

Salman Zarka · Alexander Lerner *Editors*

# Complicated War Trauma and Care of the Wounded

The Israeli Experience  
in Medical Care and  
Humanitarian Support  
of Syrian Refugees

 Springer

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## Preface

The Syrian civil war is now (2017) advancing into its sixth year and is widely recognized to constitute an international humanitarian catastrophe. During the course of that war, much of the Syrian medical system has been destroyed, often leaving casualties with untreated injuries and other medical conditions.

This book documents the experiences gained and the lessons learned during the course of the provision of medical and humanitarian aid by the Ziv Medical Center, a civilian and governmental hospital located in the north of Israel, in accordance with the Hippocratic oath and the ethical standards governing medical aid.

This humanitarian aid project started as a military one by the Israeli Defense Forces Medical Corps (IDF-MC) in accordance with their oath: "... to extend a helping hand to the wounded and to the sick whether common or distinguished, friend or foe."

The IDF-MC has previously gained extensive experience in the provision of humanitarian assistance in areas of disaster all over the world, including India, Armenia, Turkey, Haiti, and Japan. However, the provision of such aid within its borders to those injured in a civil war in a country with which Israel has had a war relationship represents a unique situation.

The treatment of seven Syrian casualties who abruptly arrived at the Israeli border on 16 February 2013, requesting medical aid and help, was the starting point for a much more extensive provision of assistance that represents the basis for this book. These first patients were given urgent treatment by the battalion aid station and were then transferred by military ambulances to Ziv Medical Center, which is the Israeli hospital closest to the Israeli-Syrian border in the north.

After the arrival of these first seven Syrians, an evaluation of the new situation was undertaken. Although it would have been legitimate to close the border against an enemy country, a decision was made to provide medical support to the Syrian wounded arriving at the border fence. In order to ensure the efficient provision of medical care, especially for those with life-threatening injuries, a military field hospital was constructed at the border. Subsequently, the Syrian wounded were transferred from the border to the military field hospital or to one of the other civilian hospitals located in northern Israel (Ziv, Western Galilee, Poria, and Rambam), according to their medical situation.

Between February 2013 and December 2016, more than 2,500 Syrian patients were treated in Israel. Ziv Medical Center, the first hospital to treat Syrian casualties, treated more than 800 of these patients, and the number is expected to rise further. Not all of those treated have had war-related injuries. After the return of the first successfully treated casualties to Syria, others arrived at the border seeking more routine care, including pregnant women,

cancer patients, and diabetic pediatric patients. Today, some 4 years after the first Syrian war casualties arrived at the Israeli border seeking help, assistance continues to be provided to all in need.

While, as mentioned above, the nature of the conditions treated has varied widely, many of the refugees have required urgent care for injuries incurred in the context of the conflict. This book aims to provide practitioners with new knowledge on effective ways of dealing with such emergencies. The documented case reports cover in particular the specialties of trauma and critical care, orthopedics, and surgery but also relate to internal medicine, ophthalmology, obstetrics and gynecology, and psychiatric care. Some of the cases of trauma are of a nature not previously encountered by Western medicine and include instances in which multidisciplinary care played a vital role. It is hoped that the book will be of value for all who work in emergency and military medicine and related disciplines.

Safed, Israel

Salman Zarka

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## Acknowledgements

I pray and express my hope for a better future for the **Syrian people** in their country. I hope that the helping hands that we extended during their need not just saved their life and contributed to their survival, but will also serve as seeds for a better future for all our children.

I would like to acknowledge all the many people that contribute to this unique humanitarian aid. First of all, to my staff from the Medical Corps and other units of the Israeli Defense Forces, at the **Military Field Hospital** in the Golan Height, Israel. We started this project together and every day I thank God for the way we did.

The family of **Ziv Medical Center** – I am proud of you.

Thank you for your hard and professional work and for investing your soul and heart in what you do every day and night.

Special thanks to my partner **Prof. Alexander Lerner**, the head of Orthopedic Department at Ziv, and his staff for their professionalism and humanity.

I would like to thank my **parents**, whom I believe will see me today and be proud of me. And to my **wife and kids** who are the anchor of my life and give me strength every single day.

*Salman Zarka*

We dedicate this book to the multidisciplinary team of doctors, nurses, technicians, physiotherapists, and social workers who were involved in this complex treatment process of severe challenging combat injuries. Their extensive experience helps in the saving of the lives of a large number of patients with multiple complex injuries. We would especially thank the nurses of the orthopedic departments for their daily round-the-clock persistent work which made functional limb salvage possible in most treated patients.

To our families for their constant support in our professional activity and whose commitment made our efforts in this work possible.

*Alexander Lerner*

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**Part I**

**Introduction**

Salman Zarka

The Syrian civil war is now advancing into its sixth year since Syrian opposition groups started to protest against President Bashar al-Assad. When the “Arab Spring” turned the Middle East into a fireball of protests, hope, and blood, it was only a matter of time until the Syrian people, who knew only oppression, will upraise with the hope for better life.

The Syrian Spring developed to be multiple springs, summers, and winters of battles, blood, and despair. For decades the state of human rights in Syria has been the subject of harsh criticism from global organizations. Bashar al-Assad’s regime failed to improve the state of human rights since he has been taking the power, although he was accepted with big hopes from the Syrian people and the international community.

Nowadays, the Syrian civil war is not just a Syrian matter, it developed to be an international conflict, for both humanitarian and geopolitical reasons.

After years of wars, Israel which is bordered with Syria has no relationship with Syria, and they are enemy countries.

Five and a half years ago, when the battles began to destroy Syria, no one could have dreamt of the option to see a Syrian child, raised to believe that Israelis are pure evil, will be treated by Israeli doctors. No Israeli doctor, civilian or military, would have thought that a civil war in Syria will become the purest way to fulfil the Hippocratic oath to the fullness.

On February 16, 2013, this unrealistic situation became a reality when seven Syrian citizens, casualties of the civil war, abruptly arrived at the Israeli border, meeting Israeli soldiers, and asked for medical aid and help [1]. They were given urgent treatment by the battalion aid station and were then transferred to Ziv Medical Center, the closest to the borders in the north of Israel by military ambulances (Fig. 1.1).

Even though the Syrian casualties arrived from an enemy state, the Israeli Defense Forces’ (IDF) soldiers who were trained to protect the borders from the enemy country didn’t hesitate for a second to give the best treatment they could offer. The soldiers and military medical staff were led by the words from the Medical Corps’ of the Israeli Defense Forces (IDF-MC) oath: “To extend a helping hand to the wounded and to the sick whether common or distinguished, friend or foe.”

The IDF-MC has extensive experience in humanitarian assistance in areas of disaster all over the world, including India, Armenia, Turkey, Haiti, and Japan, among others [2]. But the treatment of the seven Syrian casual-

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**Fig. 1.1** Syrian wounded at the entrance of Ziv's emergency department



ties was the starting point of a very unique situation in the Israeli and global humanitarian medical aid. The state of Israel has made a strategic decision to provide humanitarian aid to people in need all over the world and is known for its willingness and readiness to deliver on this commitment (Fig. 1.2).

For the first time, the state of Israel found itself providing humanitarian aid within her borders. In addition to the strategic decision providing aid for all who needed around the world, history and Israel's unique atmosphere had a big part in this operation. The Jewish religious sources speak about helping the stranger and the enemy and command saving a life. **The Talmud tells us that by saving a single human being, man can save the world.**

Other nations living in Israel (Christians, Druze, and Muslims) have the same religious values. An additional reason specific to the Jewish people is related to the scar of the holocaust with the impact of understanding the meaning of helplessness.

As Elie Wiesel, the Nobel Prize winner and holocaust survivor, wrote "There may be times when we are powerless to prevent injustice, but there must never be a time when we fail to protest."

After the seven Syrians with war wounds were treated in Ziv [1], the Israeli soldiers at the border started to get used to see and give first aid to Syrian war casualties before they were transferred to Military Field Hospital that was constructed at the border between Israel and Syria or to one of the hospitals located at the north of Israel (Ziv, Western Galilee Medical Center, Poriya, and Rambam) (Fig. 1.3).

Since February 2013 and till December 2016, more than 2500 Syrian people were treated in Israel. Ziv hospital, the first hospital to treat Syrian casualties, has treated more than 800 Syrian patients and still counting.

At first, only war casualties, Syrians who were raised to believe in the evilness of Israelis, arrived to the border asking for medical treatment. For them, and for the medical staff, the hospitalization was very challenging. Most of the Syrian doctors have left Syria during the war, and most of the hospitals are no longer functioning [3]. In this reality, not only the injured can't get treatment in their homeland, they arrive to the Israeli border and hospital without any medical documentation. In very rare cases, we have received



Fig. 1.2 IDF military field hospital's commander, Dr. Salman Zarka, during briefing for his staff

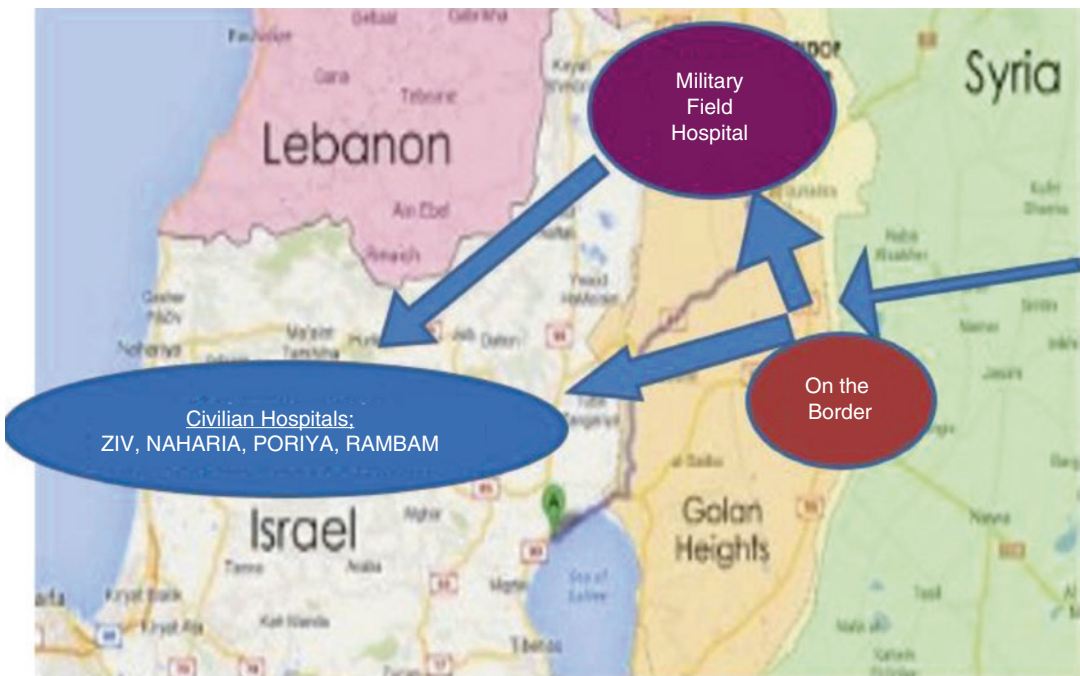


Fig. 1.3 The Syrian wounded treatment's algorithm after getting to the Israeli-Syrian borders

short notes in Arabic about what was done at Syria and the questions to our staff.

The language barrier was resolved with the help of the Arab-speaking medical and social

workers staff, but the Syrian patients suffer from loneliness since the majority of them arrive alone, and some of them are just kids. Another difficult aspect is the Syrians' fear of

going back to Syria and being accused of helping the Israeli enemy. In addition to the physical treatment, the Israeli hospitals are treating the Syrian war casualties with mental, social, and psychiatric treatment, trying to cover and cure every traumatic aspect [4].

In Israel, the Syrian casualties are treated exactly as the Israeli civilians. This way of humanitarian treatment is not only rare; it is historically unique to the medical aid world. Although the Syrian patients are treated the same as Israeli citizens, the full treatment is free of charge. Humanitarian aid aims to save life and usually is supplied at the crises area. At humanitarian aid setup, the medical staff tries to make his best within the limited facilities to save the biggest number of people's life although doesn't concentrate in the quality of life. We decided to provide the Syrian wounded medical support with the Israeli standards to save life and to promote the quality of life [5].

Since the treatment is free of charge for the Syrians and no international organization pays for the prolonged treatment at the Israeli standards, the Israeli government pays most of these costs.

Despite the political and the financial issues, Syrian infants, elderly, and any human in need of medical aid continue to arrive to the border, and after the medical military staff's support, they are evacuated to the civilian hospitals (after the mili-

tary field hospital was closed) with military ambulances.

Over these years, not only the Syrian wounded arrives to the border seeking for medical aid. After the first war casualties returned to Syria—healthier, with medications and medical supplies for their ongoing treatment—Syrian patients who are not wounded arrived at the border asking for the usual medical care (Fig. 1.4). They are no longer afraid to be in Israel; they know that when they come to the border, Israeli soldiers will bring them to an Israeli hospital; and they will receive the medical care at the highest standards without charges. Pregnant women, cancer patients who needed oncology treatment, etc. are just part of the medical cases being treated in Israel due to the special collaboration between the IDF and the Israeli northern hospitals.

Usually humanitarian aid projects are time limited, but in this Israeli-Syrian special case, it turned to be a chronic long-lasting thriving case of humanitarian opportunity for hope and peace.

These days, more than 3 years after the first Syrian war casualties arrived at the Israeli border asking for help as their last hope, Syrian people feel safe and sure arriving at the Israeli border and meeting Israeli soldiers who are compassionate and fully trained to take care of them on the



**Fig. 1.4** Syrian child at an ophthalmology clinic

**Fig. 1.5** Prof. Lerner and Ziv Medical Center staff celebrating the birthdays of a Syrian child



way to the hospital. Syrian parents send their ill children to the border, knowing they will be treated as an Israeli citizen, with full care and acceptance, physically and mentally (Fig. 1.5).

The origin country and nationality as well as gender, color, and religions are not part of the Israeli medical treatment and care.

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Salman Zarka and Morshid Farhat

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## 2.1 Ethics and Conflict

Humanitarian action is a moral activity grounded in the provision of emergency assistance to those in need [1]. The principles of charity and equity are central tenets of humanitarian ethics.

In 1997, the Geneva-based Sphere Project established minimum standards for the provision of humanitarian medical aid. The primary focus is promotion of the right to life with dignity [2]. These principles and documents can help in identifying the parameters of ethical practice.

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## 2.2 Humanitarian Aid Standard

Humanitarian work is characterized by contexts in which the available resources of personnel, supplies, and health infrastructure are insufficient to meet the needs of patients and populations. These limitations are often severe and are not

restricted to health care. In an acute emergency, the level of achievable care is likely to be much lower than the familiar standard [3]. At the broadest level, all humanitarian action can be seen as a response to the right to a minimum standard of health for individuals affected by a humanitarian emergency or disaster [4].

For the abovementioned reasons, humanitarian aid as defined by the WHO [5] aims to save life and is applied for a short time after a disaster has happened. This aid is provided using temporary (tents) and less well-equipped facilities (usually different from those that offer continuous medical support to the civilian population under normal circumstances).

At Ziv Medical Center, humanitarian medical support has been provided to refugees from the Syrian civil war within the permanent structure of a civilian hospital, using the same facilities (buildings, equipment, manpower, etc.) as are used to treat Israeli people. This context differs markedly from the temporary structures typically employed in delivering humanitarian aid and is associated with the emergence of new ethical issues.

Before discussing the influence of this setup on ethical issues related to humanitarian aid, however, it is first important to clarify that consideration was given to the allocation of separate facilities and staff to treat Syrians but that this option was rejected. Had that course of action been pursued, Syrians would have been treated to

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a lower standard than Israelis: whereas the treatment of Syrians in temporary emergency facilities would have had the aim of saving lives, the treatment of Israelis aims both to save lives and to improve quality of life. Accordingly, an ethical problem would have been created for staff in that they would have been forced to reach decisions regarding the treatment level on the basis of the identity of the patient and not the severity of the disease. The decision to treat Syrians and Israelis to the same standard of care ensured that this ethical issue did not emerge and avoided what would have been a slippery slope.

All the patients at Ziv, regardless of their country and nationality, are treated to an identical standard, at the same facility and by the same staff, in accordance with the severity of the situation. Thus the treatment for the Syrian refugees similarly had the goal of not just saving lives but also improving the quality of those lives in terms of both physical and mental health.

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### 2.3 Agreement to Treatment— Legal and Bioethical Aspects

According to the Israeli law, every patient has to sign an agreement to be hospitalized. The same standard has been adopted with the Syrian wounded, who have been asked to sign the same agreement in their mother language, Arabic. As a part of the Israeli Patient's Rights Law, each Syrian patient receives the information about every procedure that he or she is to undergo and can ask for additional clarifications from the medical staff. When a Syrian patient does not agree to a suggested treatment, others are suggested, and the patient can also exercise a right to be discharged from the hospital if he or she deems the suggested treatment not to be acceptable.

According to the Israeli Patient's Rights Law, in emergency cases in which it is not feasible to obtain agreement from the patient (owing to unconsciousness), three physicians have to sign the agreement before the treatment. In nonemergency situations, court approval is needed for medical procedures; this is relevant especially in pediatric cases when the child's parents are not present.

With the exception of children, the Syrian wounded are hospitalized alone, without their families, and rely on Ziv's staff for all their needs. It is important to note that in this respect there is a difference in the treatment of Syrians and Israelis, in that Israeli citizens are accompanied by their families, who provide support both at the hospital and later at home. Furthermore, when an Israeli patient is released from the hospital, the sick fund will continue to cover the provision of health care within a community setup.

Based on the previous experience of others, published in the professional literature, we knew that culture-related humanitarian aid has a far higher likelihood of success. An Arab-speaking social worker, who is a member of Ziv's staff, accompanies the Syrian wounded and tries to help them, in place of their families, in matters of language and culture.

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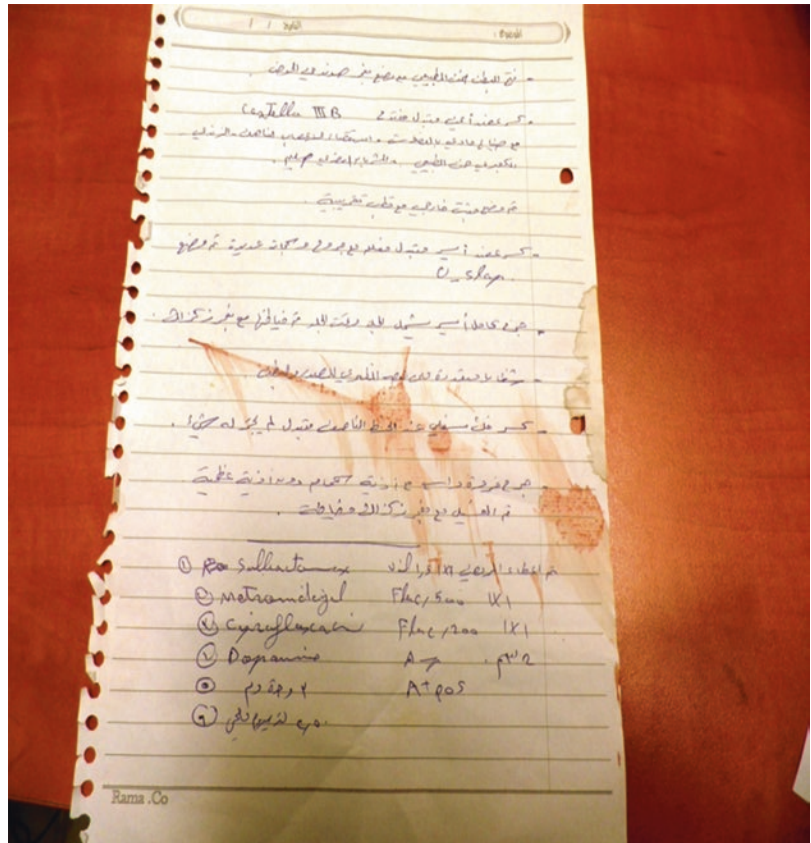
## 2.4 Partial Information

Initial understanding of the medical condition is based on information provided by the patient. The staff asks about the mechanism of injury as part of the anamnesis. However, sometimes the patient provides insufficient detail, and the staff have no other resources to learn about the event. Usually the patient has no idea about drug sensitivity, vaccination status, and previous health status. On rare occasions, letters are received from Syrian medical staff regarding prior treatment (Fig. 2.1). There is, however, no connection between the Ziv and the Syrian staff, and this represents a large obstacle in obtaining medical details.

The Syrian patients who come to Ziv Medical Center arrive without identification, and reliance is placed on the details that they provide, for instance, regarding their name. These details may not be accurate and cannot be used for cases of readmission according to Israeli standards of risk management.

In order to deal with the problem of identification of patients upon readmission, several options have been considered, including biometric, photographic, and other means. Until now, however,

**Fig. 2.1** Notes from Syrian physicians



all these options have been excluded owing to security and logistic considerations on both sides, the Israeli and the Syrian.

**2.5 Treatment Priority**

As the Syrian patients are treated in local Israeli facilities and not in their own country, as would be usual in humanitarian operations, there is an element of competition for medical care between Israeli citizens and the Syrian patients. This raises ethical considerations concerning the value of human life versus the basic rights of Israeli citizens to receive the available health services. Israeli citizens are not always willing to accept the situation whereby Syrian people are being treated at “their” facilities. Sometimes they complain that their medical services are being delayed due to the Syrian wounded, and they want priority as citizens of Israel. The addi-

tional load on the Israeli government medical system is a further important ethical question that has been discussed since 2013. According to the Israeli laws, Israeli citizens have the right to receive medical treatment, and they pay tax for that purpose. Treating others who are not Israeli citizens at “their” facilities could give rise to legal issues. On the other hand, preferentially treating Israeli patients merely because they are Israelis would represent an ethical problem, especially when the Syrians have more urgent problems. At Ziv Medical Center, priority for medical treatment is set according to the emergency of the case and not according to other considerations.

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**Part II**

**Psychiatrics**

Uri Yatzkar, Lidia Isakson, and Faras Issa

The mental health and psychological support for Syrian casualties brought to the Ziv Medical Center is the responsibility of the Arabic-speaking social worker, who was appointed focal point from the beginning of admission of these patients. Psychiatric evaluation was made according to the mental situation. After 3 years of experience, the social worker identified three types of trauma during the inpatient admission of these patients:

- War trauma linked to several years of aerial bombings, explosions, and collapsed buildings as well as witnessing fatal injuries and losing family members and friends
- The trauma of the injury often associated with loss of a limb or serious damage to an organ or function, with residual pain, disability, and discomfort
- The trauma of being brought to and confined in an alien environment, associated with an enemy country, for treatment

Many of the patients experience all three types of trauma, with each of them needing different support. The hospital stay does not always allow adequate treatment of the trauma. This situation

means that the team needs to place emphasis on the best possible outcome of the medical care and creating a friendly environment.

During their hospital stay, most patients experience some shift in their attitude regarding the “enemy as a host” and become less frightened of this environment. However, they continue to express major concerns impacting on their psychological state. These patients worry about the situation at home and the fate of their families and continue to feel loneliness, miss their families and friends, and express their boredom with being confined to the hospital bed.

These concerns and feelings are not always related to the length of stay in the hospital but in the severely injured patients, weakness and inability to cope lead to more longing for family members.

Most of the Syrian casualties are in the 16–30 age group, and these patients expressed more boredom and loneliness than older patients. Some are unable to read or less inclined to read. Their requests for television could not be met, and this has led to more frustration and loneliness, loss of appetite, and even anger. Contact with families was limited to WhatsApp recordings for those who could use this technology. The lack of vocal communication is a significant factor in missing family and friends.

These feelings and low food intake may slow the healing of wounds and other injuries and lead to a need for more hospital days. In some cases,

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patients in the 16–20 age group have demanded discharge although they were not medically ready. In several cases, patients threatened suicide if they were refused immediate discharge and transfer back to Syria. The social worker made efforts to convince these patients that they could not receive the necessary medical care in Syria and requested consultation with a psychiatrist. The argument of the lack of medical services usually worked, but some patients insisted on going back, despite the threat to their lives because of their injuries, such as from wound infection and lack of medication.

The Syrian patients included children, most of them with orthopedic and surgical injuries involving pain, limited mobility, and loss of vision or hearing in some. These injuries are difficult for any child, without the added issue of being far from home and not understanding the language, even if they understood less about being brought to “enemy” territory. They are certainly not immune to war trauma and the disruption in their lives. The impact of war trauma was greater on children than on the young adults and was alleviated somewhat by being accompanied by their mothers or a grandparent (usually paternal grandmother).

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# Treatment and Support for Patients with Mental War Trauma

# 4

Lidia Isakson, Faras Issa, and Uri Yatzkar

The mainstay of the psychological support is daily visits by the social worker to all the Syrian patients. The main task in these visits is to explain what the doctors find and advise and give information on the injury and treatment plans. An attempt is made to explain the short- and long-term effects of the injury and give the patients a sense of control, making sure to check that each patient has understood.

To assess the extent of psychological problems and support needed, the social worker gets information from the night nursing staff on sleep patterns, nightmares, shouting, distress, overall behavioral problems, and contact with other patients. The day nursing staff report on the patient's willingness to eat the meals provided as well overall behavior.

The patients most in need of support are identified, and consultation with a psychiatrist is requested for some. Given the fact that there is no continued contact after discharge, the psychiatrist's interventions may lead only to the dispensing of suitable drugs.

A major difference in providing psychological support to the Syrian patients as opposed to Israeli citizens is indeed the lack of opportunity for continuity in treatment. Psychological treatment in

Syria is generally lacking, particularly in the areas from which these patients come.

It is therefore not feasible to recommend treatment for post trauma distress syndrome (PTSD) treatment on their return to Syria. The only treatment methods that can be advised are drugs, such as SSRI; benzodiazepine such as Clonex, Cipralex, and valium; and other psychotropic drugs. On discharge, the patients needing these drugs are given 2 months supply.

Another difference is that the work of the hospital social worker generally involves contact with the broader family and with the community resources. These are not available in the treatment of the Syrian patients, and the social workers find it challenging to work without such support.

Over time, Ziv Medical Center has provided more books and newspapers, in addition to the Koran for the Syrian patients. Radios have been distributed, and all these have led to less frustration and boredom. Once a week, the social worker brings "home" foods such as falafel, humus, and pita bread. The change of routine in the meal provides satisfaction and decreases the feeling of alienation. These meals are seen as a treat, and the challenge is to find more ways to provide such culturally close activities.

The continued challenges in the work of the social worker have brought attention to the need for training and individual support. The International Red Cross Society (ICRS) is now

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funding the training of social workers in dialectical behavior therapy (DBT) together with social workers from another hospital treating Syrians.

The treatment of Syrian casualties, with its relatively high need of mental health and psychological support, has now continued for several years. The social workers appreciate that the medical outcome of treatment may be hampered or slowed by psychological problems. The support in this area needs their continuous attention and effort in finding new ways to alleviate the problems during the limited period of hospitalization. There are some tools that we may be able to give the patient returning to Syria and to the conflict environment. Taking into account the short duration of the admission, cognitive and behavioral tools such as emotion regulation, relaxation techniques, and psycho-education can be tried. This requires developing and testing a protocol in patients with severe mental distress, suited to the expected length of stay.

Due to language problems and based on the value of experience gained in treating these patients, it is difficult to change the staff and provide more relaxation time. The staff also find satisfaction in their efforts with these “different”

patients. To avoid burnout, it has been accepted that the social workers need professional backup support and greater involvement of the psychiatric department.

In conclusion, Syrian patients arriving for treatment at Ziv hospital have difficulties characterized by a number of dimensions: physical, psychological, and environmental including breakdown of societal structures. They come after a long period of uncertainty and risk exposure, which are heightened by treatment in an unfamiliar hospital considered at least initially as hostile, by its location in a country seen as hostile. Realization of this complicated situation by the therapists is essential, as evidence shows the link between optimal outcome of the medical problems and adequate attention to the mental health issues. The mental intervention in Ziv is carried out mainly by the experienced Arabic-speaking social worker and integrated with psychiatric evaluation when needed. More training and research are needed for improving the attention to mental health problems, testing cognitive and behavioral tools and assuring support of the main provider of these services.

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**Part III**  
**Trauma**

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## 5.1 Case Presentation

A 19-year-old man was admitted 6 months after abdominal and bilateral limb trauma secondary to gunshot wounds resulting in left above knee amputation and extensive open right groin and thigh wounds. He had undergone a laparotomy and ileostomy in Syria and on arrival, although hemodynamically stable, was emaciated and dehydrated, had infected groin and thigh wounds and extensive chemical burns to the abdominal skin (Fig. 5.1). A stoma bag was not in situ.

He received fluid resuscitation, antibiotic therapy, anti-tetanus, and nutritional support, and underwent CT scan in order to determine exactly what surgery had been performed previously. CT scan confirmed resection of the ascending colon and showed no intra-abdominal sepsis.

In order to facilitate healing of the abdominal skin and improve nutrition, laparotomy to restore the continuity of the bowel was planned.

At laparotomy, there was no evidence of abdominal sepsis or fistulation. After the division of extensive adhesions, it became evident that the patient had undergone resection of the ascending and transverse colon. The small bowel was intact, and he had an end ileostomy. Ileocolic anastomosis was performed.

The patient made an uneventful postoperative recovery, continued nutritional support, and received abdominal wound care.

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## 5.2 Teaching Points

Documentation of injuries and procedures and the transfer of patient documents at times of conflict may be limited. Patients with complications, therefore, require radiological and surgical exploration to fully define their injuries and previous surgery.

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## 5.3 Clinical Implications

Stoma care in austere settings presents a prohibitive management challenge. The absence of stoma bags leaves effluent leaking freely on to the abdominal skin. This may result in extensive chemical burns.

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**Fig. 5.1** Extensive abdominal skin burns secondary to ileostomy effluent leaking onto abdominal skin



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#### 5.4 Damage Control

While bowel resection and ileostomy may be lifesaving in terms of control of sepsis, stomas should be closed as soon as reasonably possible. This may not be possible where surgical services are hugely restricted in war zones.

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#### 5.5 Summary

Postoperative care, including stoma and wound care, is an important issue in planning acute and definitive surgery for war injuries.

# Things Aren't Always What They Seem: The Case of Hala

# 6

Anthony Luder

## 6.1 Case Presentation

Hala, an 8-year-old Syrian girl, was brought to Ziv Medical Centre with her mother in November of 2013. Hala, who had been previously healthy, was seriously injured after an artillery shell landed on the roof of a shelter, penetrated it and exploded inside. What happened next was not entirely clear since she arrived without any documentation or medical referral, as is the case with most of the Syrian war wounded who have been cared for in Ziv since the beginning of the current campaign. The mother gave a history that extensive skin lesions (see illustrations) had been caused by burns sustained after the shell explosion. These burns had subsequently been treated in Syria using materials whose nature was not known, and in particular the mother claimed that various chemicals had been used which had failed to heal the burns and actually aggravated them. Hala apparently had been treated over time with antibiotics, but we had no details of which, in what dose or for how long. Hala was one of five children in the family, of Southern Syrian Moslem descent. The parents were first cousins. The mother stated that she had a second child, a son, who had also



sustained injury and developed similar skin lesions, although he was only mildly affected and was not brought to Israel. The other children had escaped injury and were healthy. On arrival Hala was a sick child with high fever and extensive skin lesions on her upper and lower legs shown in the illustrations. The lesions were extremely painful and were characterised by sero-mucoid non-purulent discharge. The margins were slightly raised and sometimes had a violaceous

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hue. She had anaemia and persistent pronounced leucocytosis with neutrophilia, usually in the range of WBC  $48\text{--}61 \times 10^3/\mu\text{L}$  (absolute neutrophils  $39\text{--}50 \times 10^3/\mu\text{L}$ ).



Cultures of the wounds revealed *Klebsiella* sp. and *Escherichia* sp., and initial treatment was begun with antibiotics, topical cream and dressing combined with pain relief and nutritional support.

The combined efforts of many skilled professionals were required to save Hala's life, doctors, surgeons, nurses, nutritionists, physiotherapists, teachers, medical clowns and social workers. Following a period of stabilisation, it was elected to perform skin transplantation in view of the large size of the skin defects. Attempts to do this were tried on two occasions, and unfortunately both attempts failed to generate significant skin healing. It became apparent that the child's condition was not typical of thermal or chemical burns and that another explanation was likely. Marginal skin biopsies revealed deep lymphohistiocytic and eosinophilic infiltrates together with plasma cells. There was evidence of small vessel vasculitis with necrosis and thromboembolism. Some evidence of patchy fat necrosis was seen.

Gram and PAS staining for micro-organisms was negative in some sections, whereas gram-negative bacteria in micro-abscesses were seen in other fields. While not being pathognomonic, this histological picture taken together with the clinical and laboratory features is compatible with a diagnosis of *pyoderma gangrenosum* with chronic inflammation. Lesions of this kind are unusual in children and maybe related to inflammatory bowel disease, systemic vasculitis, neoplasia, chronic infection as well as toxic, radiation and drug-induced aetiologies. However, history together with extensive investigations which were carried out permitted exclusion of all these causes.

At this time the possibility of an alternative diagnosis was considered. Based on the persistent neutrophilia of the patient, the lack of purulent infection, failure to identify a more common underlying disorder, related parents and possible family history of a similar condition in a brother, a rare genetic cause of *pyoderma gangrenosum* which could explain the clinical and histological picture was considered. Four reports of children with *pyoderma gangrenosum* and leukocyte adhesion deficiency type I (LAD I) had been reported in the literature [1–4] by 2013, and subsequently a fifth report has been published [5]. It has never been reported before in patients from the Middle East including Israel.

LAD I is a rare Mendelian autosomal recessive trait caused by mutations in the *IGBT2* gene, chromosome 21q22.3 (OMIM \*600065). This gene codes for the  $\beta$  subunit of the Integrin  $\beta 2$  receptor family (CD18) which are exclusively expressed on the plasma membranes of neutrophil leukocytes [6]. Integrins play a key role in the margination, adherence and transmigration of neutrophil leukocytes from the blood into extravascular spaces, when stimulated to do so by inflammation-related chemotaxis gradients. Failure of this process is the hallmark of LAD. Currently four types of LAD have been well characterised. LAD II was first described in two Israeli Arab brothers, but LAD I is pan-ethnic and rare. It was first described in 1980 [7], and some hundreds of patients have been reported since then. The disease leads to severe bacterial disease, delayed separation of the umbilical stump after birth and chronic non-purulating

skin and deep infections. However *pyoderma gangrenosum* is a rare correlate and presentation of LAD. The diagnosis of LAD is made by the demonstration of defects in random neutrophil migration and chemotaxis to various chemoattractants. Adhesion to and transmigration across endothelial cell layers are impaired. Other cell characterisation and genetic tests may be done when necessary.

Accordingly neutrophil function studies were carried out, and these (*E. coli*-induced migration studies and phorbol myristate acetate (PMA) activation studies) were markedly impaired compared with controls. These studies confirmed the diagnosis of LAD I. This rare disease is inherited as a Mendelian autosomal recessive and is very severe. As a recessive disorder, it is much more likely to occur when the parents are related, as were Hala's parents. LAD carries with it a high chance of early death. The only known cure is through haematopoietic stem cell transplantation HSCT ("bone marrow transplantation"). This procedure is risky and involves ablation of the native bone marrow and its replacement with healthy donor marrow (from a family member or unrelated donor). During the procedure, which can take many weeks, the patient is at risk from severe infections and bleeding, and there is a definite associated mortality rate. The family needs to give informed consent for such a major undertaking, and this requires both parents to understand and agree. A suitable donor, preferably from the family, needs to be sought and identified. Considerable family and social support is required, and after discharge the patient remains immunocompromised for a long period requiring high-grade medical follow-up and treatment. This treatment is not available currently at Ziv Medical Centre, and unfortunately it was not possible or practicable to transfer Hala to another hospital in Israel.

None of the required conditions and circumstances were in place for Hala. The dilemma was considerable. On the one hand, returning her to Syria, where HSCT was not available for Hala and her family, would almost certainly mean her death, perhaps a very painful and unpleasant one. On the other hand, there was no realistic possibility of performing a successful HSCT in Israel, without family, without support, without a donor

base and without even consent (the mother clarified that she did not feel competent to give such consent alone, even if she had understood all the implications and medical facts which she did not). So what were we to do?

We decided to search for hospital in the Arab world, to which theoretically Hala and her family might be able to travel and which would be able to carry out the treatment, would accept her and also would waive charges (the family had no means to pay for this very expensive treatment whose price tag can easily run to hundreds of thousands of dollars). With much effort, a possible solution was found. An institution offering HSCT was located in Amman, Jordan (details available from the author). An email address was posted on their website, and a letter was sent to them explaining all the circumstances. Without too many expectations, the letter was sent and resent. We waited for a few days and then to our great pleasure a positive response was received. The next challenge was arranging for her transport to Jordan. Given the legal, security and logistic difficulties, this seemed to be an insurmountable obstacle. However, after lengthy consultations with the responsible officers of the IDF, we were assured that if she returned to Syria, the IDF would be able to promise that she would get to the hospital in Amman. Naturally we were somewhat sceptical, but given that we were out of options, we agreed to the plan. After almost 80 days of intense treatment, we made our farewells to Hala and her mother, and full of trepidation, she returned to her wrecked home in Syria.

In all honesty we didn't know what to expect. However, to our great relief and delight after 10 days, we received an email from the receiving hospital that Hala had arrived and that preparations were being made for her HSCT. Naturally I and all the staff would dearly like to see her again and hopefully, someday, that will be possible.

### 6.1.1 Teaching Points

1. Poorly healing and large skin ulcers, especially if not associated with purulent discharge and persistent hyperleucocytosis, may indicate an underlying immune deficiency.

2. Biopsy and specific cell function studies were necessary to make the diagnosis in this case.
3. An open mind is necessary when dealing with patients from Syria. Expect the unexpected.
4. Genetic disease is relatively common in the Moslem Arab population (in Syria and throughout the Middle East). Thus even rare genetic disorders should be high on the differential diagnostic list especially if there is a probable family history and the parents are related.
5. Special investigations may be necessary and solutions sought “out of the box”.

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## 6.2 Clinical Implications

LAD I carries a high morbidity and mortality rate. HSCT is a risky and difficult mode of treatment requiring sophisticated high-level medical facilities for its success. In addition specialised long-term follow-up with robust social support is needed. It is almost inconceivable how this could be provided for a war victim in current circumstances in Syria. Nevertheless one little girl is worth all our efforts. “He who saves one life is as he who saves an entire world”.

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## 6.3 Summary

The current crisis in Syria has brought hundreds of patients to our medical centre in Israel for treatment including 78 (at the time of writing) children. Hala came to us apparently suffering

from life-threatening war-related injuries and severe burns. Only through high perspicacity and medical skill were we able to treat her successfully, stabilise her and prove that in fact she was suffering from a devastating, rare, genetic form of immune deficiency. She has been offered the best hope of cure with the help of the IDF and a philanthropic medical institution in Jordan.

“Things aren’t always what they seem”.

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## 7.1 Case Presentation

A 25-year-old man was brought to the trauma room with shrapnel injuries to the abdomen and back. He was hemodynamically unstable. He remained unstable after immediate fluid resuscitation. FAST scan demonstrated fluid within the abdominal cavity. He was transferred directly to the operating room for laparotomy (Fig. 7.1).

At laparotomy, 2 L of blood was found in the abdominal cavity. There were multiple penetrating injuries to the small bowel and active bleeding from the right iliac bone and muscles of the pelvic and abdominal wall. The patient was unstable, hypothermic, and acidotic. Damage control measures were undertaken with rapid stapled resection of the small bowel (leaving the bowel ends stapled off), packing of the pelvis, and debridement of the wound on the patient's back. The patient received 5 units of blood, 10 units of cryoprecipitate, and 3 units of fresh frozen plasma. He remained ventilated and was transferred to the ICU.

Two days later, at second-look laparotomy, there was no evidence of abdominal sepsis, and the bowel ends were anastomosed. An open fracture of the right iliac bone was evident with extensive muscle damage. The patient returned to the ICU.

On the sixth postoperative day, CT scan of the chest and abdomen to investigate a pyrexia showed an abdominal collection and bilateral pneumonia. A further laparotomy was performed, the abdominal cavity lavaged (there was no anastomotic leak) and closure achieved using composite mesh. Negative-pressure wound therapy (NWPT) was applied.

The patient's recovery was complicated by *Clostridium difficile* infection and recurrent chest and abdominal sepsis which resolved with antibiotic therapy and percutaneous drainage of the abdominal wall abscess. The healing abdominal wound was covered with a split-thickness skin graft. His total length of stay in hospital was 2 months.

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## 7.2 Teaching Points

Patients with uncontrolled hemorrhage should be transferred immediately to the operating room.

Damage control laparotomy includes the control of sepsis.

Relook laparotomy and lavage are important measures in the control of sepsis.

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**Fig. 7.1** Temporizing abdominal closure and critical care



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### 7.3 Clinical Implications

Repeated laparotomy may result in abdominal wall defects that are amenable to composite mesh closure and subsequent skin graft.

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### 7.4 Damage Control

Damage control refers not only to resuscitation and surgery but also to ongoing management in the ICU of physiology, the anticipation and

prompt investigation of complications, and the aggressive treatment of sepsis.

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### 7.5 Summary

Damage control principles are crucial to immediate survival and the reduction of complications. These principles should be applied in major trauma across all hospital departments that work together to improve outcomes.

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### 8.1 Case Presentation

A 42-year-old man with shrapnel injuries to the abdomen and pelvis was brought to the trauma room. He had undergone laparotomy in Syria 3 days earlier.

On assessment in the trauma room, the patient was fully conscious and hemodynamically stable. He had a laparotomy wound with a left iliac fossa stoma. An abdominal drain was in situ, draining serosanguineous fluid. There was an infected wound in the right buttock. On rectal examination, a tear was found in the rectum with a gauze pack placed in the tear. A urinary catheter was in situ draining turbid urine.

A full-body CT scan with intravenous contrast was performed. Contrast introduced into the stoma and bladder showed free air and fluid within the abdominal cavity. The urinary bladder appeared intact (Fig. 8.1).

The patient was started on antibiotics and intravenous fluid and underwent repeat laparotomy. At laparotomy, there was no bowel injury. There was a large nonpulsatile hematoma in the right pelvis. A large necrotic wound in the right

buttock was communicating with an area of substantial damage to the anus and rectum approximately 6 cm from the anal verge (Fig. 8.2).

The wound was lavaged and extensive debridement performed. The defunctioning colostomy was left in situ. The anorectum was inspected at proctoscopy.

The patient made an uneventful recovery and was discharged 2 weeks later.

### 8.2 Teaching Points

Intra-abdominal injury should always be suspected where there is urogenital or rectal trauma and where there is pelvic fracture.

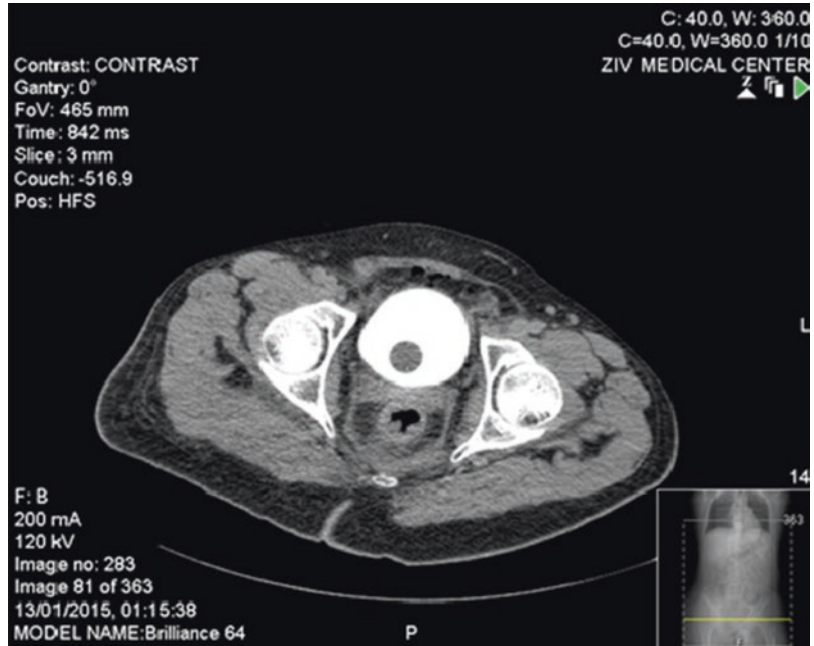
### 8.3 Clinical Implications

In conflict zones where communication between surgical teams in the field and where high level definite care is limited (or absent), it is essential that the receiving surgical team fully investigate patients who have received initial emergency care (especially laparotomy) in the field. Repeat laparotomy permits review of surgical procedures undertaken in the field, a search for missed injuries, the diagnosis of early complications, such as hematoma or abscess formation, and thorough lavage of the abdomen.

Contrast imaging is an important adjunct in the exploration of the extent of injuries.

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**Fig. 8.1** Pelvic sagittal CT: The rectal wall is thickened; there is surrounding edema. The bladder is intact



**Fig. 8.2** Soft-tissue damage to the gluteal region. It is not clear that the wound extends to the anorectum. Clinical and endoscopic examination is required



## 8.4 Damage Control

Rectal tears should be defunctioned unless it is certain after clinical and radiological assessment that the tear is extraperitoneal.

## 8.5 Summary

Relaparotomy at a center for definitive care should always be considered after primary laparotomy in emergency settings in conflict zones.

T. Salamon and A. Altshuler

A.S, female patient 15 years old, arrived a week from injury. She was injured from multiple shrapnel to her abdomen and lower extremities and had other medical attention in Syria—unknown, no accompanied documentations. She was transferred to our facility due to deterioration in her hemodynamic state—sepsis ARDS/SIRS, high fever, tachycardia, and hemoglobin drop (38 °C, 153 BPM, and 7.0 gr%, respectively). Prior to her arrival, she had a below-the-knee amputation on the right leg, severe injury to her left lower extremity, and explorative laparotomy. In our facility (after the usual evaluation), the BKA was converted to an above-the-knee amputation, due to a severe infection of the stump, a re-abdominal exploration of the abdominal cavity, and an external (Ilizarov) fixator to her left lower extremity. With debridement, antibiotics, and blood product transfusion, her fever resumed to normal, hemoglobin above 10, though still had tachypnea and tachycardia. Her blood pressure was 110/70 mmHg, though red-flush face and extended neck veins. For further evaluation she had a computed tomographic angiogram CTA that revealed a huge

arteriovenous fistula involving her femoral vessels (Fig. 9.1), showing the abdominal veins vigorously on the arterial phase (demonstrating the high flow rate within the shunt).

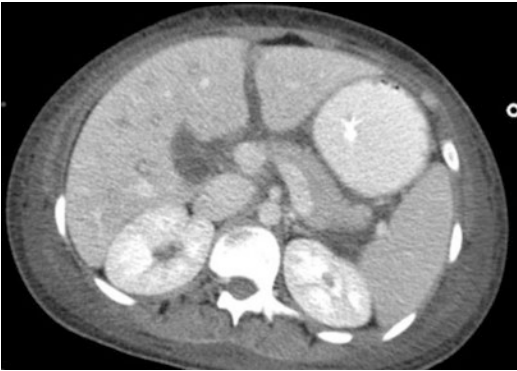


**Fig. 9.1** Large pseudoaneurysm and A/V fistula of RT CFA

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We categorized her as a right heart failure due to a large arteriovenous fistula (Fig. 9.2).

She was treated in the angio suite—a left femoral arterial approach up-and-over access was established. Viabahn (Gore) size 8 × 100 mm was deployed in the common femoral artery, sealing the vessel's communication (Figs. 9.3 and 9.4).



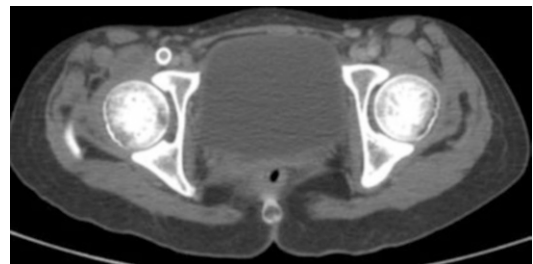
**Fig. 9.2** Huge IVC, IMV, and splenic vein



**Fig. 9.3** Covered stent insertion



**Fig. 9.4** Covered stent insertion



**Fig. 9.5** CT scan 1 month later

Post procedure, an immediate heart rate reduction 126 to 111 BPM and further clinical improvement in her general condition (Fig. 9.5). Further improvement in the breathing rate, reduction of edema, and steady hemoglobin

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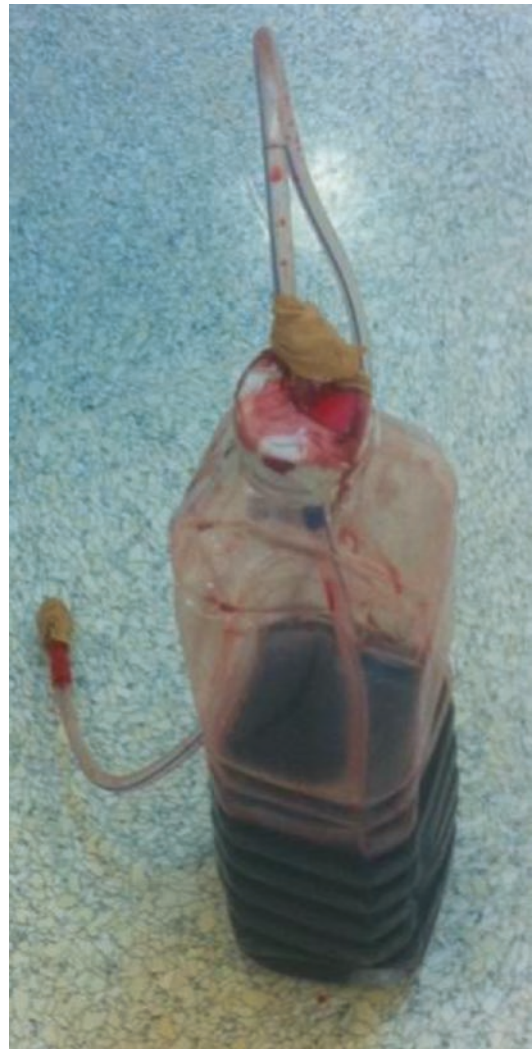
### 10.1 Case Presentation

A 32-year-old man was brought to the trauma room 8 h after being shot in the chest. He had already received immediate care in Syria and arrived with a chest drain in situ, containing 1300 mL of blood-stained fluid (Fig. 10.1).

On examination, he was hemodynamically stable but pale and with a pulse of 82 beats per minute and blood pressure of 113/58 mmHg. The gunshot wound was in the left anterior chest wall, in the third intercostal space. There was no exit wound. Breath sounds in the left chest were diminished, and a small solid object, most likely a round, was palpable in the back (in the posterior chest wall).

Primary survey revealed no other injuries. CT angiogram confirmed a metal foreign body in the left posterior chest, a fractured left ninth rib, an intercostal drain in situ within the left hemithorax, a left pleural effusion with consolidation in the left upper lung, and left lower lung contusion. There was also consolidation at the base of the right lung. There was no pericardial infusion, no spinal injury, and no abdominal injury.

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**Fig. 10.1** An improvised chest drainage system in the field

The round was removed under local anesthetic in the trauma room. The patient was transferred to the ward where he received oxygen, analgesia, physiotherapy, intravenous broad-spectrum antibiotics, and two units of packed red blood cells. He made an uneventful recovery.

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## 10.2 Teaching Points

Log roll and thorough primary survey are essential to the detection of injuries not immediately visible in the trauma room.

Chest drain insertion in trauma should be covered with antibiotics [1].

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## 10.3 Clinical Implications

Most penetrating chest trauma may be managed with a chest drain.

CT angiogram is a useful, noninvasive modality to exclude bleeding within the chest cavity.

## 10.4 Damage Control

Early insertion of chest drain and early and aggressive management of sepsis prevent complications and promote speedy recovery.

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## 10.5 Summary

Fatal chest injury is rarely seen in war trauma as casualties succumb to major vascular injuries in the field. Most chest injuries seen by medical staff, as in this instance, may be managed with chest drain insertion. This should be performed under aseptic conditions and with antibiotic cover.

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Salman Zarka and Y. Viner

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## 11.1 Case Description

A 13-year-old Syrian boy was admitted in the emergency room with a bullet wound in the abdomen. Knowledge regarding the patient's medical history was only that he was wounded in the abdomen and underwent surgery 24 h later. Details were not known.

When received in the hospital emergency room, the wounded Syrian boy was fully conscious; hemodynamics and respiration were stable, with signs of a gunshot wound to the right upper abdomen and signs of post laparotomy. Computer tomography revealed lack of a spleen (after splenectomy) and a small amount of free air. Another problem especially evident among the wounded Syrians is no imaging investigation or clinical examination, which can show and help us about their medical history, and because of that wounded Syrians need to go through a second laparotomy. The findings discovered after opening the abdomen were

splenectomy, pancreatic tail resection, and bloody peritoneal fluid. Patient was stable throughout the surgery, and after surgery under anesthesia and on a respirator, and was transferred to intensive care for further therapy. In PICU after admission, the patient developed signs of shock (tachycardia, hypotension, and decreased urine output). Each patient transferred from Syrian territories to Israel was taken for culture and given antibiotics according to the protocol and injury. An important detail to note, patients who come have had initial treatment in Syria, such as opening the abdomen, the introduction of drains, and catheterization. We give attention to these drains; catheters as a source of infection should be replaced as soon as possible. Most of the bacteria infecting wounded Syrians are resistant to antibiotics, which means that most wounded Syrians are kept in an isolation room. After stabilizing his condition, the disease process was usual, and after 2 weeks a second laparotomy was necessary because of fever.

Some words about ethical problems with the Syrian children who were hospitalized without parents. The consent for all surgical and medical interventions to save lives is signed by three specialists. All other medical acts taking place with guardian consent are received by the court. Two weeks later it was decided to begin waking the patient and transfer him to independent breathing. A few words about the recovery process: my feeling, always as a doctor, that the patient begins

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breathing alone when hemodynamically stable brings relief, but not only with the wounded Syrian children. The real shock starts here. The injured patient arrived not accompanied by family and hearing a foreign language and does not know the place, in addition to suffering withdrawal symptoms from drugs. What is needed from the medical staff, who wake you up in accordance with the preestablished process of withdrawal from drugs, is to build a patient-friendly environment and speaking with the patient.

---

## 11.2 Discussion

This case as one of many demonstrates the complexity of treating Syrian children in different medical situation. We chose this case that verifies the complexity of being treated at Syria and have no documents about that and the need for emergency treatment at Israel without parents signing. Treatment of such patients is a very difficult process that requires first of all an experienced staff, awareness for the different issues, and involvement of many specialists for the solution of medical and ethical problems. The staff has to be aware about the whole problems and challenges of the child and take care for all of them. It is really very problematic to treat Syrian child in

intensive care unit especially when you have to build a patient-friendly environment in his way to recovery. You need not just the correct language but to understand the culture to help and courage the patient to do what is necessary to proceed in the treatment. Although there are some differences between Syrian Arab culture and the Israeli Arab culture, they are very similar that make us at Ziv more competent to assist the Syrian people in their needs.

In order to solve the problem of no data on treatments that were provided at Syria, we decided that every Syrian wounded treated at Syria will undergo total body CT, blood tests, and bacteria culture due to high prevalence of antimicrobial resistance [2, 3].

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A. Izakson

Anesthesia for trauma patients presents unique challenges for anesthetists. Most urgent cases occur at night or during weekend shifts, when more experienced anesthetists are not available. Patient information is limited, and previous medical history and details of chronic medication, allergies, or genetic abnormalities are unknown.

Patients often present intoxicated, with a full stomach, and with the potential for cervical spine instability. Patients often have multiple injuries, requiring several procedures, sometimes in different positions. A difficult airway is not unusual, and special airway management equipment may be required at short notice. Occult injuries, such as tension pneumothorax or cardiac tamponade, can manifest at unexpected times.

The management of trauma patients may require the participation of a multidisciplinary team, namely, a trauma surgeon, orthopedic surgeon, neurosurgeon, plastic surgeon, vascular surgeon, radiologist, laboratory technician, blood bank technician, intensivist, and, of course, the anesthetist, who will continue the resuscitation,

already in progress, and whose role is fundamental for the final outcome of the patient.

Anesthesiologists are able to identify and treat life-threatening injuries first during the “primary survey” and to later proceed to a more detailed patient physical examination.

All efforts during resuscitation should focus on reversing the acidosis, hypothermia, and coagulopathy, as the vicious circle of the lethal triad is invariably fatal.

The anesthesiologist plays an important role in determining which procedures will be performed and in which order and which procedures should rather be postponed until the patient is more stable.

After this introduction, I'd like to share with the readers our experience when relatively small community hospitals with the everyday shortage of manpower, budget, and facilities have to provide an acceptable level of acute postoperative pain treatment to many injured patients at the same time.

Fear of uncontrolled postsurgical pain is among the primary concerns of many patients about to undergo surgery. During the past two decades, like new technologies, microprocessor-driven, patient-controlled analgesia (PCA) devices, extension of epidural analgesia beyond the operating room to control pain, and emergence of peripheral nerve blocks under US guidance to aid postoperative pain control have gained widespread use.

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Providing a good level of postoperative pain treatment is a challenge for every hospital.

This is a time-, manpower-, and resource-consuming process.

Keeping all those issues in mind, we have chosen the US-guided peripheral nerve blocks as a main modality for the management of acute postoperative pain. We used truckle blocks (TAP block and rectal sheath block) in cases of abdominal surgeries and upper and lower extremities peripheral nerve block in cases of orthopedic surgery. Those blocks have provided the acceptable level of acute pain care with a reasonable duration (up to 24 h) even after single injections. Using this method we were able to liberate the nursing staff of being actively involved in the pain management process and to redirect manpower recourses for the other areas.

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## **12.1 Case Presentation**

### **12.1.1 General Information**

A twenty-two-year-old man has been admitted to Ziv Hospital from Syria border due to war injury, open fracture of right femur, open fracture of right tibia, and bilateral lung contusion.

The patient underwent emergency orthopedic surgery including debridement of the wounds and application of external fixations.

After the surgery US-guided femoral nerve block with 25 mL 0.5% bupivacaine and US-guided low sciatic nerve block with 20 mL 0.5% bupivacaine have been done for acute postoperative pain.

The patient has been transferred to the orthopedic department with visual analog pain score between 2 and 3.

The patient was almost pain free for 18 h at least.

The second injection of the same US-guided blocks has been done 24 h after the day of surgery.

### **12.1.2 Teaching Points**

US-guided peripheral nerve blocks may be a wonderful technique of acute pain treatment in the majority of cases of orthopedic trauma.

These blocks cause remarkable decrease of postoperative pain, provide the good level of patient satisfaction, and have minimal impact on manpower recourses.

The procedures usually are not time consuming.

### **12.1.3 Clinical Implications**

One of the best modalities of acute pain management in cases of extremities trauma.

# High-Velocity Bullets Urogenital Combat Injuries: Lessons from the Syrian War

# 13

Ran Katz

The Syrian ongoing civil war has introduced the trauma and urological teams at Ziv Medical Center, serving the north of Israel and the Golan Heights, to a variety of devastating combat injuries in Syrian refugees, treated in our center an act of humanity. Among them, urogenital injuries caused by close proximity to high-velocity bullet sources (e.g., machine guns) were noted in about 5% of the patients.

Differing by the level of injury, these injuries were characterized by severe local damage to soft tissues, associated damage to adjunct viscera, significant blood loss, and following preliminary treatment and damage control procedures—an extensive locoregional fibrosis.

Examples are here given to different injuries at different levels:

Following hemodynamic stabilization and ligation of bleeding vessels, debridement, and suturing of the colonic perforations, the upper ureter was closed with a ligature, and a percutaneous feeding tube was inserted into the kidney.

In our institution, the tube was replaced by formal 10 Fr. nephrostomy. The patient suffered from retroperitoneal abscess treated with prolonged antibiotic therapy.

Four months later, his ureteral injury was reassessed. Combined antegrade and retrograde ureterograms revealed a 3 cm stricture of the upper ureter (Figs. 13.1 and 13.2).

## 13.1 Upper Ureteral Injury: Case Presentation

A 25-year-old man suffered multiple bullet shots to the left upper abdomen. During a damage control laparotomy at a frontline medical facility, colonic perforation was found, associated with bleeding from the colonic mesentery and a complete transection of the left upper ureter.

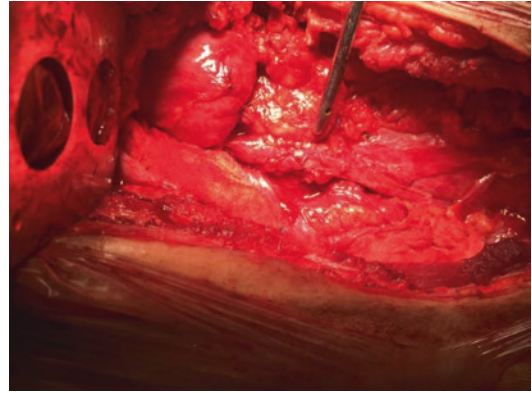
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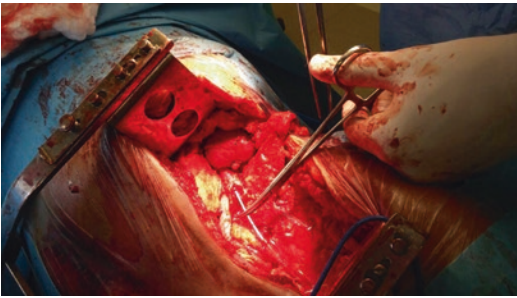
**Fig. 13.1** Antegrade nephrostogram of upper ureteral injury



**Fig. 13.2** Retrograde ureterogram of the same injury



**Fig. 13.4** The uretero-ureteral anastomosis



**Fig. 13.3** Retroperitoneal dissection of the injured ureter. The two ends were mobilized, and an internal double-J stent was placed. Note the significant gap

### 13.1.1 Teaching Points

The patient underwent open exploration of the upper ureter through a lumbotomy approach. Significant scarring of the retroperitoneum was found. Following dissection of the scar tissue, the upper and lower ends of the ureter were isolated, leaving an 8 cm gap between them (Fig. 13.3).

In order to re-approximate the ureteral ends, the distal ureter was mobilized all the way to the bladder, and the left kidney was completely mobilized and descended. These maneuvers allowed the formation of a tension-free uretero-ureteral anastomosis (Fig. 13.4). The anastomotic site was further wrapped with retroperitoneal fat in order to minimize the risk of

retroperitoneal fibrosis. The internal stent and nephrostomy remained for an additional 8 weeks and then removed.

### 13.1.2 Clinical Implications

The long-term follow-up of ureteral reconstruction is usually good. Yet the majority of ureteral injuries are associated with iatrogenic damage related to electric spark injuries, transection, or ligation of the ureter during elective or urgent surgery (e.g., caesarian section). Differing by the level of injury, Syrian war injuries were characterized by severe local damage to soft tissues, associated damage to adjunct viscera, significant blood loss, and following preliminary treatment and damage control procedures—an extensive locoregional fibrosis.

### 13.1.3 Damage Control and Final Reconstruction

During an emergency surgery, no attempt should be made to re-anastomose the ureter; the tissue is burned, unprepared for reconstructive surgery due to local spillage; and associated life-threatening injuries are often present. The fastest way to secure the ureter is to perform a simple tube ureterostomy. In this fast procedure, a simple 5–8 Fr. feeding tube is inserted through a simple skin incision. The tube is inserted

through the ureteral stump up to the renal pelvis and secured with a vicryl 3:0 suture on the stump and a 0 silk suture on the skin level. The procedure is rapid. It can be performed by one surgeon, while others continue their life-saving procedures. Alternatively, the ureter can be ligated and marked with a metal clip, and percutaneous nephrostomy can be placed later in the angiography suite or bedside.

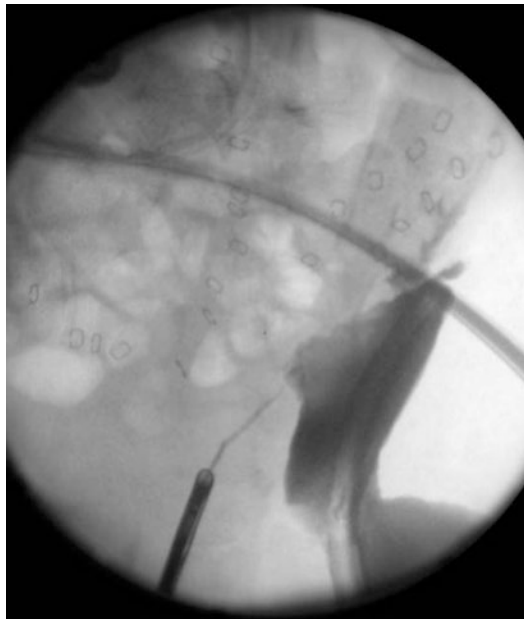
Following recovery, a reconstructive surgery can be performed safely between 3 and 6 months from the injury.

The factors which predict the success of ureteral anastomosis are the tension over the anastomosis, the presence of active infection, the blood supply to the ureteral stumps, and the development of re-fibrosis around the anastomotic site.

During surgery, careful dissection of the ureteral stumps, combined with renal mobilization, can produce a tension-free anastomosis. Appropriate drainage and antibiotic coverage will decrease the risk of reinfection. Wrapping the ureter with local fat tissue (preferably the omentum) will decrease the risk of recurrent periureteral fibrosis and external compression. Under such conditions, the long-term rate of patient anastomosis is excellent.

## 13.2 Lower Ureteral Injury: Case Presentation

A 32-year-old male suffered multiple gunshot wounds to the left lower abdomen and pelvis. He was operated urgently in a frontline facility where he underwent ligation of bleeding vessels in the pelvis, colectomy, Hartman's procedure, and temporary ileostomy. The left ureter was lacerated and sutured over a feeding tube. The patient was transferred to our center with significant ischemia of the left leg and pelvis and underwent left hemipelvectomy. During the procedure, the feeding tube was found floating in the pelvis. Due to hemodynamic instability, further dissection of the ureter was not attempted. On postoperative day no. 6, urine was noted to appear in the surgical drain.



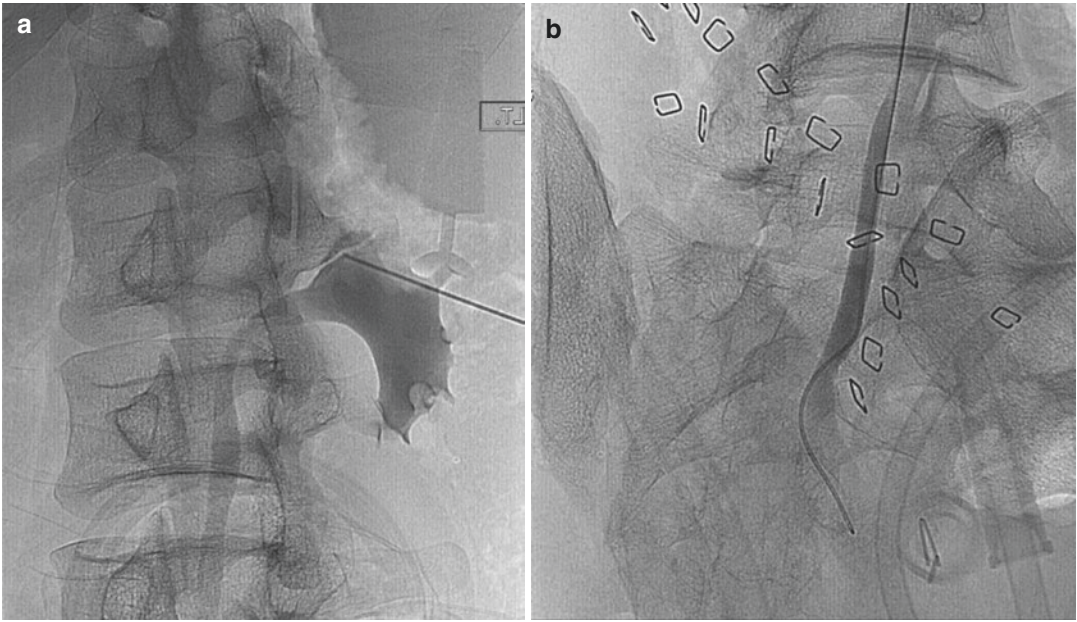
**Fig. 13.5** Retrograde pyelography of the disrupted ureter

### 13.2.1 Teaching Points

The patient underwent left retrograde pyelography which demonstrated complete disruption of the ureter with contrast leak from the ureteral stump to the drain (Fig. 13.5). An antegrade pyelogram showed complete transection of the distal ureter (Fig. 13.6). A percutaneous nephrostomy was placed and the urinary leak subsided. The patient is currently in rehabilitation and will be further referred to ureteral reconstruction.

### 13.2.2 Clinical Implications

As mentioned in the previous case, urgent reconstruction of the ureter is nearly always fruitless. The tissues are contaminated and edematous, and the blood supply is often not adequate, resulting in tissue necrosis, sloughing, and breakdown of the anastomosis. The appropriate and easy to perform percutaneous tube ureterostomy offers a rapid long-standing drainage of the ureter, allowing later reconstruction. Once a ureteral damage has been diagnosed after the laparotomy, the best management is placing a percutaneous nephrostomy until the patient heals.



**Fig. 13.6** Antegrade pyelography of the same patient showing mild hydronephrosis (a) and complete transection of the lower ureter (b)

### 13.2.3 Damage Control and Definitive Reconstruction

Following general recovery of the patient, the ideal time for reconstruction is between 3 and 6 months following the injury. The best way to reestablish the connection between the ureter and the bladder in cases of lower ureteral injury is dissection of the ureter up to a healthy tissue and reimplantation into the bladder. Large gaps can be bridged by Boari's bladder-flap technique, reinforced by anchoring the flap to the psoas muscle ("psoas hitch") with excellent long-term results.

## 13.3 Proximal Urethral Injury: Case Presentation

A 23-year-old man suffered multiple bullets injury to the upper thighs. One bullet traversed the perineum and completely disrupted the posterior scrotum and the bulbar urethra. The testicles and the anus were spared. He underwent surgical debridement of his wounds, and a suprapubic

cystostomy tube was placed. Three months later a complete blockage of the bulbar urethra was noted, and the patient underwent perineal urethrostomy. The perineal opening became gradually obstructed despite repeated self-dilatations. Six months later, he was transferred to our center for reevaluation.

### 13.3.1 Teaching Points

The patient's evaluation included cystoscopy, both through the suprapubic tube and the urethra, and antegrade and retrograde urethrography (Fig. 13.7). Complete obstruction of the bulbar urethra, five centimeters long, was found.

### 13.3.2 Clinical Implications

Complete obstruction of the bulbar urethra is often the result of a traumatic pelvic fracture, where the urethra is torn between the two sides of the pelvic ring, moving in opposite directions. Later, the urethral tears result in fibrosis.





**Fig. 13.7** Combined antegrade and retrograde urethrogram. Note the complete blockage of the bulbar urethra

In contrast, high-velocity, high-power gunshots result in “amputation” of urethral segment and extensive tissue damage. Reconstruction of the urethra following such an injury is a delicate procedure which often involves grafting techniques in order to obtain tissue substitutes for the urethral wall. A shorter, faster procedure is the perineal urethrostomy. In this procedure, the proximal healthy urethra is diverted to the perineal skin behind the scrotum. The procedure is short and effective yet does not allow normal voiding or ejaculation. Also, a significant rate of stenosis is noted due to stricture and scar formation on the perineal skin.

### 13.3.3 Damage Control and Definitive Reconstruction

The patient was operated in the high lithotomy position. Using a perineal approach, meticulous dissection was performed, removing a large area of scar tissue, including the stenosed perineal urethrostomy until the external urinary sphincter. The corpora cavernosa were separated in order to shorten the distance between the two sides of the urethra, and a primary anastomosis between the distal urethra and the sphincteric region was performed. The patient was left with an indwelling catheter and a supra pubic tube for additional 4 weeks and then was weaned of all the tubings successfully.

## 13.4 Penile Urethral Injury

A 20-year-old man was injured from bullets in the upper thighs. One bullet tore the ventral aspect of the penis about 2 cm below the glans.

During urgent surgery, the penile wound was debrided and sutured, and a suprapubic tube was placed. Six months later he was referred to our service for further treatment.

### 13.4.1 Teaching Points

The distal urethra is covered by the corpus spongiosum of the penis which fens and becomes the glans penis. The complete blood supply of the glans penis arises from the corpus spongiosum. Hence, complete traumatic transection of a large distal urethral segment might result in necrosis of the glans. In young healthy patients with good blood supply, collaterals may develop and ensure perfusion of the glans and the urethra distal to the disruption.

### 13.4.2 Clinical Implications

As in proximal urethral injury, distal injury may be treated by diversion—that is, resection of the fibrotic tissue and exteriorizing the urethra to the mid shaft of the penis. This may be performed as a first stage allowing further reconstruction later. Typically, such a procedure is incorporated with grafting of oral mucosa to the surface of the penile shaft, distal to the urethral meatus, and tabularization of the graft 6–12 months later.

### 13.4.3 Damage Control and Definitive Reconstruction

On surgery, 3 cm of fibrotic tissue was removed (Fig. 13.8). The urethra was mobilized bilaterally, and an adequate blood flow was noted from both sides of the anastomosis, suggesting good collateral flow to the glans penis. A primary anastomosis was performed over a 20 Fr. urethral catheter. The anastomosis was further enforced



**Fig. 13.8** Penile urethral injury. Note the significant fibrosis obliterating the urethra



**Fig. 13.9** Complete anastomosis following dissection and re-approximation of the urethral ends. The suture line was covered with tunica vaginalis from the left testicle

and secured with a second layer of a patch from the tunica vaginalis layer of the testicle (Fig. 13.9). This layer is rich in blood vessels and offers additional sealing to the anastomotic suture line. The catheter was placed for 3 weeks and then removed.

### 13.5 Discussion

Injuries of the urogenital tract encounter for about 5% of all combat injuries and are often associated with significant injuries of the abdomen, pelvis, and the lower extremities.

The mechanisms of combat injuries vary and are often complex. Blunt injuries occur due to

blast from explosions. Burns occur mainly on the external genitalia, crush injuries are caused by collapsing of nearby structures, and penetrating injuries are due to shrapnel following explosion or due to direct shots from various weapons.

Direct injuries from high-velocity high-energy bullets are associated with significant local tissue damage as well as combined damage to several organs, depending on the bullet's course. Following damage control laparotomy, the healing process of such injuries is often associated with severe local fibrosis.

Direct injuries of the kidney might result in lateral kidney laceration, complete disruption of the kidney, or damage to the main renal vessels. Common associated injuries include colonic perforation, lacerations of the spleen or the liver, and penetration of the pleura.

The management of renal injuries is conservative as possible. The retroperitoneal space is a closed compartment, and perinephric bleeding gradually increases the pressure, thus alleviating the bleeding. Conservative management as possible is advised, including blood transfusions as required and close monitoring. If the patient undergoes laparotomy and a retroperitoneal hematoma is bulging and elevating the visceral peritoneum, still a conservative approach is indicated, unless the hematoma is rapidly expanding and the patient is hemodynamically unstable. Opening of the peritoneal leaf might result in additional bleeding, and therefore proximal control of the aorta is often required. In such cases, salvage of the injured kidney is very difficult to perform, and nephrectomy is often required.

Transection or lacerations of the upper ureter might result from direct penetrating injury from a shrapnel or a bullet, or from incidental injury during dissection of an injured colon. In both cases, immediate reconstruction is not advised. The field is often contaminated, and the blood supply to the ends of the ureteral stumps is not guaranteed. Attempts to reconstruct the ureter over a stent often result in breakdown of the suture line and urinary leakage. A rapid and safe approach would be a tube ureterostomy procedure. The upper ureter is identified, and the ureter is cannulated with a 5–8 Fr. feeding tube. The tube is

exteriorized and connected to a urine bag. Following recovery of the patient, and after a minimum of 3–6 months from the injury, a reconstructive procedure is performed.

Bladder bullet injury is treated as any other traumatic injuries to the bladder, and the essence is differentiating between intraperitoneal to retroperitoneal injuries. Intraperitoneal injuries require immediate laparotomy, while purely retroperitoneal injury (such as a low bullet which traverses the pelvis and lacerates the bladder below the peritoneal reflection) may be managed conservatively with prolonged catheterization.

For intraperitoneal injuries, the surgical treatment will include good debridement of the bladder perforation and closure over a large catheter and a suprapubic cystostomy. The surgeon should not be worried about bladder volume. In these instances, following debridement and suturing, the bladder always seems shrunken, yet following recovery, the bladder often regains its elastic properties, and the final bladder capacity is not hampered.

Urethral injuries from traversing bullets are associated with significant injuries to soft tissues in the perineum and injuries to the upper thighs. Significant bleeding ensues, often followed by urinary retention. The best immediate care is placing a suprapubic cystostomy and debriding the local wounds. Efforts to reestablish the continuity of the urethra over a catheter are typically unsuccessful since large segments of the urethra are often missing and the blood supply of the stumps may be compromised. As with other causes of urethral injury, a minimal period of 3 months is recommended before a reconstructive procedure is performed. Preoperative assessment must include combined antegrade and retrograde urethrography, in order to measure the correct length of the gap between the urethral stumps, and antegrade and retrograde cystoscopy, in order to assess tissue fibrosis, the sphincteric mechanism, and exclude residual foreign material such as shrapnel or bone fragments.

Proximal urethral injuries are best treated with excision of the scarred tissue and primary end-to-

end anastomosis of the urethral stumps. Care must be taken to isolate healthy and bleeding tissue and preserve the sphincteric mechanism, often only few millimeters from the suture line. In our patient, previous attempt to perform a perineal urethrostomy resulted in additional fibrosis. A useful tip in such cases is to perform antegrade flexible cystoscopy, identify the proximal urethra, and leave the scope inside with maximal illumination. A “cut to the light” dissection is carried until the proximal end of the urethra is exposed. In order to decrease the distance and thus the tension between the two ends of the anastomosis, the two corpora cavernosa are dissected and separated, allowing the urethra to pass between them. This maneuver decreases the angulation of the urethral course in the perineum and allows gaining additional 1–2 cm to the reconstruction. The anastomosis is carried with multiple single vicryl sutures, and catheters are left in place for 3–4 weeks. The goals of surgery are patent anastomosis, normal voiding and ejaculation, and urinary continence. The overall success rates of such a procedure are good. The longer the urethral damage and the poorer the blood supply, the success rate decreases. In such complicated cases, urethral realignment by itself is a good result since stricture formation can be treated with ambulatory or self-catheterization.

The Syrian civil war exposed our team to various complex and unique injuries, different than other military injuries that, unfortunately, we are accustomed to. High-velocity gunshot injuries, often neglected and contaminated, resulted in extensive tissue damage and a reconstructive challenge.

From the humanitarian aspect, treating miserable patients, for whom we offered temporary relief from the horrors of war in their country and a hope for better health and life quality, is a unique experience and a privilege. We operate on young men and children, our neighbors from across the border, knowing that we will probably never see them again, and we wish them all the best and hope that our modest contribution will help bring peace to the region.

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**Part IV**  
**Orthopedics**

Shehade Husein and Ebrahim Nadir

## 14.1 Introduction

Fracture of the femoral head is a rare and severe, relatively uncommon injury [4, 7]. It usually results from hip dislocations or fracture dislocation [8]. The association of femoral head fracture with hip dislocation is strong. It is difficult to understand how a shearing fracture of the femoral head could occur without dislocation. Approximately 5 to 15% of posterior hip dislocations have been noted to be associated with femoral head fractures due to contact between femoral head and posterior rim of the acetabulum. Anterior hip dislocations are usually associated with impaction/ indentation fractures of the femoral head. The first description of femoral head fractures following posterior hip dislocation was noted by Birkett in 1869 [4]. Thompson and Epstein's classification of posterior hip dislocations, published in 1951, included the classification of femoral head fracture as a separate entity. This classification did not include anterior hip dislocation, nor did it include fractures of both

the acetabulum and the femoral head. Pipkin's classification is the most commonly used classification system [9]. It divides fractures of the femoral head into four basic types according to the relation of the fracture line to the fovea capitis femoris and the associated injury of the femoral neck or the acetabulum. It was first published in 1957 as detailed below:

Diagnosis of the femoral head fracture or of fracture dislocation of the hip is aided by a complete history, physical examination, and imaging, including computed tomography [1] and MRI. Fracture of the femoral head represents a severe injury to the hip joint and, historically, has been associated with a relatively poor functional outcome. The main complications associated with fracture of the femoral head and subsequent treatment include avascular necrosis of femoral head, peripheral nerve damage, post-traumatic osteoarthritis, and heterotopic ossification [2]. Treatment consists of urgent closed or open reduction of the dislocated hip preferably within 6 h after the injury [3, 4], followed by nonsurgical or surgical management of any associated fractures. Controversies include the preferred surgical approach (anterior versus posterior) and whether to perform a femoral head fragment excision or an internal fixation [5, 6].

We present a case of missed diagnosis or neglected fracture dislocation of both hips with a fracture of both femoral heads Pipkin type II, a very rare and severe injury that was associated with multiple fractures of long bones.

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## 14.2 Case Report

A 25-year-old male patient, Syrian citizen, was transferred to our emergency department (ER) complaining of severe pain and an inability to bear weight on both legs. The patient claims to being involved in a road accident 6 weeks prior presenting to the ER. The patient, uncertain about the nature of the accident, believes that the vehicle in which he was transported was either blown by a landmine or by an adjacent missile explosion. The patient was transferred to a local Syrian hospital. His x-ray revealed fracture of the left thigh and both legs. The fractures were operated and internally fixated. Since the accident, he was unable to mobilize or to bear weight.

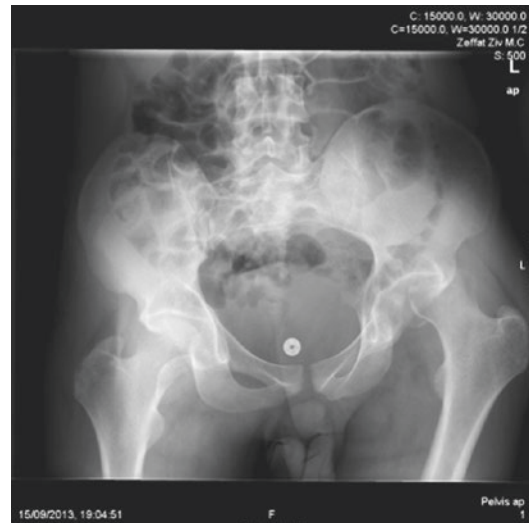
On admission, the patient was alert. His blood pressure and pulse rate were within normal limits, and he presented no open wounds or skin lesions. Examination revealed healed scars on the left thigh and on both legs resulting from previous injuries and operative interventions. His left leg was externally rotated and shortened. The right hip joint and both knees were painful and showed limited range of movements. Popliteal and ankle pulses were palpable. Furthermore, the patient complained of drop and numbness in the right foot. No additional impairments were noted in his physical examination.

## 14.3 Radiologic Findings

In order to evaluate the injuries, the patient underwent a series of radiographs of the pelvis, both thighs, and legs which revealed a fracture dislocation of the left hip (Pipkin II), a fracture of the right femoral head (Pipkin II) (Fig. 14.1), a fracture of the left femoral shaft fixed by plate, and a fracture of the upper third of both tibial bones fixed by plates (Figs. 14.2, 14.3, and 14.4). CT scan of the pelvis revealed a fracture of the right hip (Pipkin II) with displacement and a fractured left femoral head (Pipkin II) with posterior dislocation (Figs. 14.5 and 14.6).



**Fig. 14.1** CT scan: a Pipkin II fracture of the left femoral head with posterior dislocation. Pipkin II fracture of the right femoral head without dislocation

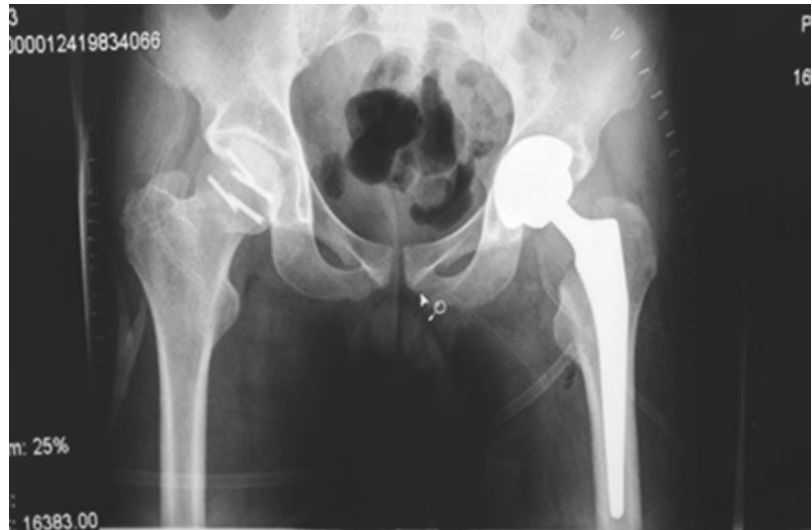


**Fig. 14.2** Shows a pre-oppelvis x-ray

## 14.4 Diagnosis

1. S/P high-energy polytrauma patient. S/P ORIF plating left femur and both tibia.
2. Fracture dislocation of the left hip (Pipkin II).
3. Fracture of the femoral head right hip (Pipkin II).

**Fig. 14.3** Shows the post-op pelvic X-ray ORIF right femoral head THR left hip



**Fig. 14.4** Shows the ORIF left femur



**Fig. 14.5** ORIF right tibia

## 14.5 Surgical Management

On the day following his admission, the patient was taken to the operating room. Following the administration of general anesthesia, the right hip was addressed. A lateral approach (Hardinge) was used: the anterior capsule was opened, the joint was explored, and the femoral head fracture

was reduced and fixated by headless screws. Anatomic reduction and stable fixation were achieved and confirmed by fluoroscopy. The stability of the joint was also confirmed.

Next, the patient was turned on his right side. A posterior (Kocher-Langenbeck) approach for the left hip was applied. The defect of the femoral head was great; the fragments were far too small and could not



**Fig. 14.6** Shows the ORIF left tibia

be fixated. The joint was replaced by cementless prosthesis with ceramic liner and head (Fig. 14.5).

## 14.6 Postoperative Management

On the second postoperative day, the patient was mobilized out of the bed with the aid of gutter crutches, full weight bearing on his left leg, and non-weight bearing on his right leg. One week postoperatively, the patient was discharged, returning to his country.

## 14.7 Discussion

Fracture of the femoral head with hip dislocations occurs as a result of a high-velocity injury frequently associated with multiple organ damage [2]. The mechanism of injury for femoral head fracture is traumatic dislocation of the hip. Shear forces against the femoral head as it exits the contained acetabulum are thought to cause the femoral head fracture. Due to the inherent stability of the hip joint, significant force is required to disrupt the posterior hip capsule, and more may be required to add a shearing injury and produce a femoral head fracture as the head is pushed against the posterior rim of the acetabulum [4, 6],

most often due to motor vehicle collisions, fall from a height, motor vehicle-pedestrian accidents, and sports injuries. It is extremely rare that fractures of the hip should include both joints, left and right, and long bones. The combination of femoral shaft fracture and hip dislocation was first reported by Sir Astley Cooper in 1923—Helal and Skevis speculated that this injury is the result of two forces; the hip joint dislocated by axial impaction, and the femoral shaft fracture occurs after a direct blow to the thigh [7]. The incidence of long-term complications such as avascular necrosis (AVN) following posterior hip dislocation is about 13% and increases to 18% in the dislocations associated with femoral head fracture [6]. The rate of AVN may be affected by the time frame in which the femoral head remains dislocated [1, 4, 8].

Urgent gentle closed reduction for femoral head fractures is recommended. If closed reduction is unsuccessful, open reduction is indicated. A preoperative CT scan is helpful in evaluating the acetabulum and femoral neck and in checking the size of the femoral head fragments and loose bodies. If closed reduction is successful, a postreduction CT scan is indicated to evaluate the congruity of the hip joint and to determine the presence or absence of intra-articular loose fragments [9]. For isolated Pipkin type I fracture with excellent (less than 1-mm step-off) reduction, closed treatment is recommended. If the reduction is not adequate, ORIF is recommended. The same recommendations apply to type II fractures, but because of the involvement of the superior femoral head, only an anatomic reduction should be accepted for conservative care. For Pipkin type III where the femoral head fracture is associated with a femoral neck fracture, the prognosis is poor. The development of post-traumatic AVN of the femoral head is related to the degree of displacement of the femoral neck fracture. Therefore, joint replacement may be considered. In Pipkin type IV fractures, the associated acetabular fractures should dictate the surgical approach, and the femoral head fracture, even if it is not displaced, it should be internally fixated to allow early mobilization of the hip joint [5, 6].



In polytrauma patients and especially in younger more active ones, urgent ORIF may be indicated, even when the reduction is good, in order to conserve the joint, allow mobilization of the patient, and decrease the rate of post-traumatic complications. Prosthetic replacement is indicated in a Pipkin type III fracture when the patient is physiologically elderly or if the femoral neck fracture is markedly displaced. Primary femoral head replacement is otherwise contraindicated and should be performed only after an unsuccessful trial to conserve the joint [6].

Our patient was young, 25 years of age. He had been subjected to multiple trauma 6 weeks before presenting to our emergency department. He was admitted with a displaced fracture of the right femoral head without dislocation of the joint and a posterior dislocated fracture of the left hip. Since it is difficult to conceive that a fracture of the femoral head could occur without a dislocation of the joint, we hypothesize that the injuries of both hips were either miss diagnosed due to the multiple fractures of the long bones or were not treated due to unknown circumstances. Therefore, we believe that the right hip was reduced but the fracture remained untreated. In the case of the left hip, it is probable that the joint was unstable and that it re-dislocated or was irreducible. The probability for developing AVN following these types of fractures is increased considerably, more so due to the fact that the fractures were not treated in the critical time frame of 6 h post injury.

Our aim was to mobilize the patient as soon as possible and to simultaneously conserve the hip joints taking also in consideration that it is highly improbable that he should be able to find adequate rehabilitation and follow-up upon return to his

country due to the ongoing civil war. The options at hand were either to replace both joints or to try to conserve at least one of them and replace the other. We chose to reconstruct the right hip where the fragments allow internally stable fixation anatomically. The situation in the left hip was different; there were multiple small fragments that could not be fixated. Therefore, the joint was replaced in order to allow the patient the possibility to mobilize out of the bed. Unfortunately, we have no option of requesting a follow-up. However, we remain hopeful that the right decisions were taken under the circumstances and that we served the patient's best interest.

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# Complex Lower Limb Deformity in Paediatric Patient After Blast Injury with Extensive Tissue Damage and Loss: A Case Report

Alexander Lerner

## 15.1 Case Presentation

A four-year-old Syrian boy sustained a blast injury following detonation of land mine. After 13 surgeries in Syria, he was discharged to home without the possibility to stand and to walk due to severe deformity of his right lower limb. Half a year after the injury, he was admitted with his father to Ziv Medical Center in Zefat, Israel. On admission, initial examination demonstrated severe fixed varus deformity of the right ankle with extensive scarring process around his ankle and leg (Fig. 15.1). Neurovascular status of the right lower limb was normal.

Radiographs on admission demonstrate subluxation of the ankle joint with loss of distal articular surface of the tibial bone. Reduction of ankle subluxation with correction of deformity was started by a closer manner in the operation room and gradually continued using hinged circular Ilizarov frame. Cancellous bone allograft material was used to fill the distal tibial defect. One week later, the malalignment was gradually restored (Fig. 15.2).

Full weight bearing on the injured lower limb was allowed. Control X-rays showed proper alignment, and the boy was discharged to his home on day 20 with crutches and the Ilizarov device in situ.

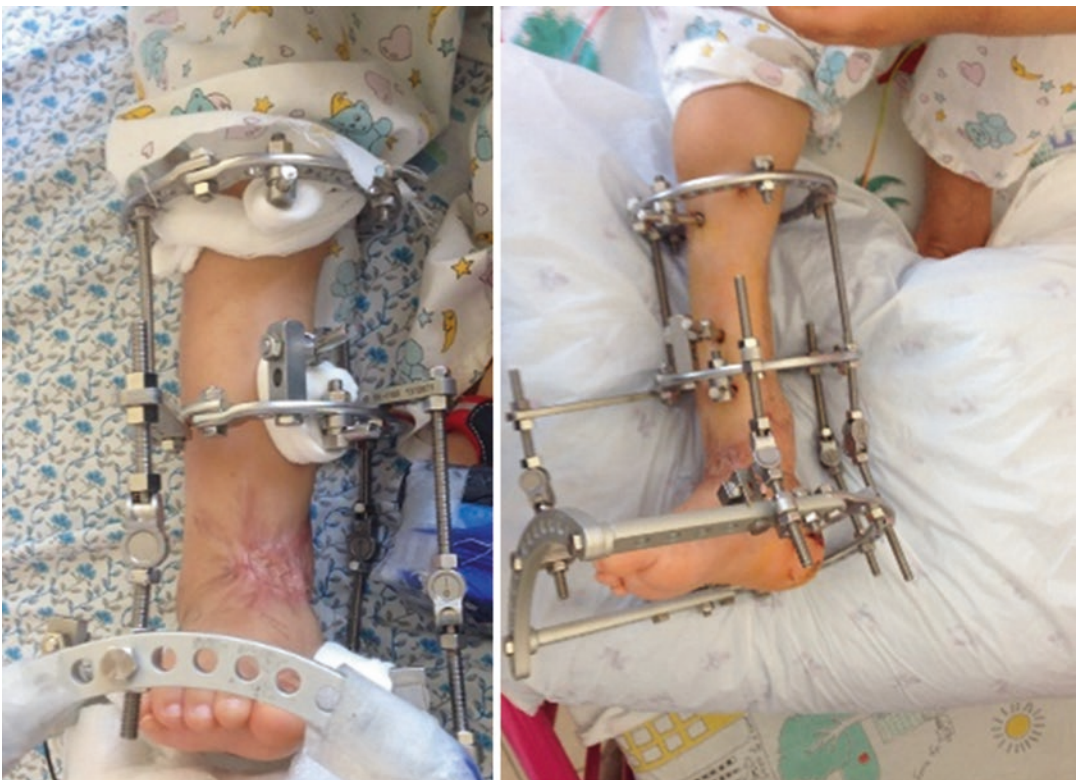
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**Fig. 15.1** Clinical photos on admission demonstrate severe varus deformity of the right ankle with extensive scarring process around the ankle and distal leg



**Fig. 15.2** Clinical photos performed 1 week after surgery demonstrate anatomical alignment of the right ankle and foot in Ilizarov frame

## 15.2 Clinical implications and Conclusions

- A minimally invasive Ilizarov method is successful in paediatric patients who suffered after extensive war trauma.
- A number of unnecessary orthopaedic and plastic operative procedures may be excluded using the technique of gradual complex deformity correction in Ilizarov frame.

# Acute Shortening and Angulation for Limb Salvage in Pediatric Patient After High-Energy Blast Injury

# 16

A. Lerner, H. Shehade, N. Reshef, and D. Rothem

## 16.1 Case Presentation

A 10-year-old Syrian girl presented to the emergency department with her mother 12 h after blast injury to the right lower limb. The girl arrived to the hospital in a relatively stable general condition. Details of the treatment she received in Syria were unknown. There was an open 18 cm wound on the anteromedial aspect of right leg with large skin, muscle, and bone defects. Pedal pulses were palpable, and there was no distal neurovascular deficit; the foot was warm. Radiological examination on admission confirmed comminuted fractures of the left tibia and fibula with extensive bone loss. Extensive lavage and radical debridement were performed by admission under general anesthesia. Denuded and comminuted bone fragments with questionable viability were removed, and the leg was stabilized using a unilateral tubular external fixation frame. The wound was left open, with paraffin gauze dressings (Fig. 16.1).

Repeated debridement procedure under general anesthesia was done 48 h later. Temporary acute shortening and anteromedial mal-angulation was performed to bring wound edges together and to close bone ends and the fracture site by viable soft tissues. Distal and proximal ends of the tibial bone were approximated by 8 cm shortening. The tibial bone fragments were angulated in a varus position 45°. Combination of acute limb mal-angulation with shortening allowed more complete coverage of the bone ends by the soft tissue (Fig. 16.2). During the operative procedure, peripheral pulse, capillary refill, and distal limb color were continually checked to ensure vascular viability.

Local wound treatment was continued using method of negative pressure wound therapy (NPWT). Conversion to hinged Ilizarov circular

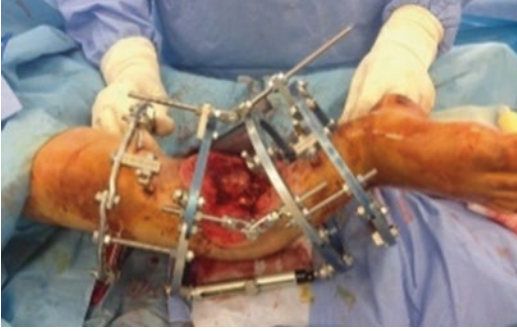


**Fig. 16.1** Clinical picture demonstrates extensive tissue defect of the right lower limb after blast injury and primary debridement. Fracture stabilization using tubular external fixation frame

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**Fig. 16.2** Clinical picture after performing acute shortening-angulation procedure. Conversion to hinged Ilizarov circular frame

frame was performed on day 10 using half pins of primary tubular external fixator. Skin grafting to granulating tissue was done 5 days later. After initial healing of the anteromedial wounds, gradual correction of the mal-angulation was begun. Over a period of 2 weeks, axial alignment was restored via isolated anteromedial distraction using the hinged circular Ilizarov external fixation frame, and full weight bearing to the injured limb with crutches was started (Fig. 16.3). Proximal tibial elongation corticotomy for distraction osteogenesis was done 1 week later. Graduate distraction osteogenesis in the Ilizarov frame by the rate  $\frac{1}{4}$  mm  $\times$  4/d was started after 5 days. Control X-rays showed proper tibial alignment, and the girl was discharged to her home in Syria on day 70 with crutches and the Ilizarov device in situ.

## 16.2 Damage Control

- Severe open limb fractures must be managed according to the principles of damage control orthopedics.
- Primary fracture stabilization using minimal invasive tubular external fixation frames prevents further soft tissue damage.
- A staged protocol of minimal invasive external fixation combined with radical repeated aggressive debridement procedures seems to be an effective method for treatment of patients with complex high-energy war injuries with extensive tissue damage/tissue loss.



**Fig. 16.3** Full weight bearing to injured limb after tibial realignment using hinged Ilizarov circular frame

## 16.3 Clinical Implications

- The technique of temporary acute limb shortening and angulation may be useful in management of pediatric patients suffered after high-energy trauma, including war injuries.

## 16.4 Teaching Points

- Extensive soft tissue damage and loss are very common as the result of blast injuries.
- All contaminating debris, devascularized soft tissues, and denuded bone fragments must be removed during radical primary debridement and following second-look procedures.
- The number of unnecessary orthopedic, plastic, and vascular operative procedures may be reduced or even excluded using the technique of acute temporary limb shortening and angulation rather than extensive bone and soft tissue grafting.

## 16.5 Summary

- Limb salvage and reconstruction after blast injury can often challenge the most experienced surgeons to the limits of their capabilities, especially in condition of extensive tissue loss. This case demonstrates possibility of

successful limb salvage and functional reconstruction in pediatric patient by acute temporary malalignment, followed by graduate distraction histogenesis using minimal invasive external fixation frames without need in tissue flaps. Unnecessary donor site morbidity precluded using this method of treatment.

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# Staged External Fixation Protocol in Treatment of Complex Limb Trauma

# 17

A. Lerner and S. Kalfa

High-energy injuries, especially in patients suffered from war trauma, result often in severe and extensive tissue loss and soft tissue devascularization, creating high rate of complications and increasing the overall morbidity [1, 2].

However, ineffective fractures stabilization causes abundant additional soft tissue damage and morbidity, pain, and severe nursing problems during the treatment. Contrarily, early skeletal stabilization definitively improves the recovery of overlying soft tissues.

Moreover, the use of external fixation frames in the initial phase of the treatment of patients with severe high-energy injuries provides improved results of treatment in these challenging conditions. Stable external fracture fixation allows early mobilization of the patients which facilitates nursing care and avoids many

complications in the polytraumatized patients. Application of this minimally invasive method does not aggravate the patient's general condition. External fixation frames are especially favored in the treatment of patients with extensive soft tissue damage because stabilization can be achieved easily, further soft tissue dissection is not needed, and soft tissue care is facilitated; versatile modern external fixation frames may be deployed in almost any location and fracture pattern (Fig. 17.1). The use of two-stage reconstruction for the treatment of the complex limbs fractures has been successful in decreasing the complication rates, including wound compromise [3]. The two stages treatment protocol involve immediate primary limb stabilization with a bridging external fixator to allow the soft tissues to improve and recover followed by late definitive reconstruction and fixation of the complex limb fractures [4].

The staged treatment protocol with conversion from primary tubular external fixation to finally internal fixation has been well described and accepted for management of patients, who suffered from multiple trauma and from open low-energy fractures, and also by treating of some patients after open high-energy trauma, where there are no present severe tissue loss and relative good coverage of the fracture site may be achieved. The primary benefit for such protocol is the reduction in soft tissue complications compared with immediate open surgery [5].

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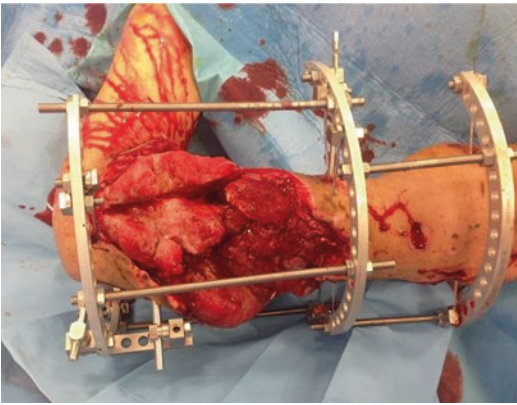
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**Fig. 17.1** M, 19-year-old Syrian patient. Status after blast injury, open forearm fractures with extensive soft tissue loss. Primary debridement procedure with minimal-invasive stabilization using tubular external fixation frame



**Fig. 17.2** Conversion to Ilizarov circular external frame was performed 2 weeks later after negative pressure wound therapy and repeated debridement

Extensive soft tissue damage and/or soft tissue loss precludes conversion to internal fixation methods. Poor soft tissue coverage of the bone ends, and fracture site leads to high-rate complications, especially in the presence of implanted internal fixation devices. Dealing these complex patients, we perform conversion of the unilateral external fixation frames to the circular Ilizarov devices (Fig. 17.2). Low morbidity associated with Ilizarov method suited it to the management of complex fractures, when extensive dissection and internal fixation are contraindicated due to comminuting at the fracture site and compromise

of the soft tissue [6]. Ilizarov method is not only method of the surgical fracture fixation, but also a unique method of continuous, guided active influence on the tissue healing process and tissue shape. Thus, by treating of the patients, suffered from high-energy trauma with severe tissue damage and loss, this method can be useful tool for limb salvage and reconstruction [7].

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## 17.1 Damage Control

- The method allows shape and function restoration of the injured limb without using of massive implanted devices and traumatic methods of the tissue transfer with attendant donor site morbidity. In unstable polytraumatized patients and those with combined soft tissue injuries (i.e., degloving, burns), stabilization of the fracture by external fixation allows early mobilization of the patient and facilitates nursing care.

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## 17.2 Clinical Implications

- The staged treatment protocol can be an effective method of the management in mass casualty's conditions, such as terror attacks, war, industrial, and train and nature cataclysms.

### 17.3 Teaching Points

- Primary stabilization of the injured limb in position of temporary malposition (shortening, angulation, rotation) will reduce the size of the soft tissue defect and may avoid the need for the technically demanding local, distant, or free soft tissue flaps with additional donor site morbidity.
- Definitive bone reconstruction can be delayed until problems in soft tissue could be treated. Later, after successful soft tissue healing, bone shape restoration can be performed by minimally traumatic manner of gradual tissue distraction.
- The unique possibility of the Ilizarov method in the further restoring of the extensive bone defects without needing massive bone grafting allows an orthopedic surgeon to be free during performing the most important part of the treatment in high-energy trauma patient – primary surgical debridement procedure.

### 17.4 Summary

A staged protocol of external fixation, including primary temporary unilateral tubular stabilization followed by definitive circular (hybrid) fixation by customized frame, seems to be an effective tool in the treatment of patients with

severe compound damage to the bone and soft tissues with poor biological conditions due to high-energy injuries. Our clinical experience emphasizes the versatility of this approach and the relative low morbidity associated with this minimally invasive method.

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Yoram Ozer and Musa Shehade

## 18.1 Our Strategy to Proximal Extremity War Injuries

- Multiple injuries.
- Life-threatening conditions.
- High-energy trauma.
- Severely infected open trauma.
- Primary mini-invasive external fixation fracture stabilization to maintain length, alignment, and mobility while affording access for wound care.

Secondary fracture and soft tissue care after medical stability is achieved.

Further assessment of the injury, mainly nerve and tendon injuries.

Immediate motion of the injured limb guided and assisted by our occupational and physiotherapists.

Delayed surgeries on nerves and tendons till soft tissue early stability achieved.



## 18.2 Case 1

Severe gunshot injury amputated the index finger.

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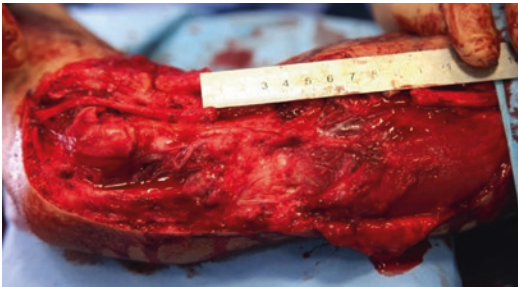
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After thorough debridement, the skin from the amputated part is used for cover and closure creating a useful esthetic four-finger hand.

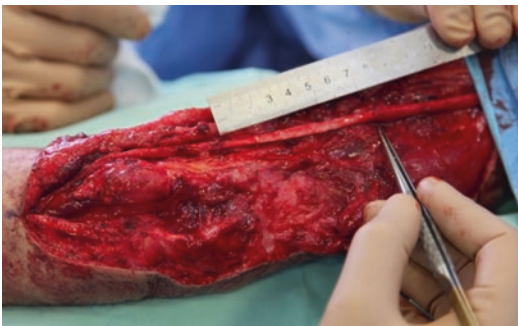


### 18.3 Case 2

Arm gunshot injury to ulnar nerve with gap of 8 cm.



The gap was bridged by nerve allograft.



### 18.4 Case 3

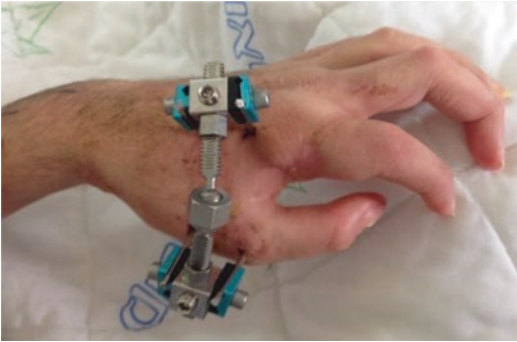
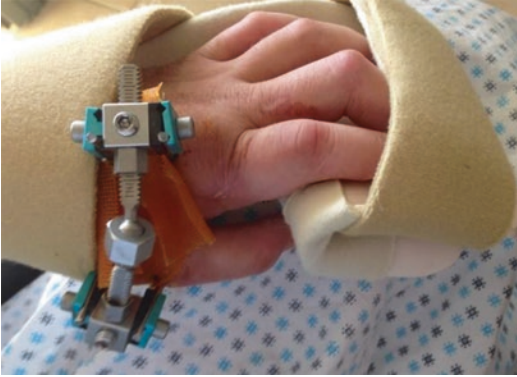
A child referred after initial treatment for a right forearm amputation and injury to the left hand with severe adduction contracture.



Right forearm got a useful prosthesis.



Left hand's first web space opened by gradual elongation of external fixation between the first and second metacarpal bones.



Good abduction was achieved with subluxation of the first carpometacarpal joint. The external fixation was replaced by plaster cast allowing spontaneous relocation of the joint.



Cast removal followed by intensive guided exercises.

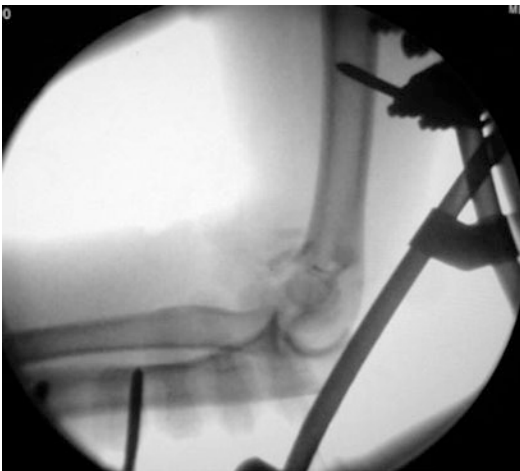
### 18.5 Case 4

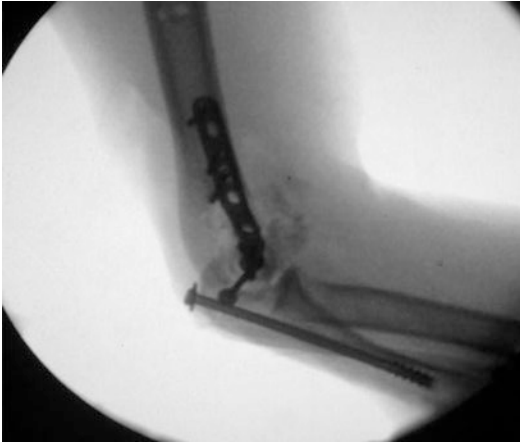
Comminuted displaced fracture of the medial condyle of the elbow by blast injury.



After stability achieved, the external fixation was converted to a stable internal fixation.

Initially treated by debridement and external fixation.





**18.6 Case 5**

Severe injury to both arms with shaft fracture and soft tissue loss, treated by debridement, external fixation, and VAC wound care.





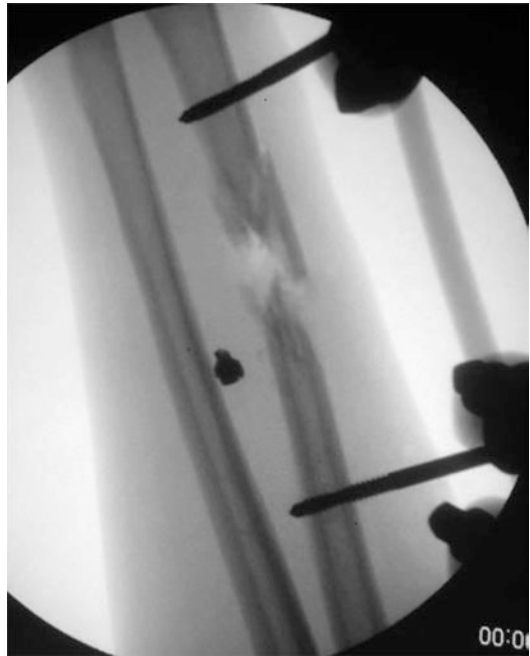
Good coverage achieved with later skin graft.



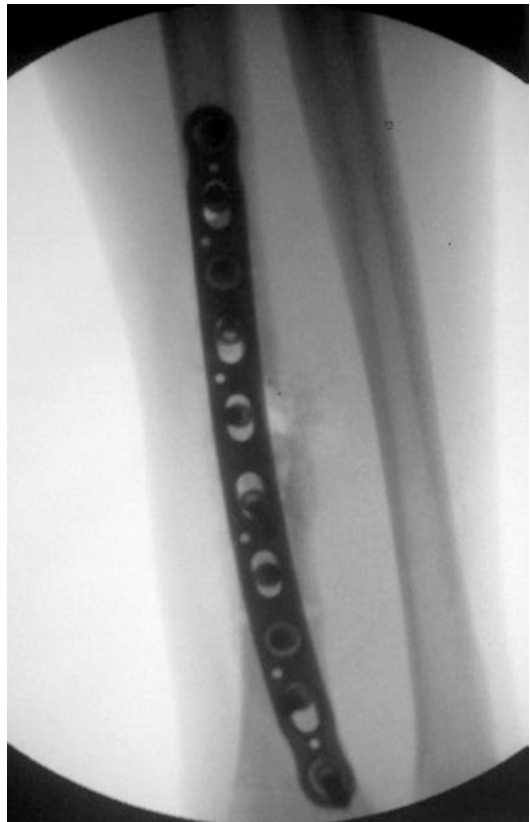


### 18.7 Case 6

Blast injury to forearm with comminuted fracture of the radius bone shaft treated by debridement and external fixation.



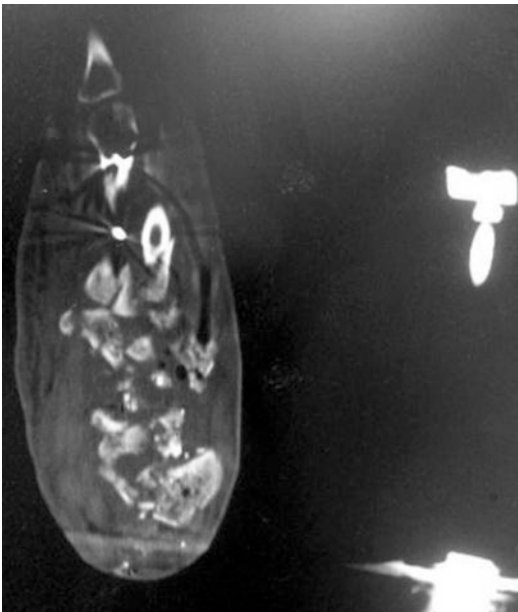
Later on, external fixation was removed. Bone graft added and internally fixed by a long plate.





**18.8 Case 7**

Blast injury to hand with highly comminuted unfixable fractures of radius, carpal, and metacarpal bone.



External fixation till stability achieved.



Bases of metacarpal bones relocated for regaining finger length and function, letting spontaneous radiocarpal arthrodesis.



### 18.9 Case 8

A soldier transferred to our department with severe infection and loss of the shaft of the humerus bone.



After debridement and a period of adequate intravenous antibiotic treatment, the bone externally fixed, and a gradual bone transport begun.



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# Open Comminuted Femoral Fracture: Staged Treatment Protocol

# 19

D. Rothem and A. Lerner

## 19.1 Case Presentation

A 24-year-old male from Syria sustained a blast injury to his proximal left thigh.

He was transferred to Israel and was admitted to Ziv Medical Center 24 h post-injury after primary suture of his wounds in Syria.

On arrival to emergency room, his blood pressure was 125/80 mmHg, but he had tachycardia with pulse rate of 124 beats per minute. His temperature was 37.3 °C.

On primary physical examination, he had deformity of his left thigh fixed with temporary Thomas splint. He had 15 cm sutured wound at lateral aspect of left proximal thigh. He had no neurological deficit, and his dorsalis pedis and tibialis posterior pulse was palpable, slightly less than his opposite side. Blood test on admission revealed Hb, 10.7, and Wbc, 4.5. On his X-ray we revealed displaced comminuted fracture of the proximal third left femoral bone (Fig. 19.1).

In the emergency room, he received anti-tetanus vaccination and antibiotic treatment according to our hospital protocol and then was operated 60 min after arrival.



**Fig. 19.1** Radiological picture demonstrates fully displaced comminuted proximal left femoral fracture

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During the operative procedure under general anesthesia, we removed all the sutures, and radical debridement of all in vital tissue and remained foreign bodies was done; cultures were taken from the debrided tissue. Massive washing of wound with 10 L of normal saline was done.



**Fig. 19.2** Clinical picture demonstrates primary stabilization by trans-hip tubular external fixation frame

Temporary stabilization of the proximal femur fracture was achieved by fixing his fracture with bridging trans-hip tubular external fixation frame (Fig. 19.2), and we left his wounds unsutured and dressed with vacuum drainage dressings.

A second look in OR under general anesthesia was performed 3 days after the first operation, and additional thorough debridement was performed; vacuum drainage dressings were applied again.

After 10 days of negative pressure wound therapy, he was stable clinically, without signs of general or local infection, his wound had clean granulation tissue, and we took him back to the operating room for definitive treatment of the femoral fracture—conversion from primary tubular external fixation to proximal femoral intramedullary nail (Fig. 19.3).

After the operation, we continued the vacuum treatment for another 2 weeks and eventually covered the granulation tissue with skin graft from his opposite thigh. After conversion to intramedullary nail, he started walking with partial weight bearing with the aid of crunchers.

The patient was discharged back to Syria 1 month after arrival, with a stable fracture fixation and without a sign of infection after treating him according to our orthopedic damage control protocol.

## 19.2 Damage Control

- Damage control orthopedics (DCO) characterized by primary, rapid, minimal-invasive temporary fracture stabilization, usually by external fixation frames, may be followed by



**Fig. 19.3** Radiological picture after reduction and internal fracture fixation using proximal femoral nail and additional cerclage wire

secondary definitive management, once the acute phase of systemic recovery has passed.

## 19.3 Clinical Implications

- Staged treatment protocol, based on damage control principles, should be useful in management of patients, suffered after high-energy trauma with extensive tissue damage, including war injuries.

## 19.4 Teaching Points

- All contaminating debris, devascularized soft tissues, and denuded bone fragments must be removed during radical primary debridement and following second-look procedures.
- The use of external fixation frames in the initial phase of the treatment of patients with severe high-energy injuries provides improved results of the treatment.
- The use of two-stage reconstruction for the treatment of complex limb fractures is successful in decreasing complication rates.

## 19.5 Summary

- Staged protocol of minimally invasive primary external stabilization, performed in damage control procedures, followed by final

bone reconstruction, according to general and local tissue conditions, is an effective method of management after high-energy war injuries to limbs.

# Staged Treatment Protocol for Salvage After Hindfoot Blast Injury

# 20

D. Rothem and A. Lerner

## 20.1 Case Report

A 43-year-old female sustained a blast injury to her left foot.

She was transferred to Israel and was admitted to Ziv Medical Center 12 h post-injury.

On arrival she was hemodynamically stable, her blood pressure was 120/80 mmHg. Her pulse rate was 90 beats per minute and temperature was 36.4 °C.

On physical examination in the emergency room, she had extensive bone and soft tissue loss of her medial and lateral hindfoot, with gross contamination (Fig. 20.1). She had no neurological deficit; the pulse on the dorsalis pedis artery was palpable. Blood test revealed Hb.12, and Wbc, 4.5. On her X-ray we revealed comminuted fracture of the left calcaneus with bone loss.

In the emergency room, she received tetanus vaccination and intravenous antibiotic treatment including vancomycin and amikacin according to our hospital protocol. She was operated 60 min after arrival to the hospital.



**Fig. 20.1** Clinical picture of the left foot by admission demonstrate extensive tissue damage and loss

During the operation under general anesthesia, we conducted massive washing with 10 L NS, and radical debridement of all in vital tissue and remained foreign bodies was done; cultures were taken from the debrided tissue.

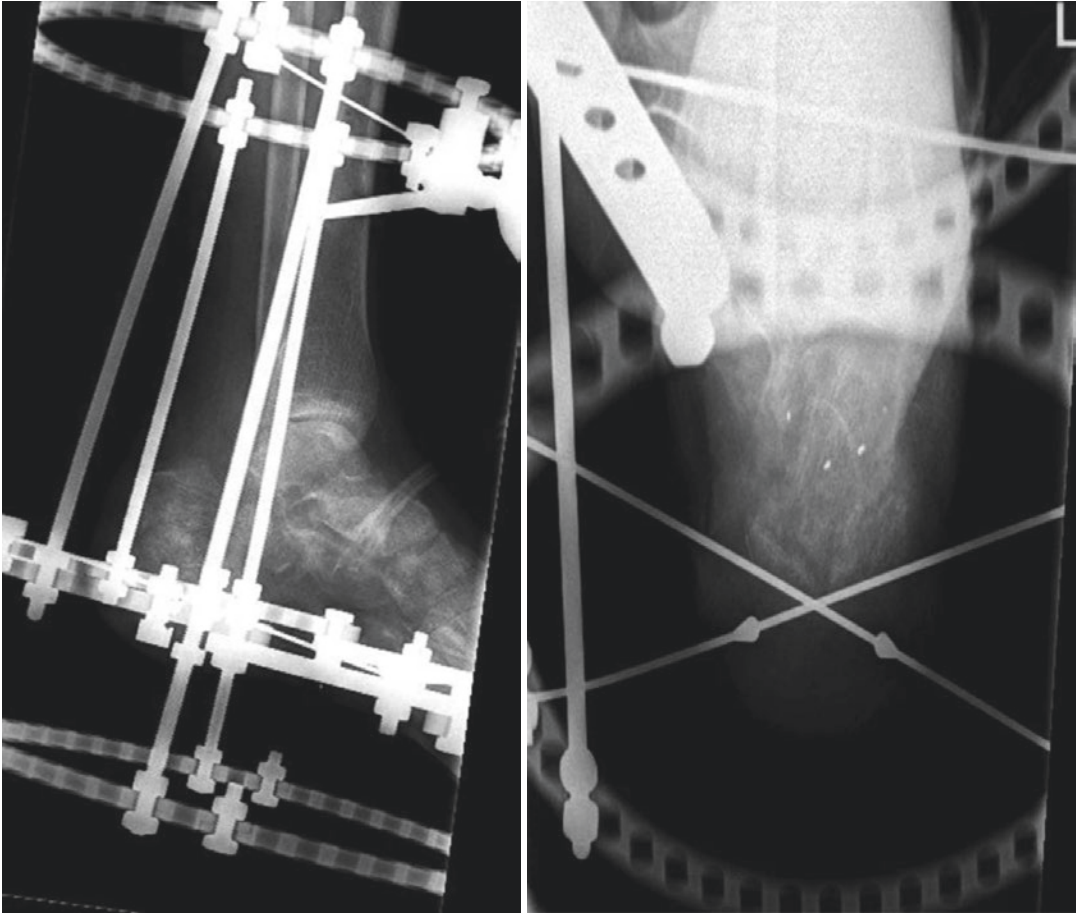
A stabilization of the foot and ankle was achieved by fixing her fracture using circular thin wire external fixation frame (Fig. 20.2), and we left her wounds unsutured and dressed with vacuum drainage dressings (Fig. 20.3).

A second-look procedure in the operating theater was performed under general anesthesia 3 days after the first operation, and additional thorough debridement was performed; vacuum drainage dressings were applied again every 3 days for another 3 weeks (Fig. 20.4).

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**Fig. 20.2** Postoperative radiological pictures demonstrate external fixation of the foot



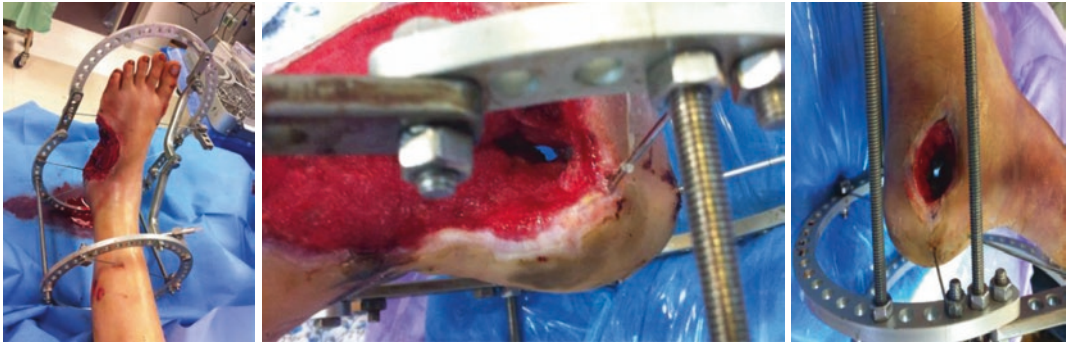
**Fig. 20.3** Postoperative clinical pictures demonstrate external fixation of the foot and open postoperative wounds

After 21 days of vacuum therapy, she was stable clinically, without signs of general and local infection, her wound had clean granulation tissue, and we took her back to the operating room for skin graft over her good granulation tissue (Fig. 20.5).

She started walking with partial weight bearing with the aid of crutches for 3 months after injury and then we removed her circular external fixation,

and gradually she was capable to walk without any aid. Control X-ray examination demonstrate solid healing after comminuted calcaneal fracture with extensive bone loss (Fig. 20.6).

One week later, she was discharged back to Syria 3 months after arrival, with a solid bone healing and without a sign of infection after treating her according to our damage control in orthopedics trauma (Fig. 20.7).



**Fig. 20.4** Clinical pictures 2 weeks after injury demonstrate granulation tissue in the wounds



**Fig. 20.5** Clinical pictures demonstrate good healing of the skin grafts



**Fig. 20.6** Control X-ray examination demonstrates bone healing after comminuted calcaneal fracture



**Fig. 20.7** Clinical pictures by discharging from the hospital demonstrate successful wound healing after complex blast injury with massive tissue loss

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**Part V**

**Internal Medicine**

Raymond Farah

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## 21.1 Case Presentation

This gentleman is 60 years old working as a physician in Derha, Syria, who was admitted with cough and dyspnea without fever, and he was found to have a large left pleural effusion; during his stay in the ward, the patient was treated as follows: large pleural effusion in the left side, as it was suspected to be malignant especially because the patient has a history of smoking. In our department, there is a suspicion of malignancy but showed large pleural effusion. In the second day of admission, the patient developed fever about 39 °C. A diagnostic procedure was done; insertion of needle to the pleural space was done to obtain some fluids for the diagnosis; the analysis of the fluids showed an acidotic fluid with low pH that was compatible with the diagnosis of empyema of the lung as a complication of pneumonia; the patient then had a pleural drainage with large thoracic tube and large spectrum of antibiotic as piperacillin/tazobactam was started. His culture from the pleural effusion showed the presence of *Actinomyces odontolyticus* bacteria.

After 10 days of antibiotics and drainage, he felt much better, had no fever, and no dyspnea or cough. The amount of fluid stayed moderately large, and so an option of treatment with urokinase was suggested to avoid thoracic surgery, and he was treated with urokinase for 3 days with a suction drainage with a significant improvement. He felt much better, the amount of drainage daily was less than 50 cc, and so the drain finally was removed; he remained stable. The histology from the fluid did not show any malignant cells.

During the admission, he was found to have high blood pressure measurements, and treatment was adjusted accordingly with better control. In addition he was found to have uncontrolled levels of glucose, and so insulin and metformin were added.

The patient was discharged from the ward with good condition without dyspnea, fever, and cough and with controlled blood pressure and glucose.

The recommendations: to arrange chest X-ray in the 2 weeks in his country and to continue the therapy for betterment of diabetes and hypertension.

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## 21.2 Teaching Points

Parapneumonic effusions are pleural effusions that form in the pleural space adjacent to a bacterial pneumonia. The following subsets are

recognized. An uncomplicated parapneumonic effusion has “exudative” chemistries, normal pH and glucose, and negative cultures. A complicated parapneumonic effusion typically has “exudative” chemistries, a low pleural pH (pH <7.20), and a low glucose and is often loculated. Empyema fluid typically looks like pus, and organisms are visible on Gram stain, although cultures may be negative. Empyema develops when there is evident bacterial infection of the pleural liquid, resulting in either pus or the presence of bacterial organisms on Gram stain. A positive culture is not required for diagnosis, since there are several reasons why bacteria may not be cultured from an empyema [1–4].

Common clinical features of bacterial pneumonia with parapneumonic effusion include cough, fever, pleuritic chest pain, dyspnea, and sputum production. However, patients may only have one or two of these symptoms. In general, the presenting symptoms, other than pleuritic pain and duration of fever, are not helpful in determining which patients have pneumonia versus pneumonia with a parapneumonic effusion or empyema. Compared to those with pneumonia alone, patients with empyema may report a longer course with several days of fever and malaise rather than hours. Among patients with pneumonia, the presence of a parapneumonic effusion was associated with an increased likelihood of being admitted, a longer hospital stay, and possibly increased mortality [5].

### 21.2.1 Management

In addition to appropriate antibiotic therapy, some parapneumonic effusions and all empyemas will need a drainage procedure. The decision about which parapneumonic effusions need drainage depends on the particular type or stage of parapneumonic effusion. Empyemas may need additional intervention beyond single tube thoracostomy (also known as chest tube drainage), including placement of additional drainage tubes under computed tomography (CT) guidance, thoracoscopy with lysis of adhesions, and decortication. Patients with persistent air leaks often require surgical or endoscopic repair procedures. These choices are discussed in the following sections.

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### 22.1 Patient Description

A 31-year-old man presented to our department of internal medicine from Syria with weakness and weight loss in the last month accompanying night sweating; he also reported the appearance of diffuse pallor of the skin. He denied vomiting, shortness of breath, or any urinary symptoms. There was no history of peptic disease or any gastrointestinal bleeding. His past medical history was unremarkable with no chronic illness or medications. In Syria he has undergone some investigations for anemia without any results until now; in the last 2 months, he continued to receive blood units for symptomatic anemia despite the absence of clear diagnosis. On his admission, he was complaining of weakness, weight loss, and night sweats. His medical laboratory analysis showed a CBC with pancytopenia. On admission, the patient was afebrile; normotensive with normal cardiac rhythm, diffuse pallor was noted. The physical examination was otherwise normal. PR has no rectal bleeding or melena. There was no sign of purpura. Abdominal examination revealed hepatosplenomegaly, enlarged lymph nodes, without other findings. Complete blood count showed leukopenia (1400/ $\mu$ L) and thrombocytopenia (80,000/ $\mu$ L). The hemoglobin level initially was 9.0 g/dL (normocytic anemia MCV 81), RDW 18, lymphocytes 54%, and neutrophils 430. Blood chemistry showed normal level of sodium (135 meq/L) and potassium (3.8 meq/L). Serum creatinine was 0.7 mg/dL, BUN 12 mg/dL, and total bilirubin 0.4 mg/dL. AST was 11 IU/L, ALT 17 IU/L, GGT 21 IU/L, and Alk-Phos 79 IU/L, and a mild elevation of LDH was noted—370 IU/L. CRP was 136 mg/dL. No sign of hemolysis, direct coombs test was negative, and haptoglobin were normal. No schistocytes on blood smear. Fibrinogen was normal. Vitamin level as vitamin B12 was 128, folic acid was 3, ferritin was 2415, iron was 121, calcium was 8.9 mg/dL, phosphorus was 5.1, and uric acid was 5 mg/dL. Peripheral blood smear showed bands 10%, lymphocytosis, and atypical lymphocytes. On abdominal ultrasonography, there was a mild hepatosplenomegaly. An abdominal and chest CT scan was done that revealed mediastinal and axillary lymphadenopathy and hepatosplenomegaly. The urine was normal. A bone marrow biopsy was performed and confirmed the diagnosis of acute myeloid leukemia and evidence of 90% blasts.

After hematologic consultation, the patient initiated symptomatic therapy; during his admission the patient continued to receive blood units. The patient was treated also with

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intravenous fluids and allopurinol until his condition was stabilized; no induction therapy was initiated because of insurance problems; important to note—the day before his discharge, fever was noticed 38.4 °C, just for one time, and according to infectious specialist of the department, the patient need to be treated with large spectrum of antibiotics for neutropenic fever. The patient received only one dose of piperacillin/tazobactam. The patient was discharged from our department to Syria with the recommendation to start the induction therapy as soon as possible in his country according to hematologist consultation and to continue fever follow-up and antibiotic treatment in case of neutropenic fever recurrence and eventual isolation; the patient is candidate for eventual bone marrow transplantation that it should be done in his country.

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## 22.2 Teaching Points

Acute myeloid leukemia (AML, also known as acute myelogenous leukemia and, less commonly, as acute nonlymphocytic leukemia) consists of a group of relatively well-defined hematopoietic neoplasms involving precursor cells committed to the myeloid line of cellular development (i.e., those giving rise to granulocytic, monocytic, erythroid, or megakaryocytic elements).

AML is characterized by a clonal proliferation of myeloid precursors with a reduced capacity to differentiate into more mature cellular elements. As a result, there is an accumulation of leukemic blasts or immature forms in the bone marrow, peripheral blood, and occasionally in other tissues, with a variable reduction in the production of normal red blood cells, platelets, and mature granulocytes. The increased production of malignant cells, along with a reduction in these mature elements, results in a variety of systemic consequences including anemia, bleeding, and an increased risk of infection. Following diagnosis,

AML is classified using the World Health Organization (WHO) classification system based upon a combination of morphology, immunophenotype, genetics, and clinical features [1]. The classification attempts to identify biologic entities in the hopes that future work will elucidate molecular pathways that might be amenable to targeted therapies [2, 3].

There are four main groups of AML recognized in this classification system:

- AML with recurrent genetic abnormalities
- AML with myelodysplasia-related features
- Therapy-related AML and MDS
- AML, not otherwise specified

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## 22.3 Therapy

For patients with a good performance status, we suggest treatment with standard induction chemotherapy followed by high-dose cytarabine consolidation rather than allogeneic hematopoietic cell transplantation (HCT). Since conventional therapy results in poor outcomes, patients with unfavorable karyotypes are encouraged to enroll in a clinical trial of an investigational therapy. As an alternative, patients may choose treatment with supportive care alone.

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Raymond Farah and Gadi Ben-Dror

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## 23.1 Case Report

A 42-year-old Syrian citizen who was injured during the civilian war in Syria had been brought to our hospital after laparotomy and splenectomy done in a Syrian hospital 3 days before arriving to Israel.

On admission, he appeared pale and with dyspneic blood pressure. Pulse and saturation were in normal limits. On laboratory examination, hemoglobin was 6.9 g%, creatinine was 10 mg% electrolytes, and liver function test were normal.

Ultrasound of the kidneys did not reveal any obstructive urinary condition.

He was admitted to the internal care unit where an abdominal and thoracic computerized scan had been undertaken that demonstrated post-splenectomy state, and many shrapnels were scattered in the abdomen. Kidneys and both ureters were intact. No evidence to hydronephrosis was found.

In the right abdomen, an arterial venous aneurysm was demonstrated with arteriography.

The patient underwent hemodialysis embolization of the RT iliac artery.

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## 23.2 Discussion

Acute renal failure (ARF) is an abrupt and usually reversible decline in the glomerular filtration rate (GFR). This results in an elevation of serum blood urea nitrogen (BUN), creatinine, and other metabolic waste products that are normally excreted by the kidney.

ARF has multiple possible etiologies. Among hospitalized patients, ARF is most commonly due to acute tubular necrosis (ATN) from ischemia, nephrotoxin exposure, or sepsis [1].

Other frequent causes of ARF among either ambulatory or hospitalized patients include volume depletion, urinary obstruction, rapidly progressive glomerulonephritis, and acute interstitial nephritis [2–10].

ARF is generally detected by an increase in the serum creatinine and/or a decrease in urine output. The magnitude of the increase in creatinine and/or decrease in urine output that is required to establish a diagnosis of ARF has been the focus of multiple expert consensus groups. The purpose of establishing a precise definition of ARF is to allow better interpretation of epidemiologic and clinical studies and to identify potential therapies. The potential limitations of the different consensus criteria that have been proposed are discussed elsewhere [11–15].

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### 23.2.1 Initial Evaluation After Diagnosis

Among many patients, AKI is mild and is manifested only by a transient increase in the serum creatinine or fall in urine output. However, AKI can cause life-threatening complications, even among those with relatively less severe disease. In addition, the serum creatinine will not accurately reflect the glomerular filtration rate (GFR) in patients who are not in steady state. Thus, among patients who have just developed AKI and in whom the serum creatinine is actively increasing, the estimated GFR (eGFR), based upon the serum creatinine, will overestimate the actual GFR. Conversely, among patients who are recovering from ARF, the eGFR may underestimate the actual GFR [15–20].

All patients who present with AR must be carefully evaluated both for reversible causes, such as hypotension, volume depletion, or obstruction, and for the presence of complications such as hyperkalemia and volume overload. The initial evaluation of the patient with ARF is directed at determining the cause and identifying the complications that may require immediate attention [21–29].

The major complications of ARF include volume overload, hyperkalemia, metabolic acidosis, hypocalcemia, and hyperphosphatemia. With severe forms, mental status changes may be present. Hyperuricemia and hypermagnesemia may also occur. The initial assessment therefore should include the careful evaluation of volume status and measurement of serum electrolytes, particularly potassium and bicarbonate, and serum phosphate, calcium, and albumin. We also check serum uric acid, magnesium, and a complete blood count.

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Raymond Farah and Moise Levovich

## 24.1 Case Presentation

The 23-year-old Syrian patient was admitted in our department due to complaints of dyspnea, dry cough in the last week without fever or weight loss.

No chronic diseases and no regular medication were noticed.

On his admission—the patient was in a good general condition, with mild dyspnea and normal temperature; hypoxemia was noticed—with 87% oxygen saturation level measured in the room air, and hemodynamically stable, pulse was normal, blood pressure 130/80 mmHg.

On physical examination the patient appeared good and not dyspneic; lung examination reveals bronchial breath sounds and decrement over left lung, heart with normal sounds, without murmurs, or friction rub; his abdominal examination was normal; no peripheral lymphadenopathy was noted.

On his chest X-ray, an enlarged mediastinum was found, enlarged heart and left massive pleural effusion (almost left white lung).

Laboratory findings in his admission, HB 11.7 mg/dL, MCV 77.8, WBC 7200, lymphocytes

17.6%, neutrophils 74%, and chemical analysis, were with normal ranges including liver and kidney function tests.

For further investigation, a chest computed tomography (CT scan) was done that showed pericardial effusion, tracheal deviation, moderate right pleural effusion, massive left pleural effusion, and lingular and left lower lobe atelectasis. A massive left mediastinal mass was also noted.

Electrocardiogram—normal sinus rhythm, without ischemic changes.

## 24.2 Conclusion

The 23-year-old patient was hospitalized in our department for the investigation of his last complaints of dyspnea and dry cough. According to the investigations that were done, a massive mediastinal mass breaking through the left lung and pericardium was found.

In this specific case, based on the clinical presentation and radiological findings, the diagnosis is almost clear-malignant tumor.

For further investigations and in order to perform open lung biopsy, the patient was transferred to the chest surgery department in the Rambam Medical Center.

The patient was admitted to Rambam with the same complaints of chest pain.

Another chest CT was performed and the same mediastinal mass was discovered; furthermore,

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the patient was diagnosed with supposed vena cava syndrome for which he received emergency steroid treatment.

In Rambam Medical Center, the patient presented with signs and symptoms consistent with tumor lysis syndrome and renal failure. He was treated with fluids, allopurinol, and dialysis with subsequent improvement of renal function.

Full body CT and PET-CT scan were done to analyze the mass and showed increased mediastinal uptake. However, no tissue was found suitable for sampling. Bone marrow biopsy yielded no clear diagnosis. The residual mass in the mediastinum yielded only necrotic tissue upon biopsy. There were no malignant cells in the pleural effusion that was tapped. No definitive diagnosis could be made and no definitive treatment could be given. The most likely diagnosis however is lymphoma. The option of sampling the mediastinal mass under mediastinal ultrasound is currently under discussion, but the patient has chosen not to wait for the biopsy.

The patient has requested to be discharged from our hospital today before our workup has been completed. We will honor his request but urge the doctors that will treat the patient in the future to sample any mass that should appear and is accessible.

The patient is discharged in good general condition, with mild residual impairment of the renal function.

### 24.3 Discussion

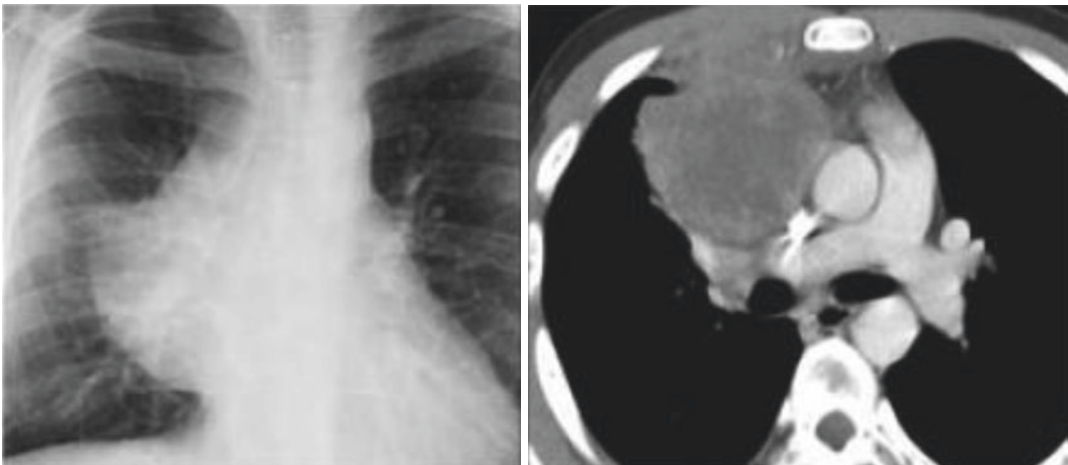
Mediastinal masses comprise a wide variety of benign and malignant lesions. Symptoms may be due to the direct involvement or compression of normal mediastinal structures. Alternatively, systemic symptoms can be present due to tumor or a variety of paraneoplastic syndromes.

The mediastinum is divided into anterior, middle, and posterior compartments (Fig. 24.1). The most common lesions in the anterior mediastinum include thymic lesions, lymphoma, germ cell tumors, and thyroid. In the middle mediastinum, lymphadenopathy is most common and is usually related to sarcoid, lymphoma, or metastatic lung cancer. Neurogenic tumors are the most common cause of posterior mediastinal lesions.

Most mediastinal masses are initially suspected based upon chest X-ray findings, with additional imaging (especially contrast-enhanced CT) being the primary modality to provide additional information about the nature and extent of the pathologic process.

Patient management requires a definitive diagnosis, which generally requires an adequate tissue sample. This may be obtained either by biopsy or as part of a planned therapeutic intervention [1, 2].

*Tumor lysis syndrome (TLS)* is an oncologic emergency that is caused by massive tumor cell lysis and the release of large amounts of potassium, phosphate, and uric acid into the systemic



**Fig. 24.1** Mediastinal mass by chest X-ray and CT scan

circulation. Deposition of uric acid and/or calcium phosphate crystals in the renal tubules can result in acute kidney injury, which results in oliguria or anuria. TLS is observed most frequently in patients with aggressive and highly aggressive lymphomas (particularly the Burkitt subtype) and T-cell acute lymphoblastic leukemia (ALL) following the initiation of cytotoxic therapy, although it may also occur spontaneously and/or in other tumor types with a high proliferative rate, large tumor burden, or high sensitivity to cytotoxic therapy [3–6].

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**Part VI**  
**Surgery**

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and S. Biswas

## 25.1 Case Presentation

A 16-year-old boy suffered a single gunshot to the left lower back, passing anteriorly to the left hypochondrium of the abdomen. He underwent laparotomy in Syria the same day. At laparotomy, splenectomy and distal pancreatectomy were performed, and he was transferred to Israel with a left chest drain and abdominal drains in situ.

On arrival in the trauma room, the patient was fully conscious, breathing spontaneously, and hemodynamically stable. The respiratory rate was 16 breaths per minute, pulse was 98 beats per minute, and blood pressure 145/66 mmHg. A 1 cm diameter wound was seen in the left hypochondrium, and a second wound, also approximately 1 cm in diameter, was seen posteriorly in the left chest. In addition to the laparotomy wound were three abdominal drains and a left chest drain.

Computed tomography (CT) of the chest confirmed surgical emphysema of the left chest wall, left lung collapse, consolidation, and a left pleural effusion. A left pneumothorax remained incompletely drained by the chest drain in situ. Within the abdomen, there was free fluid, the

anterior and posterior surfaces of the stomach had penetrating injuries that had been primarily sutured, a splenectomy was noted, and the tail of the pancreas appeared to have been resected. A laceration of the left lobe of the liver was noted, but there was no active bleeding. No obvious small or large intestinal injury was seen. There was discontinuity of the left ureter and possible drainage of urine through one of the abdominal drains (Fig. 25.1).

The left chest drain was removed and a new drain inserted. The patient then underwent relaparotomy. The small and large intestines were found to be intact. Splenectomy was confirmed. The tail of the pancreas had been resected and sutured. There was no active bleeding from the liver. A drain had been sutured into the left renal pelvis.



**Fig. 25.1** A drain was sutured into the left renal pelvis before transfer to Israel

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The drain was removed, and the severed ends of the left ureter were anastomosed over a JJ stent. The abdomen was lavaged and drains replaced.

Postoperatively, the patient was ventilated on the intensive care unit for 2 days and then transferred to the ward, where he made a steady clinical recovery. Resistant organisms were cultured from the sputum (endotracheal tube) and the rectum: extended-spectrum beta-lactamase (ESBL)-producing *Enterobacteriaceae* and *E. coli*, respectively. He completed a course of intravenous tazocin and gradually built up to a normal diet. His sleep was disturbed, and his mental health remained a concern.

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## 25.2 Teaching Points

The management of the Syrian war wounded has evolved into a protocol which includes full assessment along advanced trauma life support (ATLS) principles in the trauma room, total body CT, an antibiotic regime that takes into consideration a prevalence of antimicrobial resistance, and the policy to reexplore all patients who have undergone laparotomy in Syria [1–5]. This has enabled us to learn exactly what procedures patients have undergone in Syria (we receive no referral letters), look for missed injuries, complete staged procedures, and lavage the abdomen.

---

## 25.3 Clinical Implications

Patients are routinely assessed by a dietician and physiotherapist, and in this instance, a psychiatrist also consulted. We are well aware that the post-traumatic stress that patients from Syria suffer is underdiagnosed and undertreated. This is a priority as we seek to rehabilitate patients and help them reintegrate into society.

## 25.4 Damage Control

On completion of their treatment in Israel, patients return to Syria, still at war and desperately short of medical resources. Rehabilitating patients so that they are equipped to face the challenges they are likely to encounter on their return is a priority that we need to address.

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## 25.5 Summary

As we successfully manage complex war injuries in well-equipped surgical units in Israel, we need to consider the options available to rehabilitate patients to optimize their chances of coping in the austere circumstances of a nation destroyed by over 5 years of civil war.

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and S. Biswas

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## 26.1 Case Presentation

A 47-year-old man was brought to the trauma room by the Israeli Defense Force medical team. He was fully conscious, breathing spontaneously, and hemodynamically stable. A matter of fact, medical record in the trauma room notes his “suffering”; he was in unimaginable pain.

On examination, the pulse was 140 beats per minute and blood pressure 130/90 mmHg. He was speaking coherently and was oriented in time and place. Primary survey revealed multiple open fractures of the left hand and foot, fracture dislocation of the left elbow, fractures of the left tibia and fibula, and burns across 50% of his face, chest, abdomen, and legs. His face and nose were badly disfigured with open wounds and loss of the nasal soft tissues. There was no active bleeding from his wounds. There were no external signs of smoke inhalation.

Focused abdominal sonography showed no fluid within the abdominal cavity or pelvis. He was given intravenous morphine analgesia,

requiring doses that made intubation prudent, especially in view of his facial burns and widespread burns across the chest (Fig. 26.1). He was resuscitated with two liters of crystalloid and two units of fresh frozen plasma. Tetanus toxoid and immunoglobulin and a dose of intravenous amikacin and vancomycin were given as per our protocol for managing the war-wounded from Syria, many of whom have been found to have antimicrobial resistance [1, 2]. The fractures were reduced and splinted and wounds cleaned and covered with silver sulfadiazine dressings.

In keeping with our trauma protocol, the patient underwent total body CT scan with intravenous contrast. In spite of extensive soft tissue injuries to the face and left orbital fracture, there was no intracranial bleeding and no spinal injury. CT scan of the thorax showed bilateral lung contusions and consolidation at the lung bases. No abdominal nor pelvic injury was found. Multiple open fractures of the left leg and foot were contaminated by shrapnel fragments in the skin and soft tissues.

An Intensive Care Ambulance was arranged to transfer the patient to a specialist burns unit.

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## 26.2 Teaching Points

Extensive burns and the pain and morbidity associated with these injuries invariably leave a lasting impression on the treating physician and medical

**Fig. 26.1** The patient arrived fully conscious and in agonizing pain from extensive burns



team. As we work in the trauma room, treating and stabilizing patients, focusing on the clinical problems at hand, is both obvious and essential.

---

### 26.3 Clinical Implications

Treating the war-wounded is neither new nor a departure from the normal practice of a team with extensive experience in combat trauma [3]. It is incumbent in the care that we provide that all facilities available to the Israeli population served by Ziv Medical Center are equally available to casualties from Syria.

---

### 26.4 Damage Control

Transfer to a specialist burns unit is mandatory for patients with these injuries. This high-level care is available only in tertiary level centers in Israel.

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### 26.5 Summary

Making available the highest standard of medical care is a humanitarian imperative.

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# Nonconventional Management of Bleeding Dysgerminoma in Adolescent Syrian Female

27

J. Zidan, L. Hayari, and E. Solomonov

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## 27.1 Patient Description

A 13-year-old Syrian female was admitted to Ziv Medical Center as an emergency case. The patient was operated in Syria 2 weeks prior to her admission because of an abdominal mass; no further data was available. In her primary physical examination, an abdominal distension and diffuse tenderness mainly in the left upper quadrant of her abdomen were found. Her temperature was 38.5 °C. She suffered from tachycardia (129 pulse/min). Lung, abdominal, and pelvic-computerized tomography (CT) showed a 10 cm foreign body in LUQ with a metal finding and a pelvic-mid-abdominal nonhomogenous 9.6 × 15 cm mass with well-defined regular borders (Fig. 27.1).

One day after her admission, an explorative laparotomy was done. A surgical pad in the LUQ with puss around, a pigtail drain inside the small bowel, and a huge pelvic mass, partially necrotic, vascularized, reaching the umbilicus were found. The pad was removed, the puss was washed and drained, the pigtail drain was removed, and the mass was biopsied. Final pathology confirmed the tumor to be dysgerminoma. After 1 week of broad-spectrum antibiotics, she was reoperated;

excision of the pelvic mass and lymph nodes sampling with preservation of uterus and right ovary was performed. In pathological evaluation, a 1600 g weight, size 9 × 16 × 18 cm mass, and three para-aortic lymph nodes 1.3 cm were found. This mass was dysgerminoma: with PLAT strongly positive, C-KIT positive, and high KI-67, two of three lymph nodes with metastases. Following surgery she started treatment with four courses of BEP chemotherapy combination which includes bleomycin, etoposide, and cisplatin. She was hospitalized for all the treatment period, 4.5 months. Abdominal CT after third course of BEP was normal (Fig. 27.2). The patient was sent back home to Syria in very good performance status.

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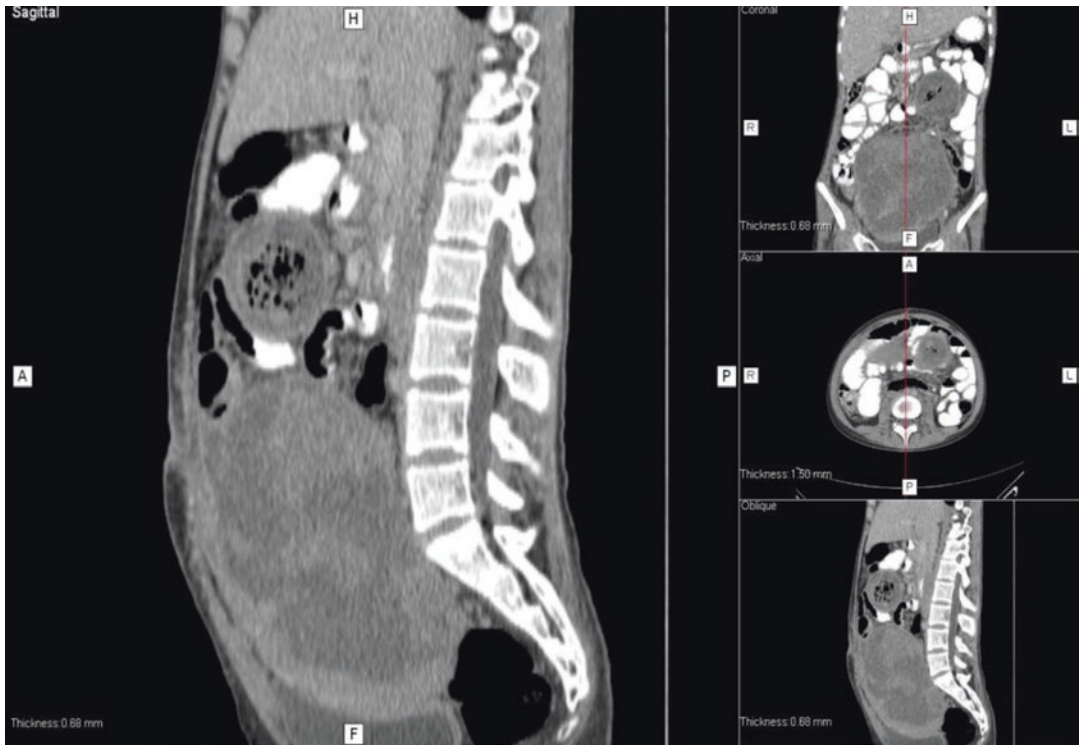
## 27.2 Discussion

Dysgerminoma is the most common germ cell tumor in the ovary. Dysgerminomas are mostly diagnosed at stage I, but they may spread to retroperitoneal lymph nodes [1]. It is acceptable to operate this tumor by laparotomy and not by laparoscopy. In most cases fertility may successfully be preserved by not excising one ovary and uterus. In our case is a young adolescent that was operated in Syria and few days later was admitted to our hospital with sepsis, huge mass in the lower abdomen, acute abdomen, and surgery complication without any diagnosis or any documents

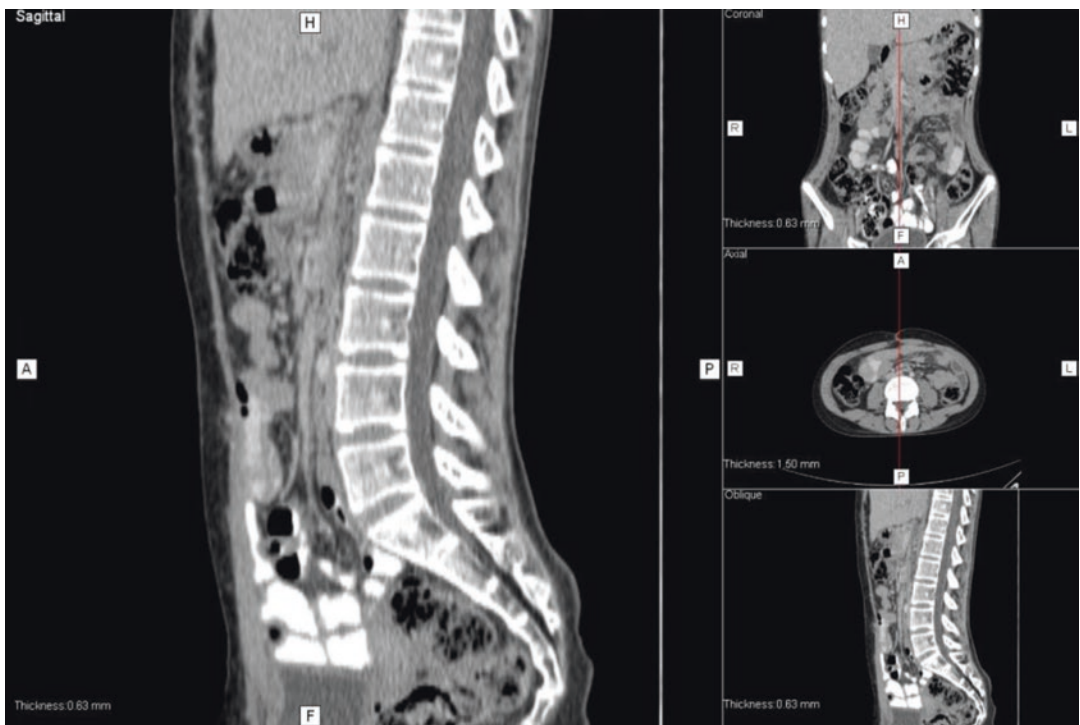
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**Fig. 27.1** Abdominal CT at admission to Ziv Hospital



**Fig. 27.2** Abdominal CT after third course of chemotherapy

about what was done at her country. Treating in these circumstances is more challengeable, and thus the surgery is more difficult although no serious complications were observed after surgery in our hospital. Patients with stage II–IV are treated by surgery and chemotherapy. This tumor is very sensitive to chemotherapy [2]. BEP combination is the acceptable combination since it was used by MD Anderson Cancer Group at 1984 [3]. Six-year event-free and overall survival rates are 86–93%, respectively [4]. In this case the patient was stage III, and it is acceptable after several complicated surgical interventions to start treatment with BEP. Doing so the girl had to stay at our hospital for long period and need not just medical treatment but social and logistical support as well. Israeli patients are hospitalized for the surgery treatment and after that are discharged home, and they come back to the chemotherapy treatment in daily hospitalization setting. For this girl we have to arrange treatment in different setting and to offer all the treatment regime according to the best medical standards although it is more challengeable than for our citizens. At the end, she was in complete response, and the multi-professional staff accompanied the girl in her struggle against the disease in a foreign country. The girl

got back home with a probability of 5-year survival and preserving fertility >90%.

**Acknowledgment** This 13-year-old Syrian girl came here to our Ziv Medical Center with her aunt, a 50-year-old disabled woman, and together they faced the challenges that all cancer patients face. There were days of despair, and more than once they almost gave up and wanted to return home. Many thanks to the hospital staff who did all they could to make this into a happy ending. She has won her life back and returned home as a strong healthy young woman with her reproductive capabilities intact.

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A. Roisentul and D. Lesmes

### 28.1 Case Description

A 24-year-old Syrian male was brought to the emergency department by the IDF Medical Corps. He was fully conscious and aware of his situation, with a GCS of 15. His chief complaint on arrival was “soreness in the throat.”

On extraoral examination, the face was symmetrical with a laceration on his right cheek and swelling and redness on his left neck anterior to the SCM muscle and just below the earlobe. No neurological impairment was noticed in the facial region.

On intraoral examination, mouth opening and movements were within normal range. The occlusion was normal and without dentoalveolar injuries. A deep, non-bleeding laceration of about 35 cm was observed at the soft palate (Fig. 28.1). There were no other injuries, and the patient was otherwise hemodynamically stable.

A CT scan examination of the head and neck area showed a comminuted fracture of the right anterior and posterior wall of the maxillary sinus, a radiopaque foreign body on the left side of the neck soft tissue level (with a well-defined projectile shape). A discernible, well-defined tract of the projectile was observed, passing

through the soft tissues of the naso-oropharynx, posterior to the mandibular ramus without damaging any major blood vessel (Fig. 28.2).

After the thorough work-up, the patient was informed of his situation with the aid of a translator, and informed consent was obtained. Under GA the bullet (Fig. 28.3) was removed from his neck through dissection of the skin in the neck, and the laceration of the soft palate was sutured. There was no need to treat the comminuted maxillary sinus fracture, and it was left for secondary healing.

### 28.2 Discussion

Gunshot injuries have been categorized in the literature as penetrating, perforating, or avulsive. Penetrating wounds are caused by the projectile striking the victim but not exiting the body. The perforating injuries have entrance and exit wounds, classically described as being without appreciable tissue loss. Avulsive injuries have entrance and exit wounds, generally presenting with an acute loss of tissue associated with the passage of the projectile out of the victim. The type of firearm used has implications in the wounding potential of the projectile [1]. In this case, there is a penetrating bullet injury, apparently due to long-distance shooting (sniper). In 2010 Shuker [2] published a report of bullet injuries similar to those that we have seen in our hospital, caused by “falling bullets” from AK-47 rifles in the Middle East.

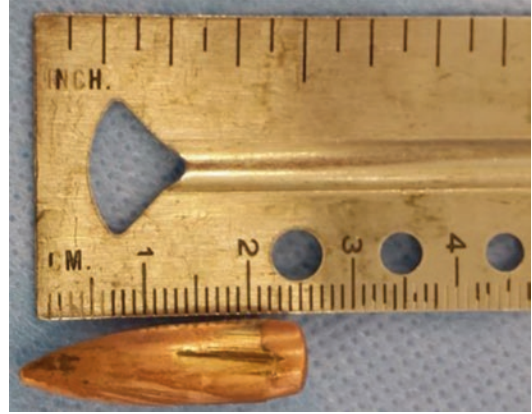
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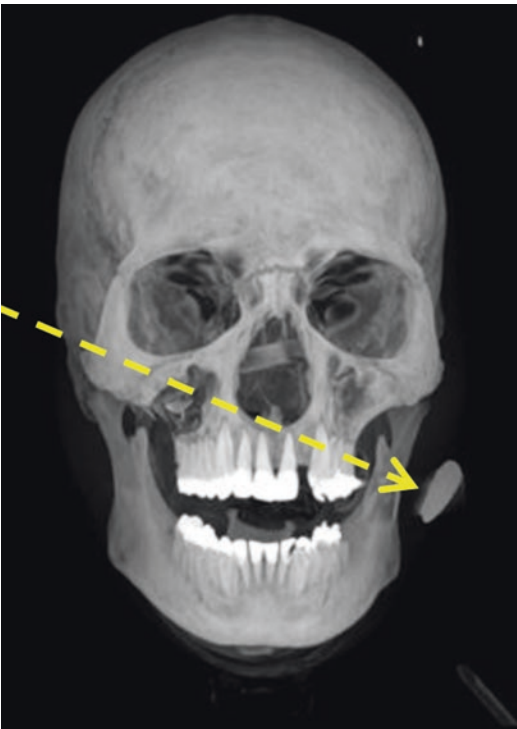


**Fig. 28.1** Bullet tract passing through the palate



**Fig. 28.3** Bullet removed from the patient's neck

The mechanism of the injury is only a little part of the anamnesis, because we have found very often that there is “another” complementary story around this sort of event. Therefore, as in this case, when we interrogated this patient, he told us that after he had been injured, he didn't know what to do. He certainly knew that the only thing he could do was make it to the frontier—to Israel. He asked his uncle to carry him on his donkey and take him to Israel. So he did, and after 3 days of journey in no one's land, he was able to reach the Israeli army post.



**Fig. 28.2** Bullet tract, from the right maxillary sinus to the left side of the neck

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**Part VII**

**Ophthalmology**

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# Ophthalmic Surgery in a Combat Zone: Functioning Under Stress and Shortage

# 29

J. Pikkell

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## 29.1 Introduction

Ocular trauma is always a challenge, and primary care has an essential effect on the final visual outcome. In cases where there is a shortage of medical supply or instruments, this challenge exceeds enormously. We present here a case report describing an epical effort of an ophthalmologist beyond the border to save sight and the original ways he found to operate under an extreme shortage and distress. Acting in extreme situations such as in war may require improvisation and courage.

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## 29.2 Patient Description

During the Syrian civil war, a wounded 46-year-old male was admitted to our hospital with a penetrating trauma to his right eye about 6 weeks prior to his admission. It appeared to us that he had been operated on the day he was wounded, by a Syrian doctor who managed to close a large central corneal penetrating wound. In the initial surgery done under retrobulbar anesthesia, the

remnants of the lens were washed out. The week after the first surgery, the patient developed a large central infected keratitis and a process of corneal melting. The same doctor performed thereafter a penetrating corneal transplantation, but due to shortage of preservative liquid, he had to harvest the donor's cornea and immediately do the grafting on the recipient. The graft was sutured by continuous 8-0 nylon sutures due to shortage of other more delicate sutures. The patient was then sent to us to complete the treatment with a posterior vitrectomy in which we succeeded in taking out from the vitreous a foreign metal body 2 × 1 mm in size; we also removed more lens material that was dropped to the posterior segment during the trauma. We then replaced the corneal sutures with 10-0 nylon continuous sutures and implanted an anterior chamber artificial intraocular lens—measured and calculated as for the other eye. The patient was then discharged equipped with drops of dexamethasone and antibiotics.

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## 29.3 Discussion

One can only appreciate the tremendous efforts of operating in a war zone and in extreme situations of shortage. The Syrian doctor succeeded in closing the primary wound and afterward to do a penetrating corneal transplant on an infected melting cornea—not a simple procedure even in

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the good conditions of a well-equipped Western hospital—with no preservative liquids and having only thick sutures. His efforts were fruitful as we could do the posterior procedures through the corneal graft and actually complete the surgical intervention. Ophthalmic surgeons can easily see what was done in previous operations on the eye since most of the eye tissues are transparent and to skip over no documents of what was done at Syria. We are usually accustomed to work in a supportive environment and in optimal conditions; however, life does put, sometimes,

challenges as shortage of equipment or trained personnel and not optimal conditions. Finding solutions as suturing with a thicker suture or an immediate transplant of a harvested cornea has to be appreciated when done in a combat zone. Primary care in ophthalmic trauma has a major impact on the final visual outcome. In this case improvising made a good result possible.

Finding unconventional solutions in difficult times are exactly the peak of professionalism where experience and knowledge play an important role.

Joseph Pikkell, F. Issa, and Y. Ben Shoushan

## 30.1 Case Presentation

A 13-year-old boy was admitted to the emergency room in the Ziv Medical Center in Safed, Israel, by the medical staff of the IDF. The soldiers reported that the boy was a shepherd and was injured while he was playing with a little shell that failed to explode, unaware of the hazard. The boy was given some initial medical help by local doctors, and the family was advised to try to cross the border in order to get proper medical care in Israel—though there is a state of continuing conflict between the two states. The older brother preferred to try to get some help in Lebanon, but his attempt to cross from Syria to Lebanon in search for help failed due to the Lebanese border keepers' refusal to let him in. The family was then advised to come to the Israeli border in seek for help. The boy was brought to the border by his older brother riding on the back of a donkey telling the Israeli medical staff the whole story and was immediately evacuated to our hospital.

On admission, the boy was unconscious, a bit dehydrated, but in a stable hemodynamic condition. His right palm was missing, and the stump was bandaged. He suffered from multiple shrap-

nel injuries in the front part of his torso and legs. His two eyeballs were totally destructed (Fig. 30.1). He was operated the morning after arrival by the orthopedic surgeons in order to arrange a proper stump and by the ophthalmologists in order to arrange for proper two sockets if he would need it for ocular prosthesis.

The department of social work was then taking the lead in treating the boy. An Arab native speaker and social worker was taking care of him 24 h a day, and a week later we have decided that we have to deliver the bad news that the boy will be blind in both eyes for the rest of his life.

In this case, delivering such a message raised difficulties that were unusual. The boy was hospitalized with no family member or any relative and, therefore, had no family support. The loss of a right palm has special meaning in Islam. The loss of sight in such a young age in the Arab society and culture raises even greater difficulties in integration in society and raising a family compared to western society. Eventually the bad news was delivered by an ophthalmologist accompanied by two senior social workers, one of which was the social worker that accompanied the boy through his whole stay in the hospital. The decision was to give the message in a clear way, stating the real situation without giving any false expectations. It was clear to us that the boy already knows that he lost his right palm, but the truth about the final visual loss without any possible

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**Fig. 30.1** The Syrian war casualty

correction had to be delivered. Though he was only 13 years old, we deliberately talked to him in a grown-up manner.

At the beginning it seems that the boy got the bad news and accepted the situation as it is. We arranged for an instructor that taught him how to use a blind cane; however, at the end he did not want to use it explaining that the use of a cane in his house—or what remained from it—is not explicable. On discharge, the staff felt that the boy did not really process the loss and is still in its angry phase.

The boy was released after about 3 months and got back to his family. Due to the Syrian war, we lost contact with him.

## 30.2 Discussion

Delivering bad news is always difficult and challenging [1, 2]. In this case, we had more difficulties that were due to:

- Differences of culture—Israel in general is an open-minded multicultural democratic society versus the Syrian society.
- The difference in language and the need of constant translation.
- A very young patient.
- No available family support while delivering the bad news.
- No possibility for longtime follow-up and longtime psychological processes.

Usually, while having to deliver bad news, we use the SPIKES model which is a six-step strategy for breaking bad news. The six steps are setting up the interview surrounding, assessing patient's perception, obtaining the patient's invitation, giving knowledge and information, addressing the patient's emotions with empathy, and giving strategies for the future.

Regarding this model, the setting of the surrounding was not necessary in these circumstances, and the patient kept asking us about his medical condition but did not really invited us; however his perception was clearly good, and much more than expected in his age, we did approach him emphatically and gave him the whole information. As to strategies, patients who have a clear plan for the future are less likely to feel anxious and uncertain. In this manner we felt that the loss of contact and ability of a long psychological process is a huge disadvantage in this case.

In previous studies, the need for training residents and senior doctors in delivering bad news was found as a crucial factor in doctors' training. Improving our communication skills might be of great help in a situation where breaking bad news is needed [3, 4].

In regions like ours—where violent conflicts are unfortunately common—the medical staff as well as other health-care staff should be prepared for these unpleasant situations of bad news breaking. Hospital managements should think in advance so as to prepare and instruct the staff for improving communication with patients and handling extreme situations.

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**Part VIII**

**Obstetrics and Gynecology**

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# Delivery of a 15-Year-Old Syrian Woman with Transverse Lie Twins

# 31

I. Ben Shachar, D. Peleg, G. Azoughi, and S. Heib

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## 31.1 Case Presentation

A 15-year-old Syrian teenager with a twin pregnancy and having labor contractions was taken to the border with Israel, and arrangements were made with the Israel Defense Forces to transfer her to the Ziv Medical Center, Zefat, Israel. This was her first pregnancy, and by her LMP, she was 40.3 weeks. She had poor prenatal care with no prenatal testing at all. It was known that she was G6PD deficient. The remainder of her history was unremarkable.

Upon arrival at the hospital, both fetuses had normal monitoring, and there were irregular uterine contractions. The cervix was dilated to 2.5 cm with 80% effacement. Ultrasound showed the lie was transverse for both fetuses.

Since labor was diagnosed, an emergent primary low segment cesarean section was performed via Pfannenstiel incision under spinal anesthesia. The first baby was a baby girl with birthweight 2644 g and Apgar 5 and 9. The second baby was also a baby girl with birthweight 2145 g and Apgar 6 and 9.

Following the operation, the patient did well. Bleeding was normal and the uterus well con-

tracted. She started breastfeeding. On postoperative day 5, arrangements were made for discharge with transport back to her family in Syria.

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## 31.2 Teaching Points

Handling a high-risk pregnancy patient in a war zone when most medical data is either partially missing or absent is a complicated situation that requires a quick and thorough workup and intervention by a well-trained staff.

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## 31.3 Clinical Implications

The decision to transfer this patient to Israel from Syria was made for both medical and humanitarian reasons. First, she undoubtedly needed an emergent cesarean section, given the abnormal lie of the fetuses. With her poor prenatal care, the exact status of the fetuses could not be determined locally. Also, with uncertain dating, these babies might actually be premature and need intensive neonatal care to minimize morbidity and mortality. Facilities for emergent cesarean and intensive neonatal care were evidently not available in her community. Transverse lie carries a high rate of both maternal and neonatal morbidity and even mortality in labor. Delivery should be carried out without delay in a hospital well-equipped for complicated cesarean delivery [1].

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Attempting to deliver this woman in an out-of-hospital setting could end tragically for both the mother and the children.

Another medical and humanitarian aspect of this case concerns the young age of the patient. Young maternal age increases the risk for adverse pregnancy outcomes and is a strong predictor for preterm delivery and low birthweight [2] as seen in the weight of the second twin in our case (16th percentile).

Finally, this patient was sent alone to the border with no family support, raising the possibility of abuse or that her life was in danger, and she or her family feared for her or the babies and therefore decided she should not be delivered locally. These aspects of delivery among adolescents at risk are well known in our community and social workers are always involved. Unfortunately, no postpartum follow-up of the mother and infants could be achieved under the current circumstances.

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### 31.4 Damage Control

No doubt that that delivery of twins with transverse lie could have ended in neglected shoulder presentation (delivery of the hand of the first fetus) which is a dangerous situation that could result in major morbidity and even mortality of both mother and fetus.

### 31.5 Summary

This is a case report of an adolescent pregnant woman crossing the Syrian-Israeli border because of labor contraction. The patient was diagnosed to have a term twin pregnancy with transverse lie of both fetuses. After a quick workup, she was rushed to the operating room, and a successful cesarean section was performed with delivery of two healthy fetuses. Both the adolescent and newborns were sent back to Syria within a week of an uncomplicated post-op follow-up. This case represents many more cases of pregnant Syrian women suffering from devastating conditions that seek assistance in our institute. Needless to say that this is completely a humanitarian act that we sincerely hope will lead to improve relations between citizens on both sides of the border.

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## 32.1 Case Presentation

A 30-year-old Syrian woman in her fifth pregnancy was admitted to the Ob-Gyn Department at the Ziv Medical Center for counseling regarding fetal malformations at 32 weeks of gestation. She reported good general health, no known allergies, and smoking few cigarettes a day. Her past obstetric history comprised two normal pregnancies ending at term with spontaneous vaginal delivery. Her third pregnancy ended at 40 weeks in a cesarean section—a 3000 g malformed fetus was born but died shortly after birth with no further genetic or pathology work-up. The following pregnancy ended 1 year ago at term, delivering a healthy baby boy by cesarean section. She conceived with her current pregnancy while breastfeeding, so was unaware of the exact gestational age. She was told by a physician in Syria that there is “something wrong” with her fetus so she decided to come to the border and get assistance from the Israeli medical system.

On the ultrasound scan, we observed a breech-positioned live fetus, biometry measurements were 28 weeks and fetal weight estimation of 1340 g. Anhydramnios and severe ventriculomeg-

aly were striking at first glance. Although the lateral ventricles measured 20 mm, the head biometry measured 26 weeks. The posterior fossa organs could not be defined and a large posterior defect in the cranium with retraction of the brain tissue and CSF into it; an encephalocele was defined. The spine was normal. In the abdomen, no stomach was detected, and two large symmetrical hyperechoic masses with many small cysts were demonstrated at the level of the kidneys compatible with cystic dysplasia. No bladder was observed although two vessels were defined at the anatomic position. The femur was mildly bowed. A detailed survey of the long bones and hands and feet was not feasible due to the lack of amniotic fluid and curved position of the fetus. After discussing the probable diagnosis with the mother and explaining that the fetus will probably die of renal dysplasia and lung hypoplasia, she opted for termination of pregnancy. In accordance with the Israeli law, she was transferred after genetic counseling to the nearest advanced pregnancy clinical ethics committee in order to consider termination of her pregnancy. The committee reviewed the sonographic data and approved the women’s request. Thus, she was transferred back to Ziv Hospital, and after informed consent, feticide was successfully performed. Considering two previous cesarean deliveries, she underwent a hysterotomy in order to evacuate the uterus and terminate the pregnancy. A male fetus weighing 1530 g was born. A large encephalocele and large

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abdomen were prominent. Unilateral postaxial polydactyly could be observed in the left hand and severe bilateral clubfoot (probably positional due to the oligohydramnios). The woman declined pathologic and genetic testing. On postoperative day 5, she was discharged and accompanied back to the Israeli-Syrian border.

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## 32.2 Teaching Points

These findings lead to the probable diagnosis of Meckel-Gruber syndrome (MKS). This is a lethal autosomal recessive developmental disorder known to be diagnosed by a triad of clinical signs: cystic renal disease, occipital encephalocele, and polydactyly (postaxial) [1–3].

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## 32.3 Clinical Implications

Prenatal diagnosis of MKS has been described as early as 11 gestational weeks [4, 5] with encephalocele being a prominent early sign and polydactyly easily detected at this stage while difficult to diagnose later when oligohydramnios is severe. Inheritance is autosomal recessive with similar occurrence in males and females. The pathophysiologic mechanism common to other disease involving CNS malformations is ciliopathy. Many genes have been associated with this condition. Lately with evolving advancement in genetic research, techniques like massive parallel resequencing and next-generation sequencing have been used to determine the exact locus of the mutations [6, 7] in order to counsel properly affected patients.

### 32.3.1 Damage Control

Our correct diagnosis and prompt management allowed effective alleviation of her concerns and distress, although this case raises some ethical problems relating to the termination of pregnancy of a foreign citizen by a local clinical ethics committee.

### 32.3.2 Summary

The presented case describes a Syrian woman, carrying a severely malformed fetus, who seeks help over the border. Sonographic evaluation in our institute revealed the typical findings of Meckel-Gruber syndrome: dysplastic kidneys and occipital encephalocele. Because of the bad prognosis of this syndrome and patient's wish to terminate the pregnancy, she was transferred to the nearest advanced pregnancy clinical ethics committee which approved the women's request. The procedure was performed with no complications, and the patient was sent back to Syria. This case raise some ethical issues relating to foreign citizen late termination of pregnancy.

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