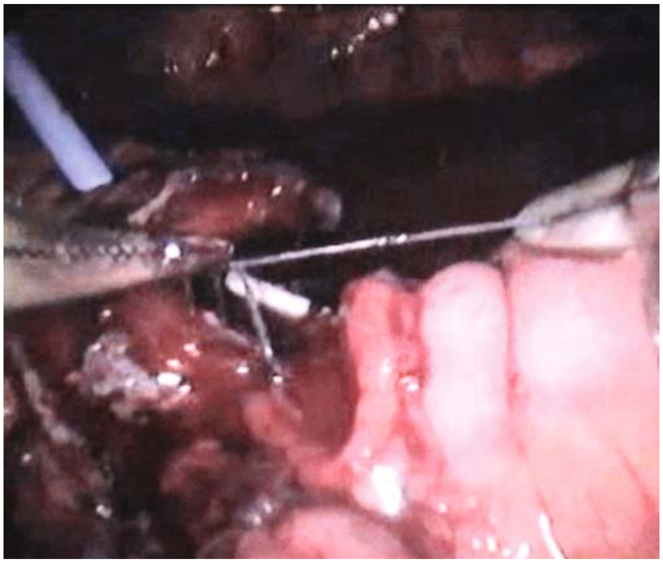


FIG. 32.28 Initial suture with 2-0 Vicryl on the posterior lip of the isolated proximal ileum to the posterior lip of the calicotomy

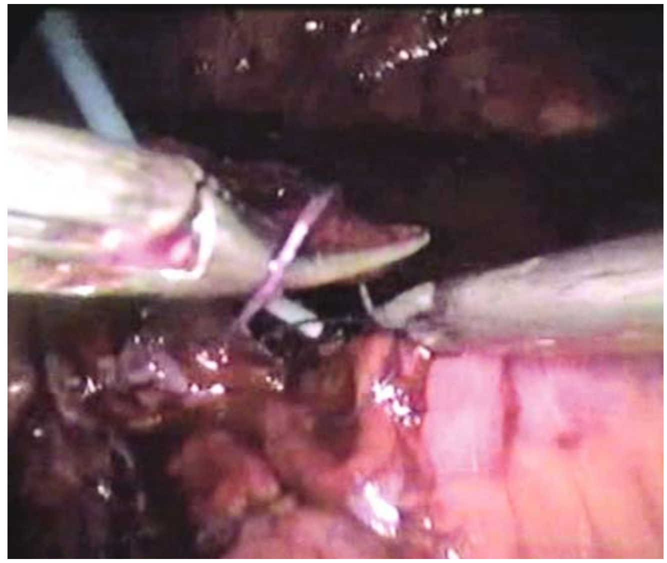
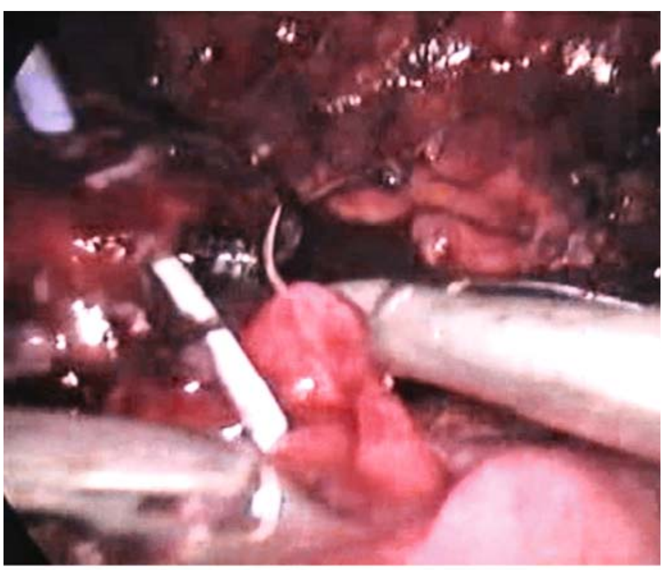
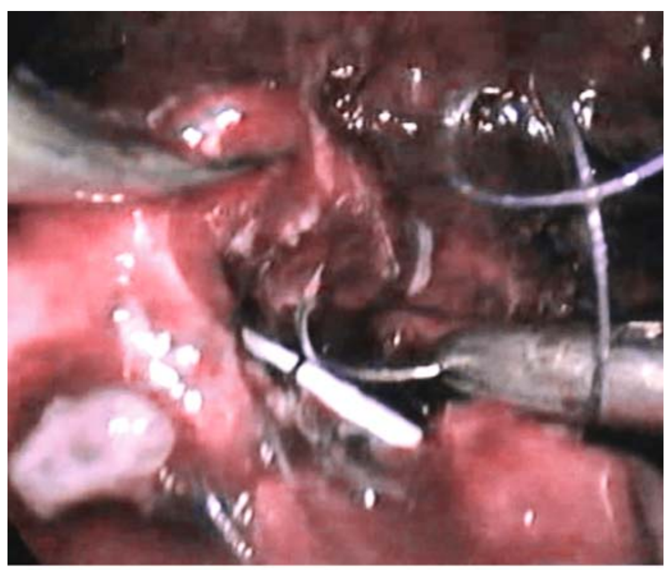


FIG. 32.29 Subsequent interrupted sutures (ileocalicostomy)



A



B

FIG. 32.30 Closure of the anterior layer in progress after introducing a double pigtail stent (ileocalicostomy)

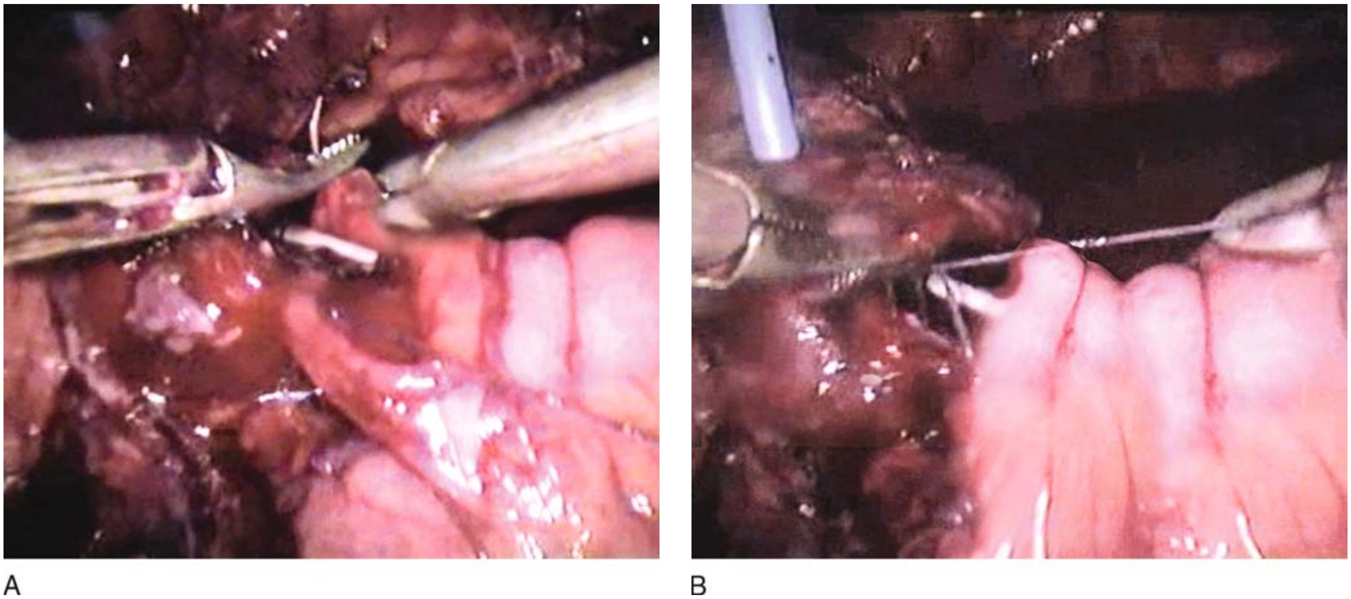


Fig. 32.31 Closure of the anterior layer is nearly completed (nephrostomy catheter left in)

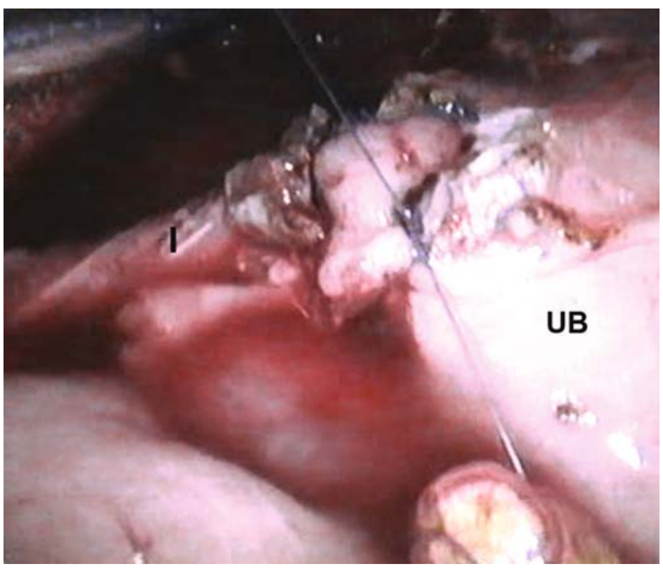


Fig. 32.32 Ileovesical anastomosis in progress (I, ileal ureter; UB, urinary bladder)

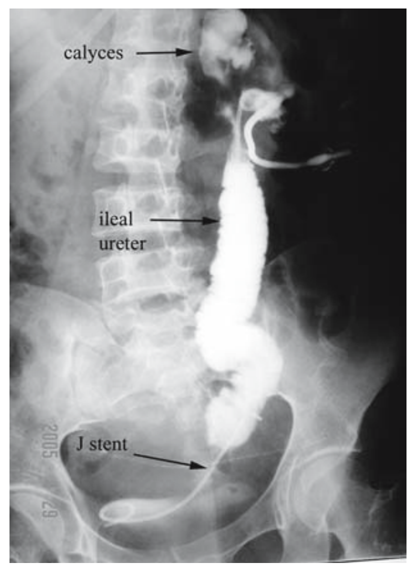


Fig. 32.33 Postoperative nephrostogram showing good drainage down the ileal ureter

Reference

1. Gill IS, Savage SJ, Sednagore AJ, Sung GT (2002) Laparoscopic ileal ureter. J Urol 163(4):1199–1202.

33 Laparoscopically Assisted Ileal Conduit (in the Neurogenic Bladder)

M. Ramalingam and K. Senthil

Management of neurogenic bladders can be frustrating, as these patients present with complex and multiple problems. Though the clinician is concerned more about preserving renal function, the patient is concerned about normal voiding without leakage. In noncompliant bladders, one of the options is augmentation with intermittent self-catheterization. Ileal conduit is done occasionally when major reconstructive procedures are not possible or not suitable [1,2].

Surgical Technique

Adequate bowel preparation is important, as children with neurogenic bladder have constipation as well. The patient is catheterized and placed in the head-low position. The primary port for the camera is inserted midway between the epigastrium and the umbilicus to gain access to both ureters and the ileum. A 12-mm port is inserted at the proposed site of the ileal conduit. A 5-mm port in the midclavicular line is inserted in the left side at the level of the umbilicus. Another 5-mm left flank port is used for suction and irrigation. The ureters are identified where they cross the pelvic brim, dissected down to the bladder, ligated and divided. The left ureter is brought to the right behind the sigmoid mesocolon. A stay suture is taken through the ureters with 3-0 Vicryl. The suture is brought out of the 12-mm trocar. The trocar is removed and reintroduced by the side of the suture. The ileocaecal junction is identified and the loop of ileum to be harvested is selected. The loop is held with a 5-mm bowel-holding clamp through the right-sided 12-mm port, and the port is sleeved up on the instrument with the tip of the instrument kept intraabdominally. The sutures holding the ureter are gently pulled to bring the ureters out first, and then the loop of ileum is brought out. As the pneumoperitoneum collapses the ileal loop comes out easily. The loop of ileum for the conduit is harvested extracorporeally. The ileoileal anastomosis is carried out in the usual manner and the mesenteric defect is closed.

Ureteroileal anastomosis is done using 5-0 Vicryl with a 5-French infant-feeding tube as a stent. Once the anastomosis is carried out, the pneumoperitoneum is again created, and the ileal loop and conduit are pulled back into the peritoneal cavity. The ureteroileal anastomosis is retroperitonealised with a 3-0 Vicryl suture, and the ileal conduit is tacked on to the lateral peritoneum to prevent any internal herniation. The ileal conduit stoma is fashioned in the usual manner. A drain is brought out through the left 5-mm port.

Conclusion

Laparoscopy-assisted procedures reduce the overall operating time and hence may be suitable in select situations.

FIG. 33.1. A micturating cystourethrography (MCU) shows a bladder with irregular contour and a bilateral grade IV reflux in a 4-year-old boy

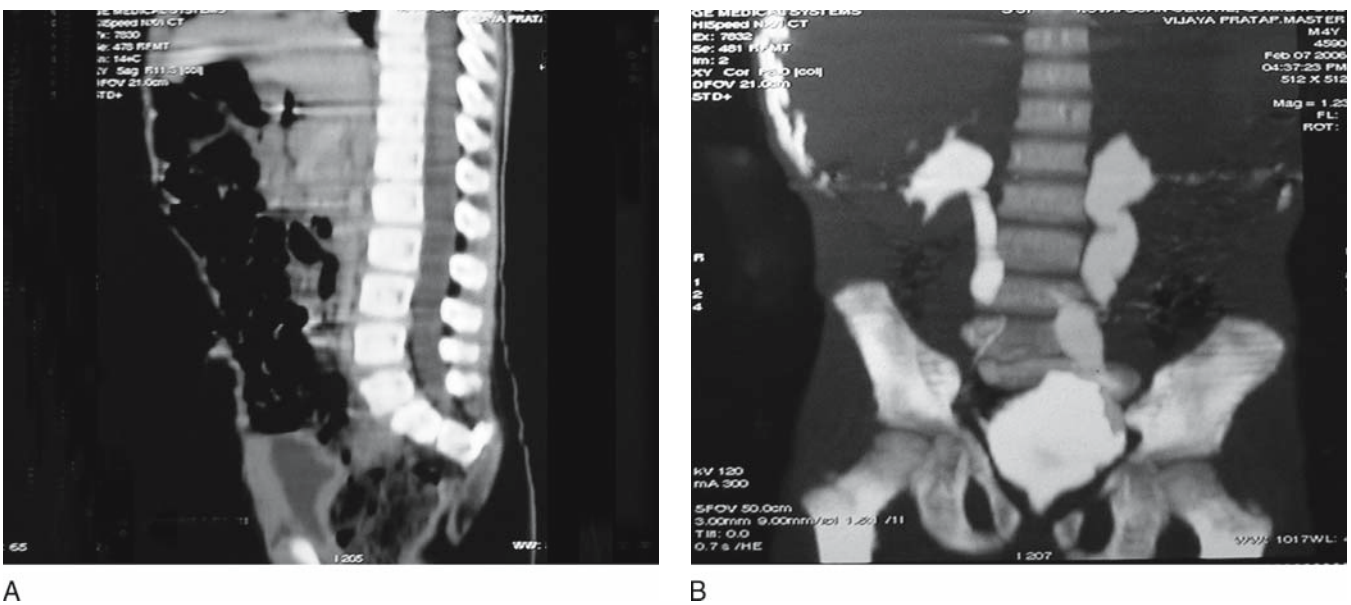


FIG. 33.2. A computed tomography (CT) urogram reveals sacral agenesis with bilateral dilated ureters

FIG. 33.3. Cystoscopic view of the trabeculated bladder

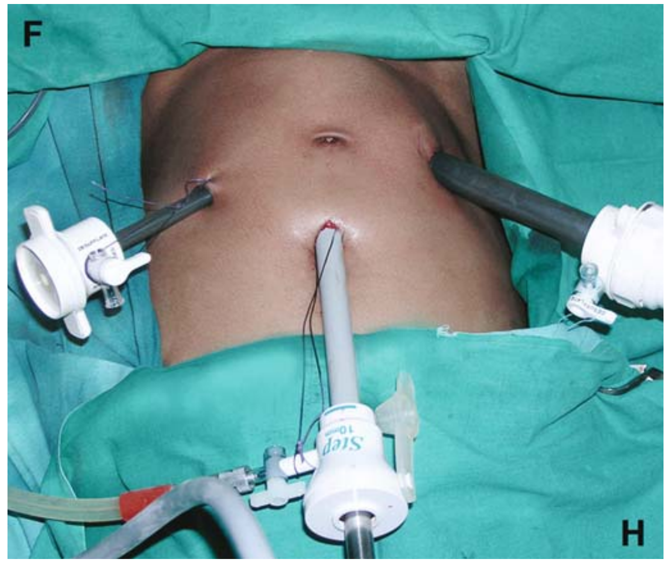


FIG. 33.4. Patient position and the port positions for accessing both the ureters and the ileum (H, head end; F, foot end)

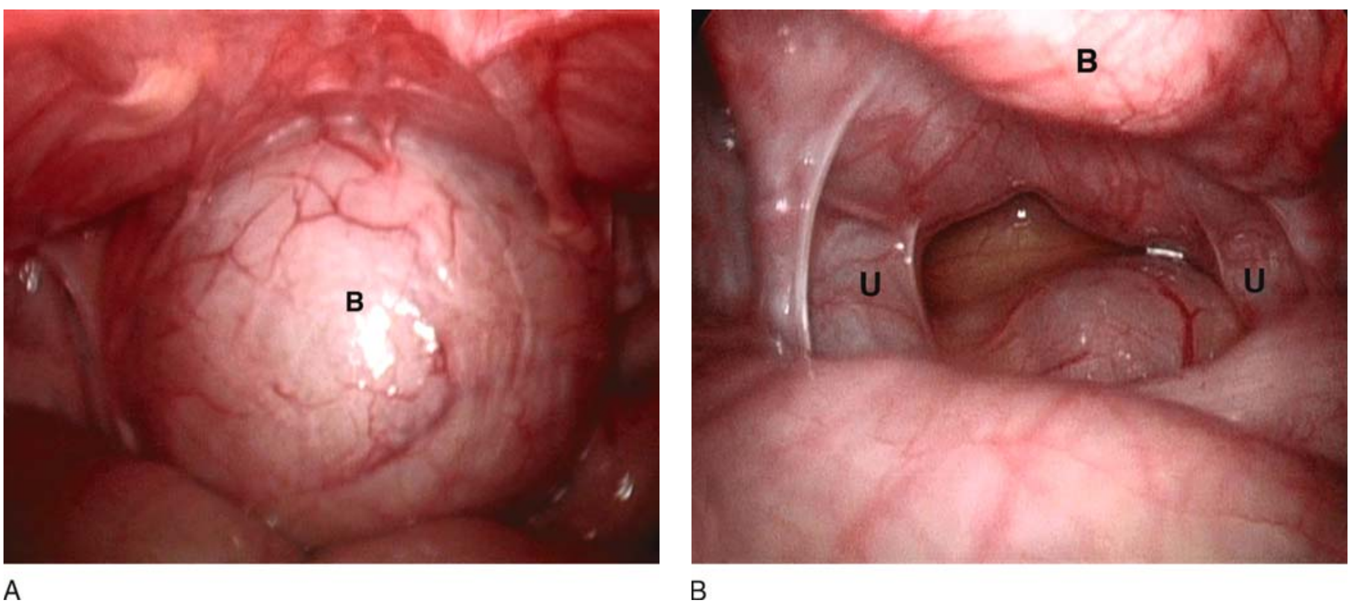


FIG. 33.5. Initial laparoscopic view of a thick-walled bladder and dilated ureters (U, ureter; B, bladder)

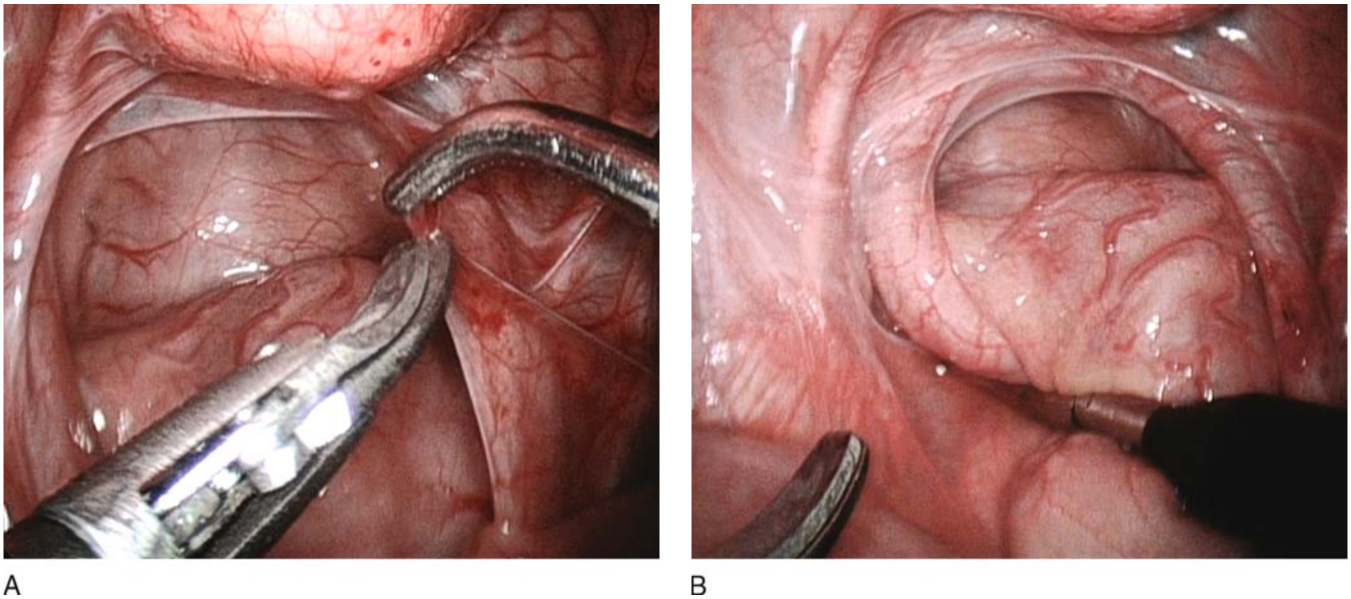


FIG. 33.6. Incision of peritoneum over the ureter to facilitate mobilization

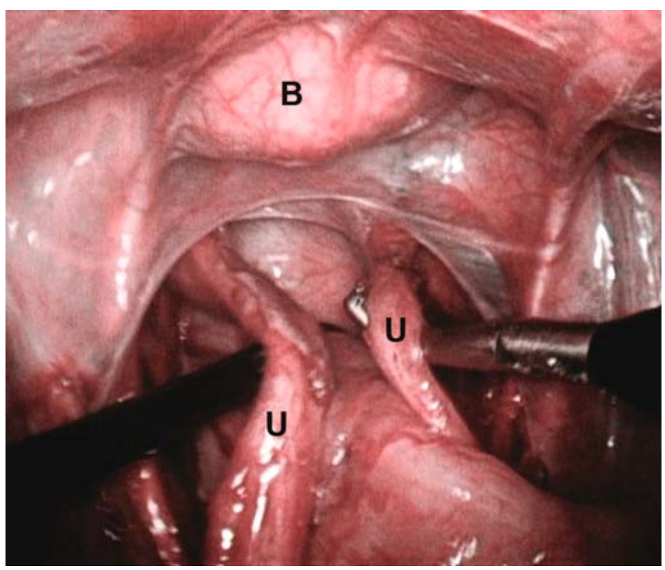


FIG. 33.7. Both ureters are mobilized (B, bladder; U, ureter)

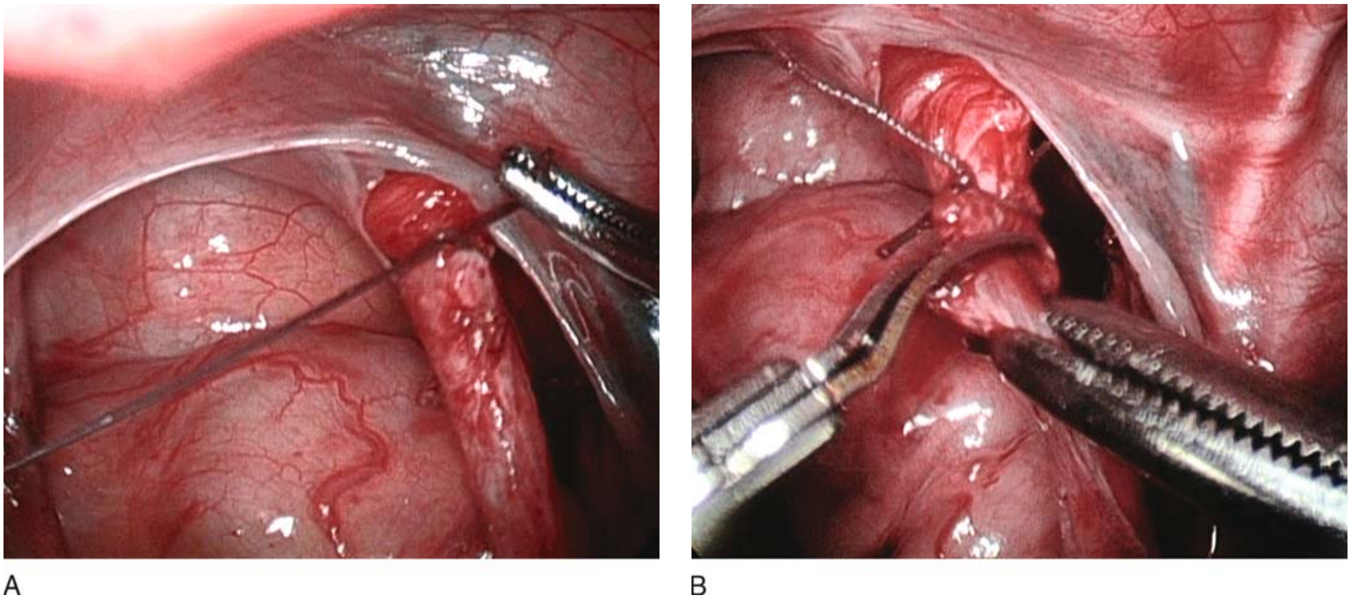


Fig. 33.8. Division of ureter as low as possible

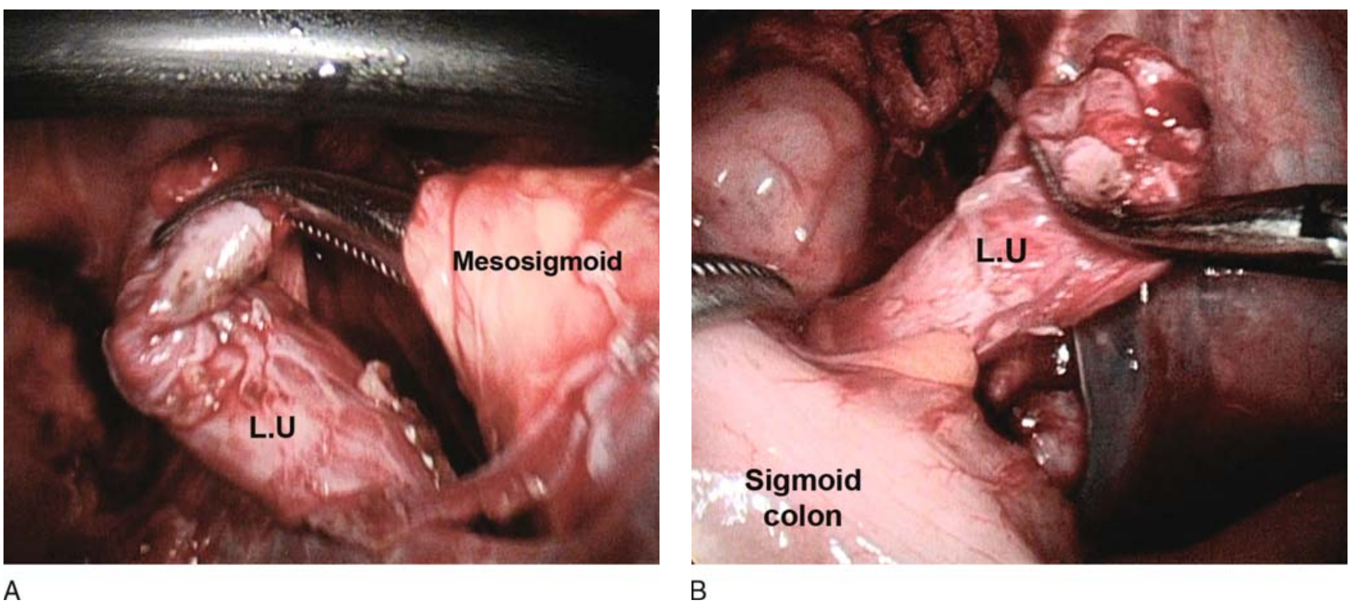
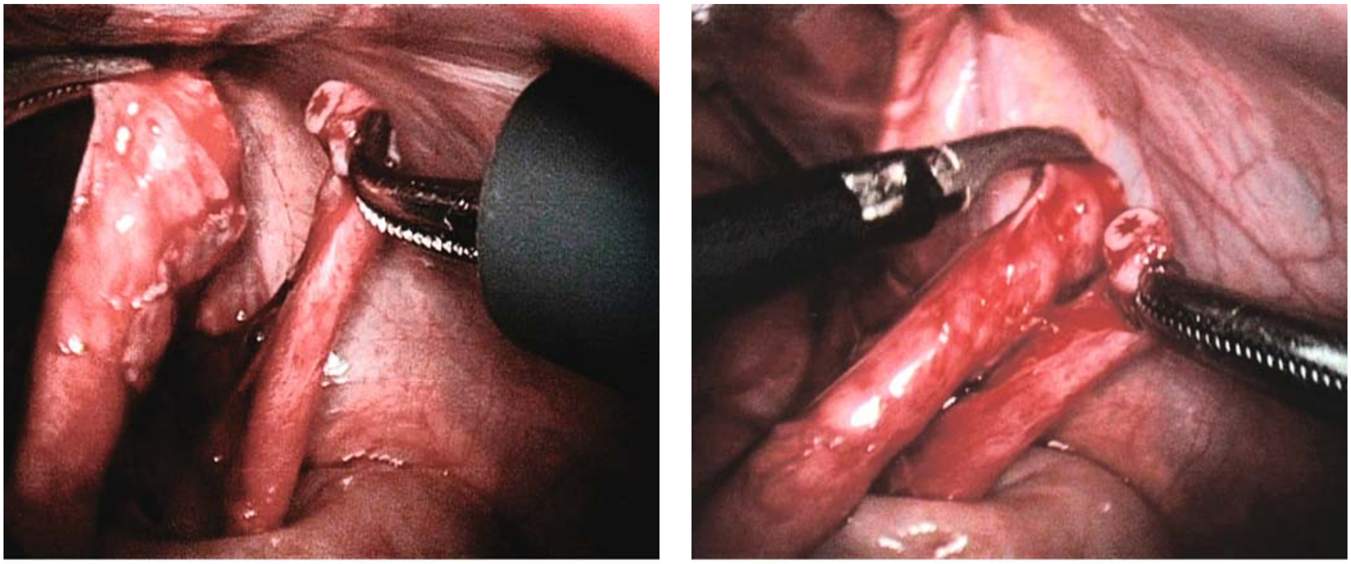
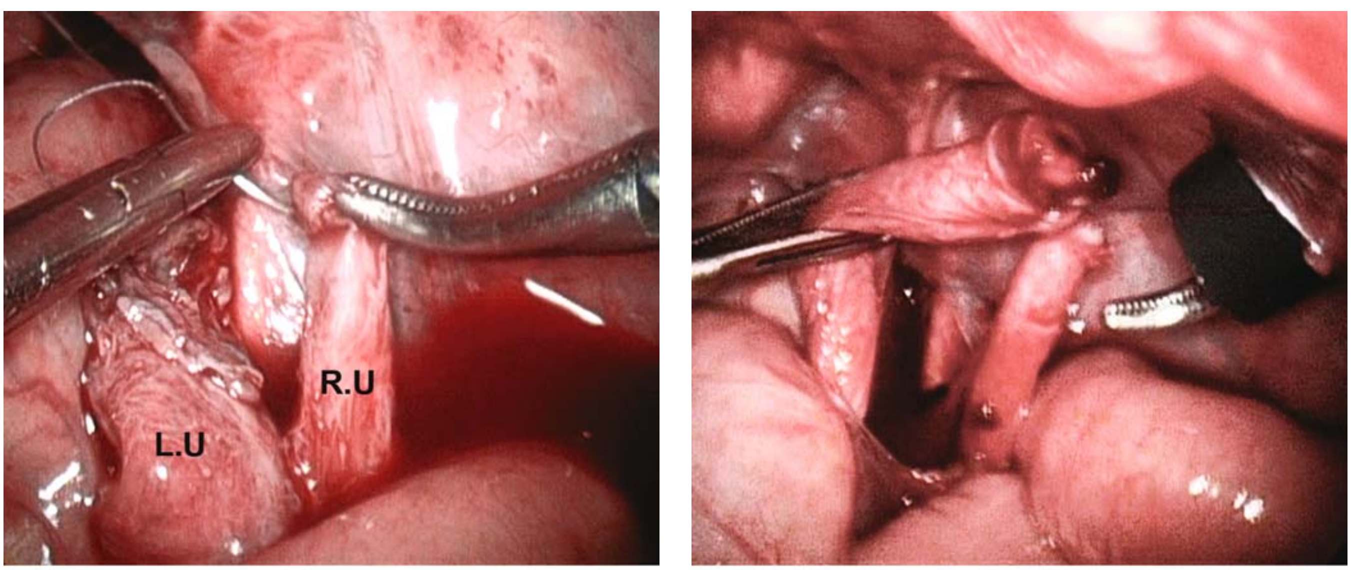


Fig. 33.9. The left ureter (L.U) is brought behind the mesosigmoid to the right



A B

FIG. 33.10. Both ureters lying tension-free at the port site



A B

FIG. 33.11. A stay suture is placed through the adventitia of both ureters to facilitate bringing them out through the 12-mm port (L.U, left ureter; R.U, right ureter)

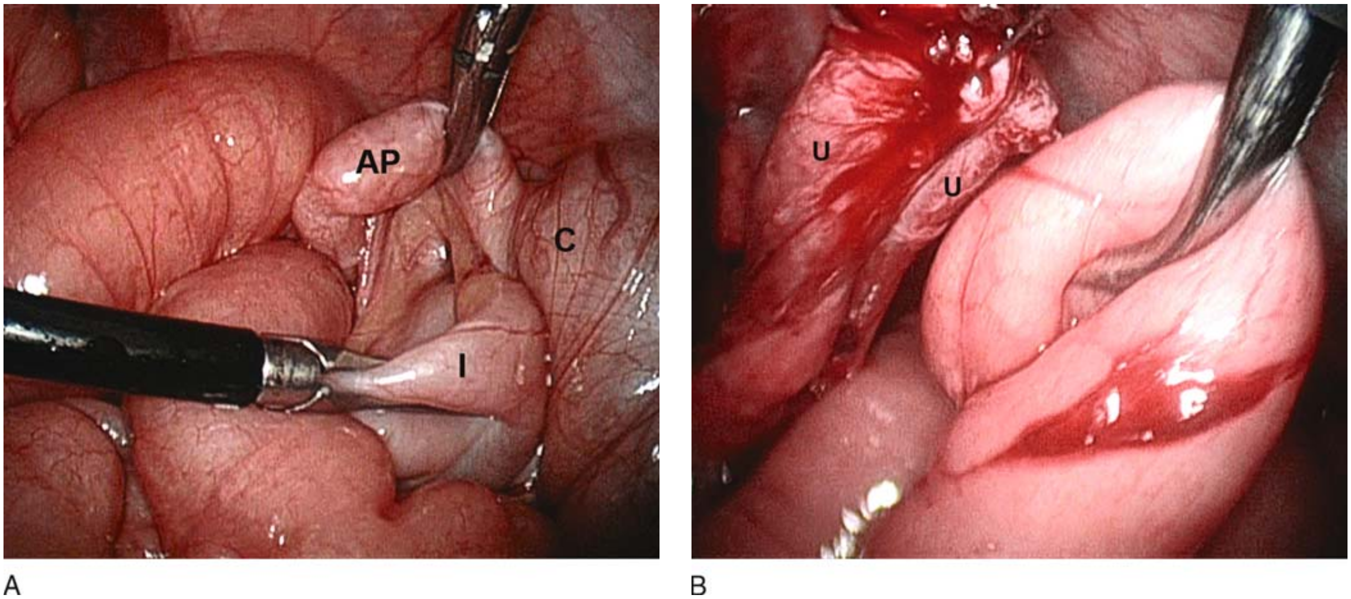


Fig. 33.12. Identifying distal ileal segment suitable for conduit (U, ureter; I, ileum; C, cecum; AP, appendix)

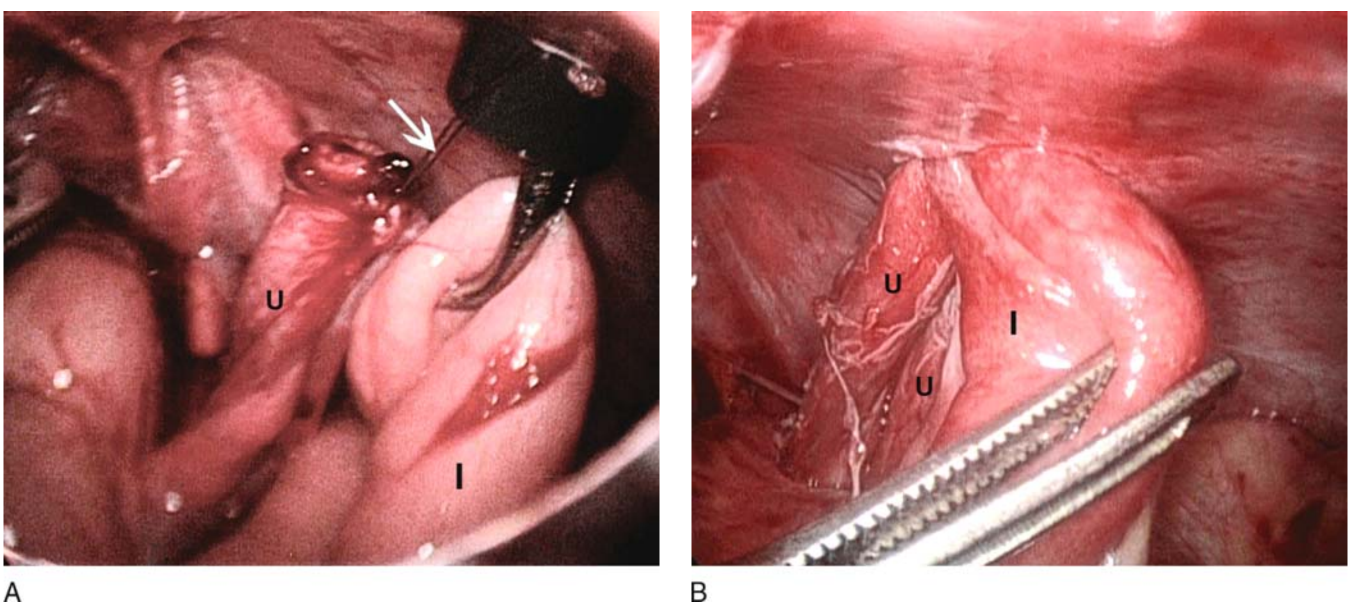
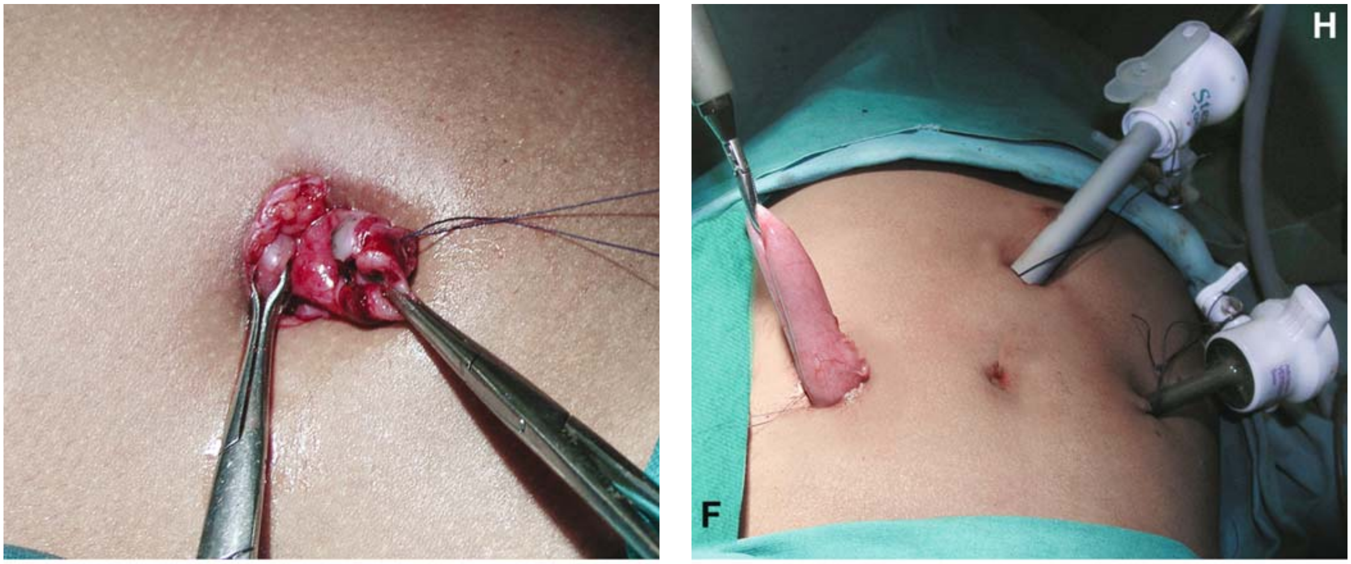


Fig. 33.13. Endoview of ureters (U) and ileum (I) being pulled out through 12-mm port; note the stay in the ureters



A B

Fig. 33.14. External view of ureters and ileal loop being brought out

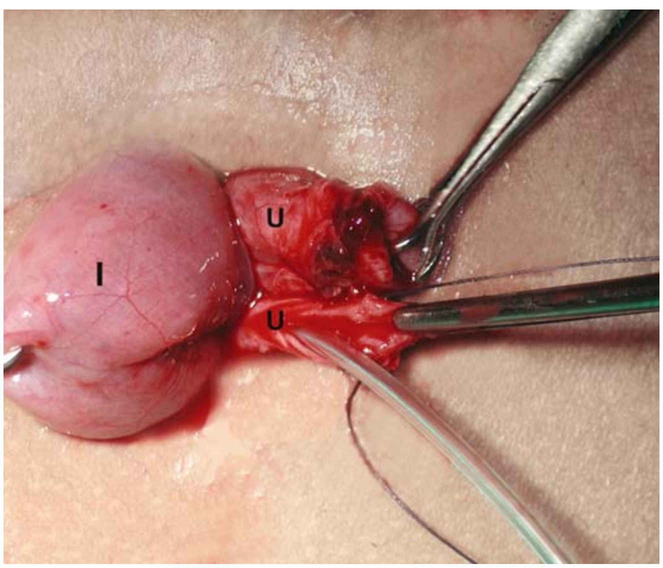


Fig. 33.15. Both ureters and ileum lying tension-free (U, ureter; I, ileum)

Fig. 33.16. Loop of ileum selected for conduit

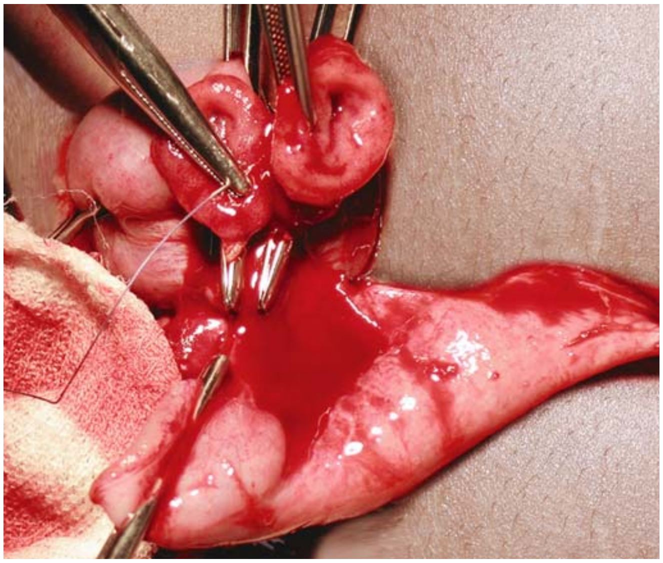


FIG. 33.17. Isolation of ileal segment

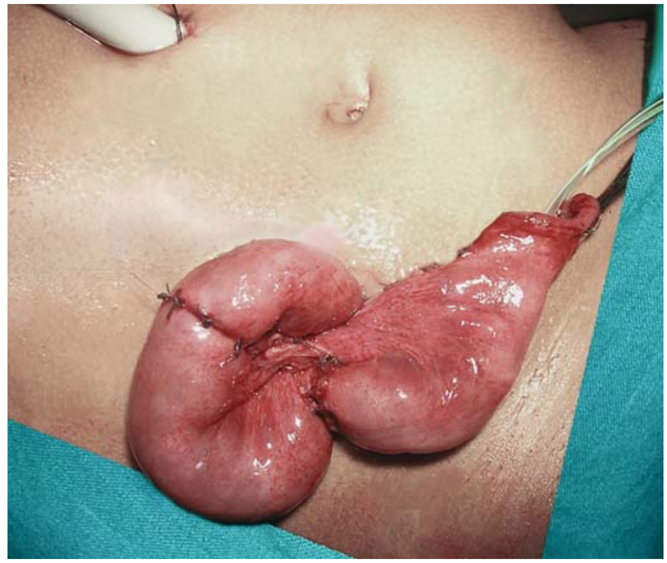


FIG. 33.18. Restoration of ileal continuity

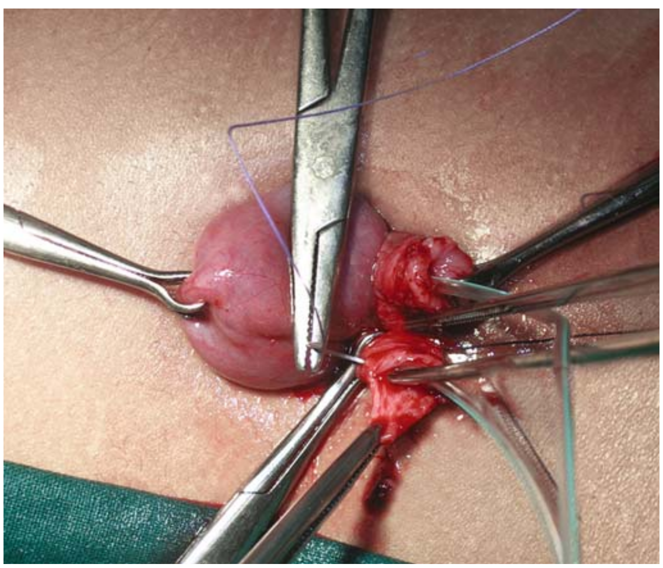


FIG. 33.19. Trousering of spatulated ureters in preparation for Wallace II technique of ureteroileostomy

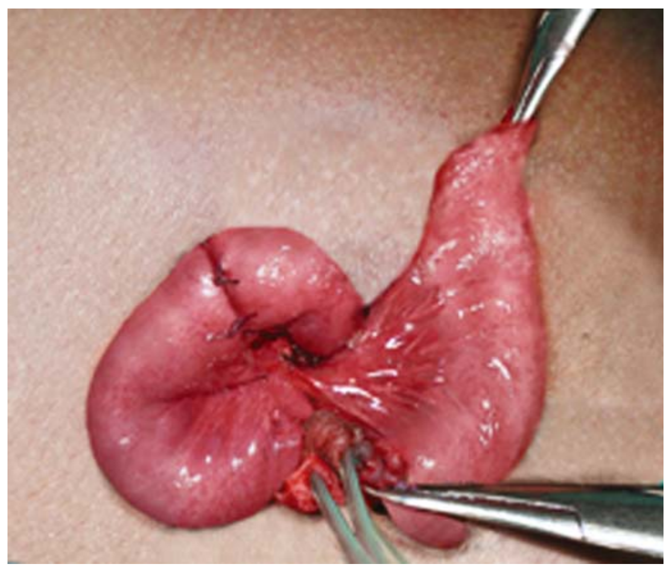


FIG. 33.20. Ureteroileal anastomosis in progress; ureteric stents inserted on both sides

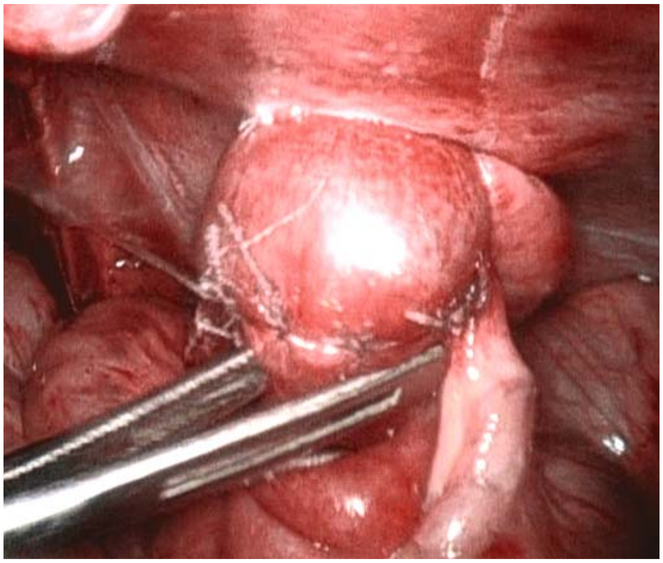


Fig. 33.21. Returning ileal segment back to abdomen

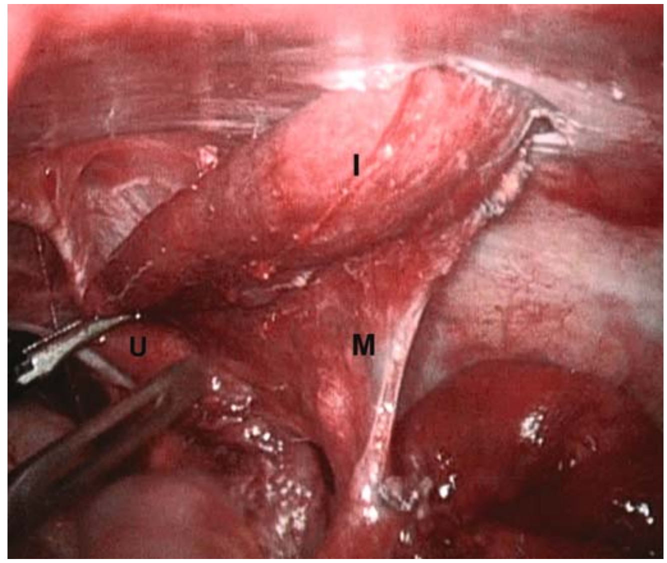


Fig. 33.22. Subsequently returning isolated conduit (ileoureteral segment) (I, ileum; U, ureter; M, mesentery)

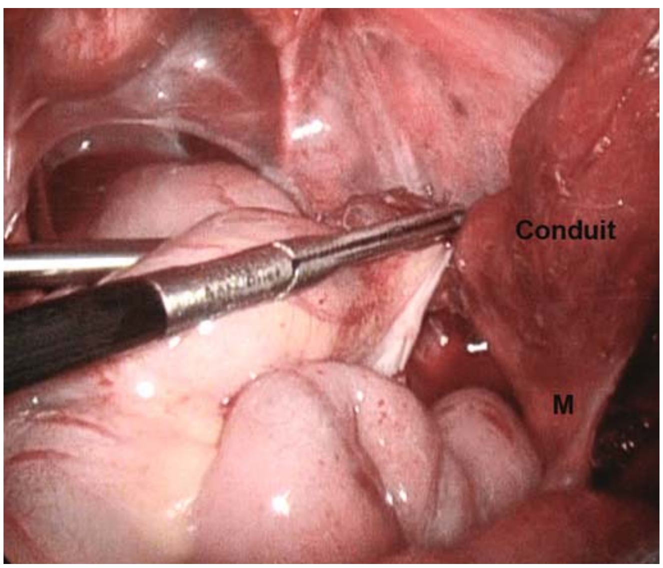


Fig. 33.23. Ileal conduit lying tension-free; note there is no twist in the mesentery (M)

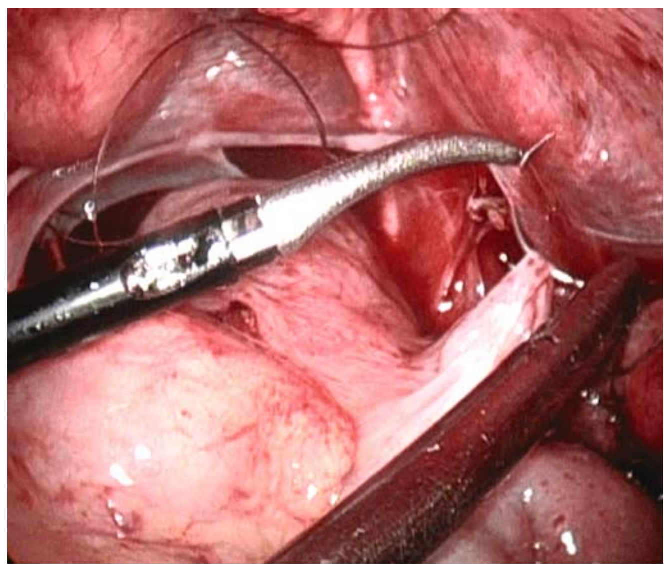
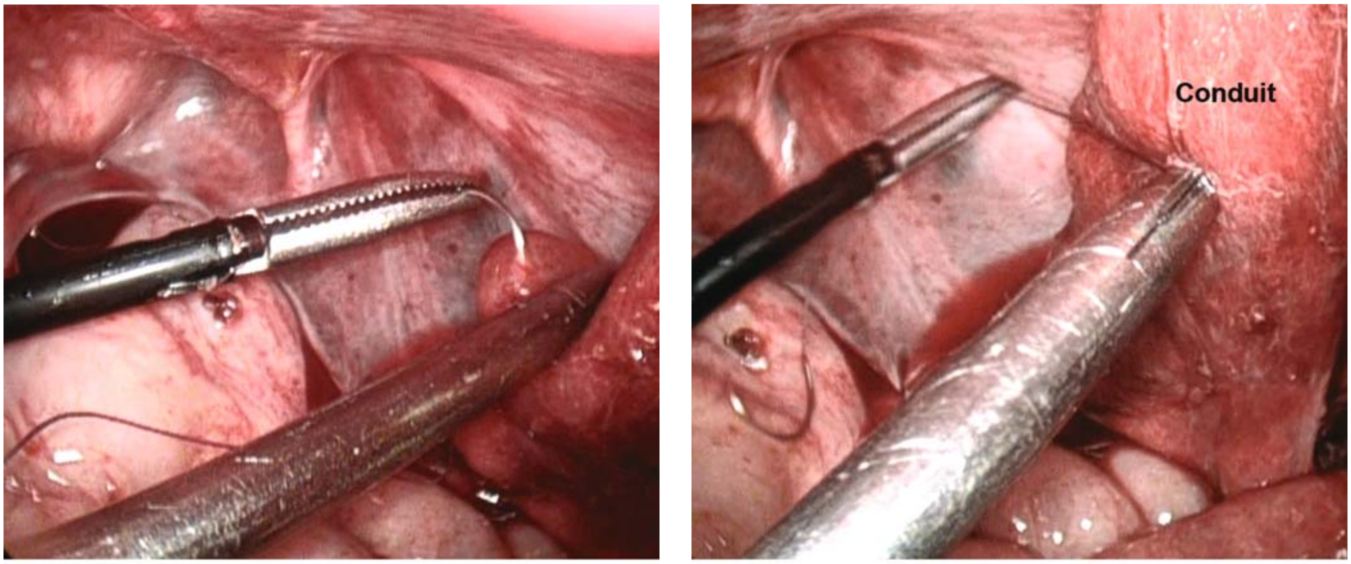


Fig. 33.24. Retroperitonealizing the ureters



A B

Fig. 33.25. The ileal conduit is tacked to the peritoneum to avoid bowel herniation

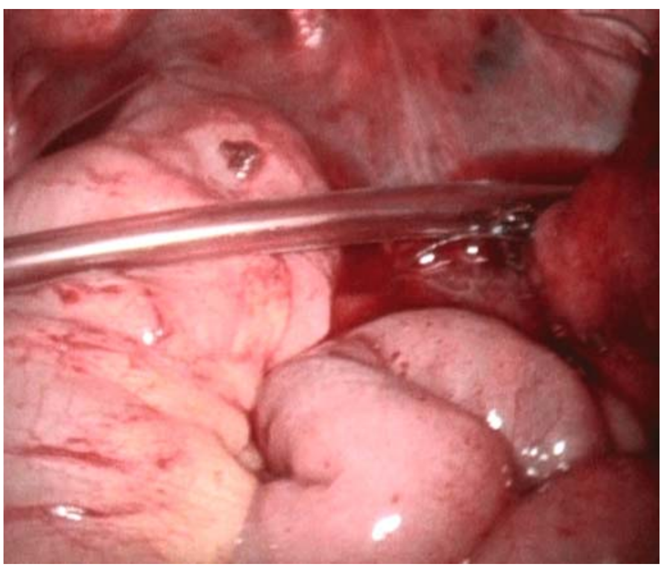


Fig. 33.26. A tube drain is introduced through the left flank port

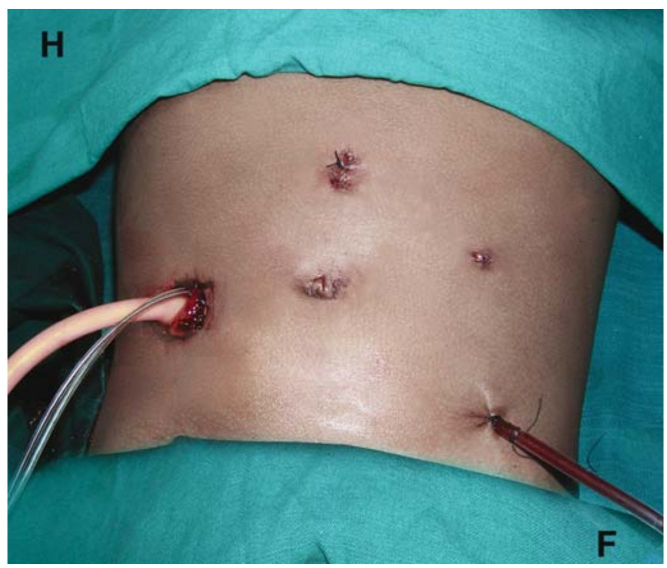


Fig. 33.27. Final view of the port site and urostomy

Reference

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34
Laparoscopic Cystectomy and Laparoscopically Assisted Orthotopic Neobladder

Christophe Vaessen

Cystectomy is the treatment of choice for localized urothelial carcinoma of the bladder involving the smooth muscle or for superficial bladder cancer uncontrolled by conservative treatment [1].

The mortality and morbidity is well known, especially in patients with a high American Society of Anesthesiologists (ASA) score [2].

Laparoscopic procedure for cystectomy have been described, either totally intracorporeal or with combined procedure [3,4,5,6]. We describe in this chapter the different steps of a combined procedure for laparoscopic cystoprostatectomy with orthotopic reconstruction. With the goal of shortening the operative time, we have chosen a combined technique of a laparoscopic cystoprostatectomy and an open reconstruction of the bladder. This permits combining the advantages of laparoscopy and the rapidity of open surgery. The advantages of laparoscopy are the magnification, the decrease in pain, and the maintenance of the immune wall. It is also an almost bloodless surgery. All these factors contribute to the decrease in the morbidity of this surgery and shorten the hospital stay [5,7]. It also contributes to a decrease in the required analgesia [4,7,8].

Preoperative Evaluation

The laparoscopic cystectomy is still under evaluation but can be considered for benign tumors of the bladder or for localized low-stage carcinoma of the bladder [9,10].

A preoperative staging of the disease must be done and a computed tomography (CT) scan must confirm the localized character of the disease (no perivesical fat involvement or obvious lymph node) and the absence of metastasis.

Preoperative Preparation

The bowels are prepared with an oral intake of 2 L of electrolyte solution. Antibiotic prophylaxis is given as per the practice in the institution.

The patient is placed in a supine position with the legs apart. A nasogastric tube and a bladder catheter are inserted. The table is placed in a Trendelenburg position (20 to 30 degrees).

Surgical Equipment

Standard laparoscopic video devices
0-degree telescope
Two 10-mm ports
Three 5-mm ports
Bipolar grasper
Monopolar scissors
Harmonic scissors or clips
Two atraumatic grasping forceps
Needle holders
Laparoscopic suction-irrigation canula
Large laparoscopic bag

Patient Position

The patient is placed in a dorsal position with the legs apart so that it gives access for a digital rectal examination if needed. Arms are placed along the body. A pronounced Trendelenburg position up to 25 to 30 degrees is recommended.

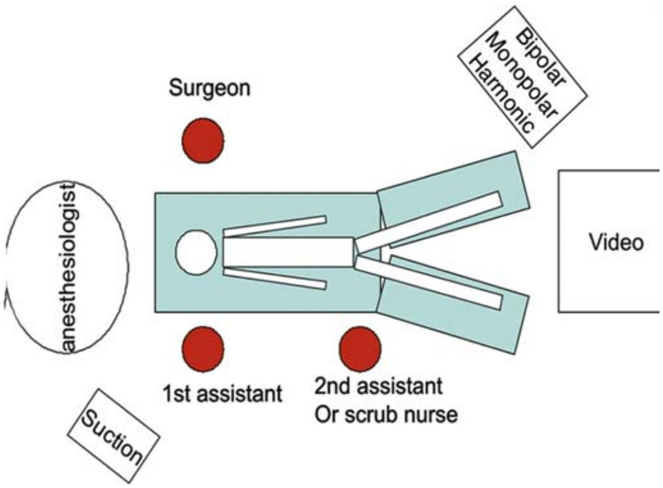

FIG. 34.1. Operating room setup

Operative Procedure

Steps of the Procedure

Step 1: Port Placement

Pneumoperitoneum is created either with a Veress needle or with an open technique. The first 10-mm port is placed at the superior part of the umbilicus. A 0-degree telescope is introduced. Three others ports are placed as shown in Figure 34.2. The subumbilical 5-mm port is introduced if needed later during the procedure.

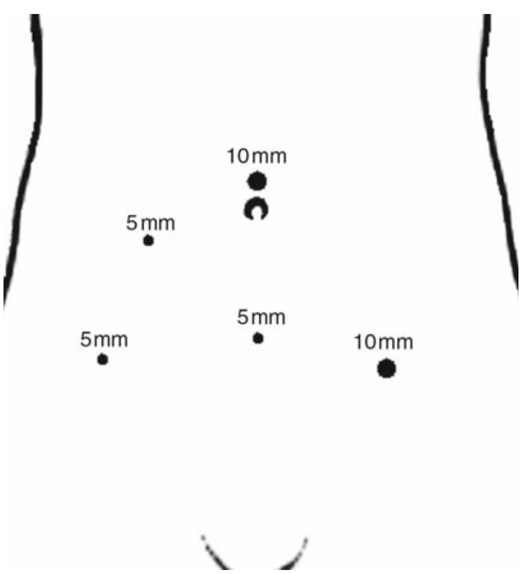

FIG. 34.2. The port positions

Step 2: Dissection of the Seminal Vesicles and the Rectoprostatic Space (Fig. 34.3)

The peritoneum is opened on the anterior aspect of the Douglas pouch. The seminal vesicles are dissected and the rectoprostatic space is opened.

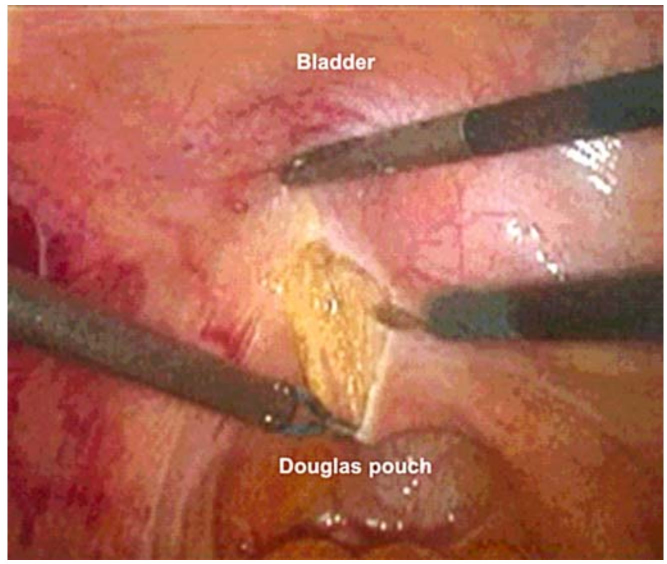

FIG. 34.3. Seminal vesicles and rectoprostatic space

Step 3: Ureters (Fig. 34.4)

The peritoneal incision is extended up to the common iliac vessels where the ureters are crossing the iliac artery. The dissection must preserve the periureteral fat.

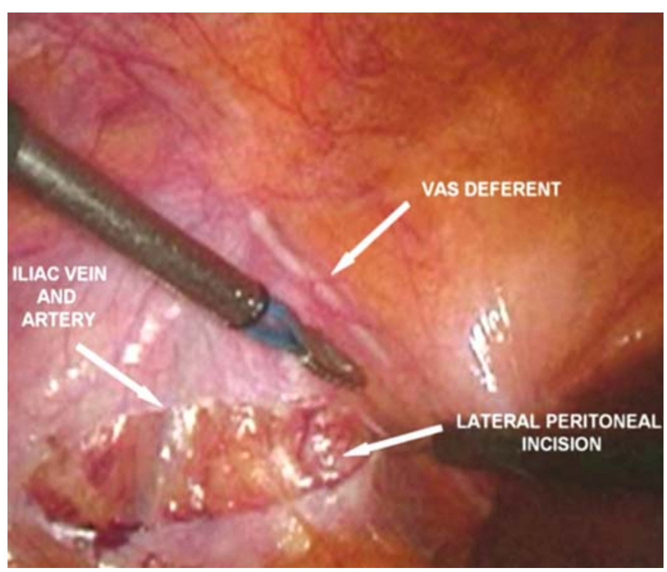

FIG. 34.4. Ureters

Step 4: Dissection of the Lateral Sides of the Bladder (Fig. 34.5)

The peritoneum is opened up to the internal ring, where the vas deferens is cut. The lateral aspect of the bladder and prostate are dissected on both sides.

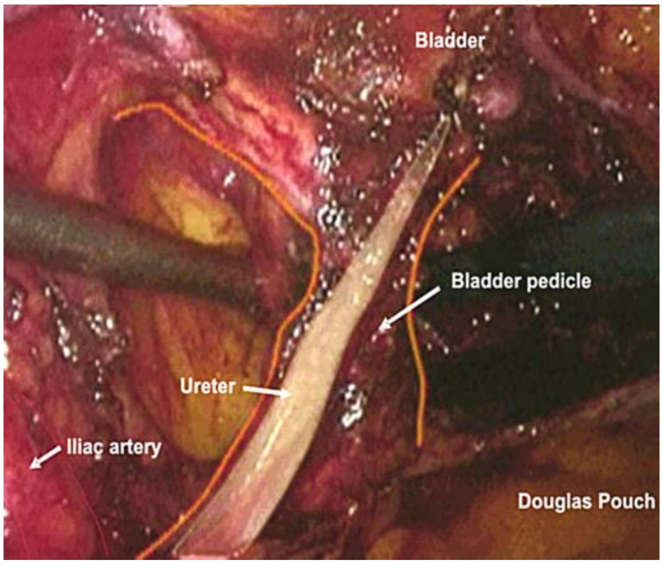

FIG. 34.5. Bladder pedicle

Step 5: Ilio-Obturator Lymph Nodes Dissection

A staging lymph nodes dissection is done in this step.

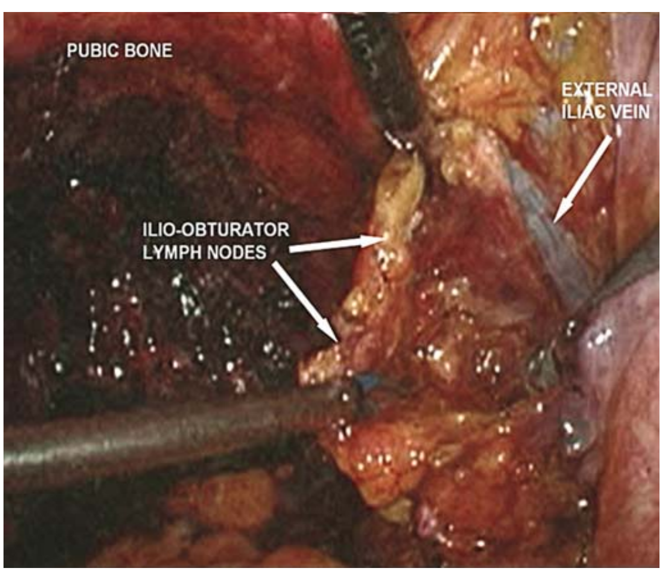

FIG. 34.6. Ilio-obturator lymph nodes dissection

Step 6: Section of the Ureters Between Clips

A frozen section of cut end is recommended.

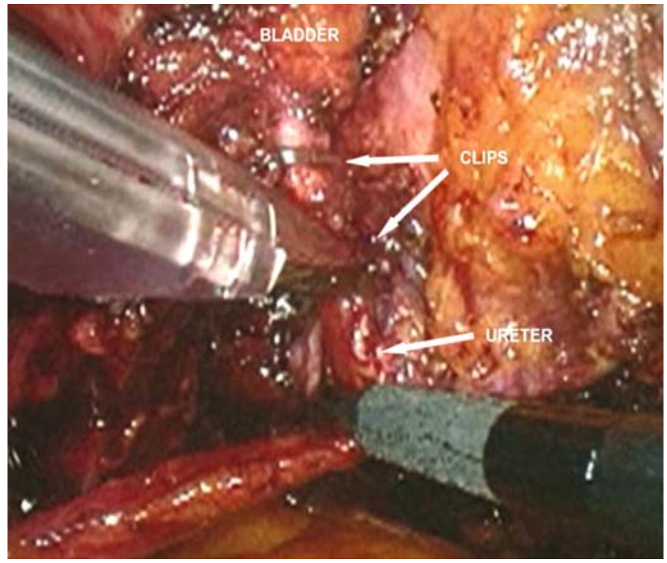

FIG. 34.7. Section of the right ureter

Step 7: Division of the Bladder Pedicle (Fig. 34.8)

The use of a harmonic scissors (Harmonic, Ethicon Endo-surgery) facilitates and reduces the time of this part of the procedure. It also minimizes the risk of bleeding. The prostatic pedicles are also divided; if necessary the dissection can be as close as possible to the prostate so that the neurovascular bundles may be protected. Stapling of the pedicles has also been described [2,5,6,11–14].

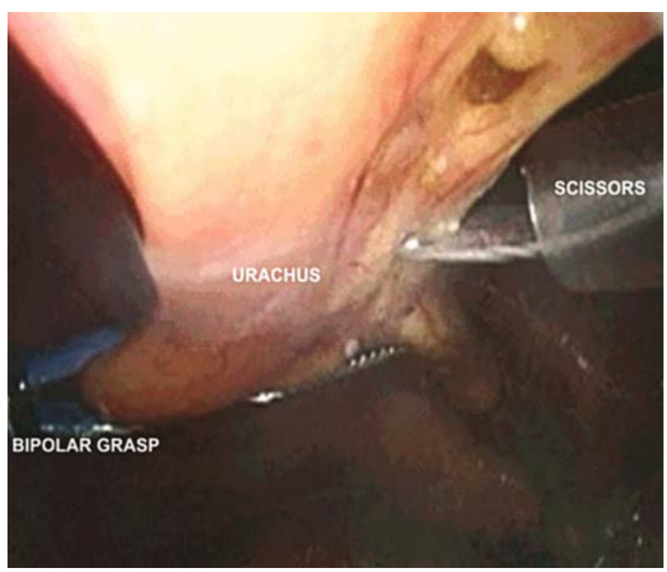

FIG. 34.8. Division of the bladder pedicle

Step 8: Section of the Urachus (Fig. 34.9)

The anterior aspect of the bladder is dissected through the pelvic fascia, which is opened, giving a clear view on the lateral side of the prostate and on the apex (Fig. 34.10). The Santorini plexus is then tied with a 2-0 Vicryl and then cut (Fig. 34.11). The specimen is now attached by the urethra only. The urethra may be cut between clips or stapled if an ileal conduit is considered. If an orthotopic replacement is performed, the urethra is cut (Fig. 34.12) and the prostatic part is quickly closed by one or two stitches of Vicryl.

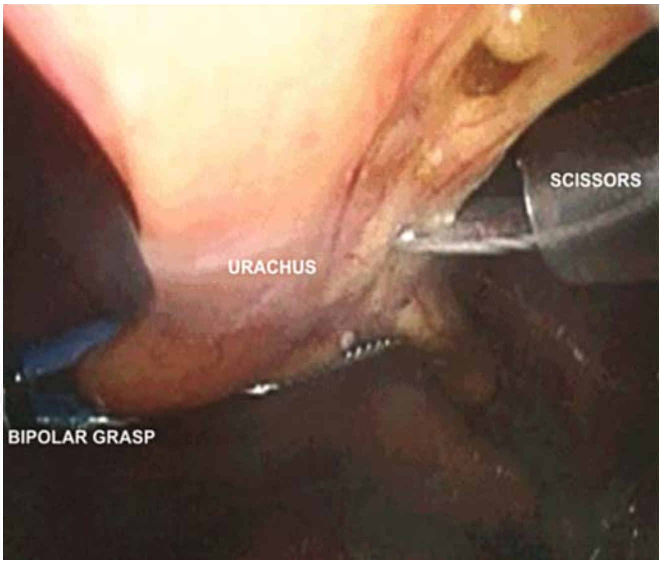

Fig. 34.9. Section of the urachus

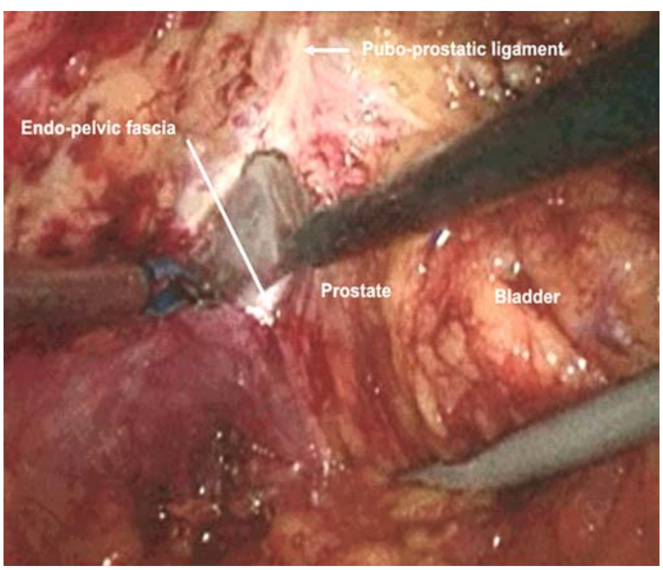

Fig. 34.10. Endopelvic fascia

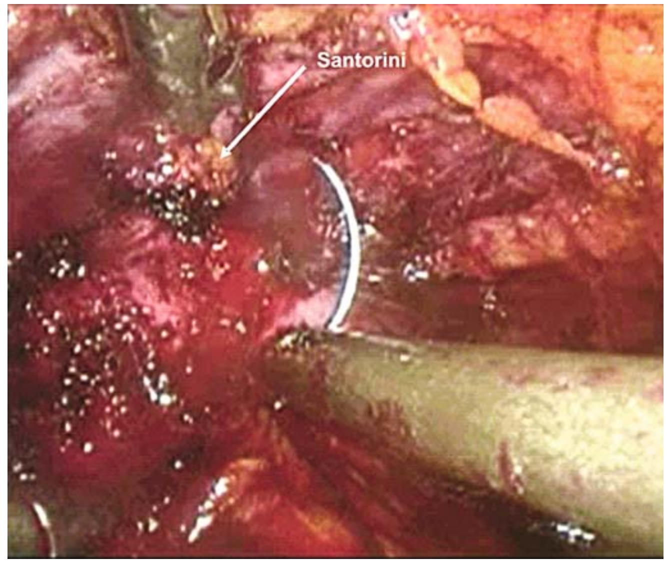

Fig. 34.11. Control of the Santorini complexes

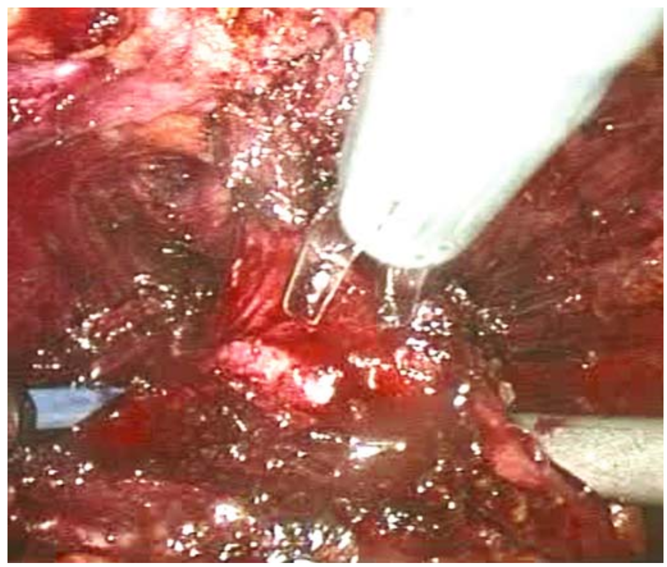

Fig. 34.12. The urethra being divided

Step 9: Specimen

The specimen is then totally freed and placed in a large laparoscopic bag.

Step 10: Bladder Reconstruction (Figs. 34.13 and 34.14)

A 4-cm median subumbilical incision is made and the specimen is removed. The ureters are long and can be easily pulled out through the incision, and are catheterized with 8-French stents. The ileal loop is harvested classically, and the bladder

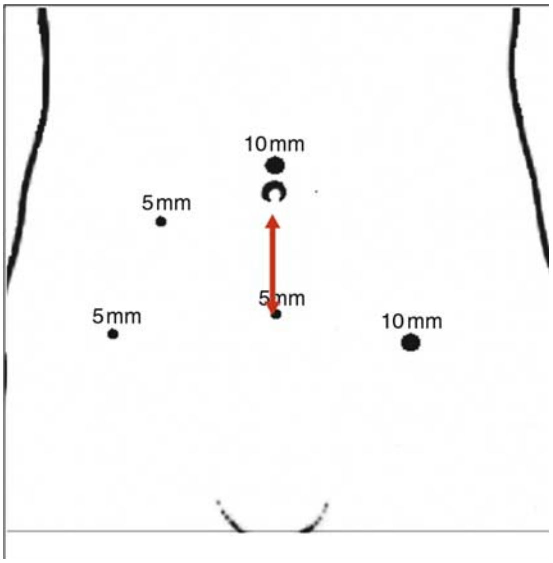

FIG. 34.13. Abdominal incision

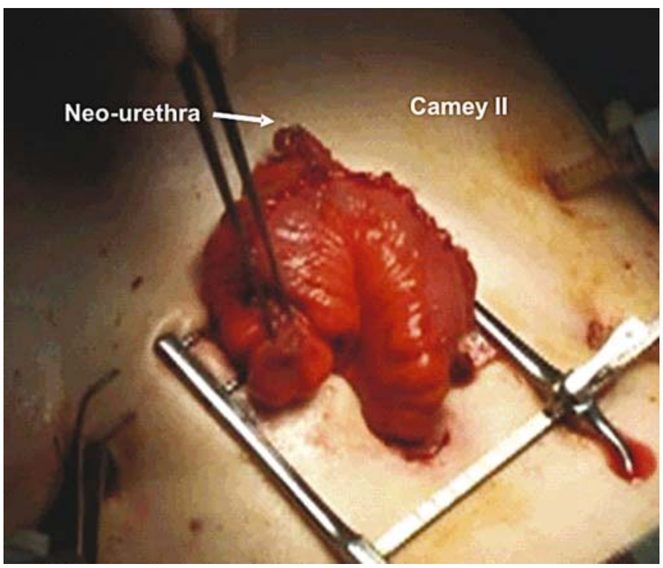

FIG. 34.14. Camey II reconstruction

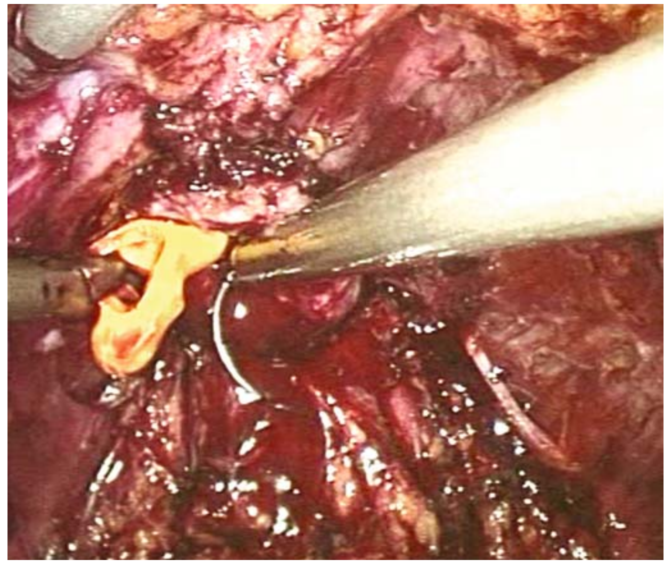

FIG. 34.15. Urethral anastomosis in progress

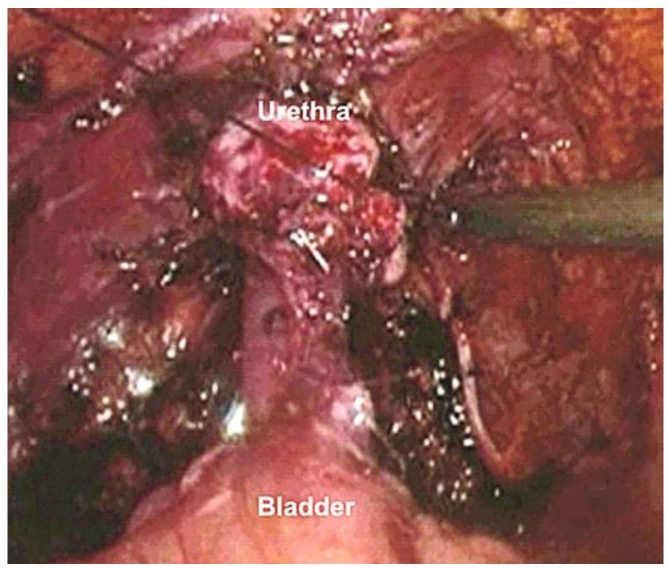

FIG. 34.16. Urethral anastomosis is completed

is reconstructed extracorporeally. The ureteral implantation into the neobladder is also done extracorporeally through this small incision.

Step 11: Anastomosis

The anastomosis between the urethra and the neobladder (Figs. 34.15 and 34.16) is realized intracorporeally with either separated stitches or running sutures. The bladder is filled with saline solution and sutures are checked for leaks. A simple drain is left in place.

Postoperative Care

Low molecular weight heparin is started within the next 12 hours. Patient-controlled analgesia is arranged for all patients except if the surgery is done for neurologic reasons.

The nasogastric tube is left in place for 24 to 48 hours and oral fluid intake is permitted on the second postoperative day. No parenteral nutrition is used except in specific cases.

The patient can be discharged as soon as the bowel transit returns to normal.

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35
Laparoscopically Assisted Ileocystoplasty

M. Ramalingam and K. Senthil

Laparoscopy assisted ileocystoplasty is a hybrid of an open and a laparoscopic approach, and it facilitates reducing the operating time by about 1 hour. The supraumbilical port can be extended to about 3 cm to bring out the distal ileum for isolation and restoring ileoileal continuity.

Subsequently the bowel segment is pushed into the peritoneal cavity, and the rectus is closed tightly around the camera port. The rest of augmentation is done with free hand suturing intracorporeally (see Chapter 24).

Fig. 35.1. A micturating cystourethrography (MCU) shows a grossly trabeculated bladder with bilateral reflux in a patient with neurogenic bladder

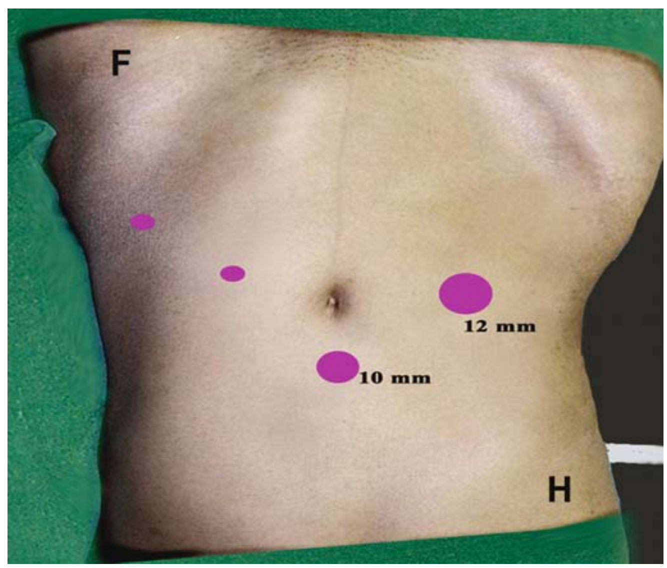

Fig. 35.2. External view of the port positions (H, head end; F, foot end)

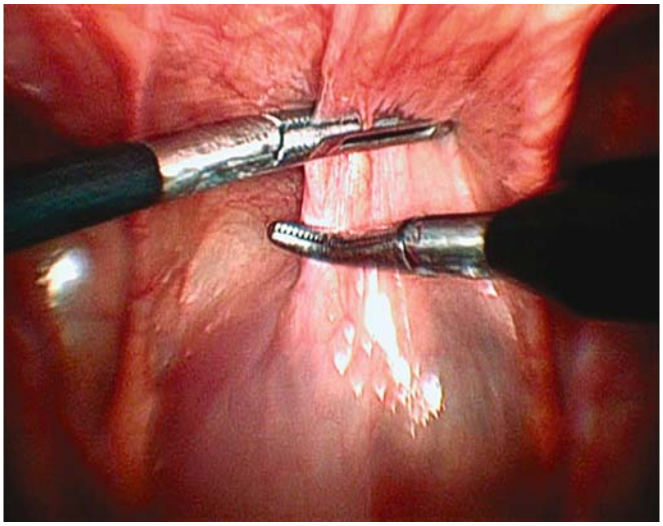

FIG. 35.3. Initial laparoscopic view shows a thick-walled bladder

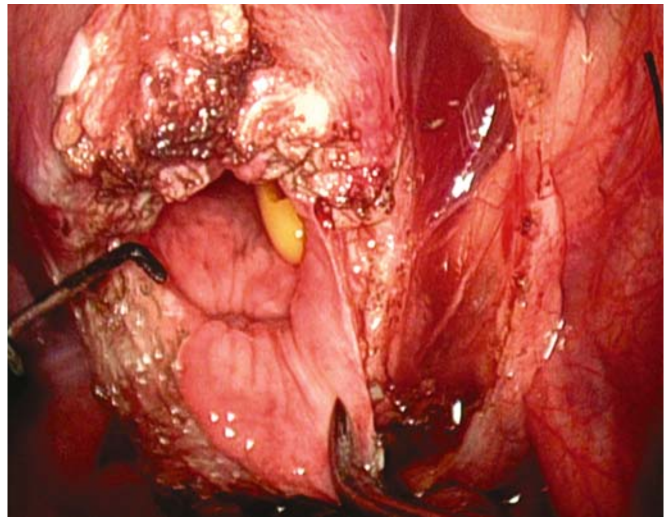

FIG. 35.4. Horizontal cystotomy is performed with hook cautery; note the thick-walled bladder

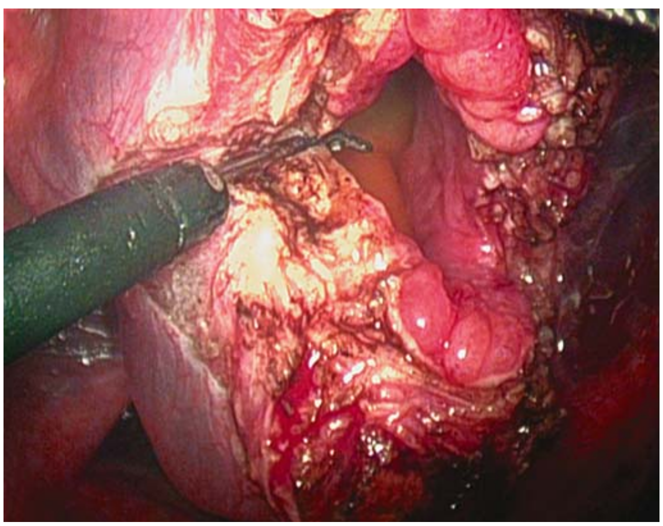

FIG. 35.5. The cystotomy is extended

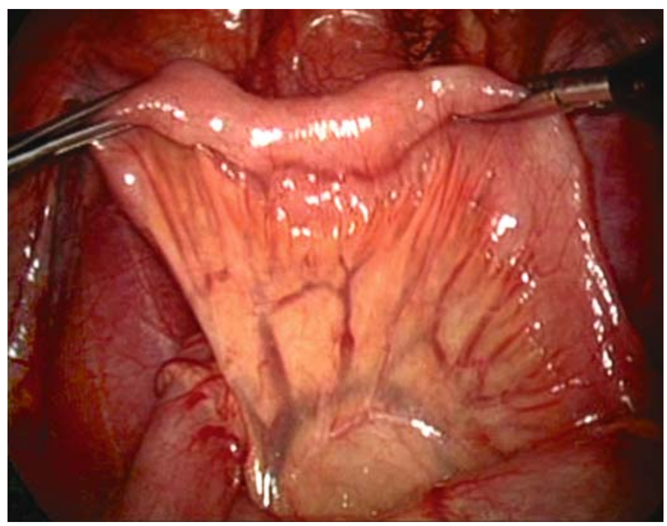

FIG. 35.6. Choosing an ileal segment suitable for augmentation (about 15 cm away from the ileocecal junction

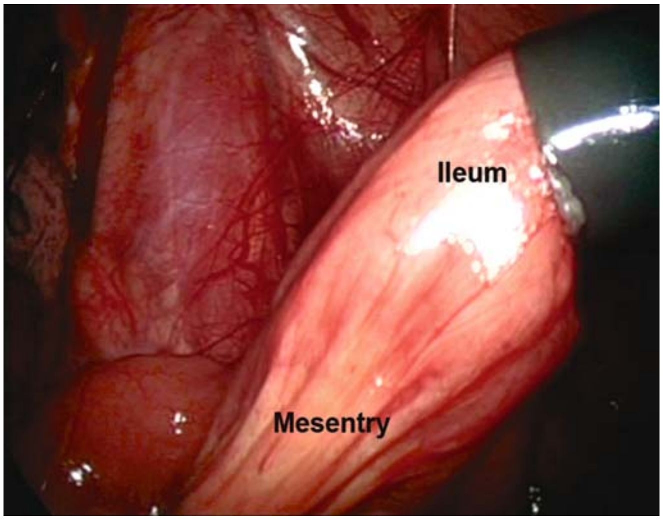

FIG. 35.7. The chosen ileal segment is exteriorized through the 12-mm port

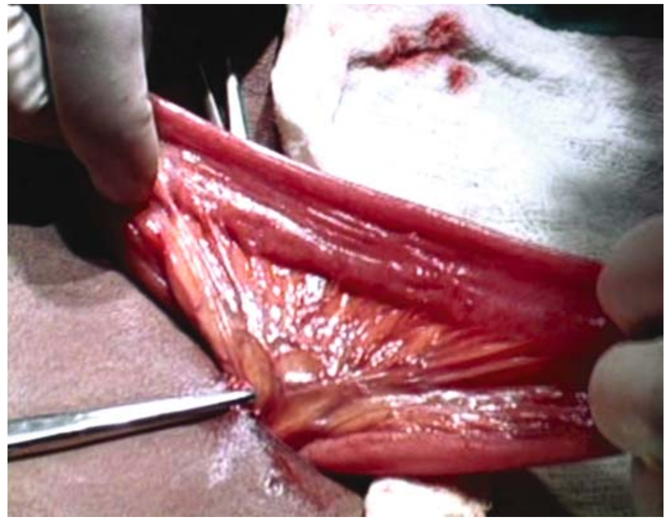

FIG. 35.8. The selected ileal segment is brought out through the 12-mm port

FIG. 35.9. Division of the ileum along with its mesentery with ultracision to prepare an ileal patch for augmentation of the bladder (performed extracorporeally)

FIG. 35.10. Bowel continuity is restored

Fig. 35.11. Thorough washing of the isolated segment with dilute povidone iodine

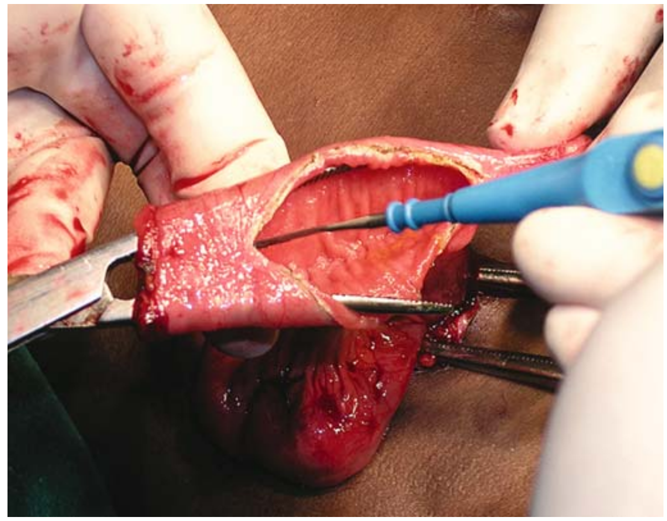

Fig. 35.12. Detubularizing the isolated ileum

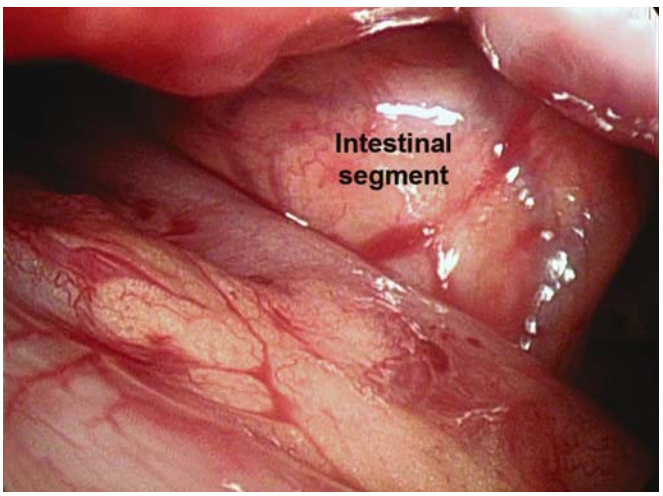

Fig. 35.13. Detubularized intestinal segment is pushed back into the peritoneal cavity

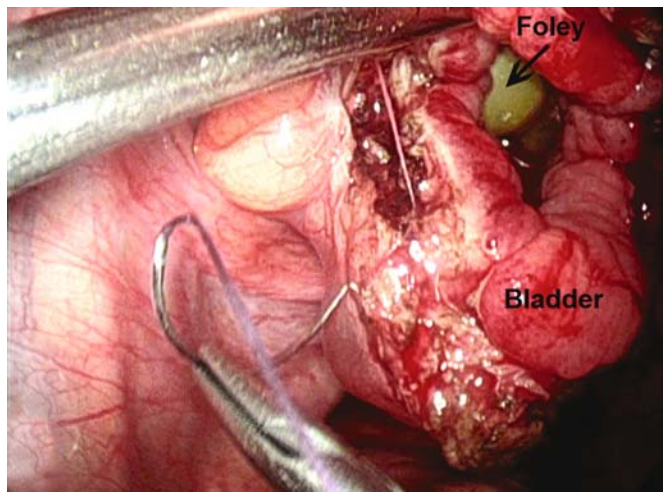

Fig. 35.14. Initial suture outside-in through the posterior lip of the cystotomy

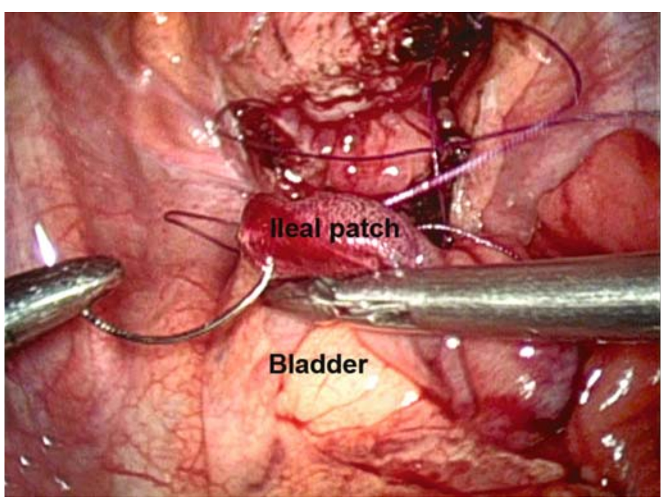

Fig. 35.15. A corresponding initial suture (3-0 Vicryl) inside-out through the detubularized ileum

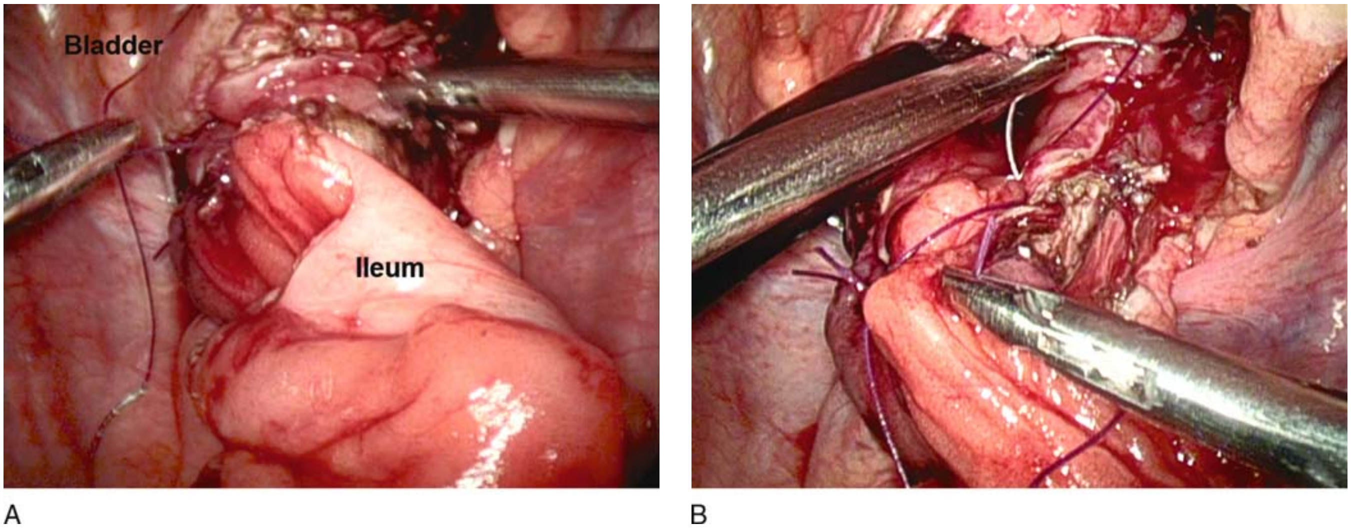

FIG. 35.16. Subsequently using either interrupted or continuous sutures, the anastomosis is continued to the right side

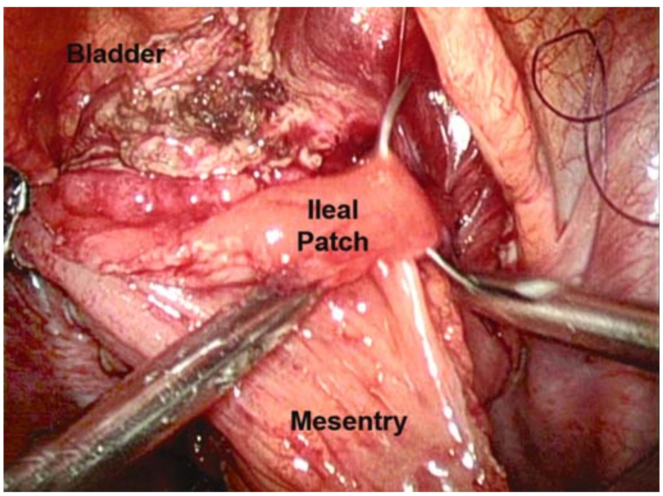

FIG. 35.17. Then the anterior layer suture starts at the right-hand corner

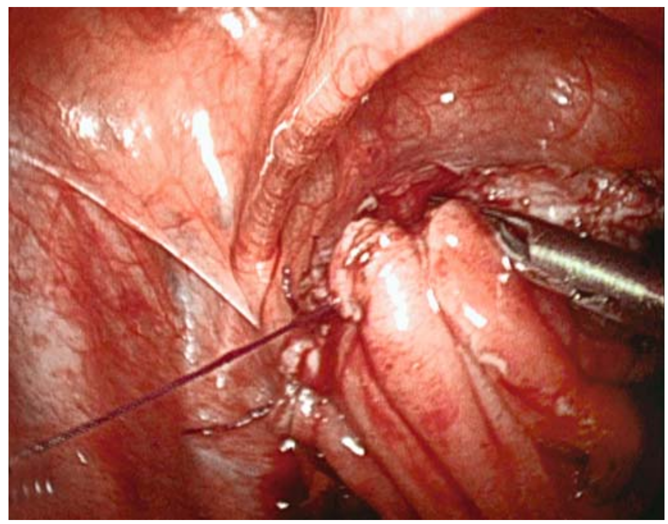

FIG. 35.18. Suturing of the anterior layer in progress

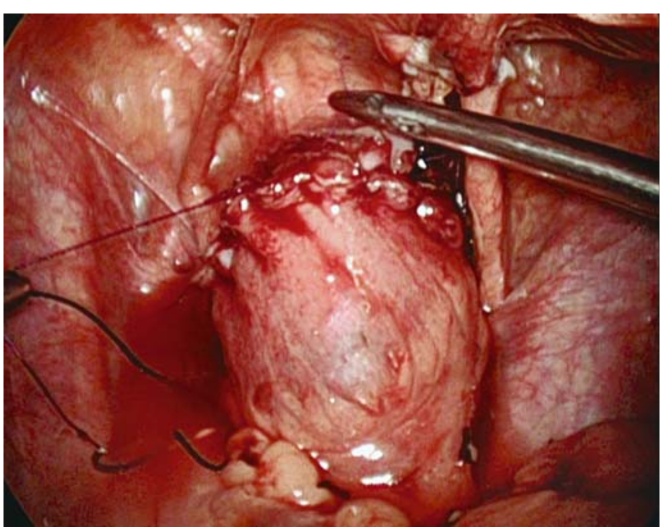

FIG. 35.19. The augmentation is nearly completed

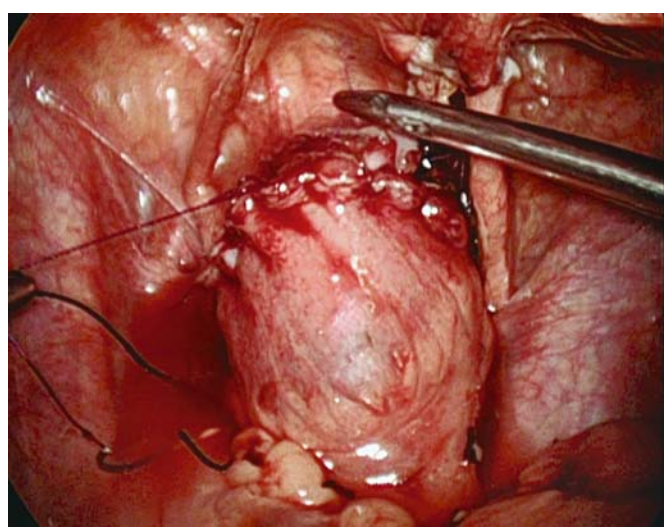

FIG. 35.20. On distending the bladder, any leak from the suture line can be noted and oversewn

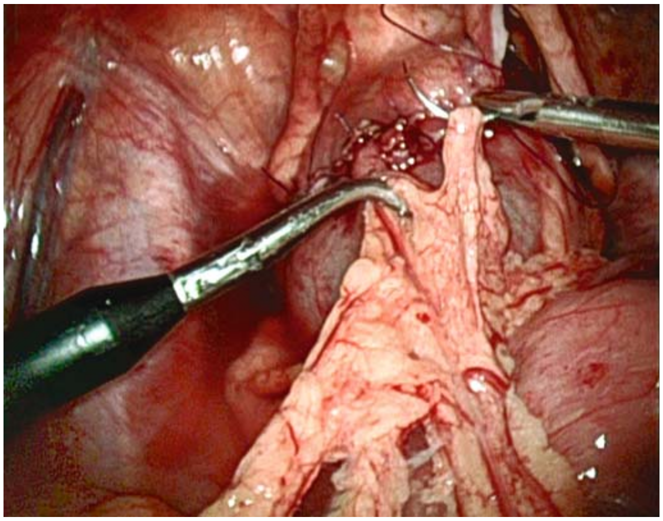

FIG. 35.21. Omental tacking over the augmented area

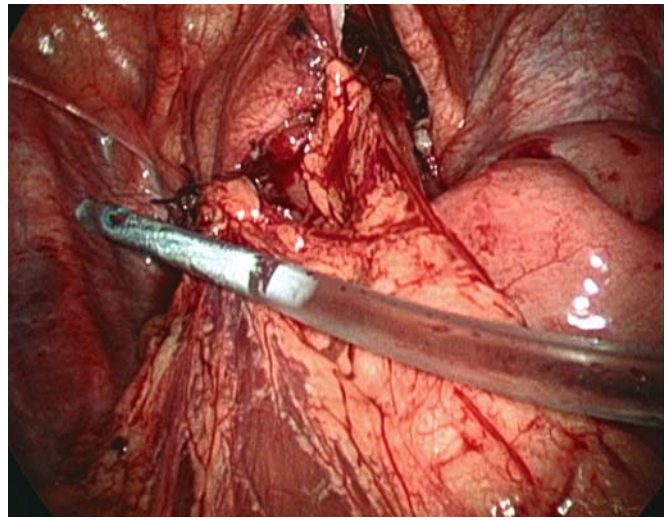

FIG. 35.22. A tube drain is introduced through the right flank port

36
Hand-Assisted Laparoscopic Partial Nephrectomy

Abhay Rané

Long-term outcome data confirm that partial nephrectomy performed in properly selected patients yields oncologic efficacy similar to that of conventional radical nephrectomy [1]. Advances in laparoscopic surgery have made laparoscopic partial nephrectomy technically feasible. Laparoscopic partial nephrectomy (LPN) was first described in 1993 [5], and is now an accepted technique for small-volume renal tumors. Patients with exophytic renal masses <4 cm are ideal candidates; however, larger tumors may be considered in selected cases with poor renal function, a solitary kidney, bilateral tumors, or genetic predisposition to renal tumors [2].

An LPN can be completed by standard laparoscopic, robotic, or hand-assisted techniques. The main challenge to the wider deployment of this technique is its technical difficulty. Tumor excision, hemostasis, and reconstruction of collecting system breaches require proficiency and skill with intracorporeal suturing techniques; the issue is further compounded with the necessity to achieve the result expeditiously to minimize warm ischemia times. As in radical nephrectomy, the hand has emerged as yet another effective tool for achieving hemostasis and aiding dissection during laparoscopic nephron-sparing surgery [3,4,6]. Hand assistance helps manipulate the kidney and dissect the mass; it also helps gain easier access to the upper pole.

Technique

The initial step in a successful hand-assisted laparoscopic partial nephrectomy (HALPN) is to select the patient carefully, giving consideration to the following factors:

- The lesion should be <4 cm and peripheral.
- Polar lesions are preferable, especially early in the laparoscopic surgeon's experience with this technique; however, masses abutting the hilar vessels and central collecting system can be resected safely by the experienced surgeon.
- Patients with prior renal surgery or a history of any inflammatory conditions of the affected kidney should be avoided early in the surgeon's experience.
- Computed tomography (CT) or magnetic resonance imaging (MRI) usually suffices for the evaluation of peripheral lesions, but deeper lesions may benefit from MR angiography or digital subtraction angiography to outline the vasculature and help plan the resection.

Patients are given mild bowel preparation the night prior to surgery.

If a deep resection involving the collecting system is anticipated, a ureteric catheter is placed retrogradely with the tip lying just below the pelvic ureteric junction; the free end is connected to a syringe containing diluted methylene blue, which helps identify sites of leakage of the collecting system preoperatively. A Foley catheter and nasogastric tube are routinely placed. The patient is arranged in a modified 45-degree flank position using a rolled blanket to support the shoulder and hip, and then secured to the table to enable preoperative side-to-side tilting (Fig. 36.1).

The patient is prepared and draped in the conventional fashion. The surgeon stands on the side opposite the affected kidney. Currently available hand-assisted laparoscopic (HAL) devices are depicted in Figure 36.2; the arrangement of the hand-assist device and ports are shown in Figures 36.3 and 36.4. For right-sided tumors, the hand-assist device may be placed in the lower midline or right lower quadrant to allow the right-hand-dominant surgeon to use an upper-midline port for dissection; however, my current preference is to place the device in the midline, due to a recently noted higher infection rate with the iliac incision.

Once the hand-access incision has been made, any adhesions are sharply divided to ensure safe placement of the ports. A camera port (12 mm) is placed in or near the midclavicular line, lateral to the umbilicus. A working 12-mm port is placed medial to the tip of the twelfth rib. The third port is placed after the kidney and mass is exposed.

The first step is to expose the entire kidney satisfactorily (Fig. 36.5). The colon is mobilized to expose the retroperitoneal structures. Gerota's fascia is then incised, and the kidney is exposed and mobilized within the fascia. Initial exposure of the kidney is performed away from the mass. As the mass is approached, a portion of perinephric fat is left overlying it. The remainder of the kidney is then exposed completely. The ureter is identified to avoid accidental injury. The renal hilum

Fig. 36.1. Patient positioning

is exposed and dissected en bloc if clamping of the hilum is anticipated. If available, a laparoscopic ultrasound probe may be inserted via the working 12-mm port whereby the depth of the lesion can be determined and any underlying vessels or collecting system identified. The fat overlying the mass is then excised and sent to the lab for frozen-section histology.

The third port is then placed under direct vision. It may be used for suction or retraction as necessary.

A large Surgicel® (Ethicon, Runcorn, UK) prepared bolster is wrapped in a portion of a surgical glove and placed in the abdomen on the liver or spleen. Finally, any bolstering sutures are prepared, which are usually a 0 Vicryl suture on a large needle; sometimes Hem-o-Lok® clips (Pilling Weck Systems, High Wycombe, UK) are used on the free end of the suture to speed placement of the bolster sutures.

A large ratcheted bulldog clamp is used for clamping the renal artery and vein "en mass"; this is taken in through the hand access device. An externally applied clamp is more difficult to maneuver with the hand in the abdomen.

A 5- to 10-mm margin of normal parenchyma is scored circumferentially with diathermy; the deeper the mass extends into the kidney, the wider the initial margin must be. The hand manipulates the kidney to improve the resection angle if and as needed. The resection plane is then gradually deepened using careful sharp dissection directed centrally along the renal pyramids. The assistant helps by providing gentle suction and countertraction during resection. Small parenchymal vessels are controlled as encountered with diathermy initially and the ultrasonic scalpel more centrally. The hand is used to palpate the mass and the evaluate the depth of resection to ensure adequate margins; it can also help elevate the mass and dissect the kidney away from it.

For more exophytic lesions where hilar clamping is not employed, the hand aids hemostasis by compressing the parenchyma below the mass.

Once excised, the mass is placed in a specimen bag for removal or removed directly through the hand-access port. In cases of doubt, the tumor and base are sent off for frozen-section histopathology.

Once the mass has been excised completely, attention is turned to achieving complete hemostasis. Any breaches in the collecting system are closed by free-hand suturing using 2-0 Vicryl (Fig. 36.7). The Surgicel bolster is placed (Fig. 36.8) and secured by bolstering sutures; Floseal® (Baxter, Bracknell, UK) is used occasionally to aid hemostasis. The renal hilar clamp is then released and hemostasis assessed. When adequate hemostasis is confirmed, the integrity of the collection system can be tested by retrograde distention of the collecting system through the previously placed ureteral catheter.

Ideally, the warm ischemia time should be 30 minutes or less.

The kidney is replaced within the Gerota's fascia pouch created during the initial mobilization. A drain is placed and brought out through the most lateral port site. The abdominal contents are replaced in anatomic position, any port sites >5 mm are closed with 0 Vicryl suture, and finally the hand-device incision is closed.

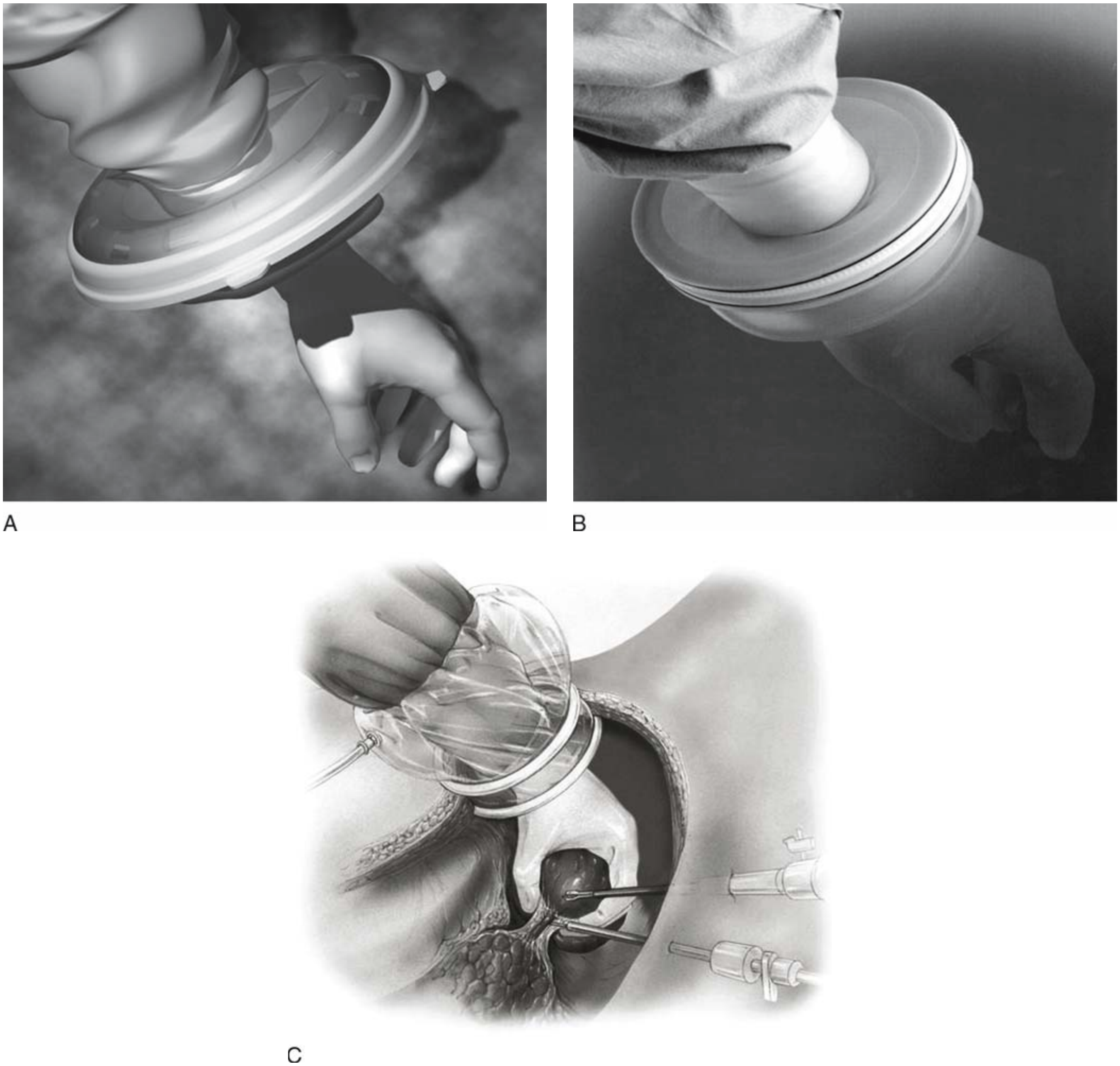

FIG. 36.2. **(A)** HAL devices: GelPort® Applied Medical, Rancho Santa Margarita, Berkshire, California, USA. **(B)** LapDisc® Ethicon Endo-Surgery, Bracknell, UK. **(C)** OmniPort® ASC Limited, Wicklow, Ireland

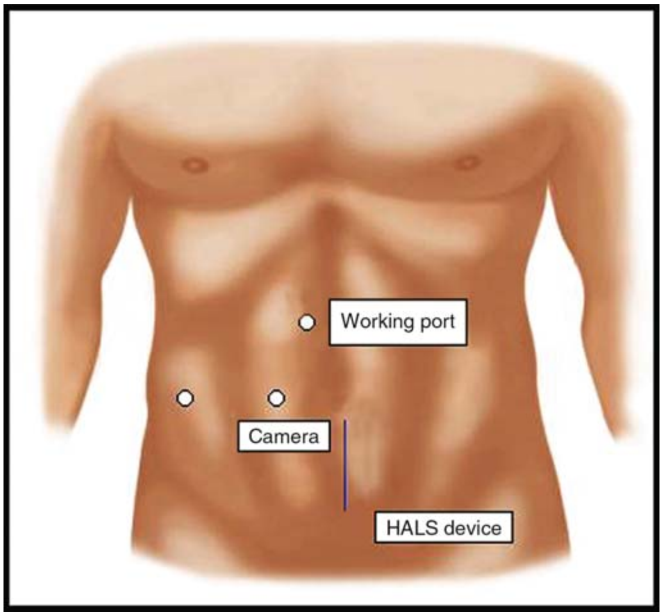

FIG. 36.3. Port positioning for right HAL partial nephrectomy

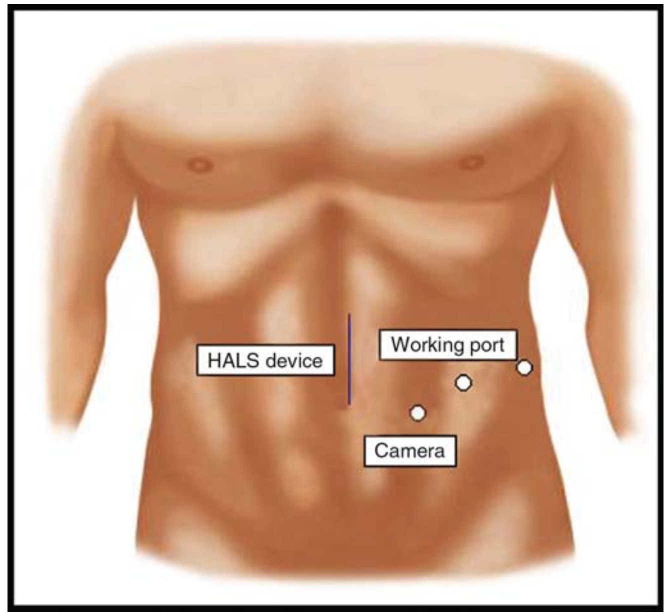

FIG. 36.4. Port positioning for left HAL partial nephrectomy

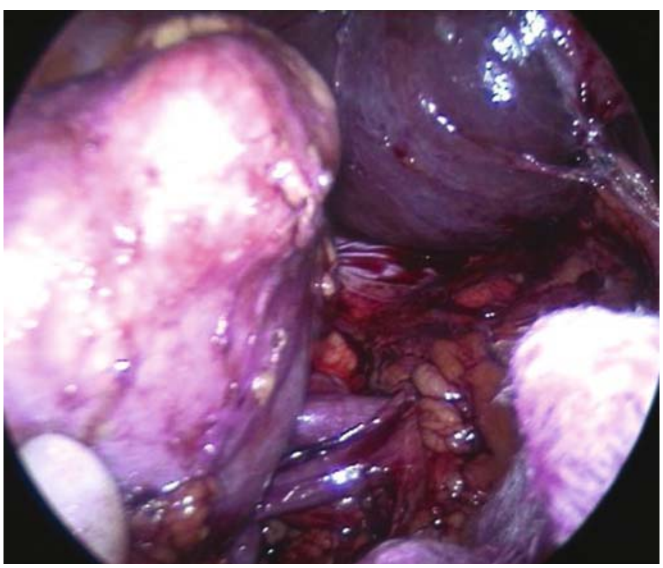

FIG. 36.5. Exophytic tumor suitable for HALPN

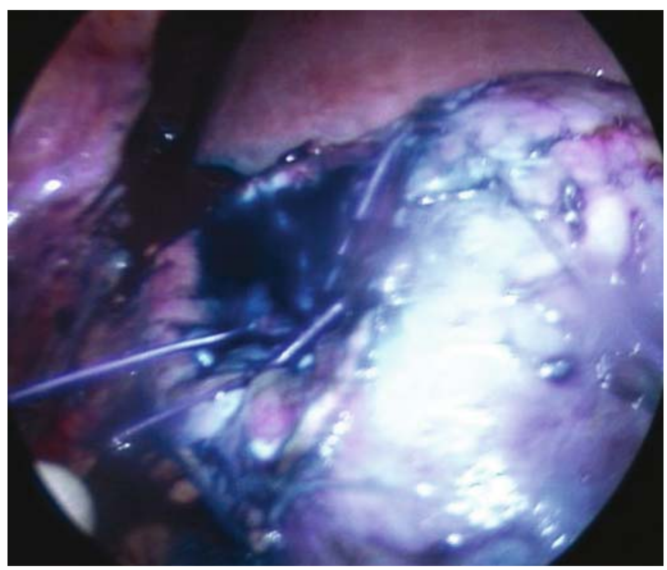

FIG. 36.6. The hand facilitates exposure of the pedicle; note the mop that can also be used in this technique

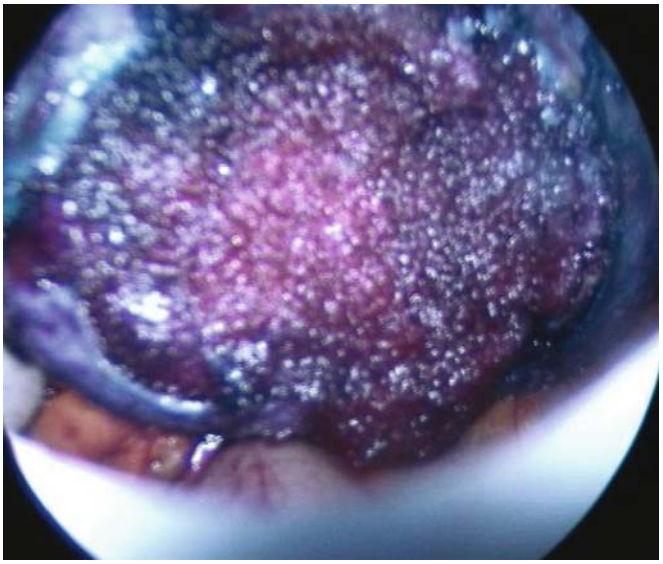

FIG. 36.7. After excision of the tumor, retrograde injection of methylene blue through the previously placed ureteric catheter shows extravasation; intracorporeal suture repair of collecting system is in progress

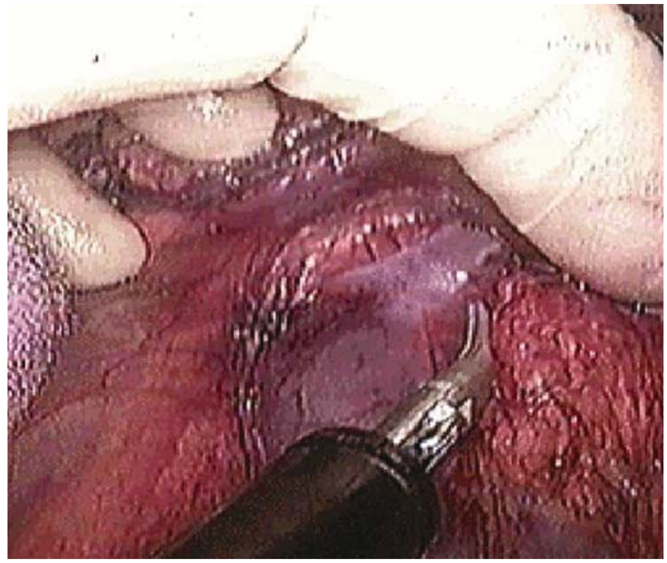

FIG. 36.8. Surgicel bolster in place

Conclusion

Hand-assisted laparoscopic surgery is an effective technique for performing partial nephrectomy.

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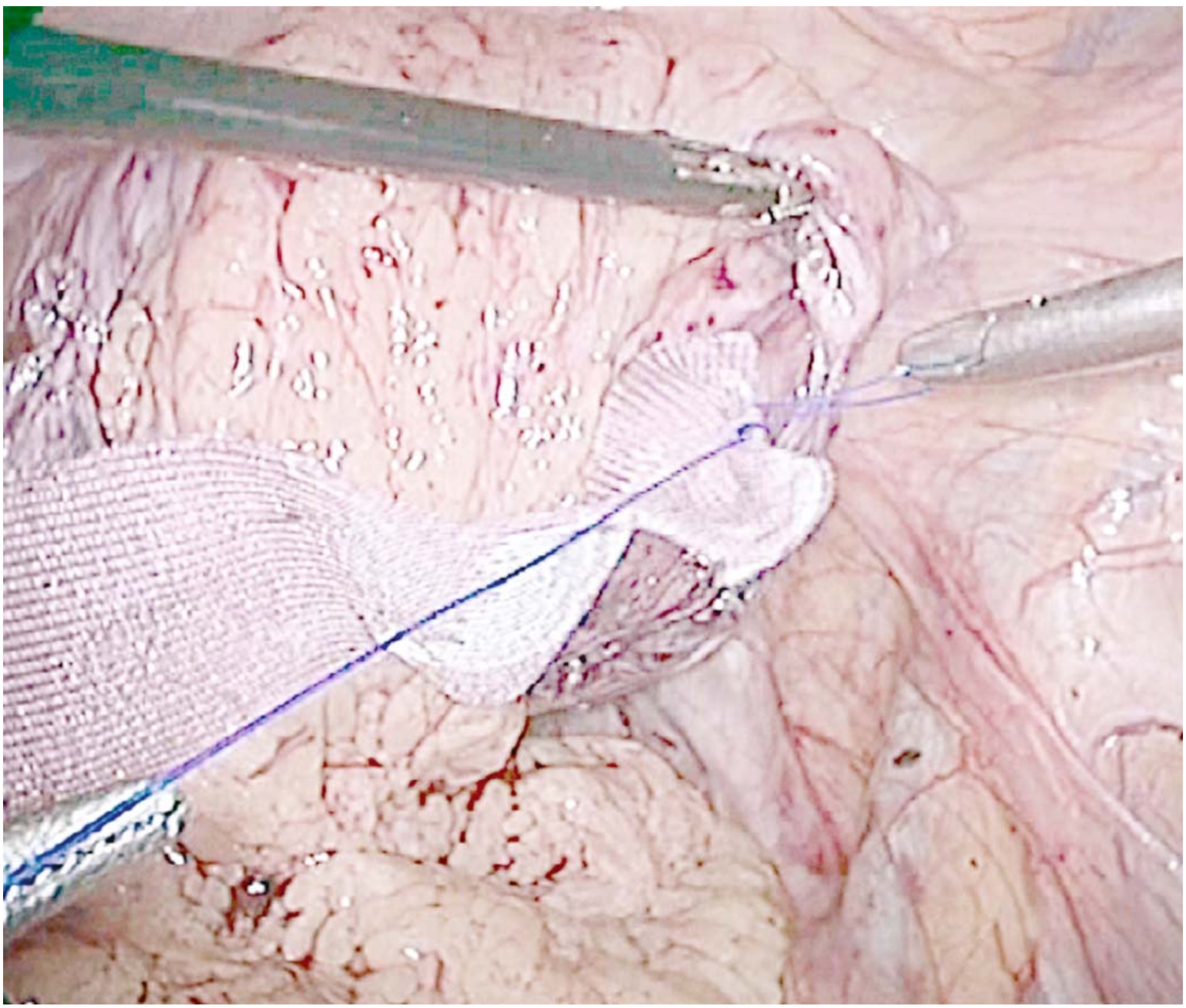
Section VIII
Miscellaneous



37
Laparoscopic Sacrocolpopexy

Ajay Rane, Suma Natarajan, M. Banumathy, M. Ramalingam, and K. Senthil

Posthysterectomy Vault Prolapse

Vaginal vault prolapse with protrusion beyond the introitus can be treated effectively only by surgery. Different surgical techniques, by both the abdominal and vaginal routes, have been developed to treat this condition. Abdominal sacral colpopexy (ASC) is a well-accepted method to treat complete vaginal vault prolapse [1,2].

Technique

Preliminary cystoscopy and bilateral ureteric stenting are performed to avoid any injury to the ureter. The patient is placed in the modified lithotomy position with the head low, which helps in inverting the vaginal vault cranially. Using three ports (a 10-mm port for the telescope through the umbilicus and two 5-mm ports in the midclavicular line), the pelvis is inspected and the bowels are pushed away. There may be adhesions between the vaginal vault and the bladder anteriorly and with the rectum posteriorly. The vaginal vault is inverted and the peritoneum over the vault is incised. The adhesions are released sufficiently. The peritoneum over the sacral promontory is incised and a tunnel is created subperitoneally toward the vaginal vault. The mesh (polypropylene) is fixed to the vaginal vault with interrupted nonabsorbable or delayed absorbable sutures. The mesh is then brought through the tunnel to be fixed to the presacral ligament over the promontory, taking care to avoid injury to the left common iliac vein. The peritoneum is closed so that the mesh is completely covered.

One of the rare problems reported is mesh erosion into adjacent organs. Nevertheless, ASC is an effective means of vaginal inversion in vault prolapse. The abdominal incision is avoided by the laparoscopic approach.

Vault Prolapse: Laparoscopic Sacrocolpopexy

Fig. 37.1. Posthysterectomy vault prolapse (note the axis of the urethra); both ureters are stented

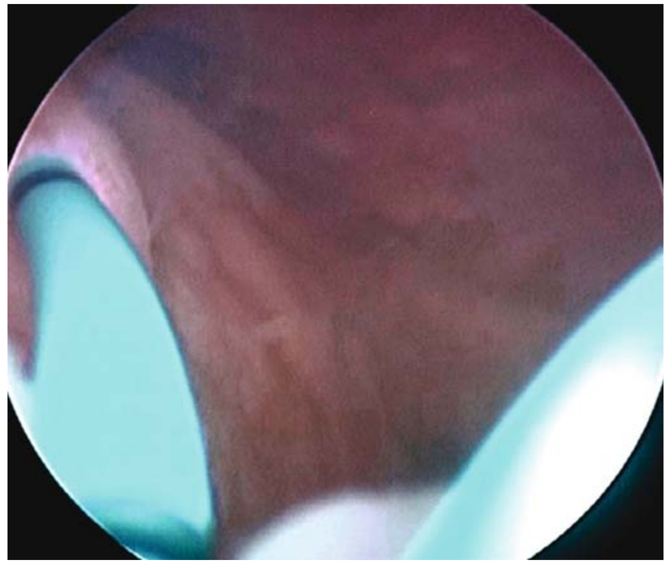


Fig. 37.2. Cystoscopy shows sagging of trigone and the posterior wall; both ureters are stented (to serve as a guide during the laparoscopy)

Fig. 37.3. External view of the port positions

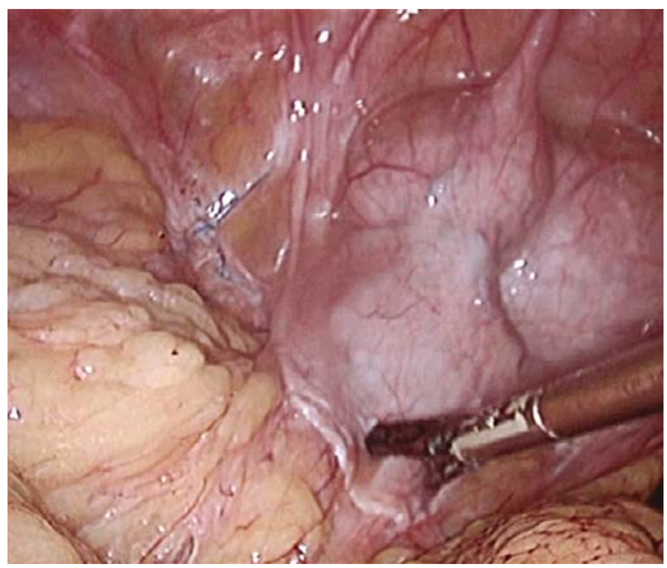


Fig. 37.4. Initial view of the pelvis showing omental adhesion to the vault

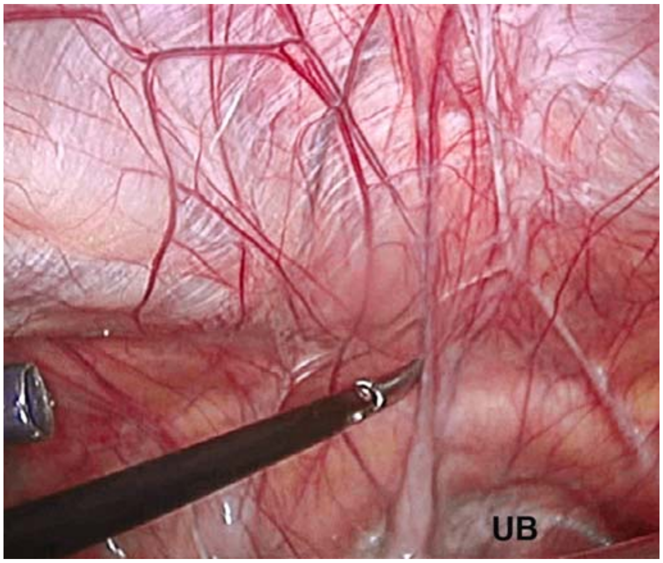


FIG. 37.5. The view of the pubic arch; note that the bladder has sagged (UB, urinary bladder)

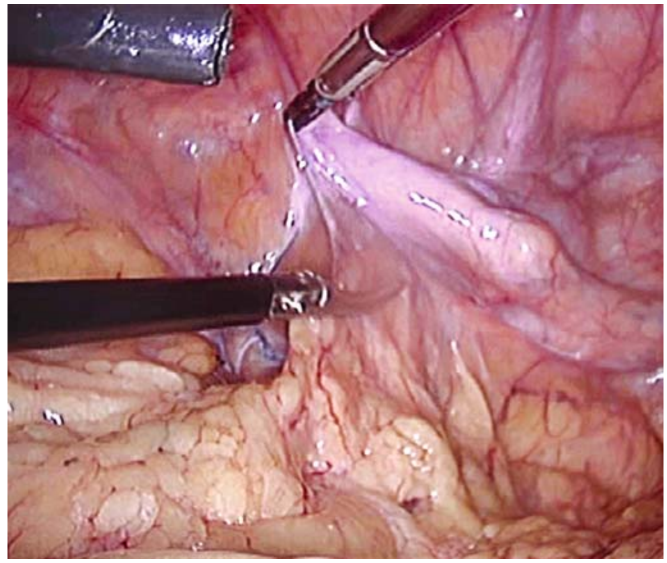


FIG. 37.6. Releasing the adhesion from the vault

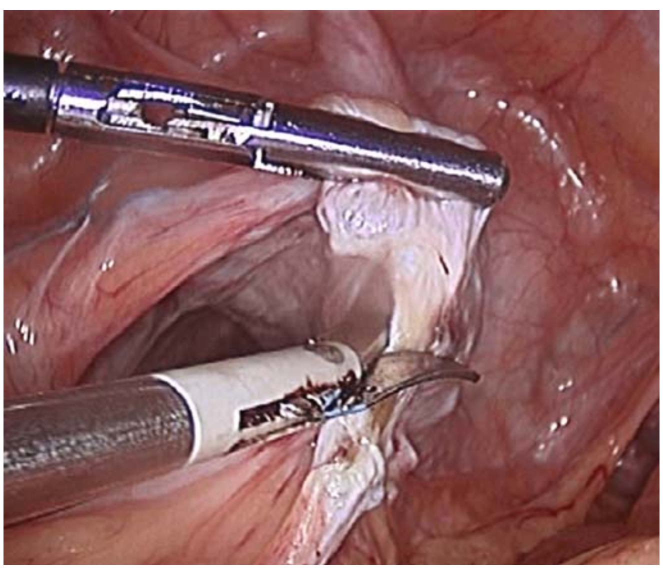


FIG. 37.7. Further release of adhesion from the vault

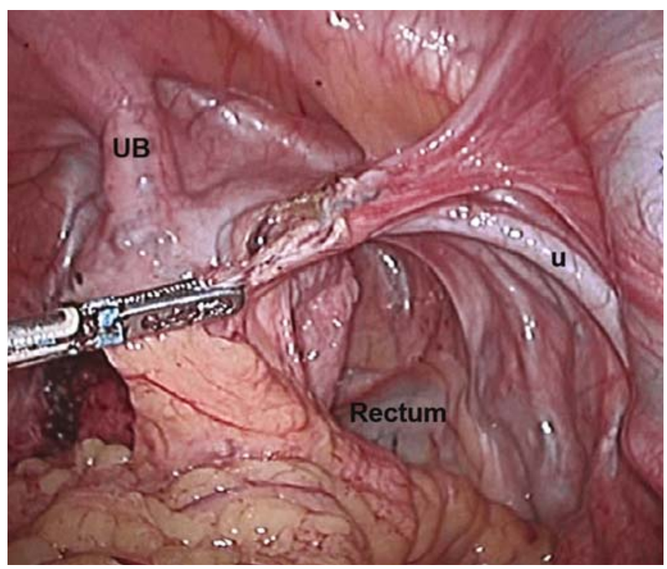


FIG. 37.8. Initial landmarks (u, ureter; UB, urinary bladder)

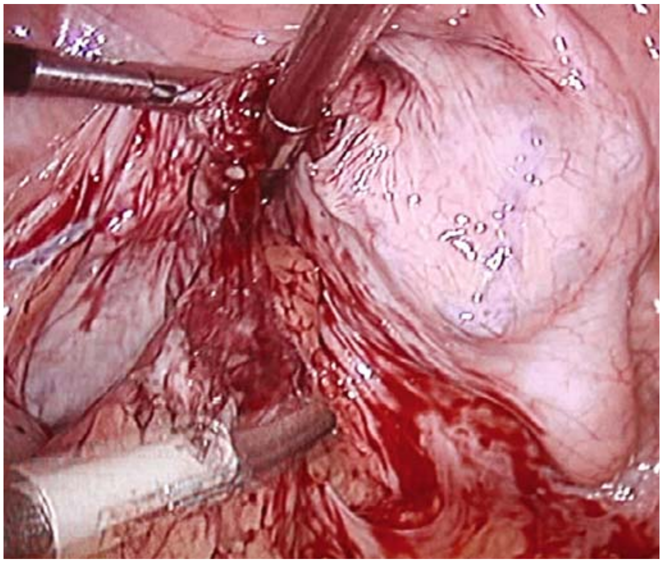


FIG. 37.9. The omentum and the peritoneum over the vault are dissected out

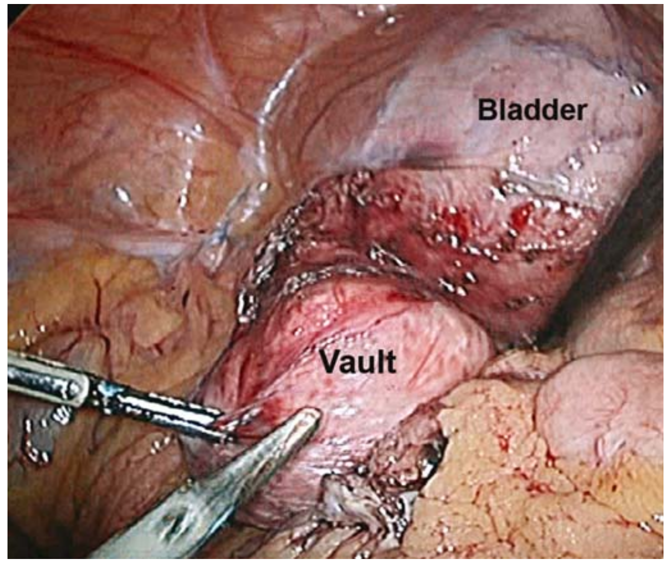


FIG. 37.10. Delineation of the vault

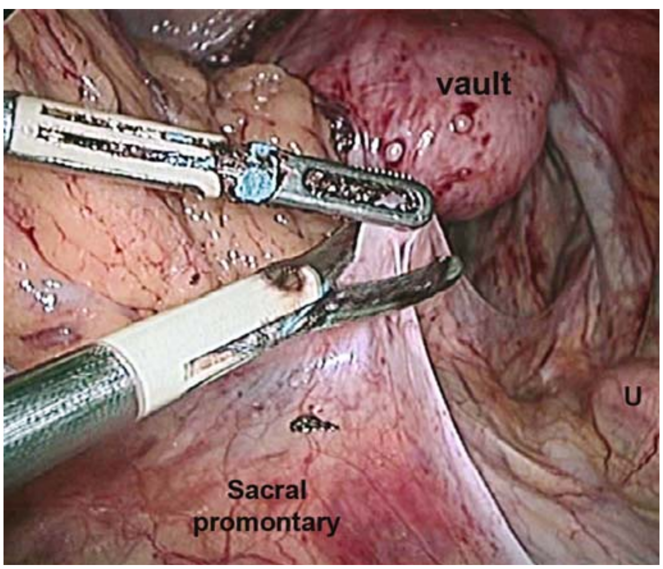


FIG. 37.11. Incision of the peritoneum over the sacral promontory; note that the course of the ureter is close by (u, ureter)

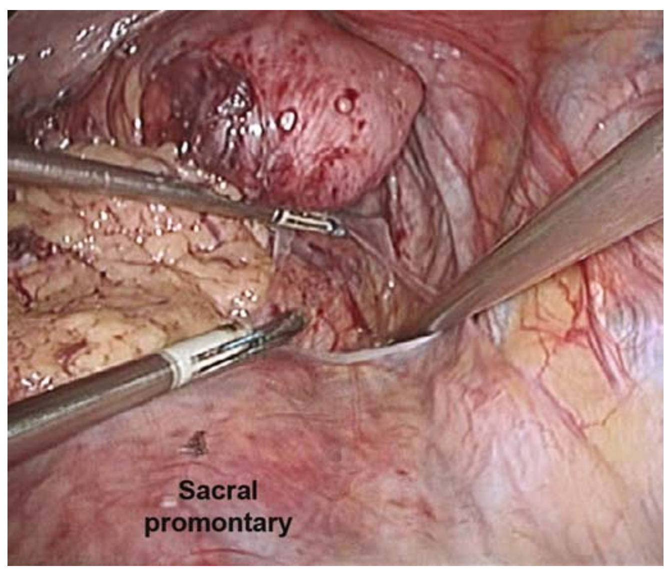


FIG. 37.12. Creating a retroperitoneal tunnel on the right side

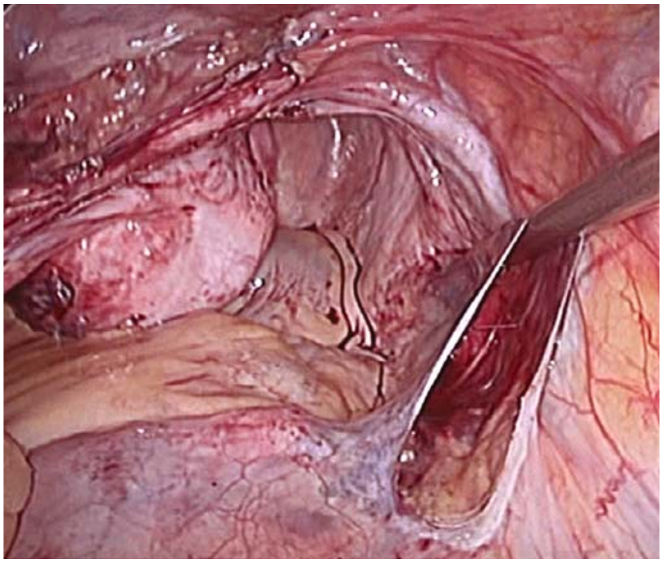


FIG. 37.13. Creating a retroperitoneal tunnel on the right side in progress

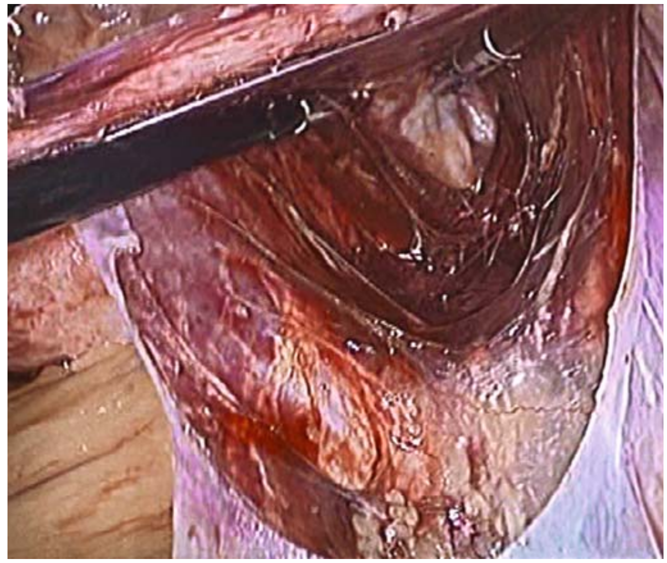


FIG. 37.14. Enlarging the tunnel

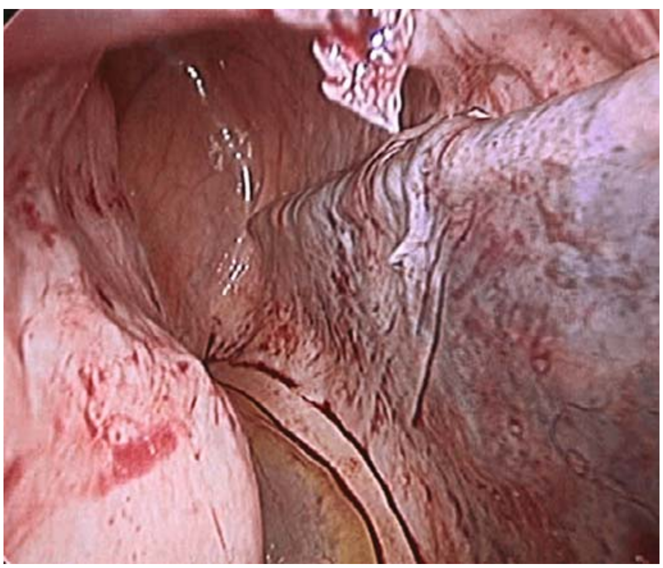


FIG. 37.15. Enlarging the tunnel in progress

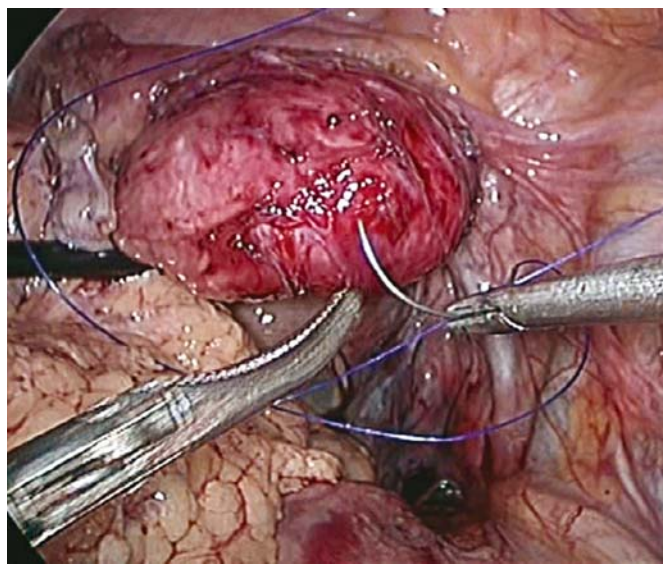


FIG. 37.16. Initial suture over the vault with 2-0 Prolene

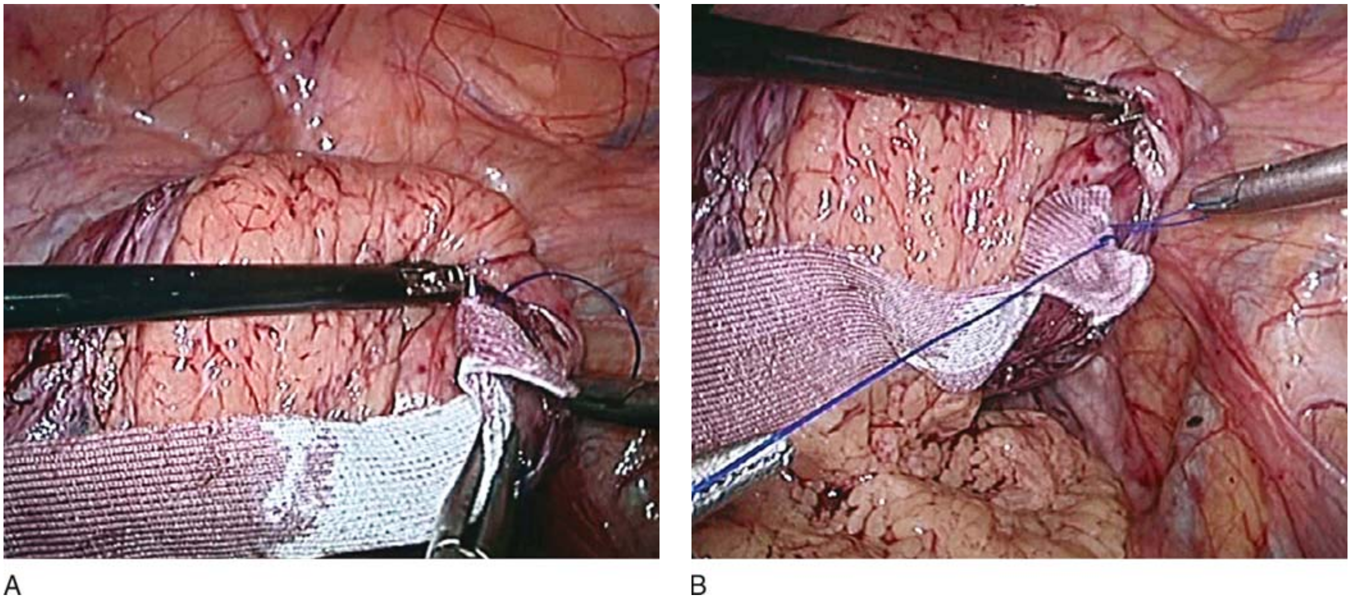


Fig. 37.17. Transfixing the mesh onto the vault

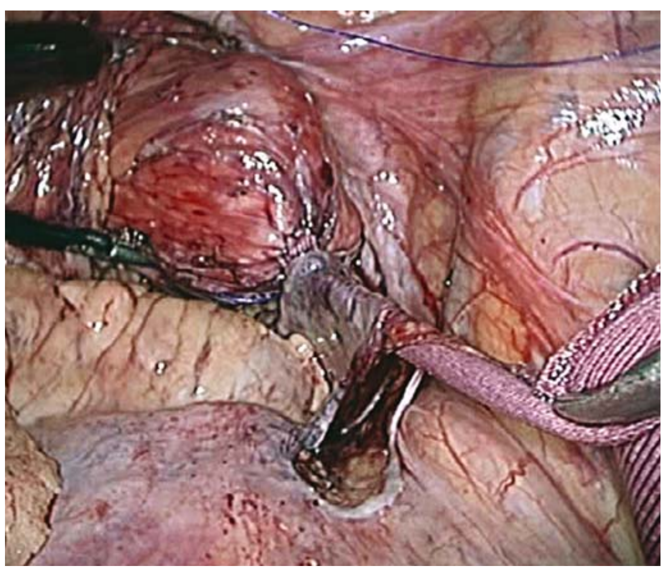
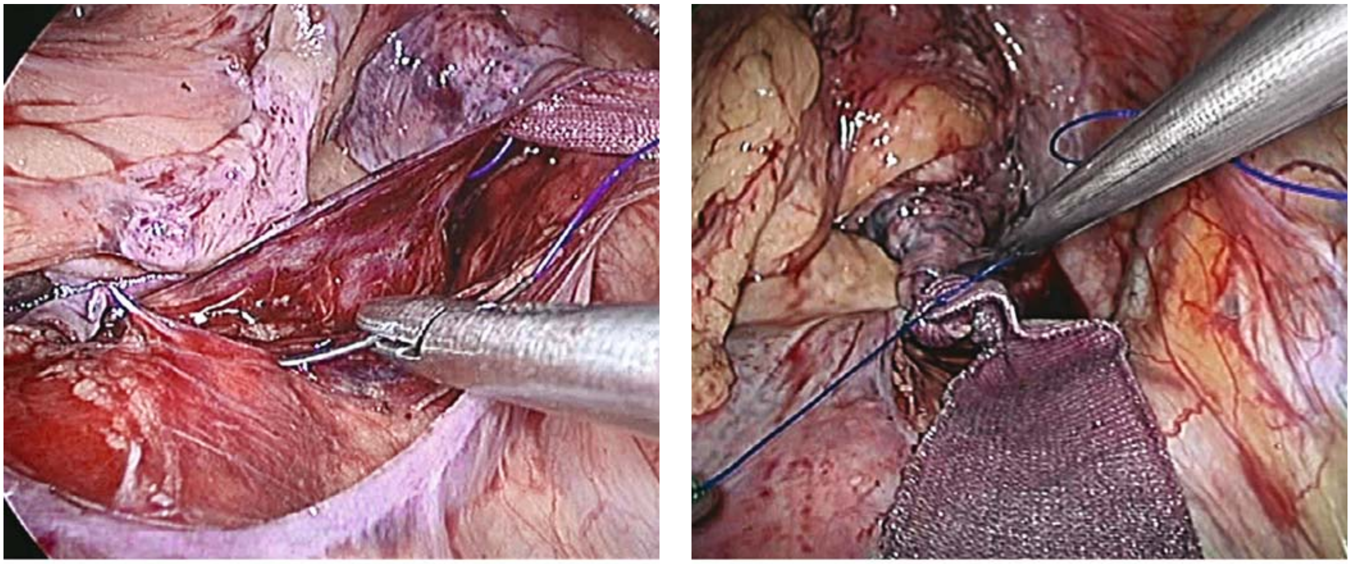
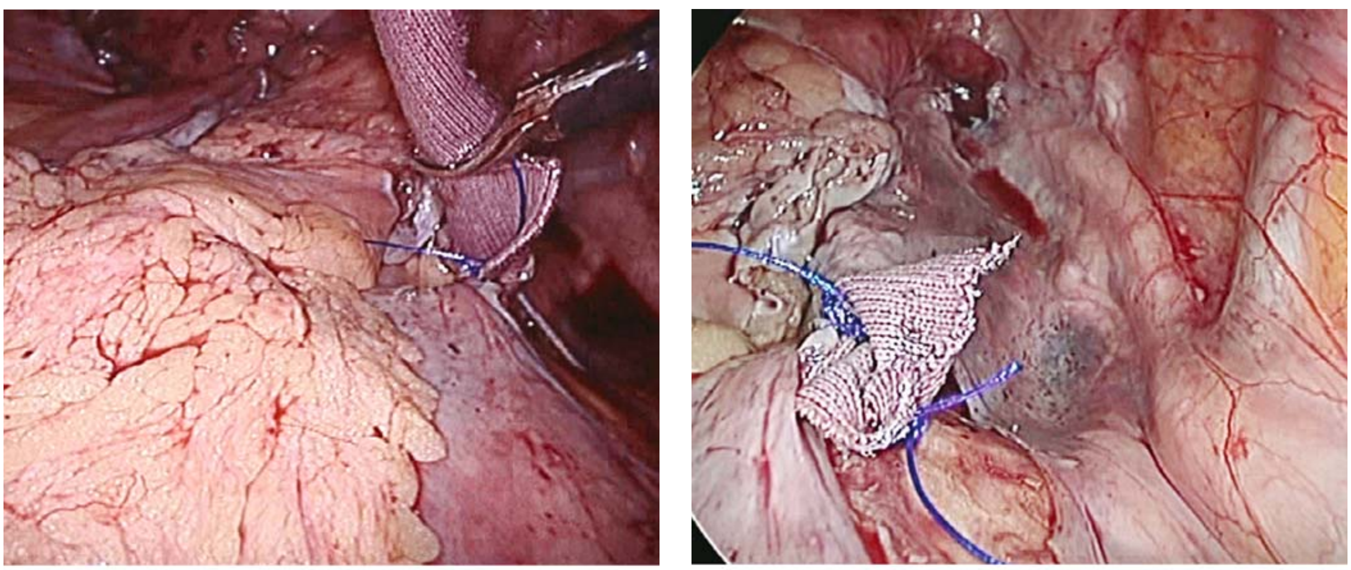


Fig. 37.18. The mesh brought through the tunnel



A B

FIG. 37.19. A suture taken through the presacral ligament with 2-0 Prolene to transfix the graft while maintaining adequate traction



A B

FIG. 37.20. Excising the excess graft

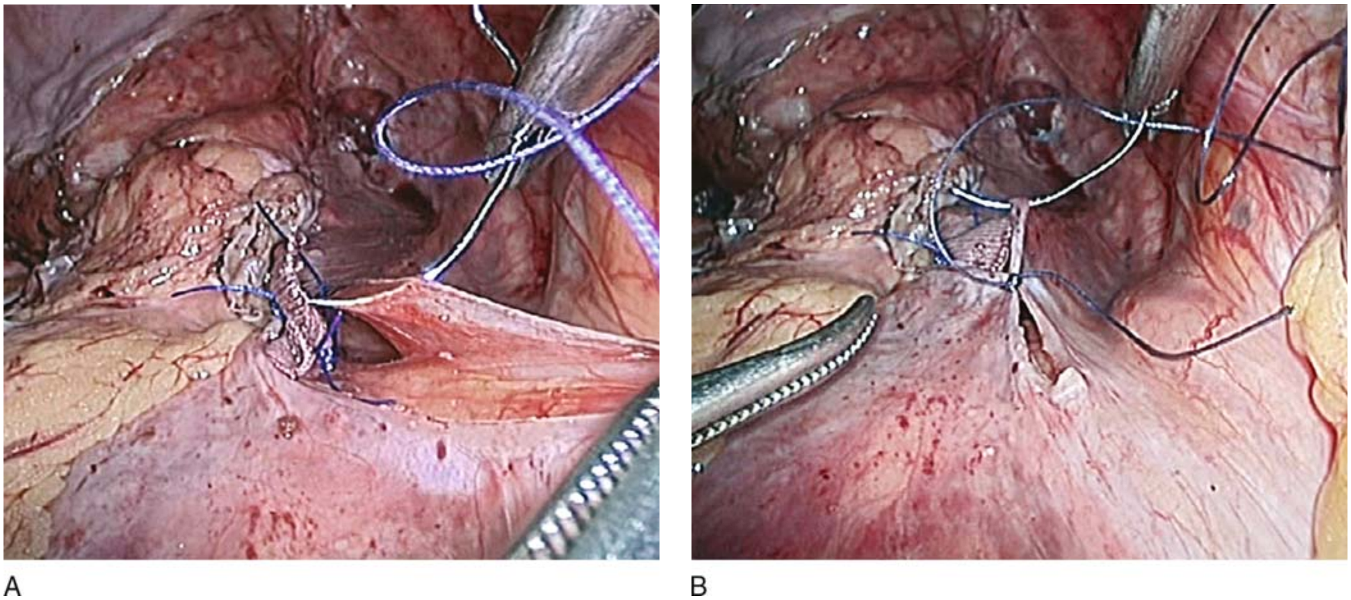


FIG. 37.21 Covering the exposed graft and presacral raw area by reperitonealization with absorbable sutures

FIG. 37.22 View of the vaginal outlet at the end of the sacrocolpopexy

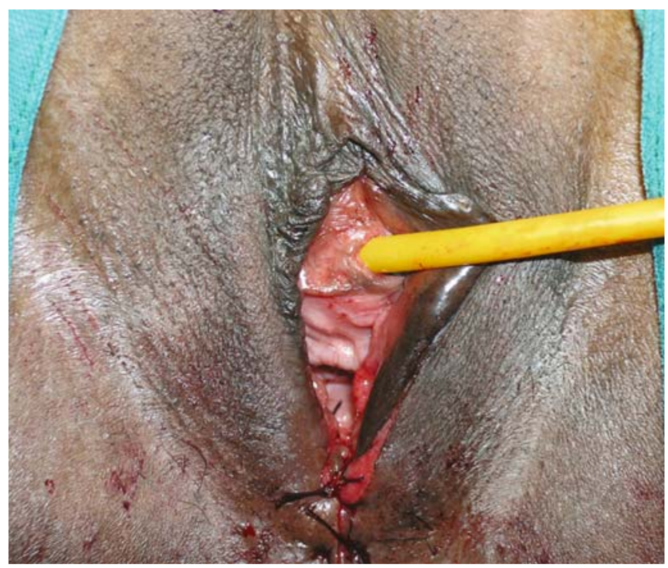


FIG. 37.23 View after the posterior colpoperineorrhaphy

References

1. Higgs PJ, Chua HL, Smith AR (2005) Long term review of laparoscopic sacrocolpopexy. Br J Obstet Gynaecol 112(8):1134–1138.
2. Ross JW, Preston M (2005) Laparoscopic sacrocolpopexy for severe vaginal vault prolapse: five-year outcome. J Minim Invasive Gynecol 12(3):221–226.

38
Laparoscopic Pelvic Floor Repair for Anterior Compartment Prolapse

Jean Luc Hoepffner, Richard Gaston, and Thierry Piechaud

Symptomatic anterior compartment prolapse requires surgical intervention. Laparoscopic pelvic floor repair is a well-accepted minimally invasive approach for this condition.

Technique

1. The patient is placed in the modified lithotomy position. The assistant uses a retractor from the vaginal end. Using four ports (a subumbilical camera port, two ports in the midclavicular line on either side, and a right flank port), the pelvis is inspected.
2. Initially the peritoneum over the sacral promontory is incised, and the peritoneotomy is extended down to the pelvic floor. The uterosacral ligament, ischial spine, and arcus tendinous are defined.
3. The posterior compartment of the pelvic floor is strengthened. A ribbon of soft polypropylene mesh is tailored to fit the area. Caudally the mesh is fixed to posterior vaginal wall with 2-0 Prolene to strengthen the uterosacral ligament. The lateral aspect of mesh is fixed to the sacrospinous ligament just medial to the ischial spine. The assistant continually stabilizes the posterior fornix.
4. Dissection of the anterior compartment: The vesicouterine space is developed until the bladder is adequately freed from the anterior vaginal wall. A Y-shaped soft Prolene mesh ribbon (common limb) is fixed to the anterior vaginal wall. The two limbs of the Y-shaped mesh are brought posteriorly through a rent made in the broad ligament on both sides.
5. Uterosacral ligament pexy: The proximal ends of both mesh ribbons are fixed to the presacral ligaments with 2-0 Prolene suture, keeping the mesh at optimum tension.
6. The peritoneal edges are sutured over the mesh, and the ports are sutured.

Conclusion

Laparoscopic uterosacral ligament hysteropexy is an accepted less morbid option. In our experience of over 3000 patients, the success rate has been very high. Mesh erosion is a rare complication. Thus the laparoscopic approach is less morbid and appealing.

Laparoscopic Repair of Uterine Prolapse

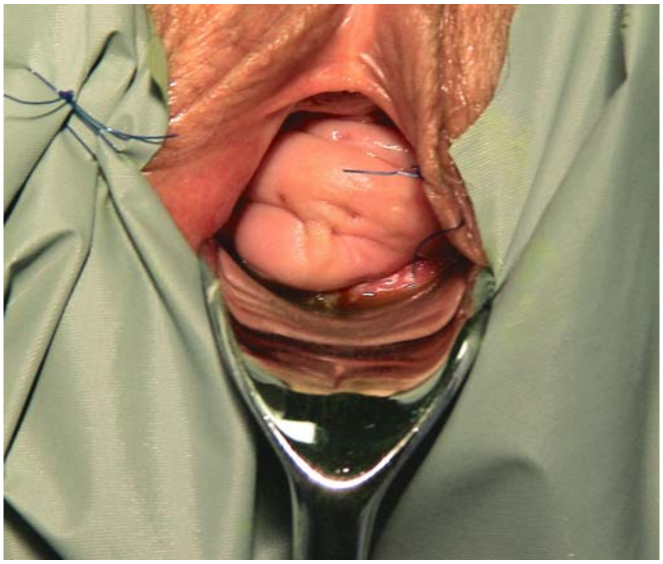


Fig. 38.1. External view of the uterine prolapse (revealing both cystocele and enterocele)

Fig. 38.2. The patient position, with the legs spread apart—modified lithotomy position

Fig. 38.3. The port positions for the pelvic floor repair

Fig. 38.4. A Deaver retractor is placed vaginally, which helps to angulate the fornix

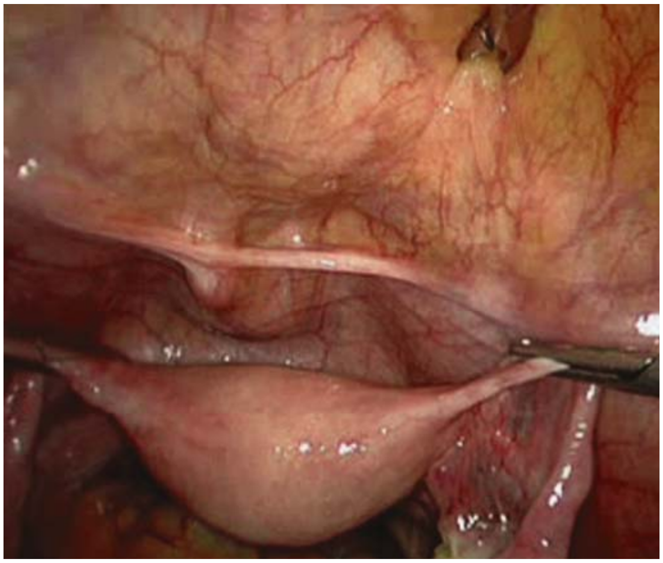


FIG. 38.5. Initial endoview shows the uterine descent

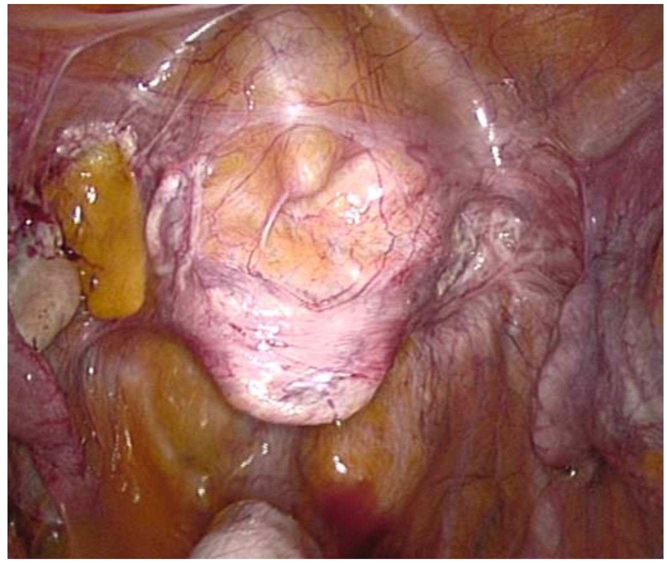


FIG. 38.6. Endoview shows the Deaver retractor helping to angulate the fornix

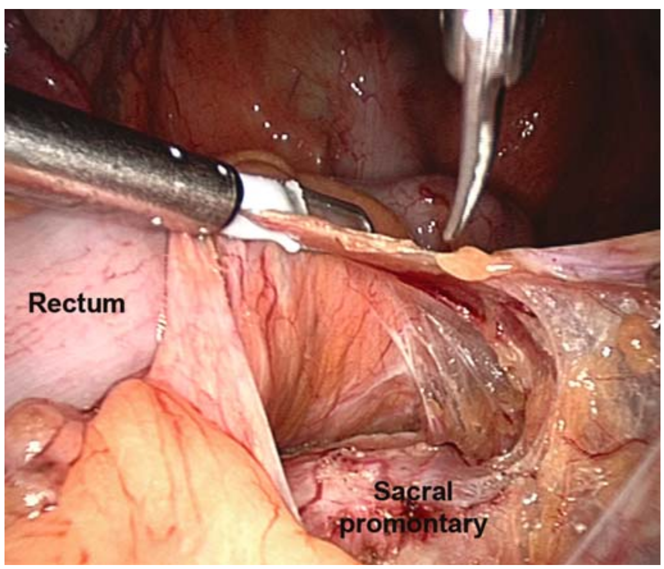
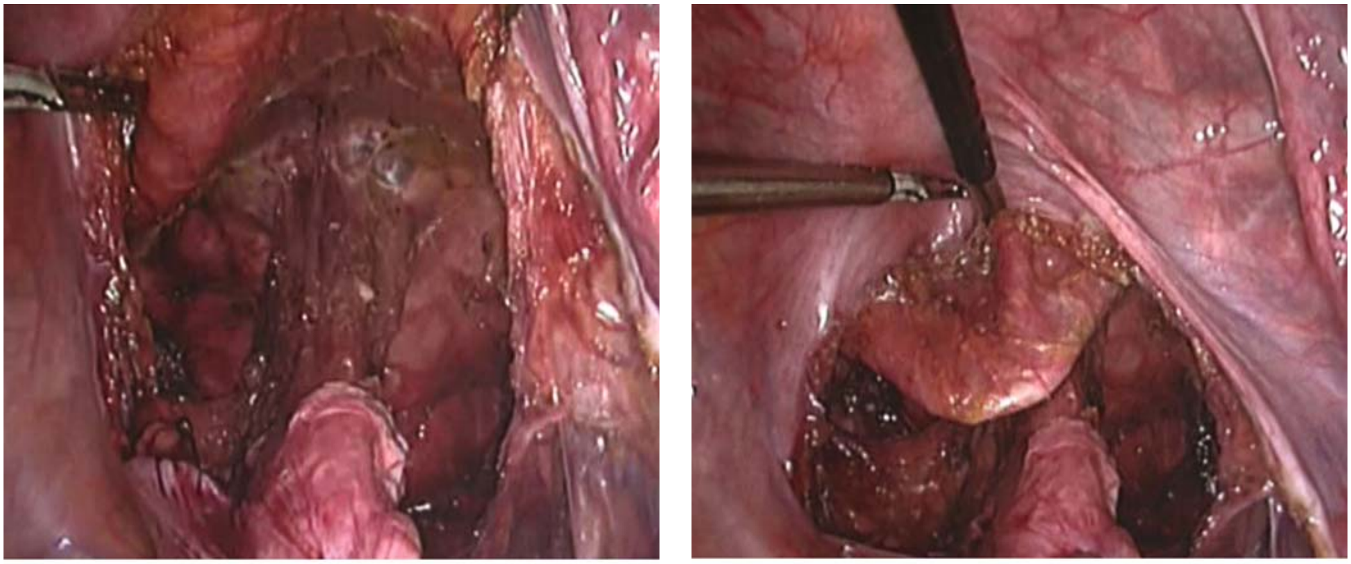
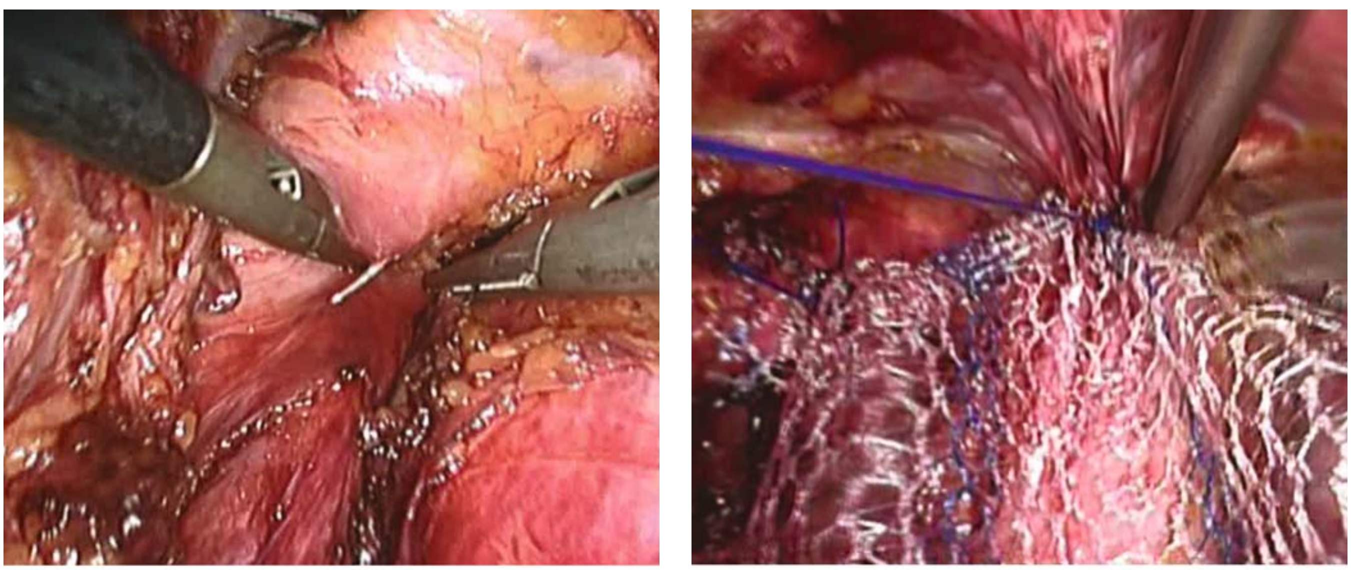


FIG. 38.7. Incision of the peritoneum over the sacral promontory



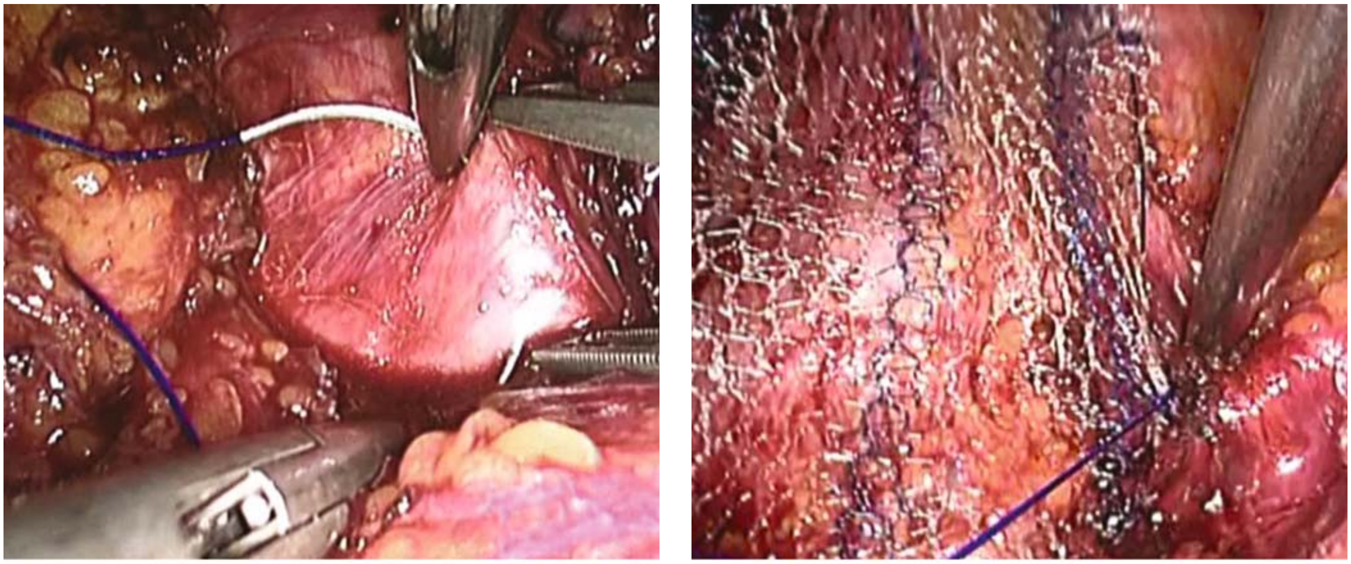
A B

Fig. 38.8. Dissection is continued down until the pelvic floor is defined



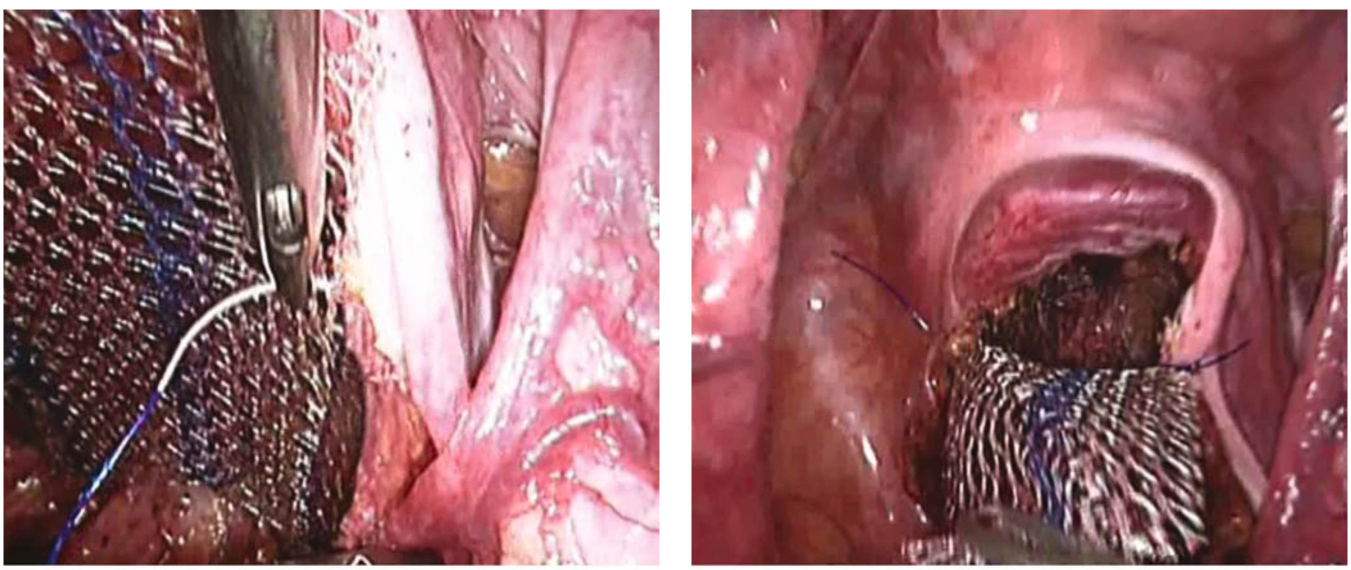
A B

Fig. 38.9. Fixation of polypropylene mesh to the right sacrospinous/sacrotuberous ligament using 2-0 Prolene suture



A B

FIG. 38.10. Similarly, mesh is fixed on the left side



A B

FIG. 38.11. Keeping the uterosacral ligament taut, the Prolene mesh is tacked

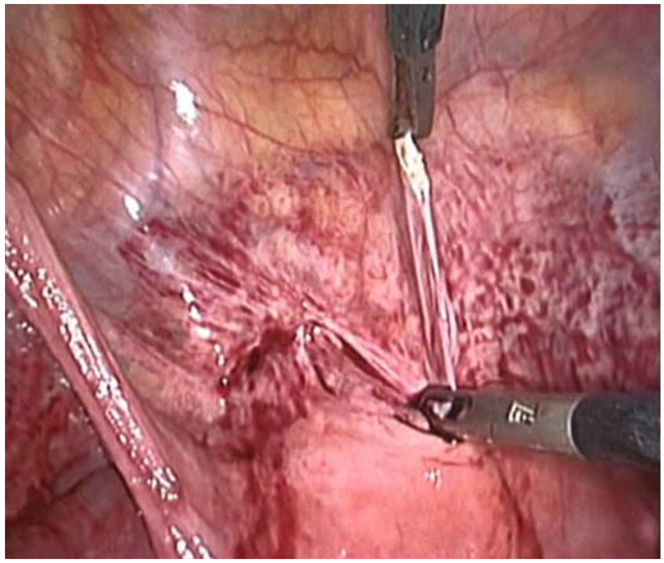
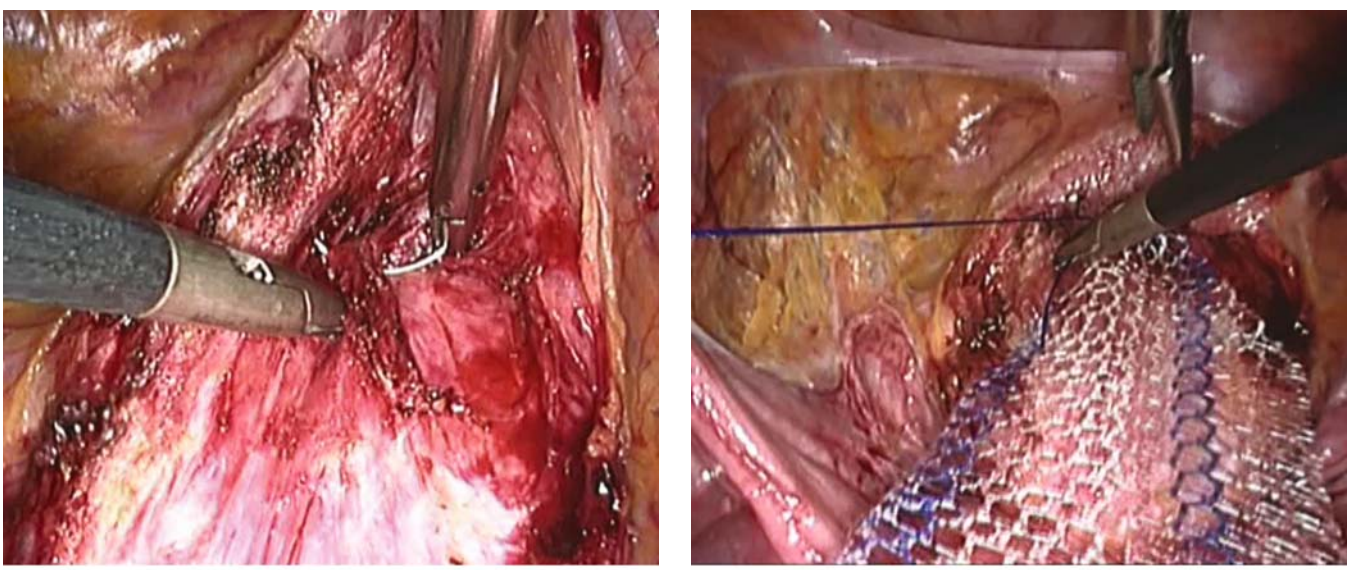
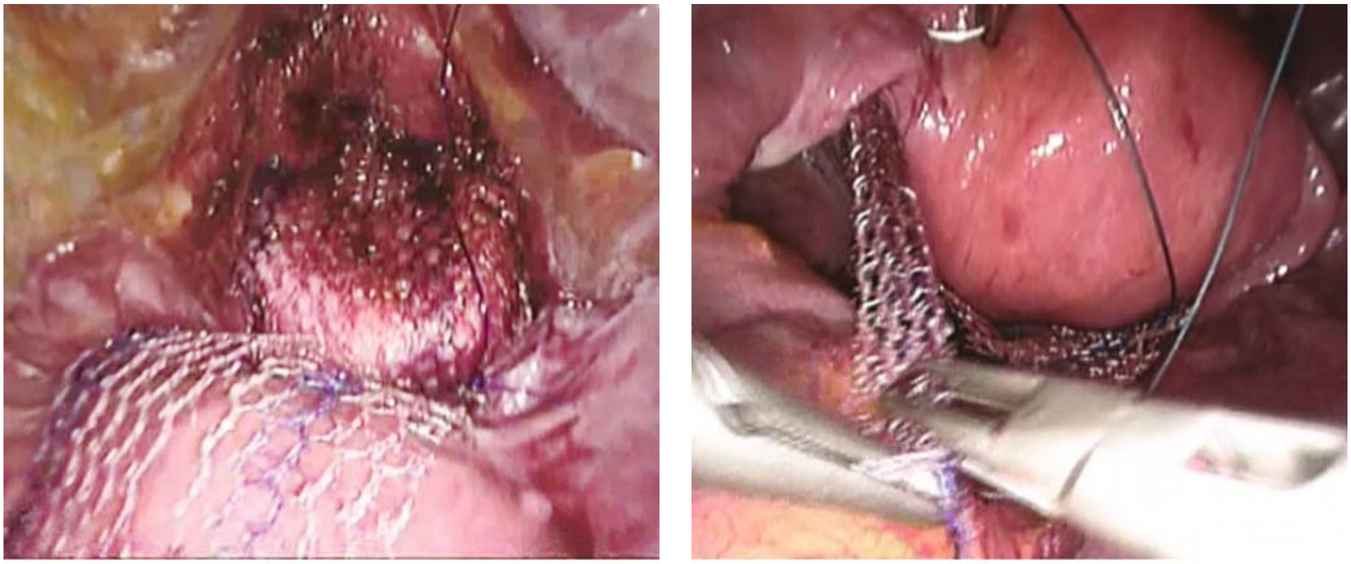


Fig. 38.12. Dissection of the uterovesical angle



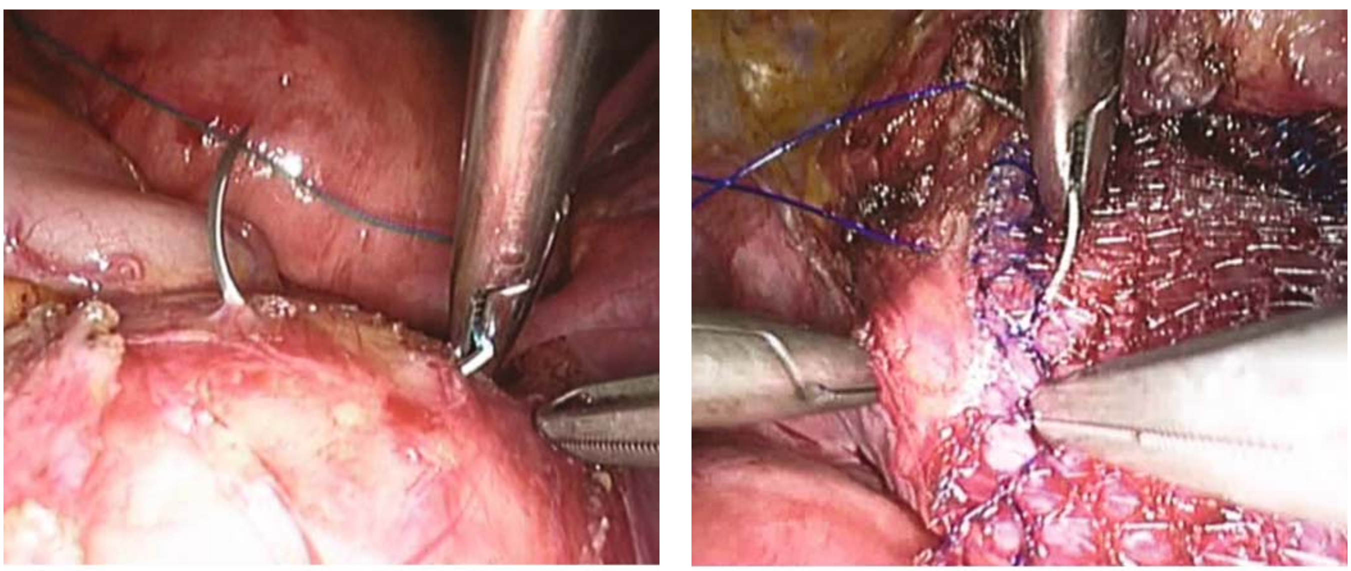
A B

Fig. 38.13. Fixing another Prolene mesh in the anterior vaginal wall (to strengthen the pubocervical fascia)



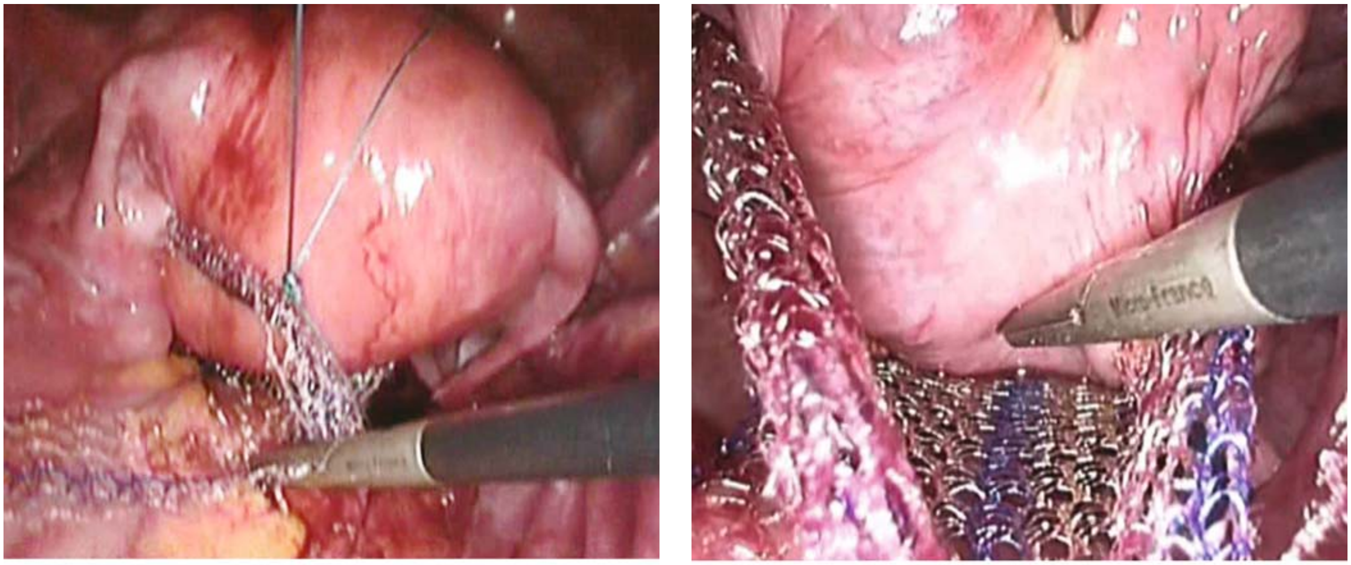
A B

Fig. 38.14. The mesh is split into two limbs and brought cephalad through the broad ligament



A B

Fig. 38.15. The cephalic ends of both the meshes are fixed to the presacral ligament



A B

Fig. 38.16. View after strengthening the pelvic floor

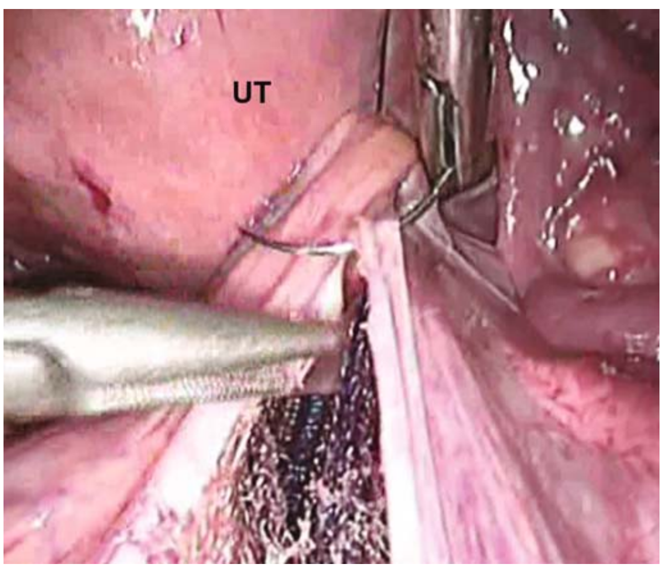


Fig. 38.17. Reperitonealization of the mesh (UT, uterus)

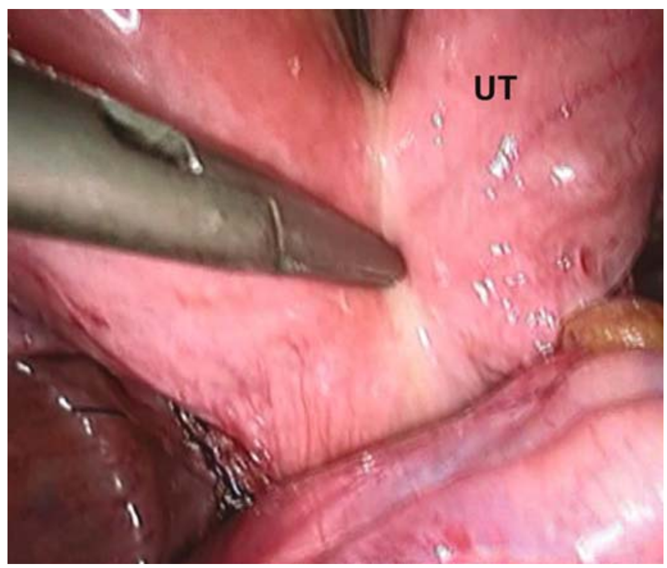


Fig. 38.18. Laparoscopic view after the pelvic floor repair (UT, uterus)

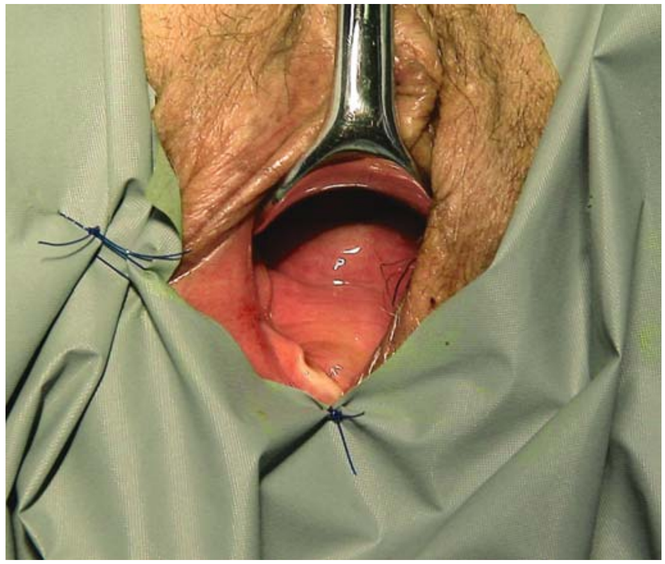


Fig. 38.19. External view after the pelvic floor repair

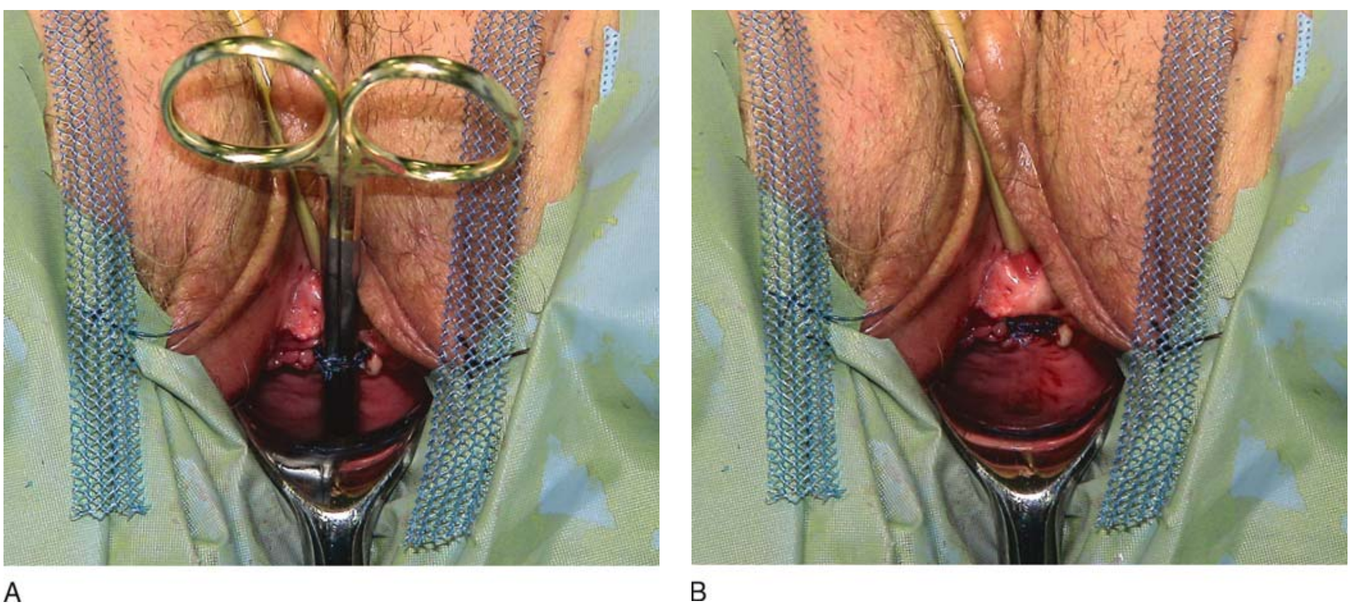


Fig. 38.20. Urethrovesical suspension [tension free vaginal tape (TVT)] can be done if there is associated stress urinary incontinence

References

1. Miklos JR, Moore RD, Kohli N (2004) Laparoscopic pelvic floor repair. Obstet Gynecol Clin North Am 31(3):551–565, viii–ix.
2. Miklos JR, Moore RD, Kohli N (2002) Laparoscopic surgery for pelvic support defects. Curr Opin Obstet Gynecol 14(4):387–395.

39 Laparoscopic Transvesical Management of a Lower Ureter in Nephroureterectomy

M. Ramalingam, Ram Mohan Rao, and Renuka Ramalingam

Sem's pluck technique is the commonly practiced transurethral management of a lower ureter during laparoscopic nephroureterectomy [1,2]. But there is always a risk of tumor seeding as the lumen of ureteric orifice remains open. Hence, we introduce a technique to clamp the ureter transvesically.

Surgical Technique

Initially the patient is placed in the lithotomy position, and a resectoscope is used to make a circumferential incision around the ureteric orifice. This is deepened adequately to free the lower 1 to 2 cm of the ureter. Subsequently using cystoscopic guidance, two ports (a 10-mm balloon trocar and a 5-mm) are introduced transvesically, one on either side of midline. The balloon of the trocar is inflated to prevent recession of the 10-mm trocar. A 10-mm Hem-o-Lok clip is introduced through the transvesical port, and the ureter is clipped to prevent spillage into the bladder. It also prevents spillage into the peritoneal cavity once the ureter is plucked. Subsequently, ports are closed and the bladder is drained by a Foley catheter. The patient position is changed to 70-degree flank, and using four ports the nephroureterectomy is completed laparoscopically. The specimen is then removed by a muscle-splitting incision in the iliac fossa.

Conclusion

Transvesical laparoscopic clipping of the distal ureter with the Hem-o-Lok is a reliable technique to prevent spillage during nephroureterectomy.

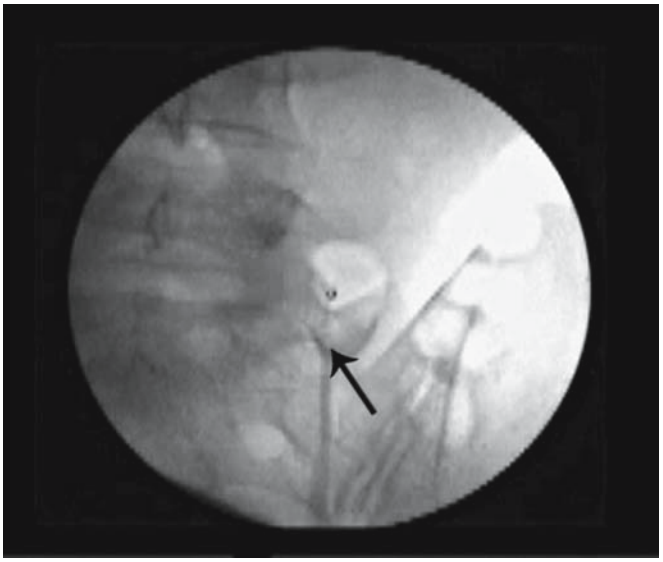


FIG. 39.1. A retrograde pyelogram (RGP) shows a filling defect (Goblet sign) in the upperureter suggestive of a tumor (arrow)

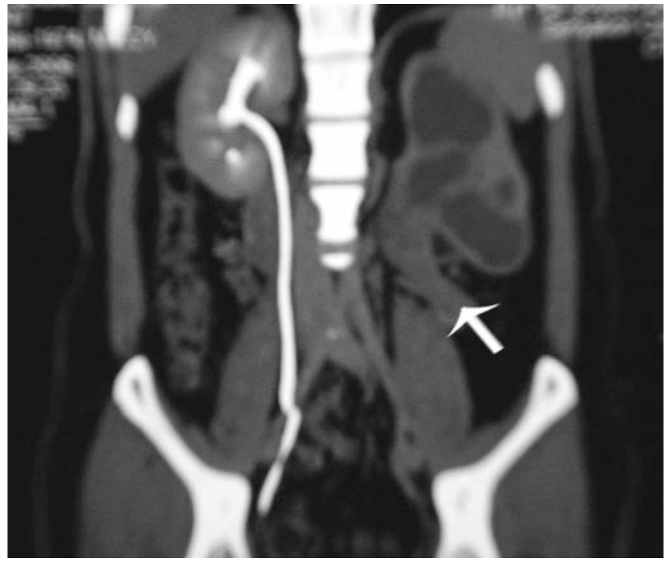
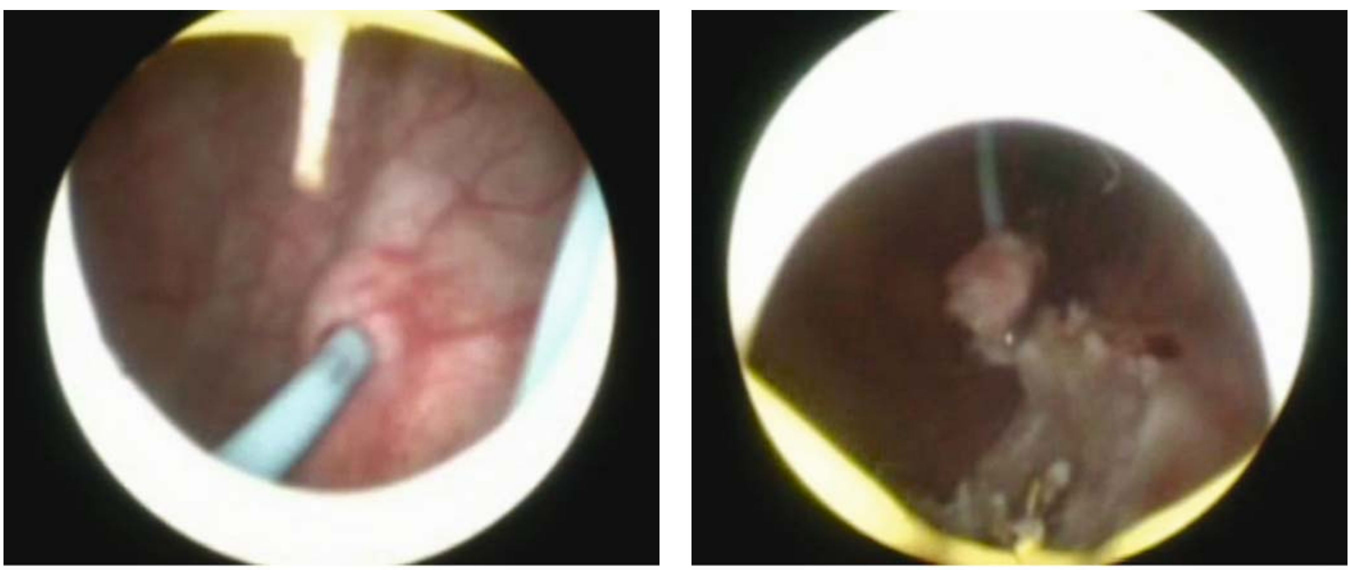


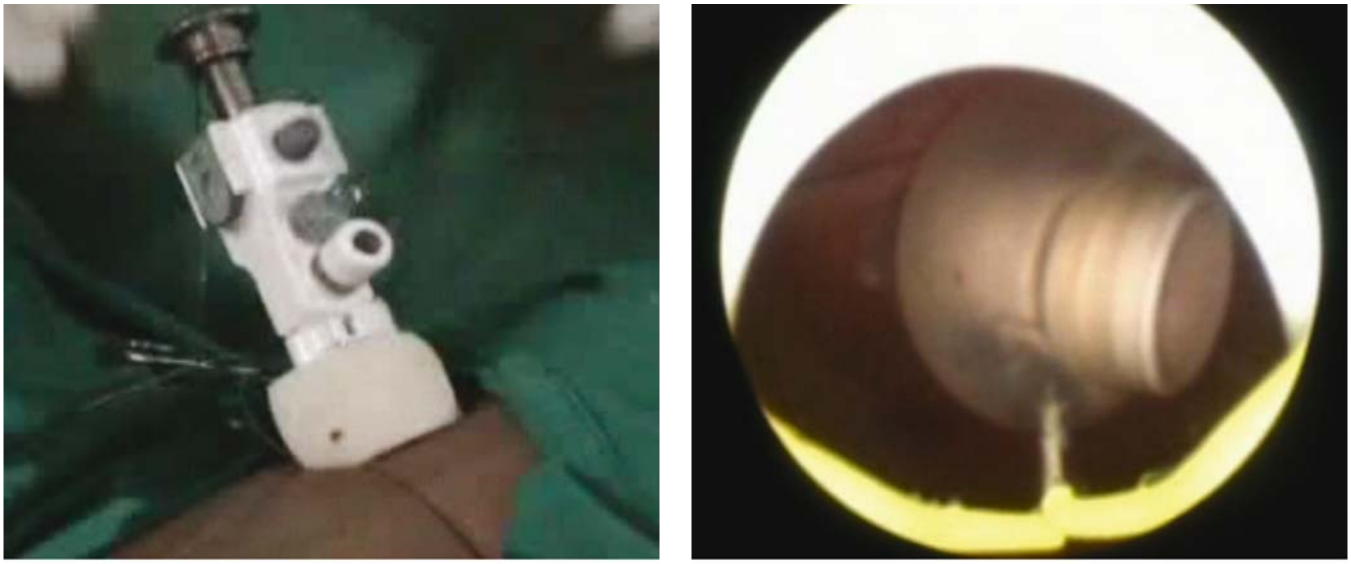
FIG. 39.2. A computed tomography (CT) scan shows a tumor (arrow) in the left upperureter



A

B

FIG. 39.3. A transurethral circumferential incision of the left ureteral orifice



A B

FIG. 39.4. Transvesical balloon-tip trocar port (external and endoview)

FIG. 39.5. External view of the transvesical ports

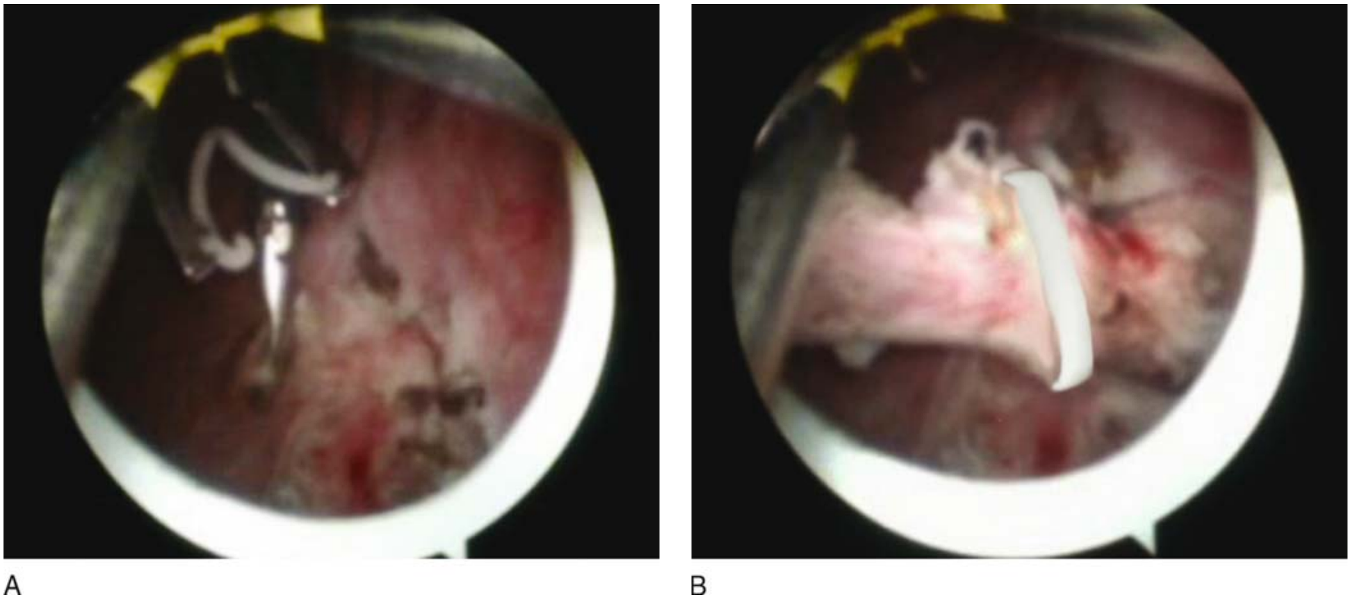


FIG. 39.6. Hem-o-Lok clip application over the distal ureter

FIG. 39.7. Clipped and disconnected distal ureter being pushed juxtavesically

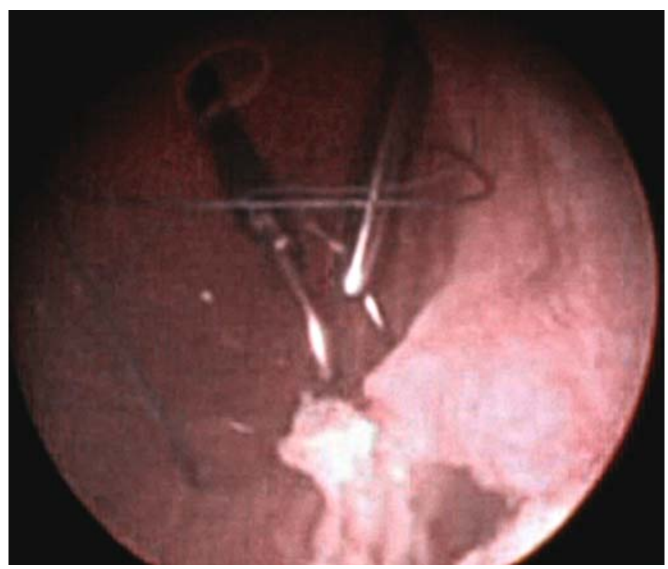


FIG. 39.8. Closure of the cystotomy wound after pushing the clipped ureter juxtavesically

Fig. 39.9. Flank position (70 degrees) and the port positions

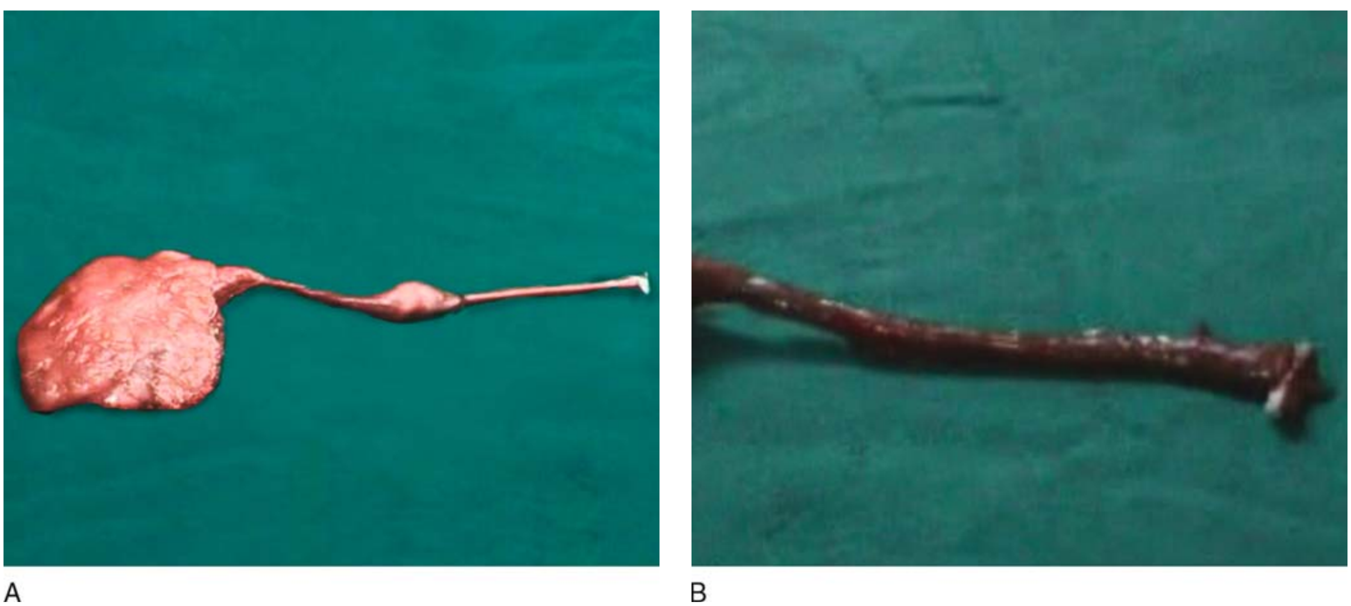


Fig. 39.10. Entire nephroureterectomy specimen removed with an intact Hem-o-Lok clip

Fig. 39.11. Postoperative CT scan (after 3 months) shows no recurrence

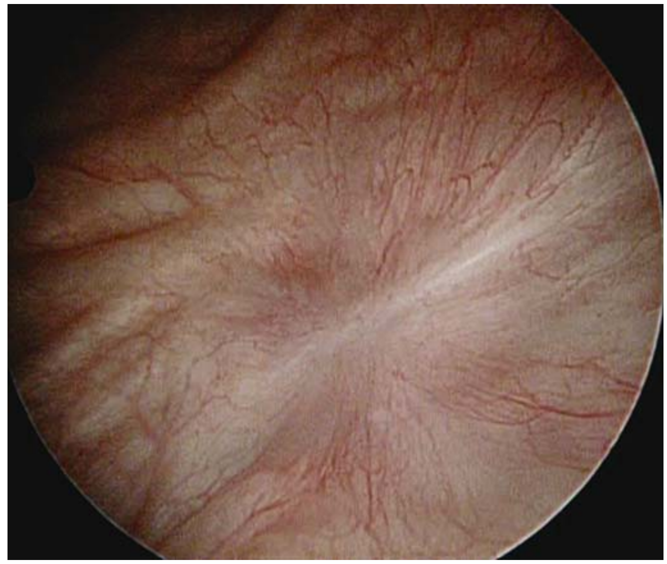
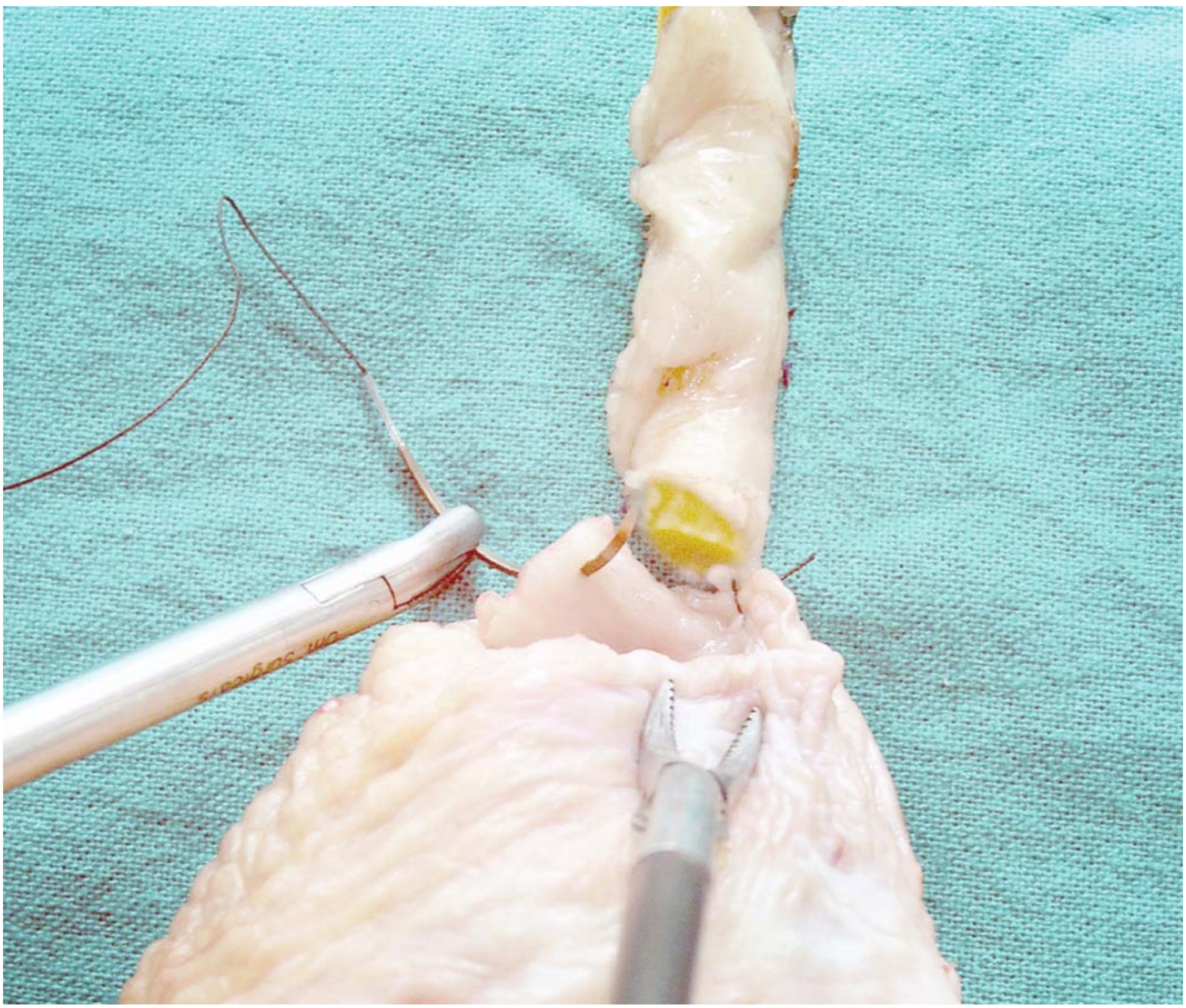


Fig. 39.12. Postoperative cystoscopy (after 3 months) shows a well-healed scar

References

1. Escalera Almendros C, Chiva Robles V, Rodriguez Garcia N, Pascual Mateo C, Berenguer Sanchez A (2006) Right transperitoneal laparoscopic nephroureterectomy. Arch Esp Urol 59(6):615–620.
2. Kaouk JH, Savage SJ, Gill IS (2001) Retroperitoneal laparoscopic nephroureterectomy and management options for the distal ureter. J Endourol 15(4):385–390; discussion 397.

Section IX
Training



40
Simple Novel Methods of Skill Transfer in Laparoscopic Urology Training

M. Ramalingam, K. Selvarajan, and K. Senthil

There is a definite role for laparoscopy in urologic surgeries today because of its obvious advantages. There is a need for training with simplified modules. Several centers offer training in laparoscopic urology [1–4]. Nevertheless, the training is not standardized, and it may involve the use of complex equipment. Here we present the simplified training methods used at our center.

Training can be in a graded fashion:

1. Dry lab exercises
2. Animal module exercises
3. Live animal lab
4. Assisting live surgery

Dry Lab Exercises

1. Hand–eye coordination
   a. Cobra drill
   b. Bead transfer
2. Dissection: using soft materials such as an orange or chicken pieces
3. Knotting and suturing techniques: step by step teaching of different types of knotting and suturing
4. Module for urethrovesical anastomosis using cut foley catheter

Animal Module Exercises

1. Ureterolithotomy
2. Pyeloplasty
   a. Chicken skin
   b. Animal module (bovine kidney)
3. Urethrovesical suturing
   a. Chicken skin
   b. Porcine module
4. Inferior vena cava (IVC) suturing module
5. Partial nephrectomy in a porcine module

Animal Lab Training in a Live Pig

A. Basic Training

1. Veress needle insertion
2. Trocar placement
3. Understanding triangulation concept
4. Dissection techniques in nephrectomy

B. Advanced Animal Lab Training

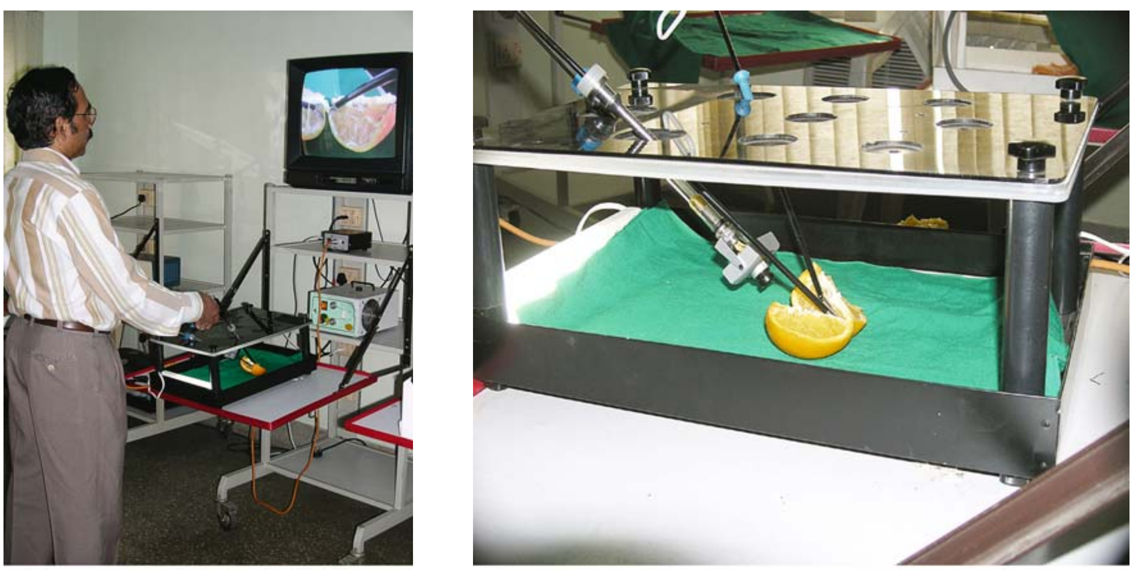
1. Partial nephrectomy
2. Ureteroureterostomy
3. Urethrovesical anastomosis
4. Retroperitoneoscopy in live animal
   a. Assisting live laparoscopic surgery
   b. Training in retroperitoneoscopy
5. Pelvic lymph-node dissection
6. Paraaortic lymph-node dissection

Dry Lab Exercises Hand Eye Coordination

FIG. 40.1. Endotrainer with conventional camera needing an assistant

FIG. 40.2. Simple endotrainer with web camera; an assistant is not needed to hold the camera

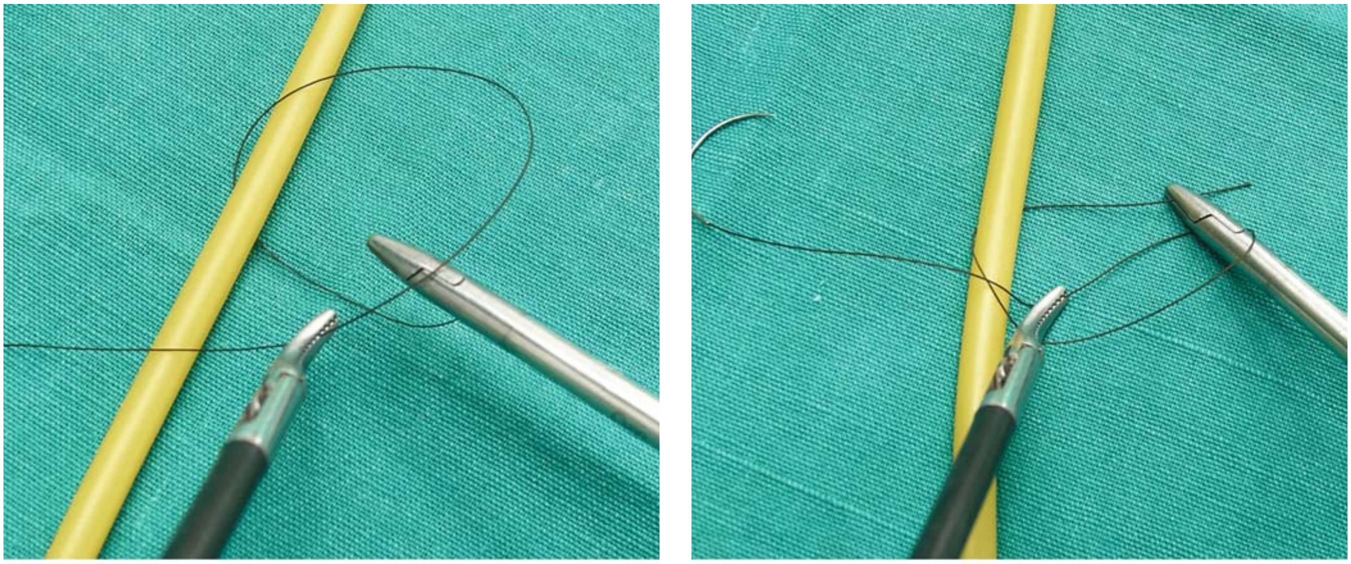
Dissection Using Soft Materials



A B

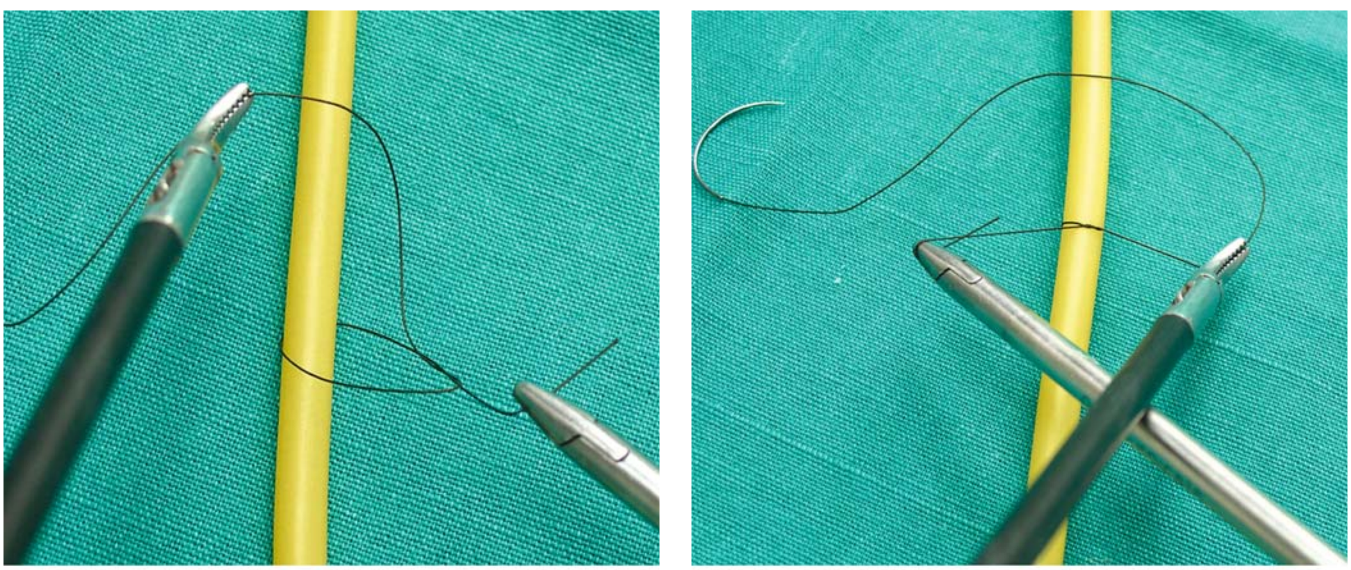
FIG. 40.3. Dissection exercise using an orange, chicken pieces, etc.; arrow points to Web camera

Knotting and Suturing Techniques



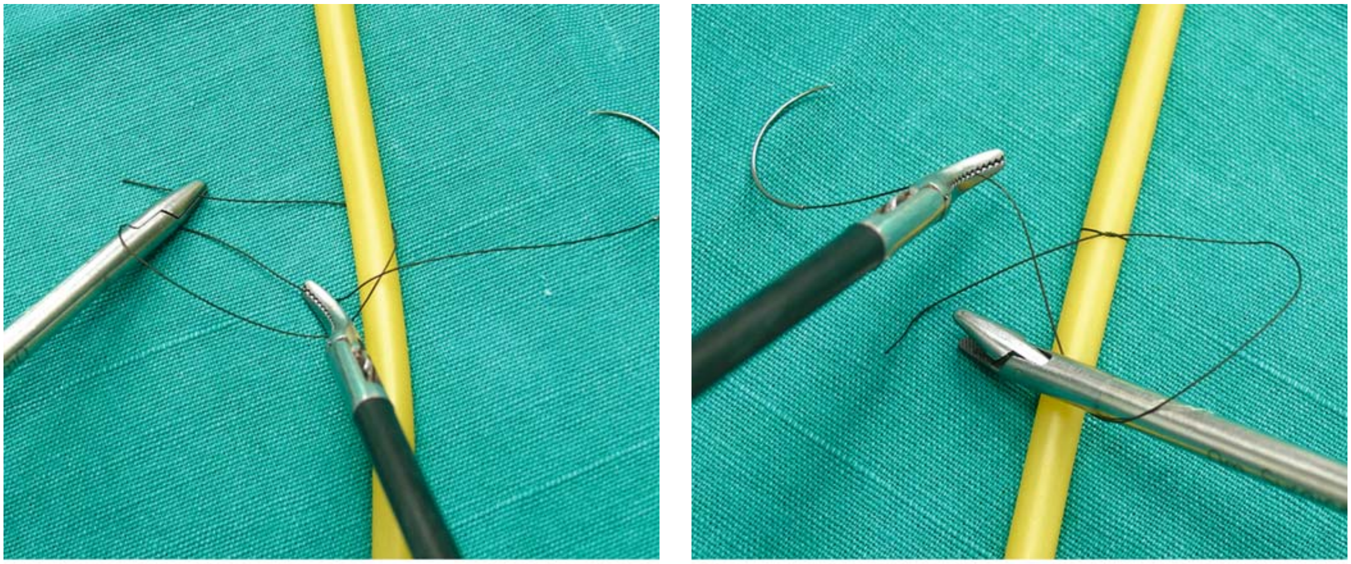
A B

FIG. 40.4. Simple knot using the loop technique



A B

FIG. 40.5. Technique of tightening the knot; hand instruments move at 180 degrees to each other



A B

Fig. 40.6. Method of squaring the knot

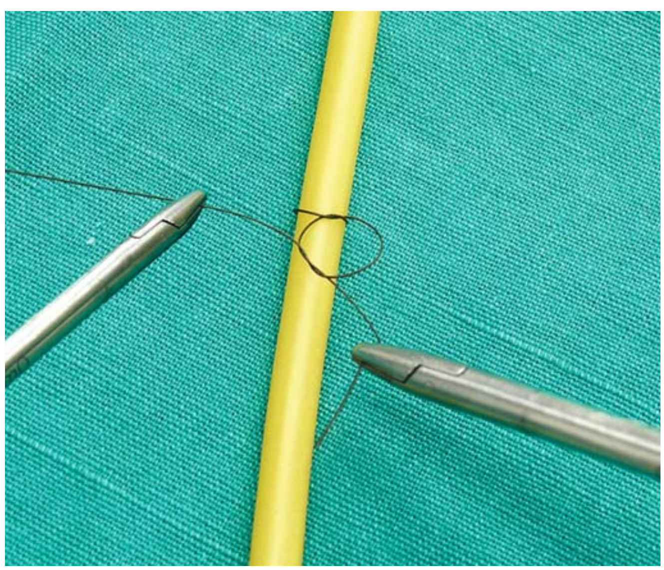
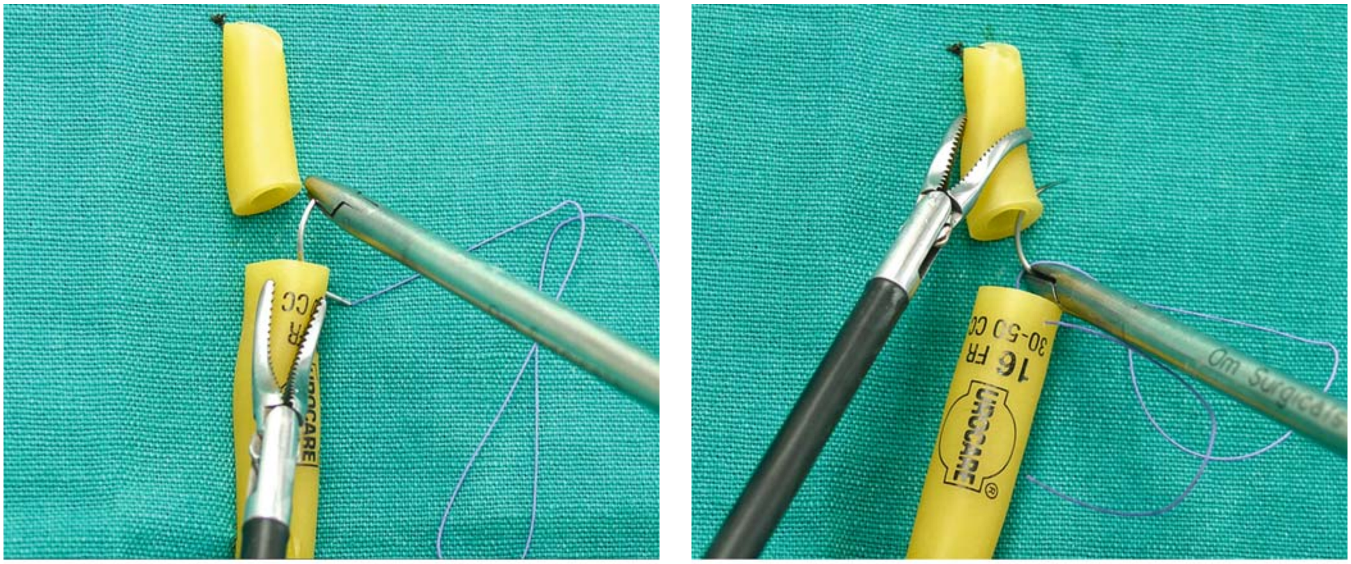


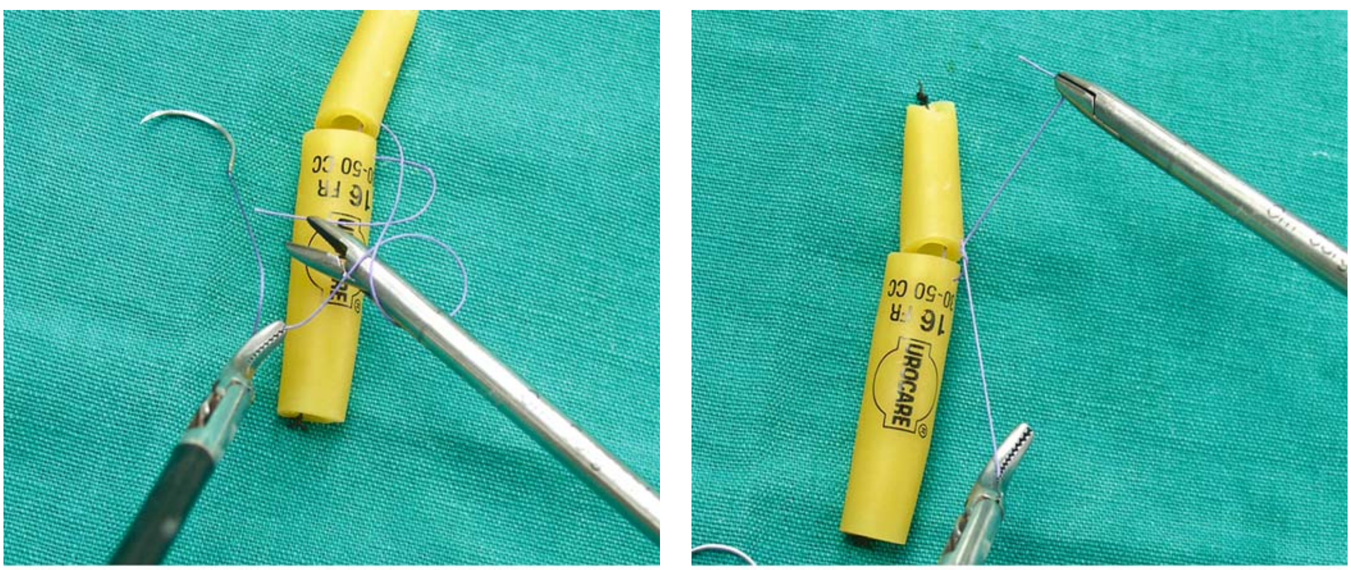
Fig. 40.7. Emphasis on ambidexterity (note the two needle holders)

Module for Urethrovesical Anastomosis Using Cut Foley Catheter



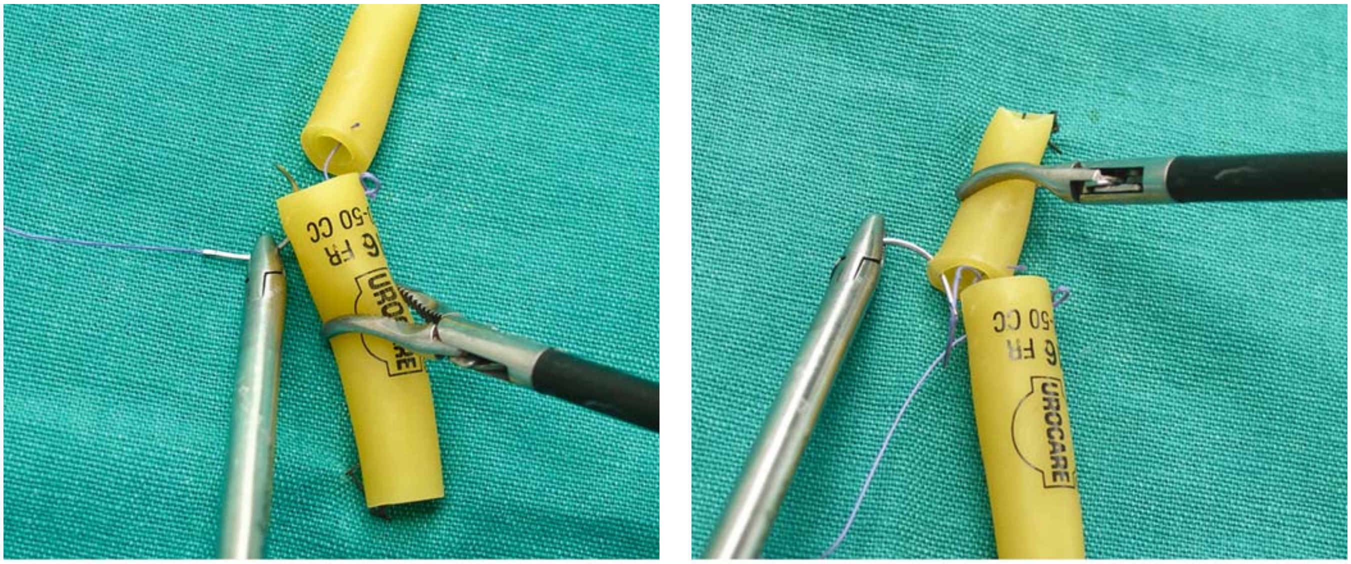
A B

FIG. 40.8. Training using cut Foley catheter; note the angle in which the needle holder drives the suture



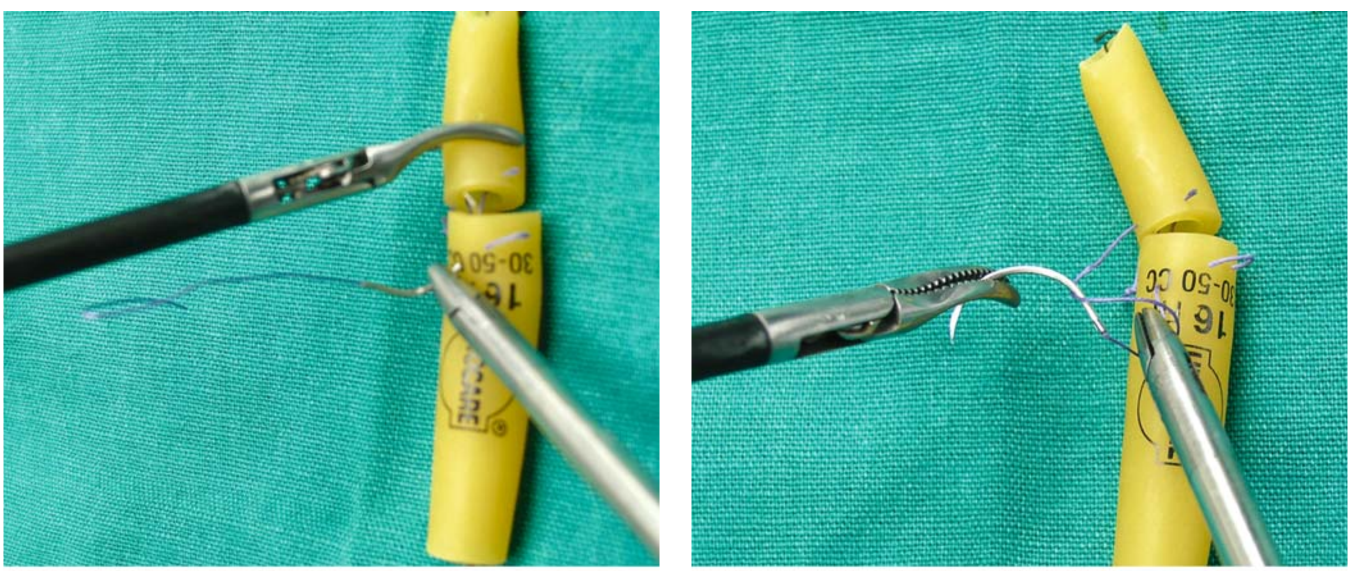
A B

FIG. 40.9. Approximation akin to urethrovesical suturing



A B

Fig. 40.10. Training with left-hand suturing is emphasized



A B

Fig. 40.11. Technique of throwing a knot using the needle

Animal Module Exercises

Ureterolithotomy Module

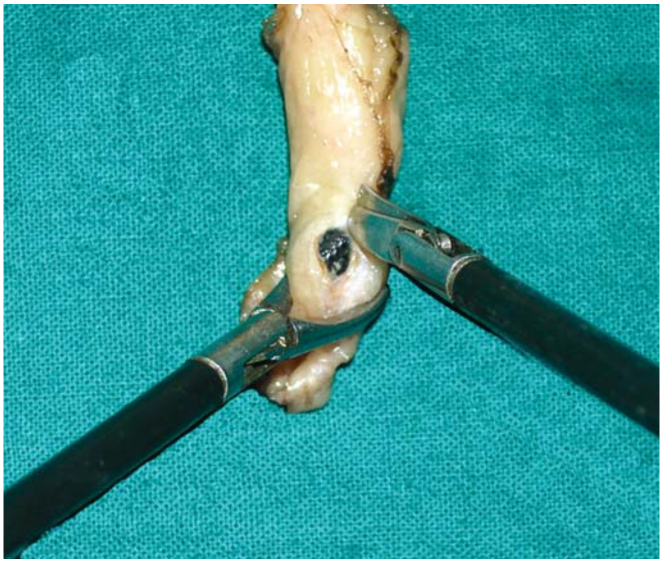


Fig. 40.12. Method of stabilizing a ureteric stone and ureterotomy

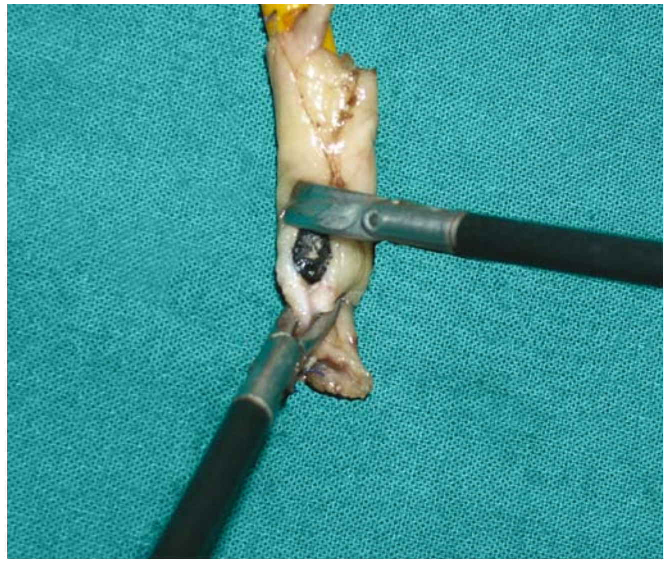


Fig. 40.13. Extending a ureterotomy a little proximally

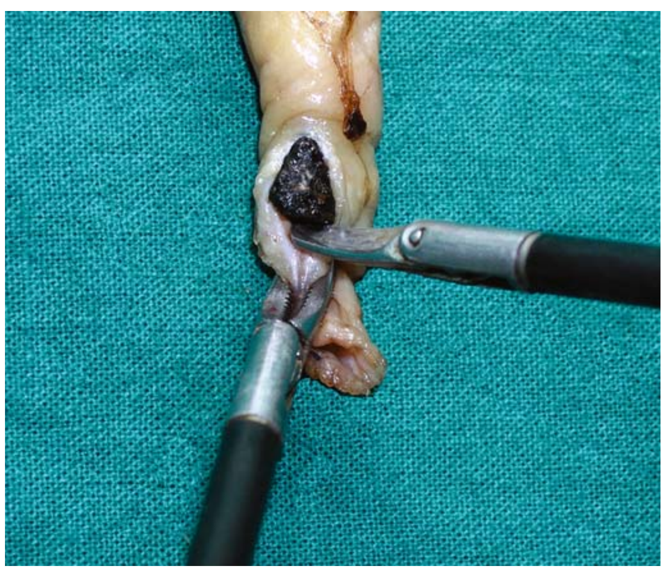


Fig. 40.14. Stone extraction

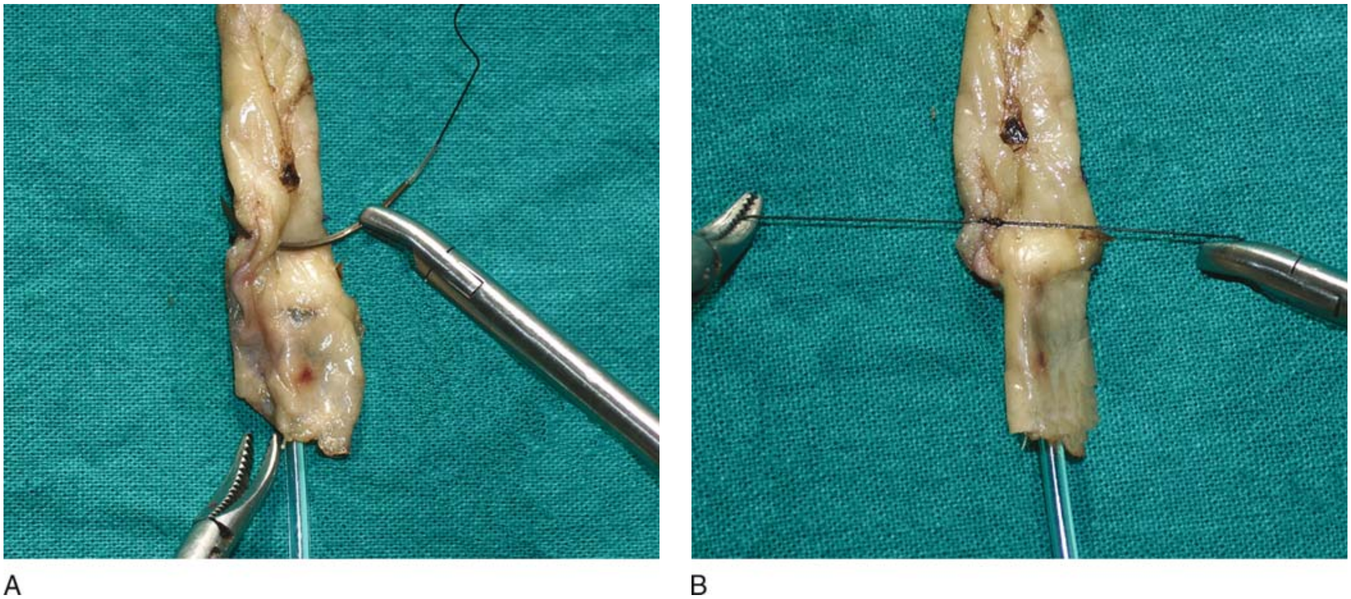


FIG. 40.15. Ureterotomy closure with interrupted suture

Pyeloplasty Module Using Chicken Skin

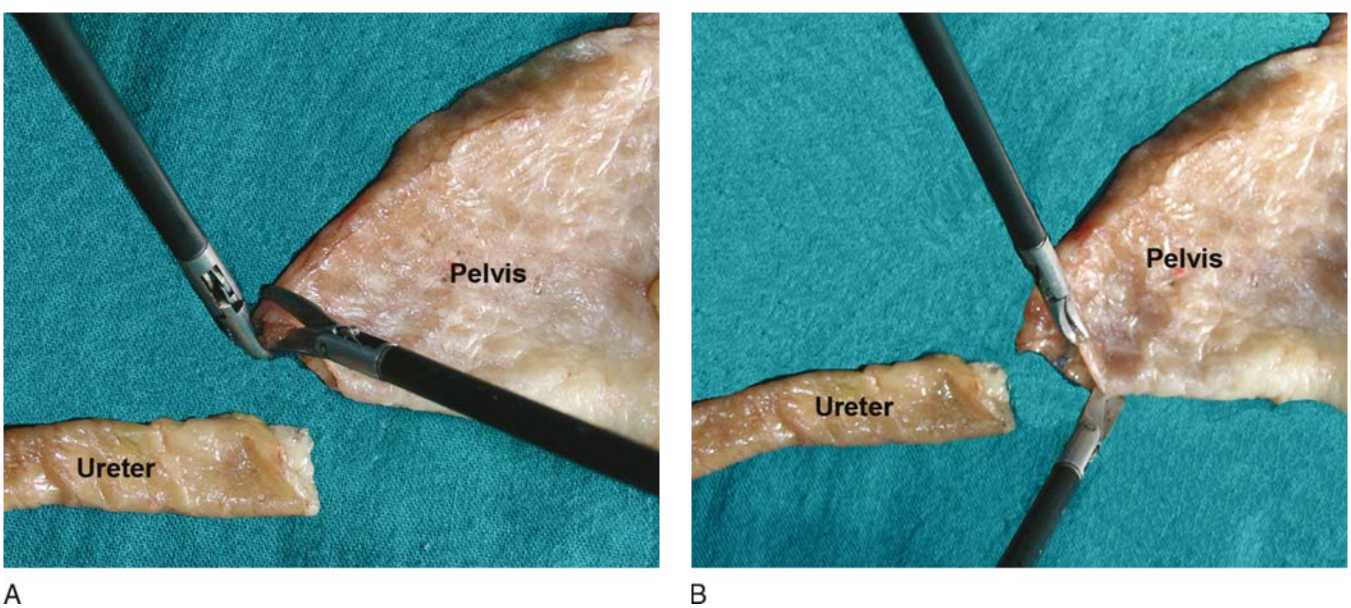


FIG. 40.16. Creating a module for pyeloplasty

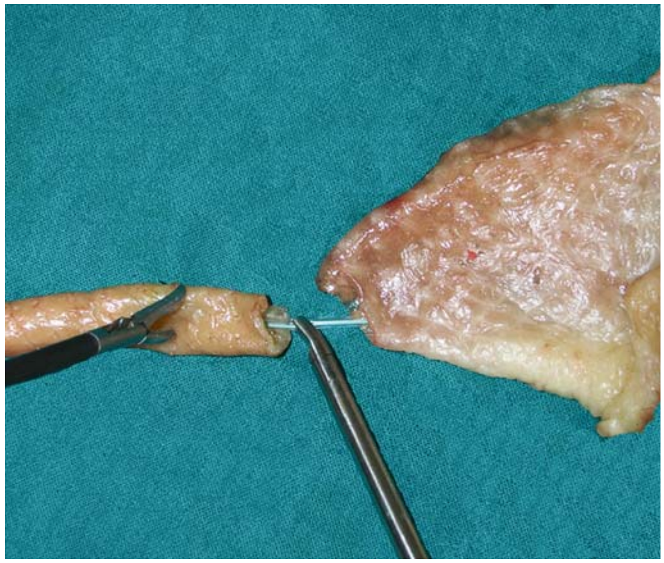
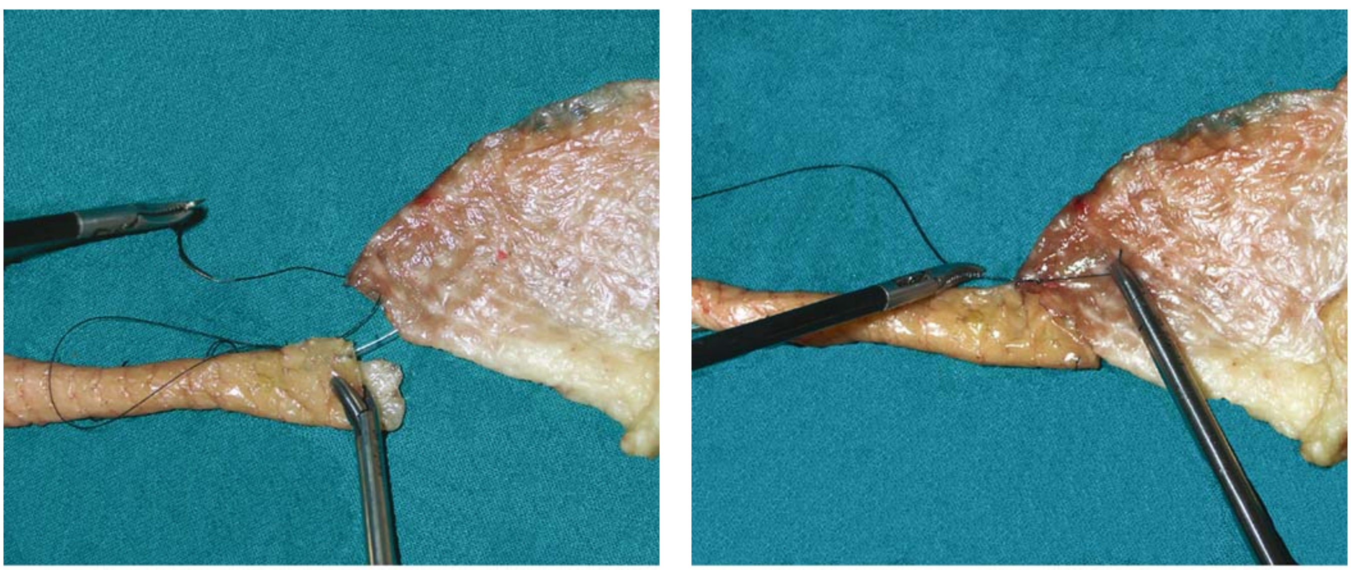
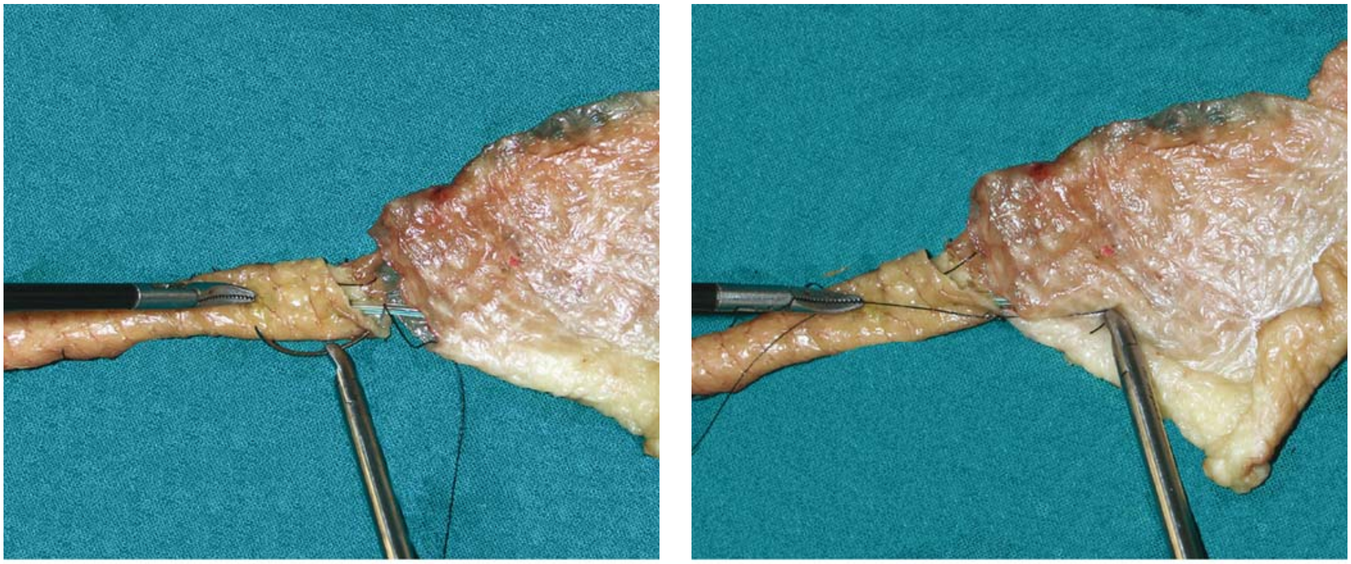


Fig. 40.17. Stenting technique



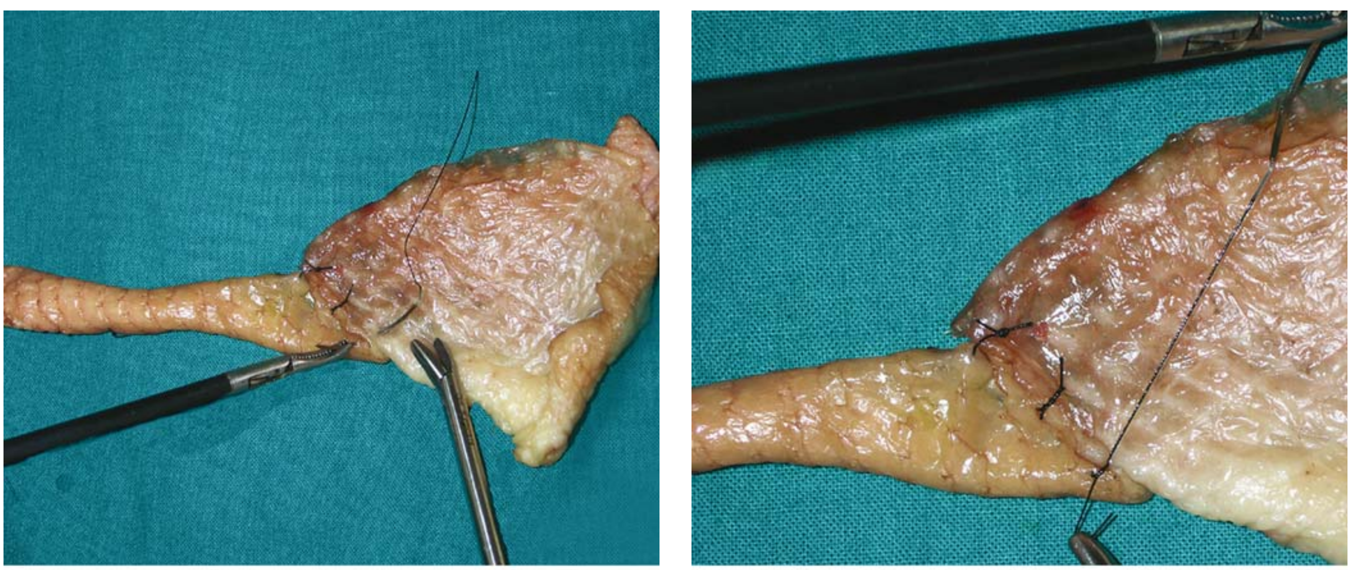
A B

Fig. 40.18. Technique showing initial apical suture



A B

FIG. 40.19. Subsequent interrupted sutures of posterior layer



A B

FIG. 40.20. Method of subsequent anterior layer suturing

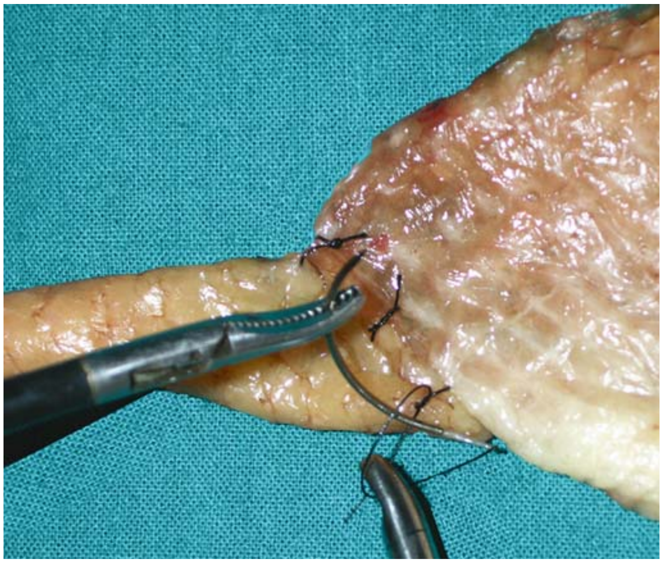


FIG. 40.21. If the suture is short, a needle may be used to throw a knot

FIG. 40.22. Completed anterior layer suture

Pyeloplasty in Animal Module (Bovine Kidney)

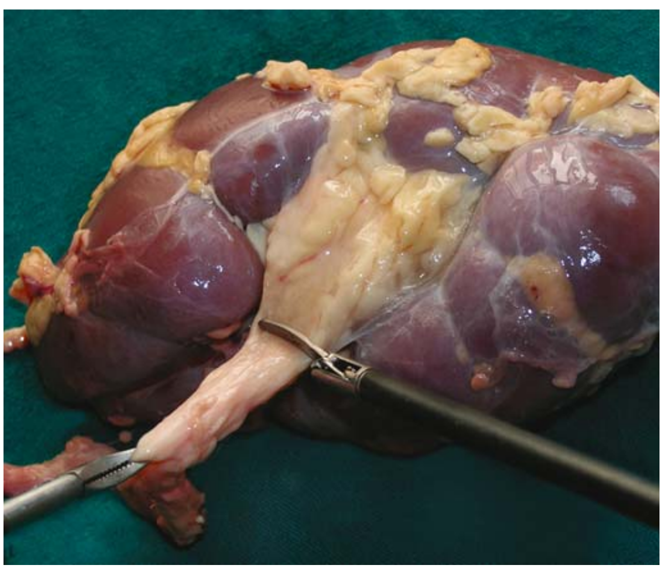


FIG. 40.23. Division of the ureteropelvic junction (UPJ)

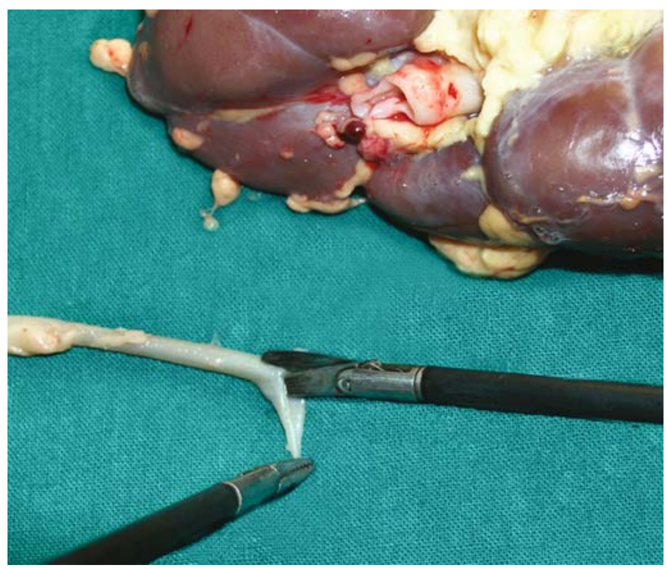


FIG. 40.24. Method of spatulation of the upper ureter laterally

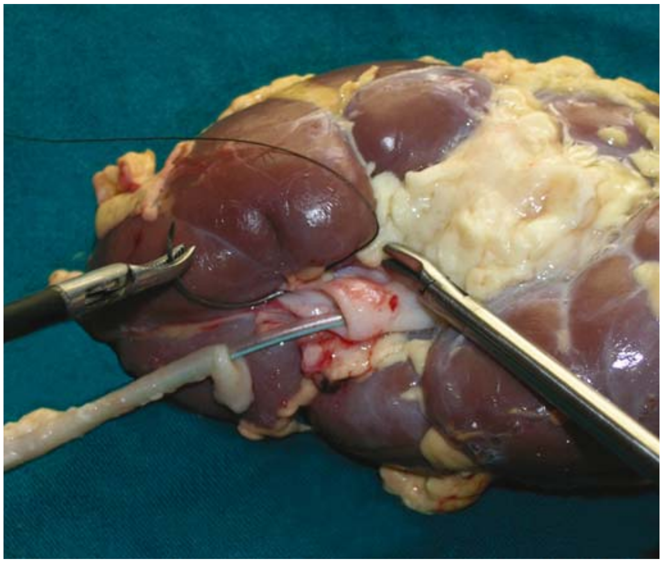


FIG. 40.25. Preferable method of initial suture taken outside-in through the pelvis

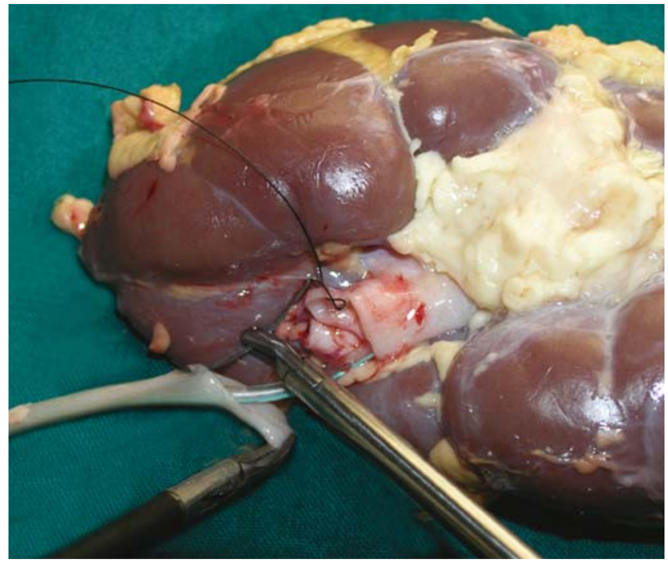


FIG. 40.26. A corresponding apical suture taken inside-out of the spatulated ureter

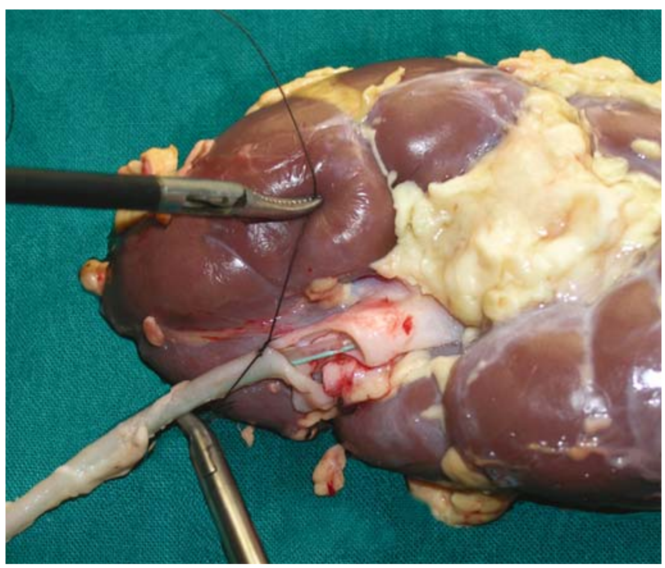
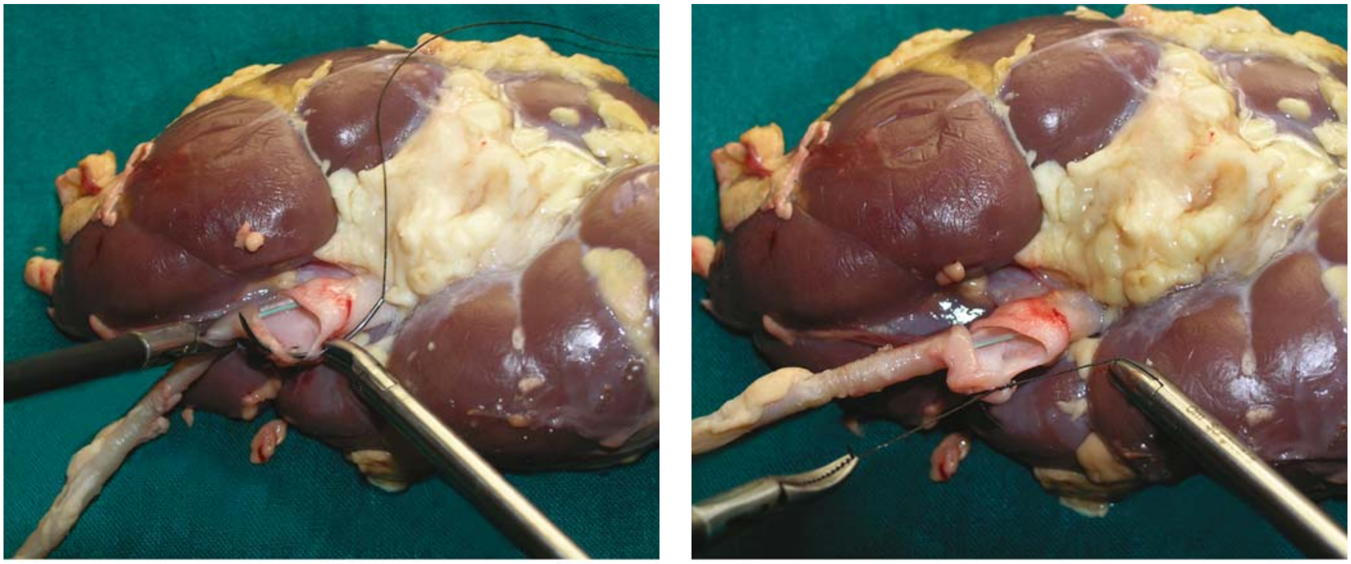
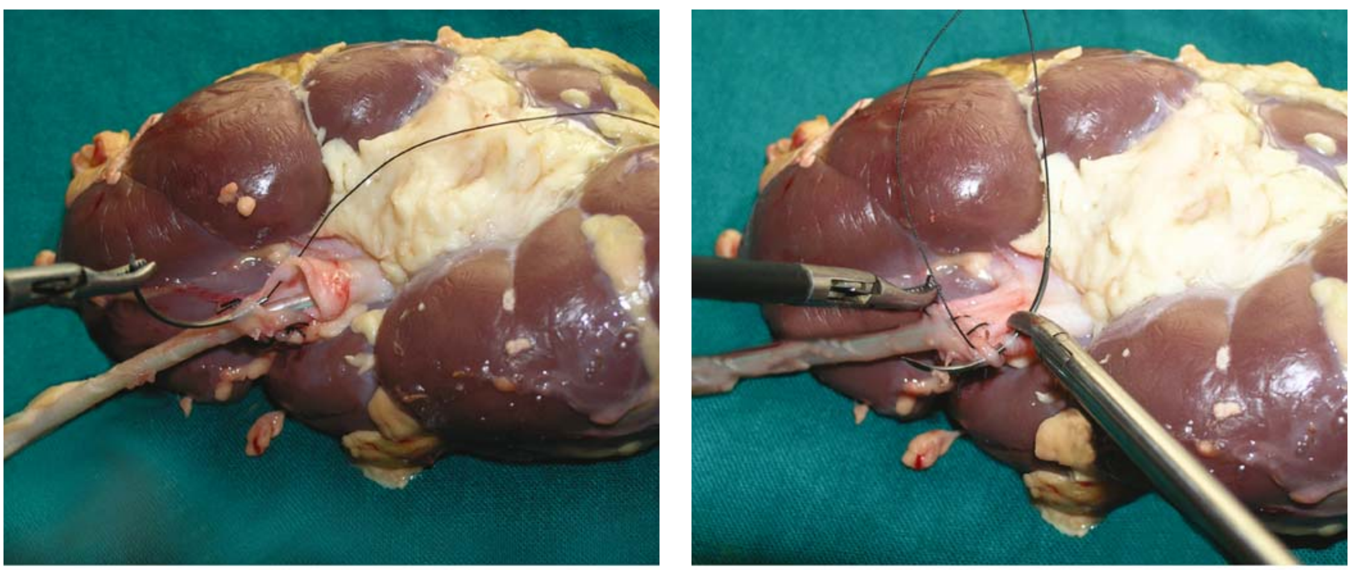


FIG. 40.27. Training how to move the instruments in a diagonally opposite direction to secure the knot



A B

Fig. 40.28. Subsequent posterior layer suturing



A B

Fig. 40.29. Method of taking continuous suture emphasising on equidistant bites

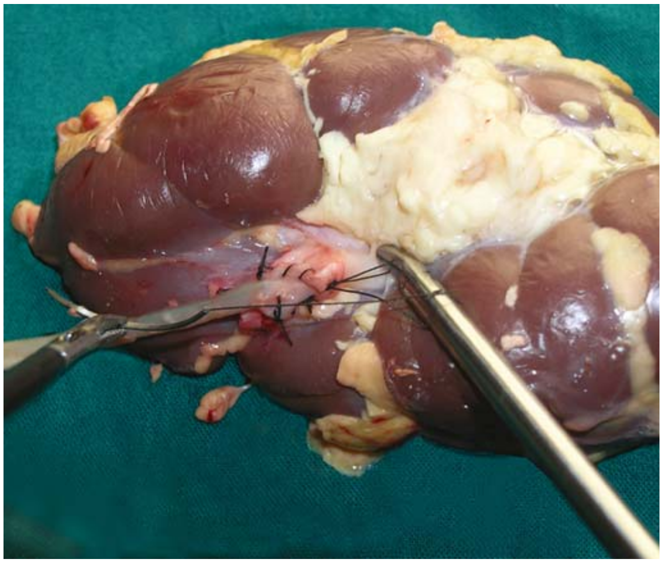


Fig. 40.30. Method of knotting (maintaining adequate tension)

Fig. 40.31. View after dismembered pyeloplasty showing good funneling

Urethrovesical Suturing

Urethrovesical Suturing Using Chicken Skin

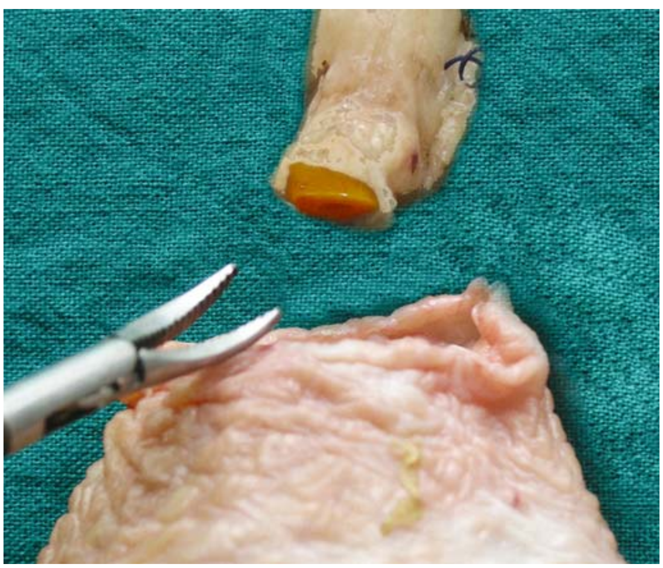


Fig. 40.32. Urethrovesical module made of chicken skin

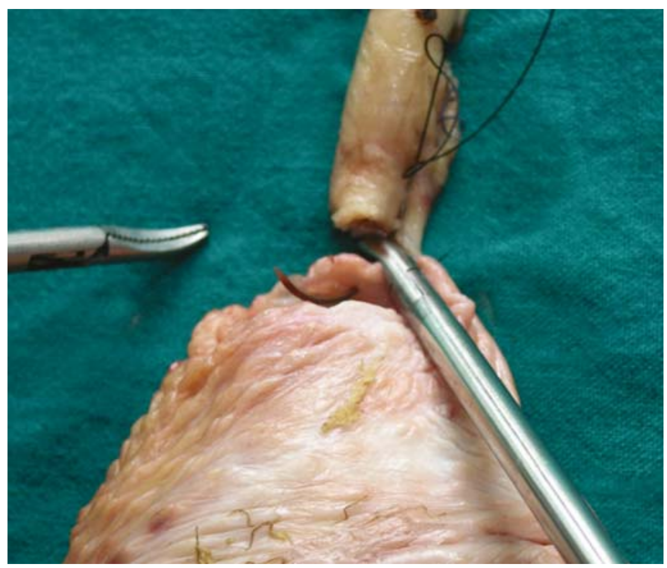


Fig. 40.33. Initial suture taken outside-in through the posterior layer

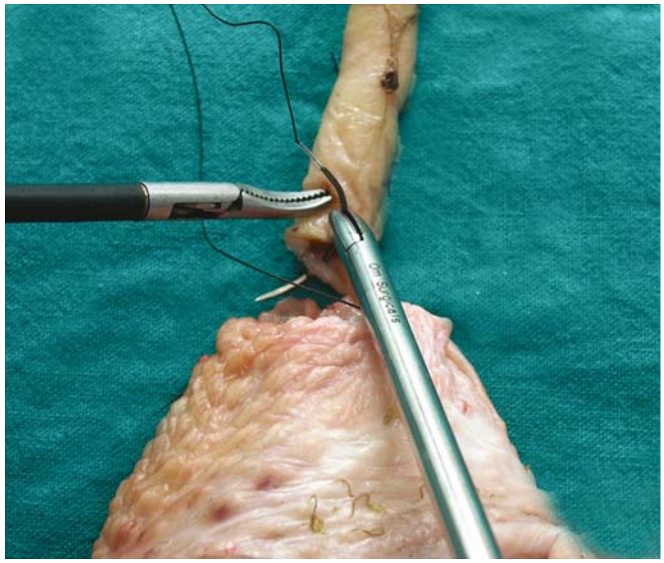
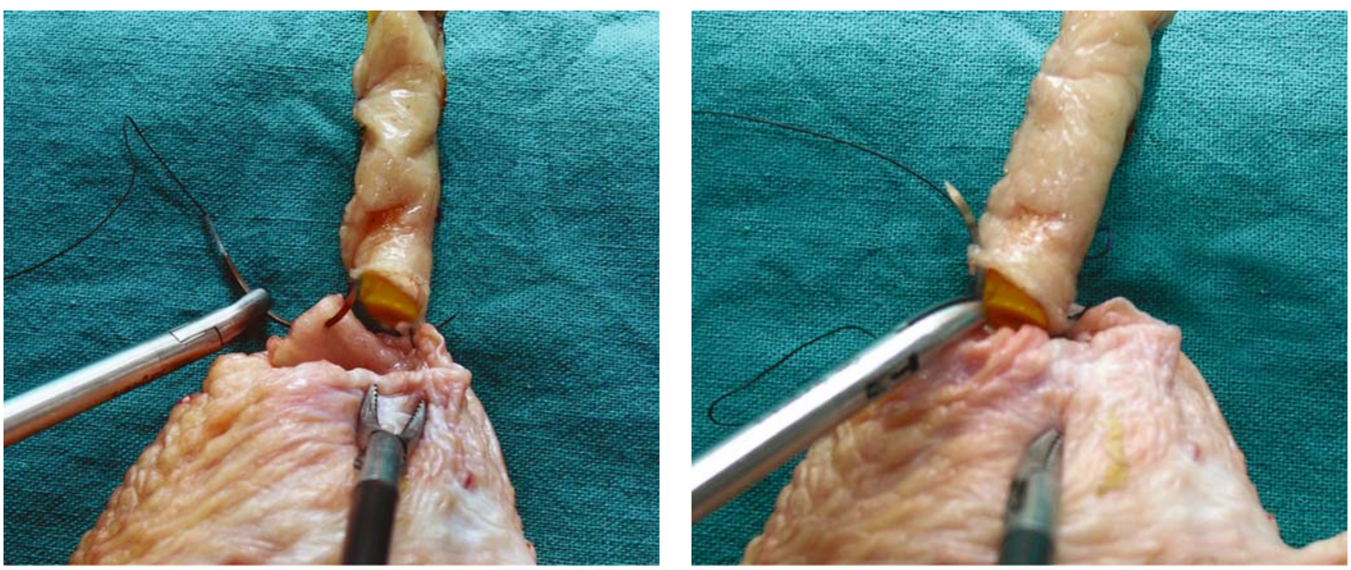


Fig. 40.34. The urethral catheter is slightly withdrawn while taking a corresponding suture inside-out through urethra



A B

Fig. 40.35. Method of taking subsequent interrupted sutures

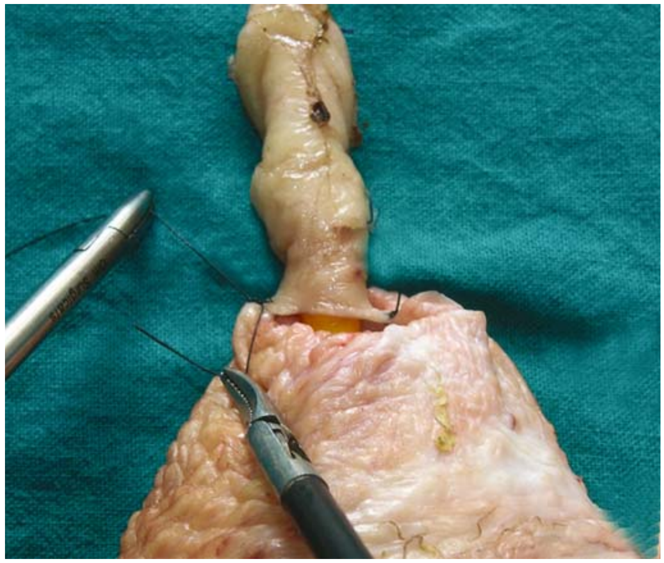


Fig. 40.36. View after posterior layer suture

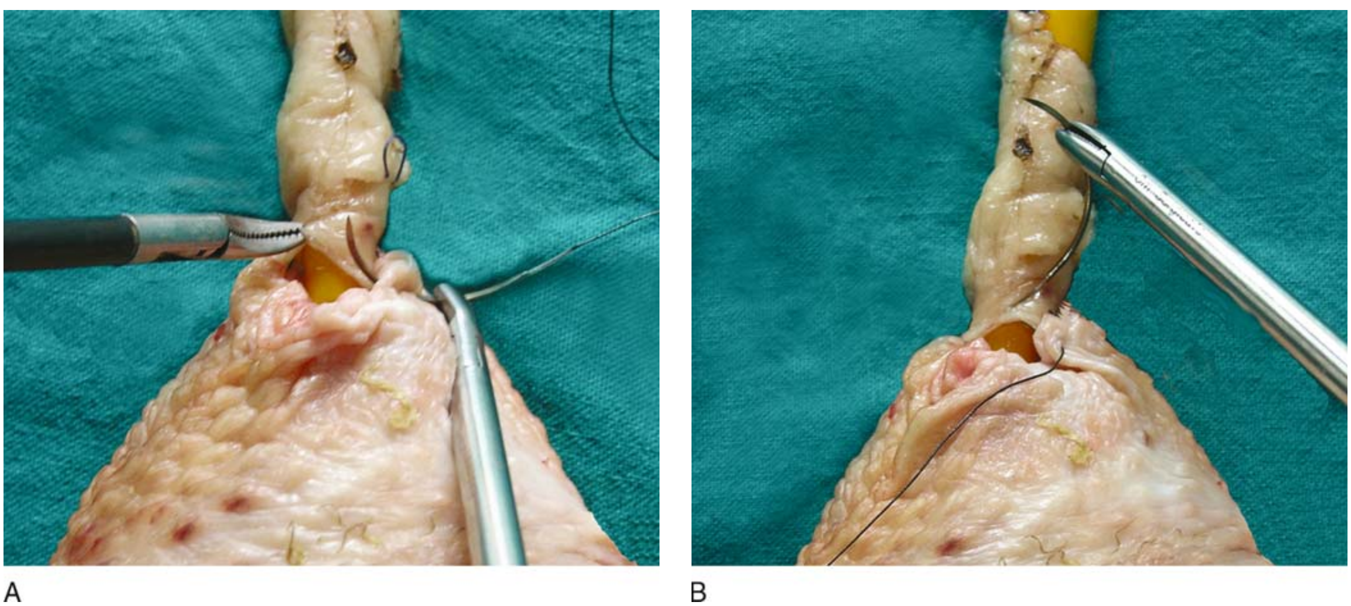


Fig. 40.37. Technique of sutures taken in the anterior layer

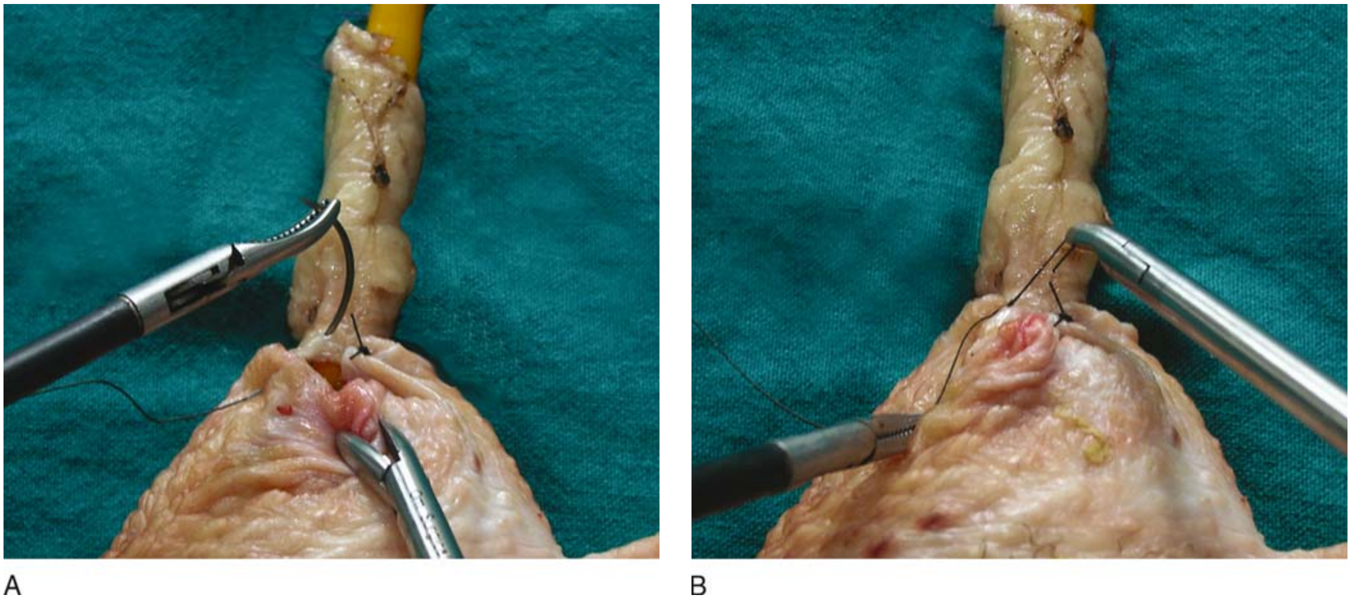


Fig. 40.38. Technique of completing the anterior layer suture

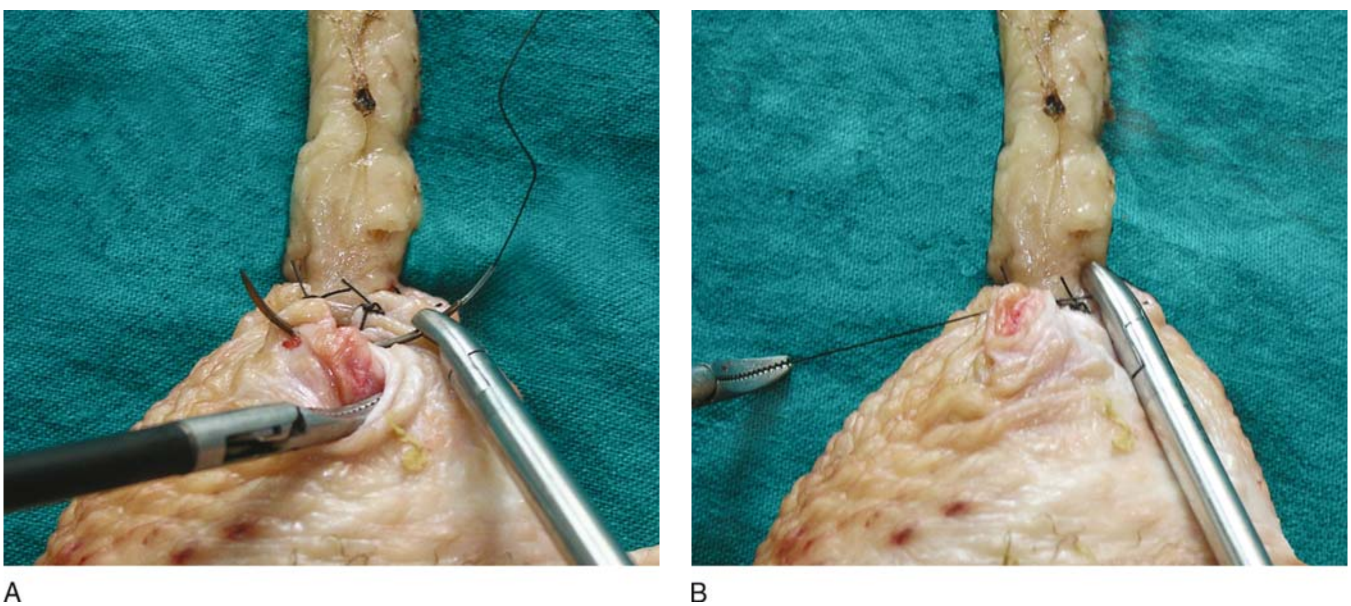


Fig. 40.39. Cystorrhaphy to complete the urethrovesical anastomosis

Urethrovesical Suturing Using Porcine Module

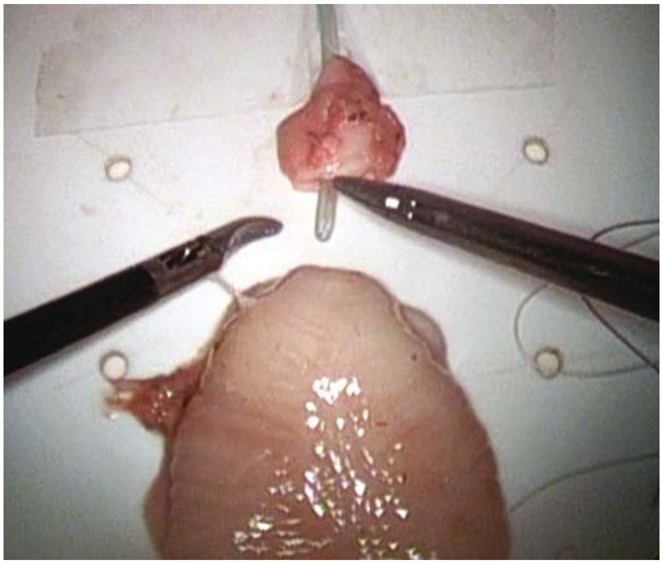


FIG. 40.40. Porcine model of bladder and urethra

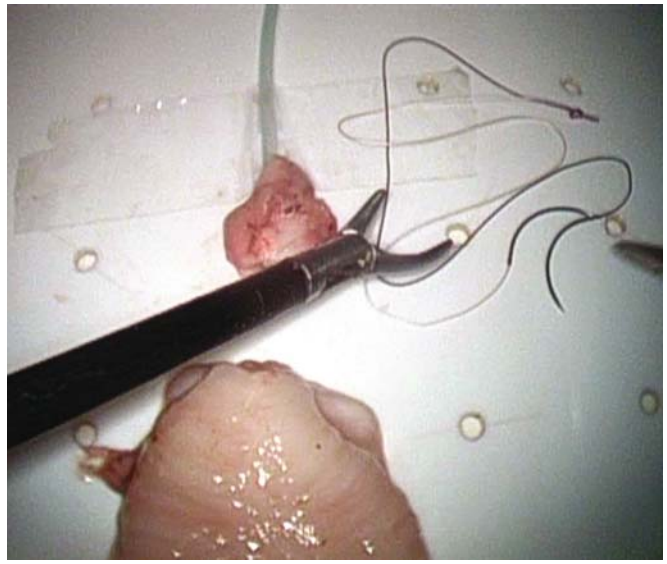


FIG. 40.41. Monocryl sutures (3-0); technique of Von Velthovan

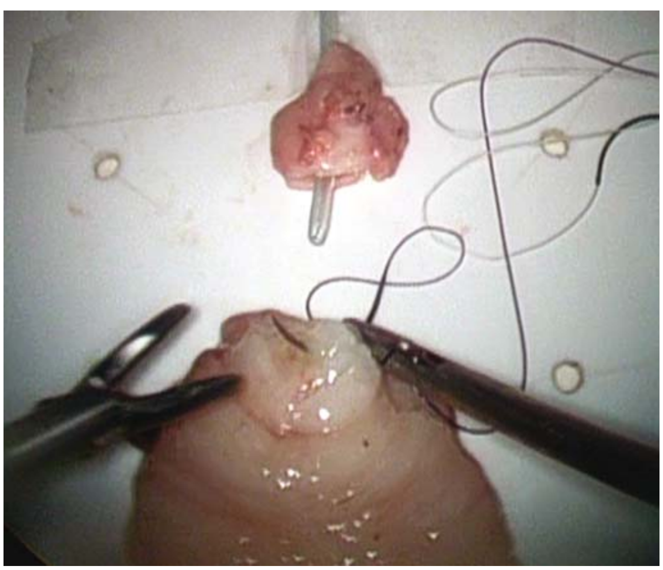


FIG. 40.42. Initial suture taken outside-in through the posterior wall of bladder

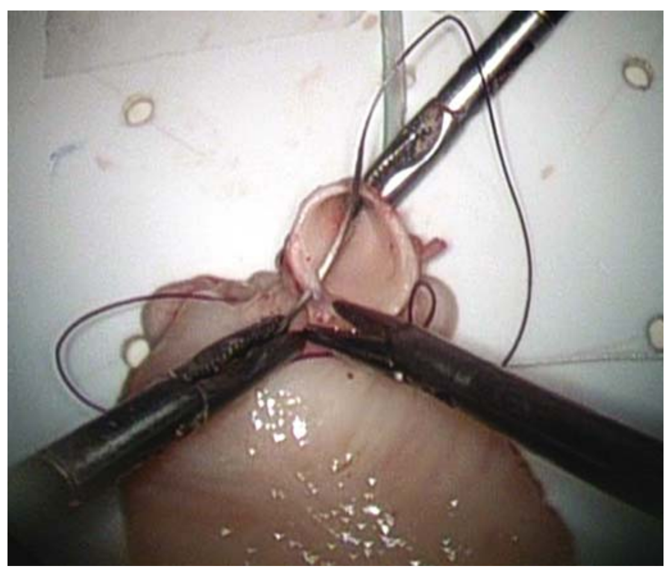
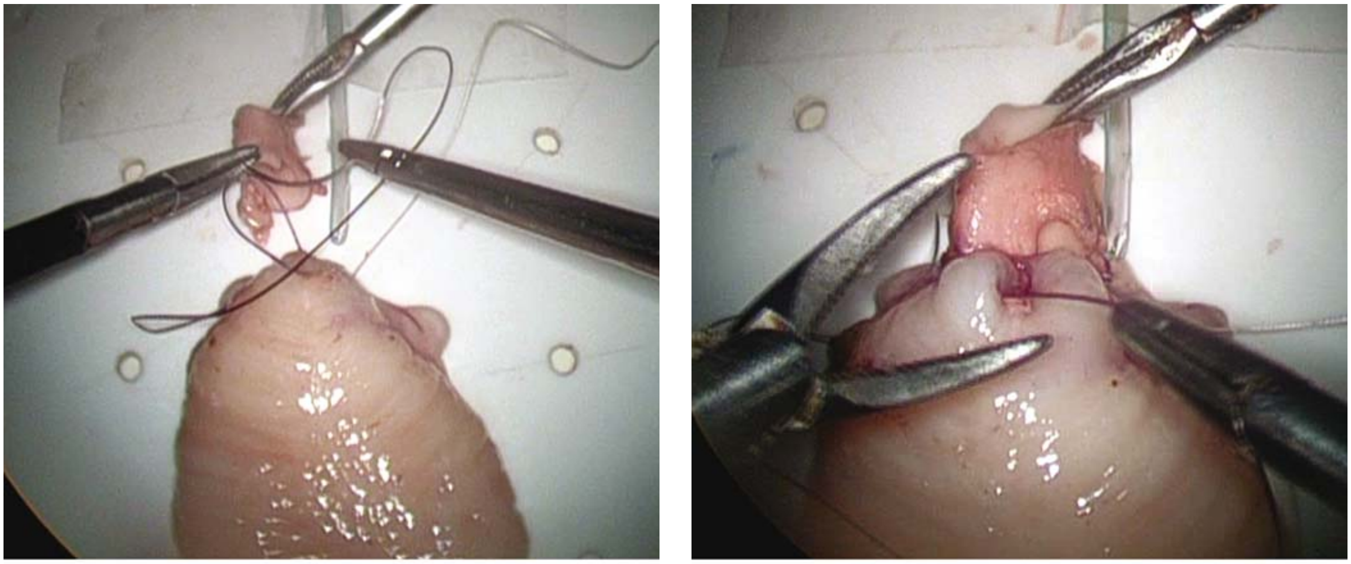


FIG. 40.43. A corresponding suture taken inside-out through the urethra



A B

Fig. 40.44. Subsequent suture of the posterior layer

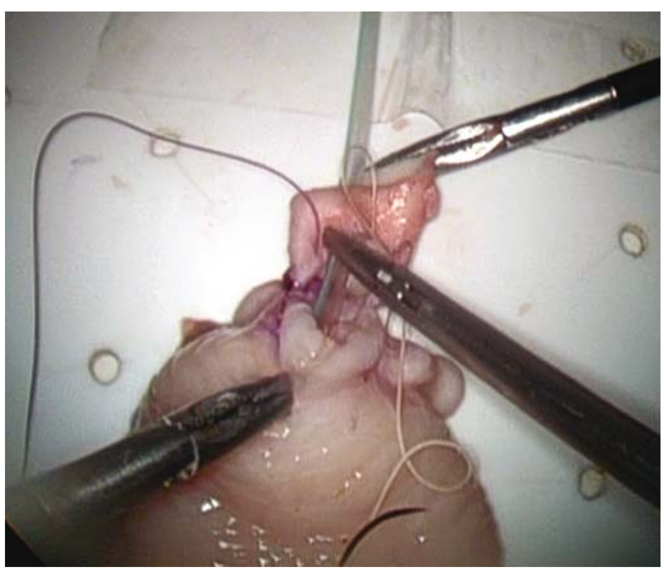
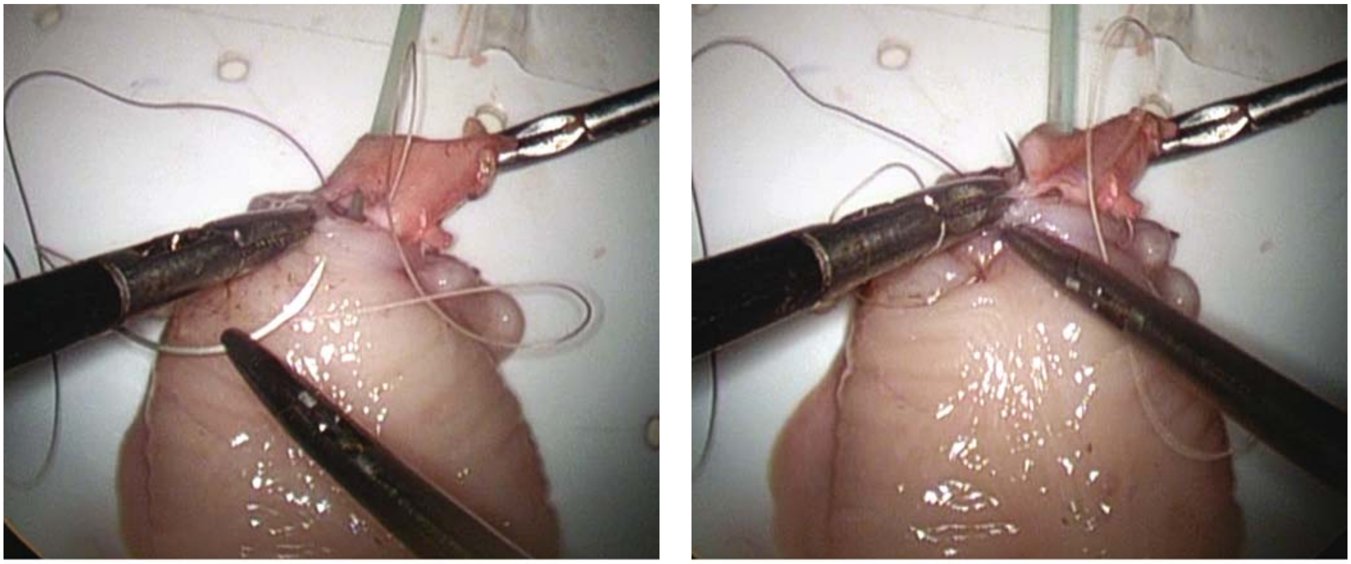
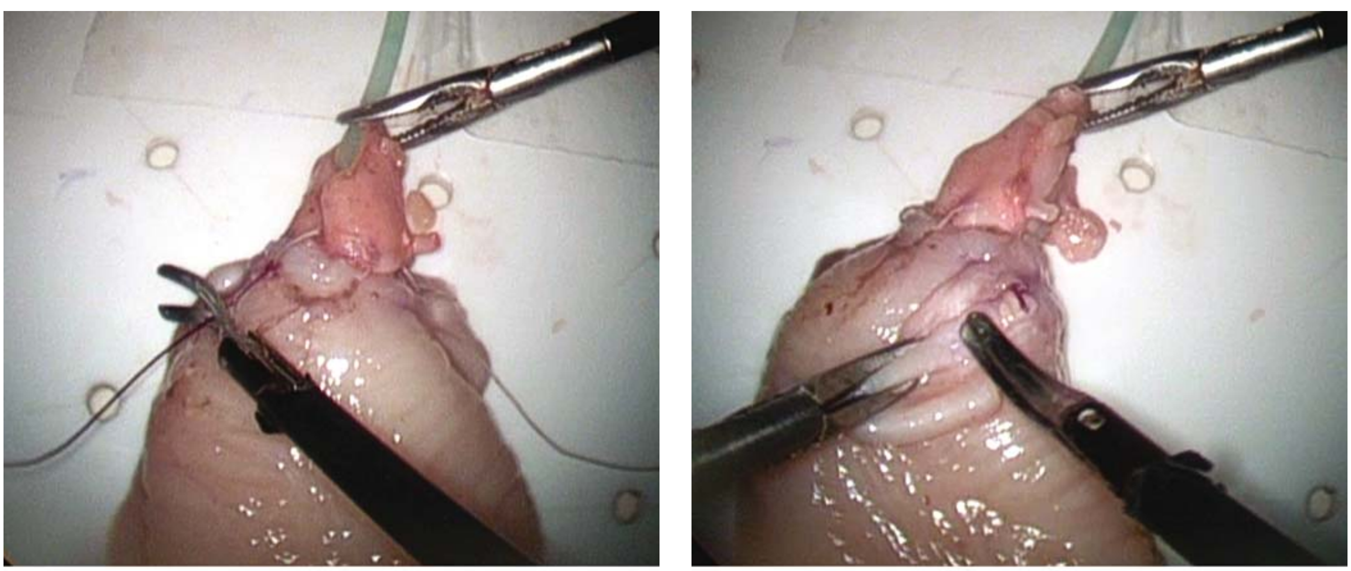


Fig. 40.45. Advancement of the catheter



A B

Fig. 40.46. Subsequently the other half of the suture is used to close the rest of the urethrovesical cut ends



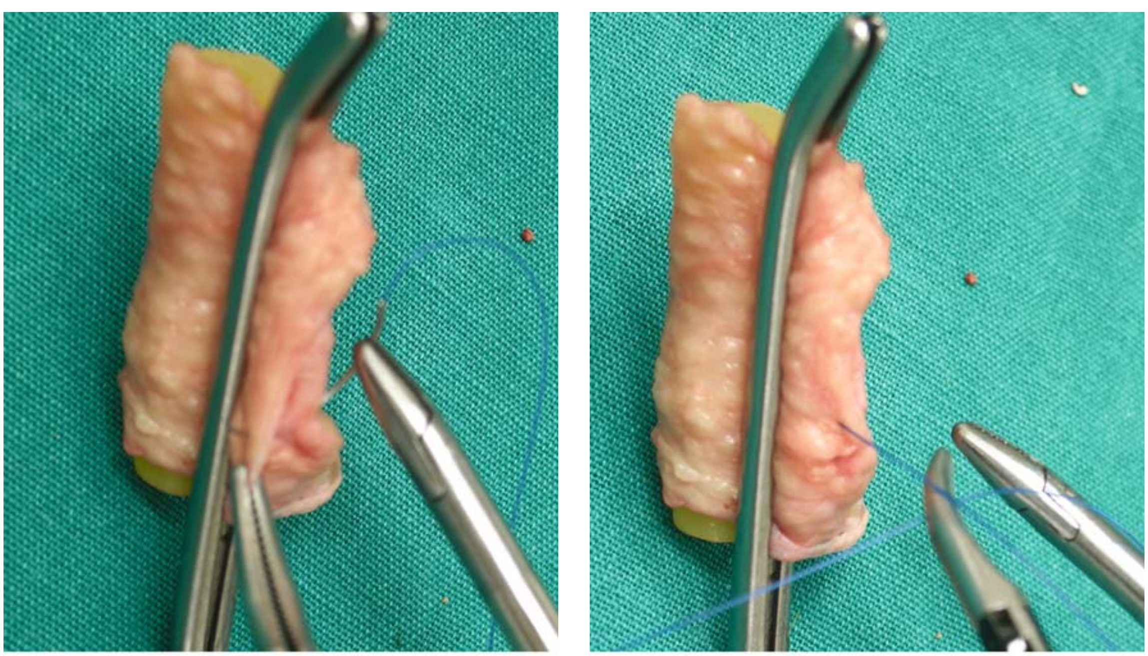
A B

Fig. 40.47. Completed view of the urethrovesical anastomosis

Inferior Vena Cava Suturing Module

A B

FIG. 40.48. Flexible trocar with Satinsky clamp



A B

FIG. 40.49. Module of IVC with Satinsky clamp; suturing of the cavotomy with 5-0 monofilament suture in sequence

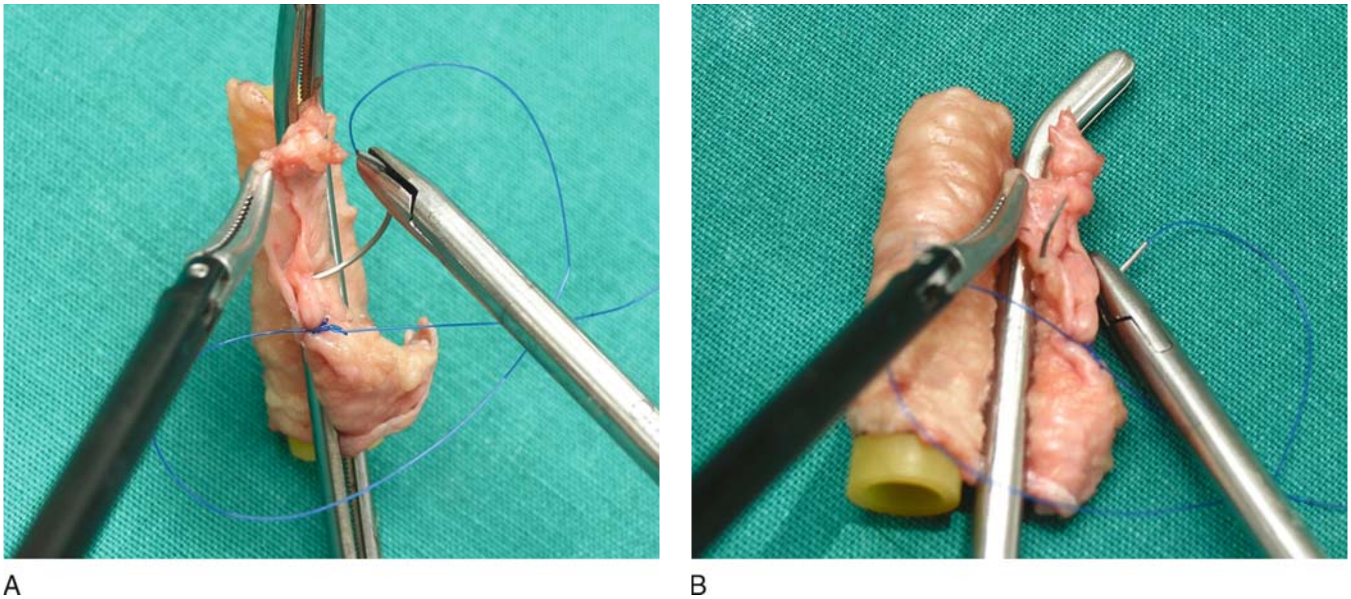


FIG. 40.50. Method of continuous vascular suturing in progress

Partial Nephrectomy in a Porcine Model

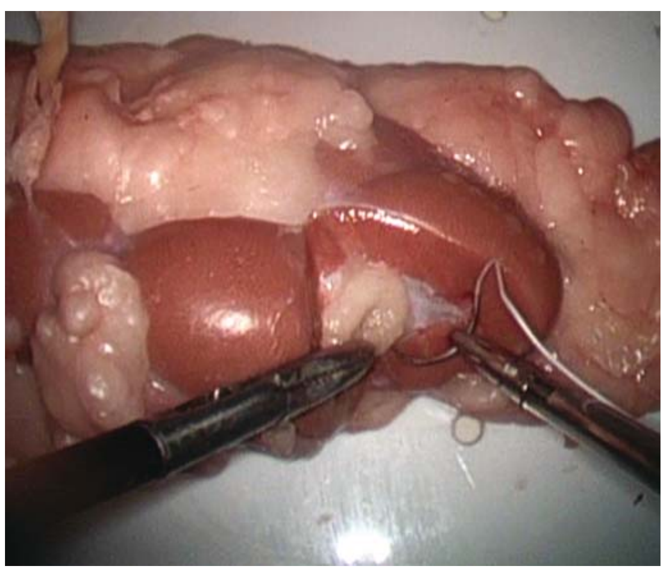


FIG. 40.51. Porcine model for partial nephrectomy

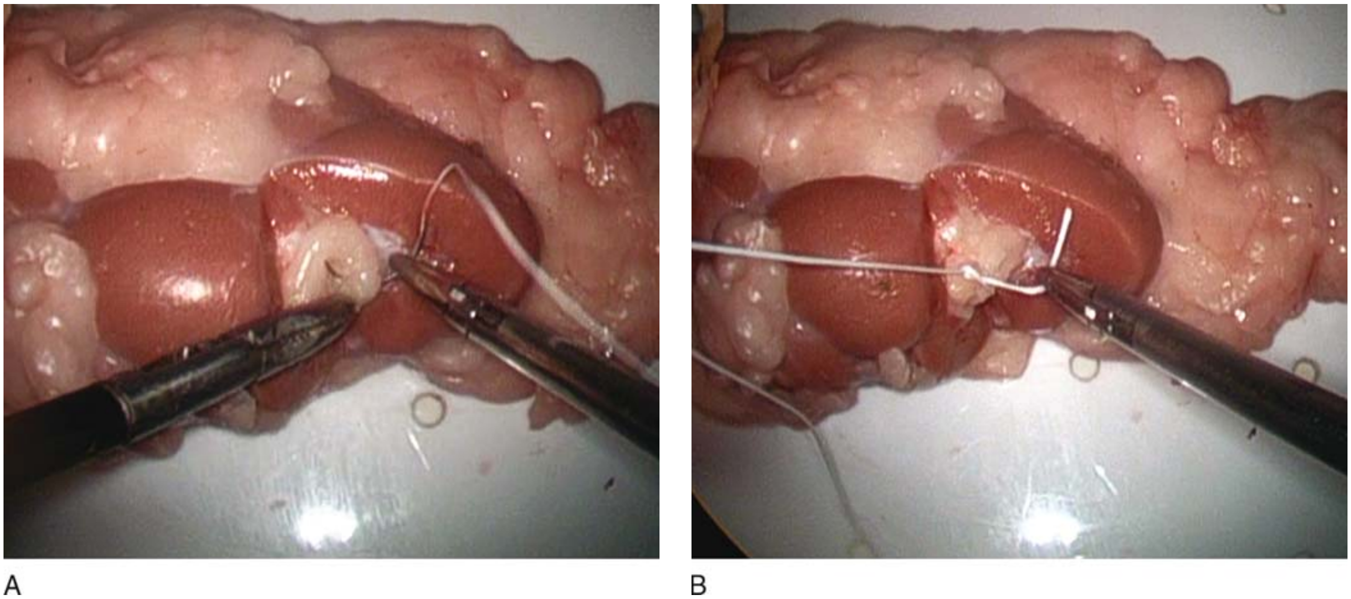


Fig. 40.52. Closure of the collecting system with 4-0 Vicryl

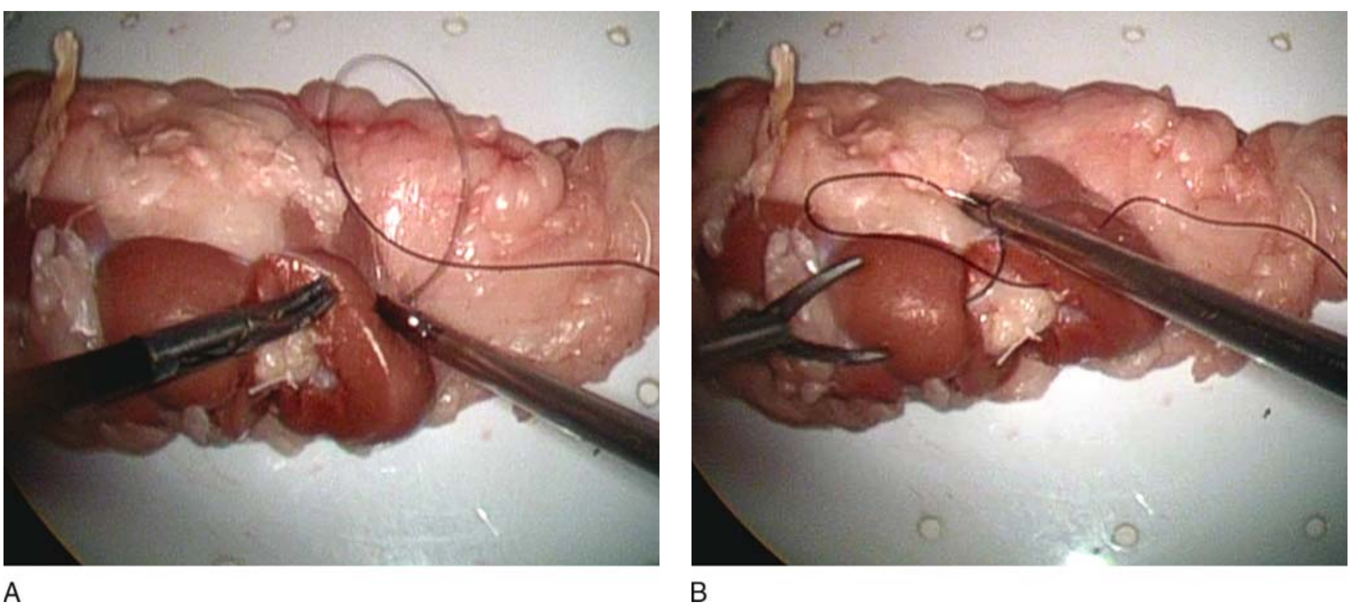
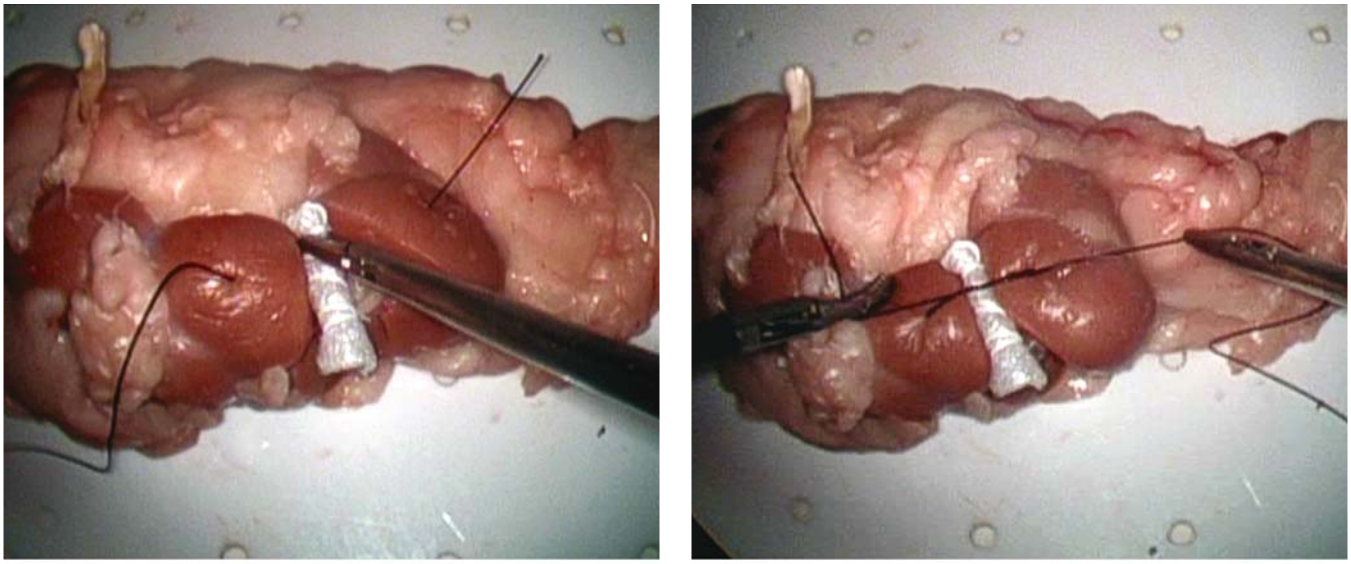
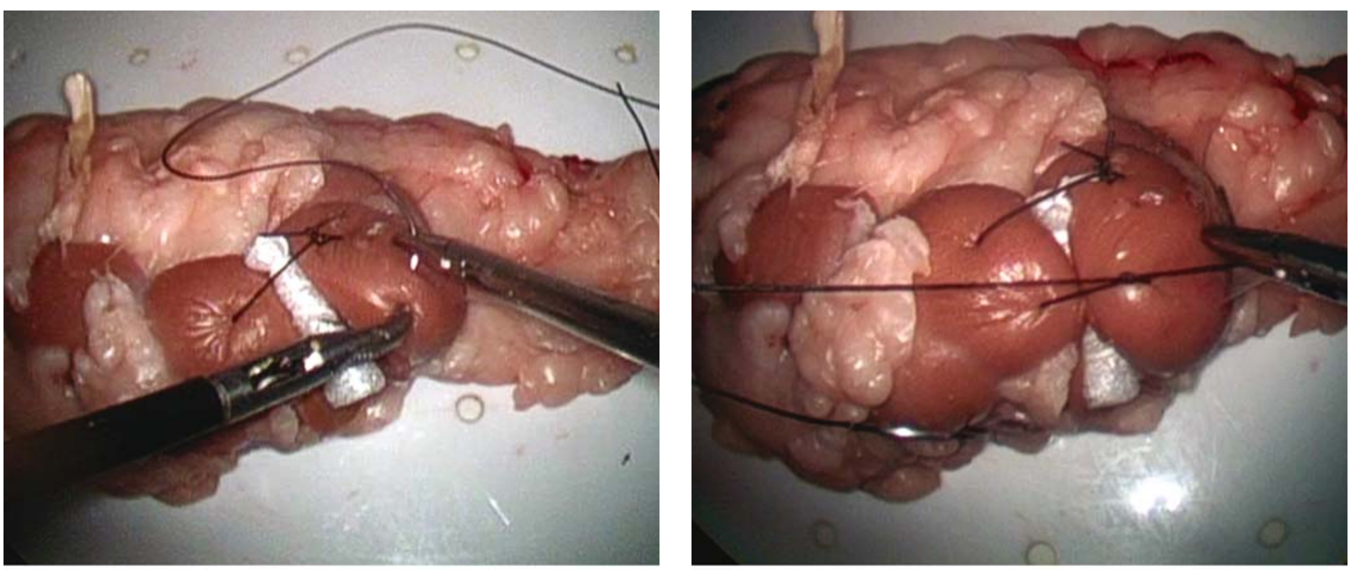


Fig. 40.53. Approximation of cut ends of renal parenchyma with 1-0 Vicryl



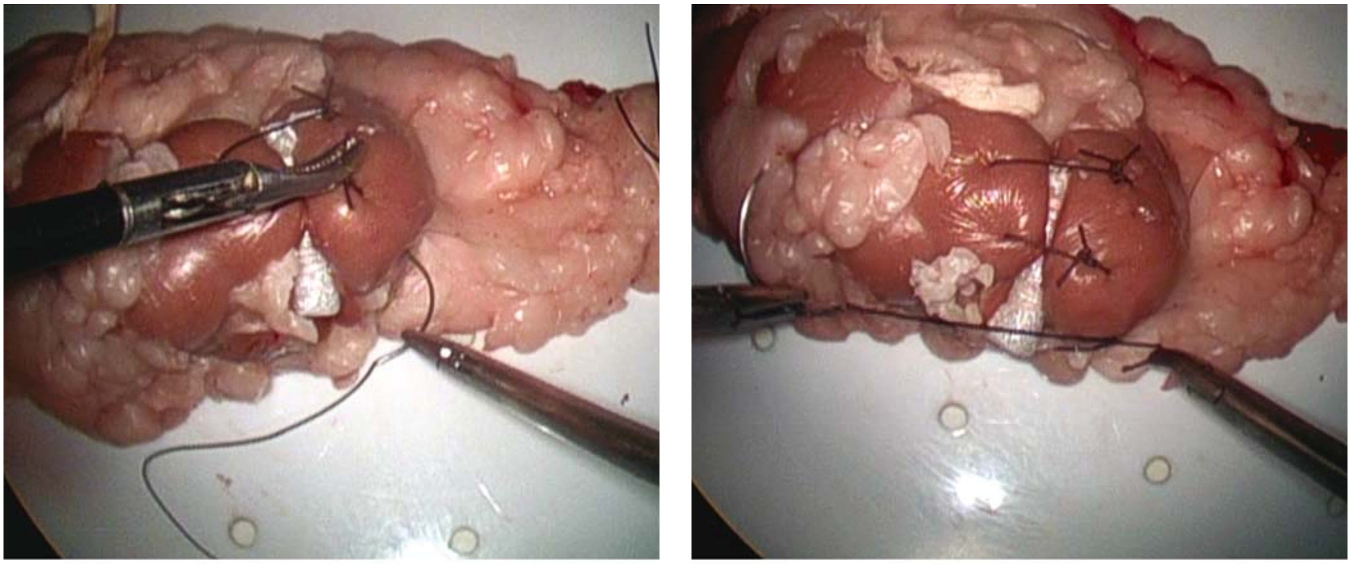
A B

FIG. 40.54. Surgicel bolster interposition



A B

FIG. 40.55. Reinforcement suture



A B

FIG. 40.56. Training with back-hand suture

Animal Lab Training in a Live Pig

Advanced Animal Lab Training

Partial Nephrectomy

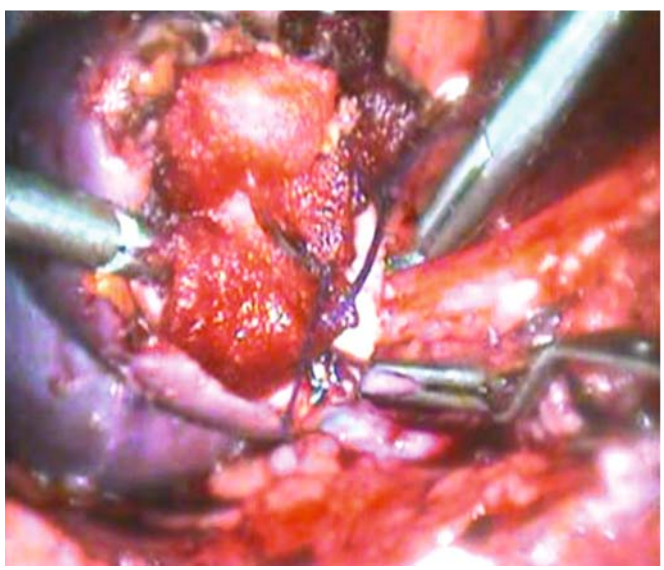


FIG. 40.57. Endo-bulldog clamp application over the renal vessels

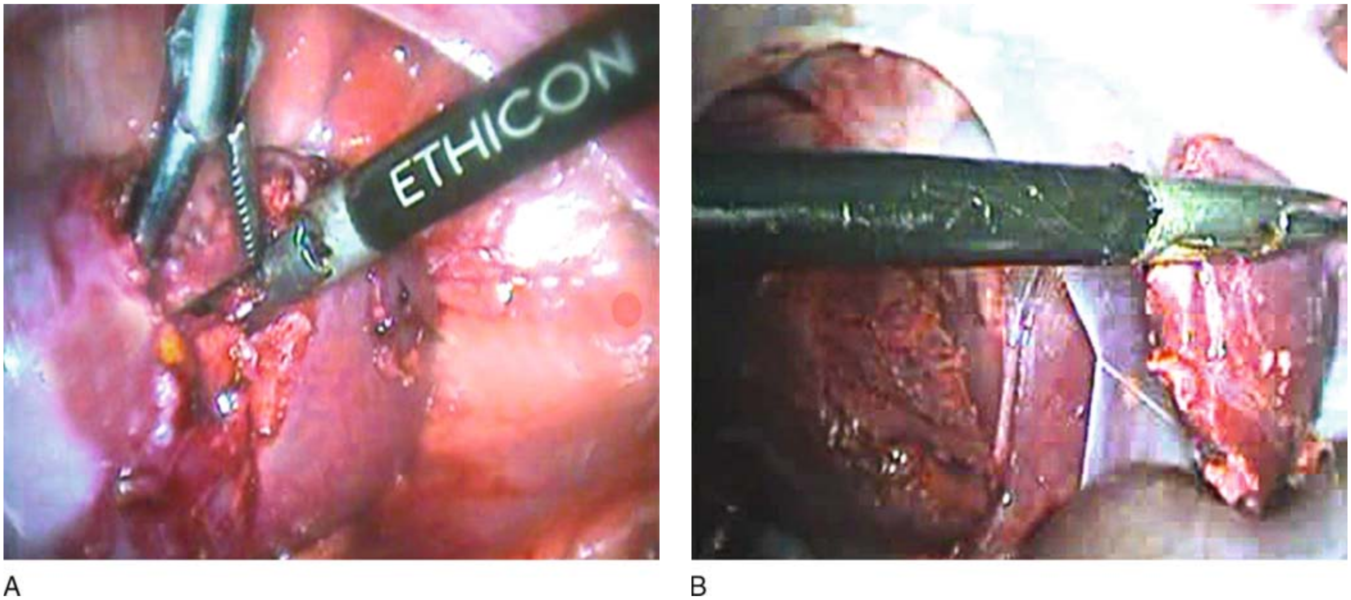


FIG. 40.58. Partial nephrectomy in progress

Ureteroureterostomy

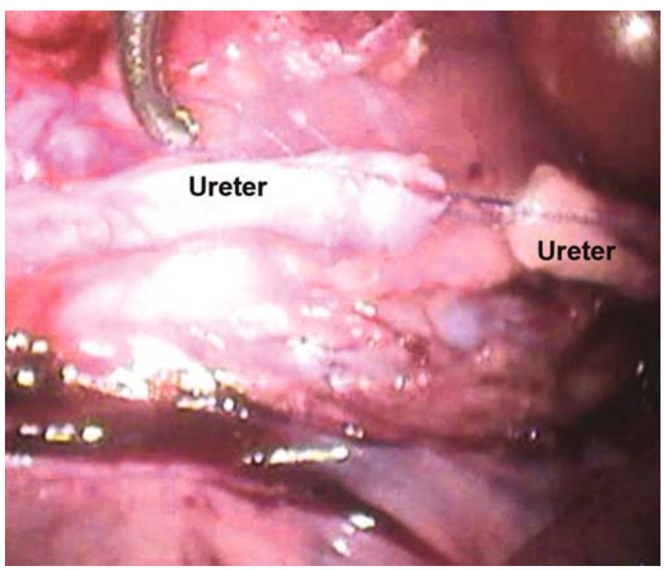


FIG. 40.59. Ureteroureterostomy practiced

Urethrovesical Anastomosis

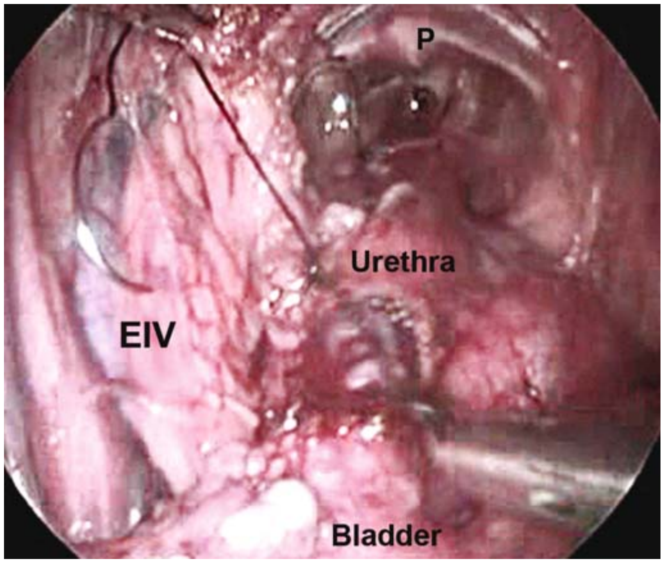


Fig. 40.60. Learning urethrovesical anastomosis in a live pig (EIV, external iliac vein; P, pubic bone)

Retroperitoneoscopy in a Live Animal

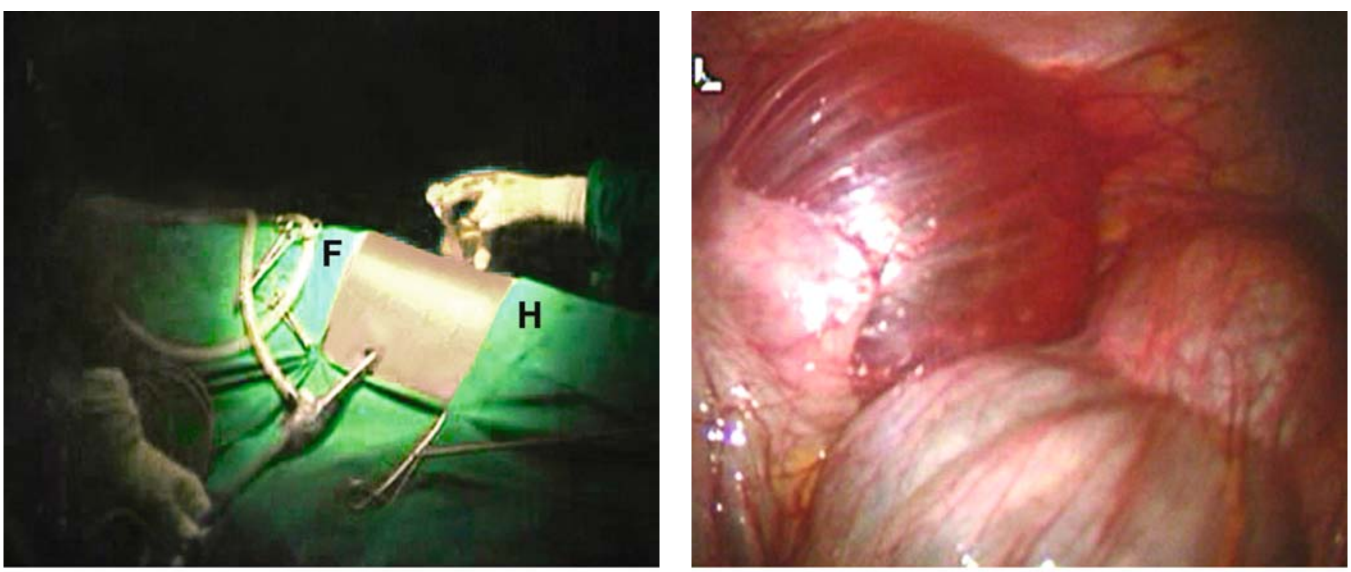
Fig. 40.61. Retroperitoneoscopic space creation and finger-guided secondary trocar placement

Assisting Live Laparoscopic Surgery

Training in Retroperitoneoscopy in Human

A B

FIG. 40.62. Trainees assisting live laparoscopic surgery



A B

FIG. 40.63. Retroperitoneal balloon inflation; an additional transperitoneal camera port is used to see how exactly the balloon inflation works and verify correct placement (H, head end; F, foot end)

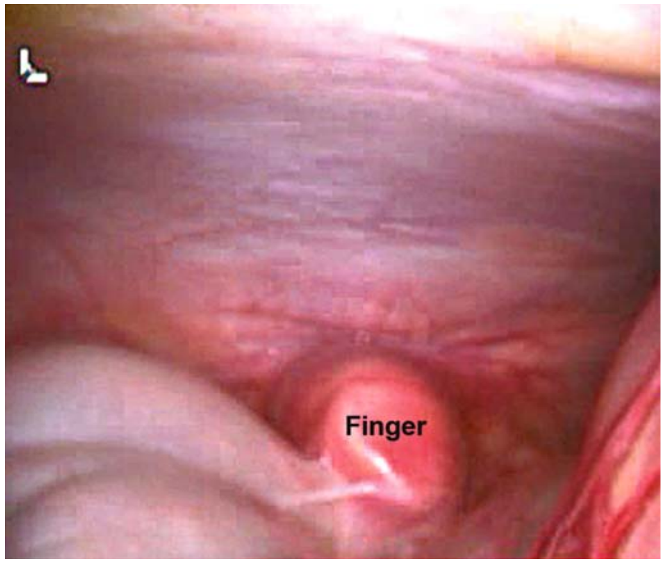


Fig. 40.64. Finger dissection in the retroperitoneum as seen by transperitoneal telescope (twin camera technique)

Discussion

Indications for laparoscopic urology are on the increase, and more so in reconstructive procedures. Ultimately the skill transfer to aspiring urologists will depend on the following:

1. The intense desire to learn and keep learning
2. The commitment of the trainer or guide to impart the skills, and to discuss the problems he encountered over the years and their solutions
3. Self-evaluation

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3. Ramalingam M, Senthil K, Selvarajan K, Pai MG (2004) Uro-lap training in India-developing country scenario. J Endourol 18: A231(abstr).
4. Teber D, Dekel Y, Frede T, Klein J, Rassweiler J (2005) The Heilbronn laparoscopic training program for laparoscopic suturing: concept and validation. J Endourol 19:230–238.

Index

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