



Experience of the Orthopedic Surgeon in the Management of War Victims

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Abstract: Surgery for victims of war is different from surgery for civilian injuries. War wounds are always extremely contaminated, and missiles may cause massive destruction of soft tissues, bones, and other structures. The principles of surgery for war wounds have been known for decades but need to be relearned by each new generation of surgeons working in a war situation. People were not at all prepared for a physical fight. Similarly, the medical institutes were not specially prepared for such a sea of casualties all of a sudden. The study's aim was to analyze the result of our experience in the surgical management of the gunshot patients admitted to *Al-Bayda* teaching hospital during the first month of the Libyan revolution of February 2011. The total number of patients admitted to Al-Bayda teaching hospital in the period from 16\2\2011 to 16\3\2011 was 288 patients. We have done debridement and repair of the wounds and fixation of fractures in different settings and follow-up was carried out for 7 months. Our orthopedic morbidity rate was 9 %, and infection was recorded in 30 patients 21%. We, as a team of orthopedic, vascular, and general surgeons, gained a very good exposure and experience to manage war or civilian unrest victims.

Keywords: Orthopedic; Gunshot; Civilian; Fractures.

INTRODUCTION

The evacuation and care of wounded people have evolved throughout the history of warfare. In the recent conflicts in Iraq and Afghanistan, an echeloned approach to trauma care has been instituted (Bagg *et al.*, 2006).

The first aid provided at the point of wounding or at the safest place near the battlefield and rapid evacuation are of vital importance, because mortality and morbidity increase with delay between wounding and treatment. The more effective the first aid and the quicker the evacuation to a hospital, the better will be the final results. If first aid is inadequate or unavailable and the evacuation chain is long, then the outcome will be more disaster (Dufour *et al.*, 1998). Even though the people of Libya were keen for liberation and freedom, the unrest was unprepared and un-

precedented. People were not at all prepared for a physical fight. Similarly, the medical institutes were not specially prepared for such a sea of casualties all of a sudden. The maximum number of patients was hospitalized on 17/02/2011 approximately 60% of war injuries involve the limbs and musculoskeletal system, the orthopedic surgeons suppose a pivotal role in the frontline treatment of these injuries, Providing battlefield orthopedic care poses special challenges, because lack of experience and working under difficult conditions, many wounds are unlike those encountered in civilian practice (Covey, 2006). Our teaching hospital was not prepared and did not have enough beds, medicines, materials, necessary equipment, and instruments to meet a large number of patients at a time with various types of gunshot injuries. Our reason for conducting this study is to highlight the unexpected load on or-

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thopedic surgeons' performance during the management of civilian war victims.

MATERIALS AND METHODS

Our materials depended on the patients admitted to the Al-Bayda teaching hospital managed by what we have at that time without any preparation and lack of instrument, beds, and experience in the management of gunshot patients all of a sudden. The total number of patients admitted to Al-Bayda teaching hospital in the period from 16/2/2011 to 16/3/2011 was 288 patients, Exclusively 140 patients had musculoskeletal related gunshot injuries. Associated injuries include general surgery, fall-down, and road traffic accidents (Table.1).

Table(1). Number of patients admitted during the period of study (16/2/2011 – 16/3/2011)

Type of trauma	Number of patients
Gunshot [Musculoskeletal]	140
Gunshot [Abdomen]	16
Gunshot [abdomen and chest]	21
Gunshot [Head and neck]	19
Gunshot [scrotum]	2
Road traffic accident	2
Fall down	6
Combined [General surgery + Musculoskeletal]	82
Total	288

The patients' ages varied from 15 to 60 years. One 15-year-old patient sustained a gunshot to the left little finger, and there was only one female patient aged 30 yrs who had a gunshot injury to the left shoulder (Table.2).

Table:(2). Age of the patient with type of trauma

Age of the patient	No. of patients	Type of trauma
5 – 10	3	Road traffic accident + fall down
11 – 15	3	Fall down + gunshot
16 – 20	35	Gunshot + Fall down
21 -25	67	Gunshot
26 -30	82	Gunshot
31 -35	40	Gunshot
36 – 40	29	Gunshot
41 – 45	20	Gunshot
46 – 50	4	Gunshot
51 - 55	2	Gunshot
56 - 60	3	Gunshot
Total	288	

The majority of patients were admitted in the first week of the revolution, and the maximum number was on battle of the Shahhat battalion (the head battalion in Jabal-Al-Akhdar) on 17th of February 2011 were 56 patients hospitalized (Fig. 1).

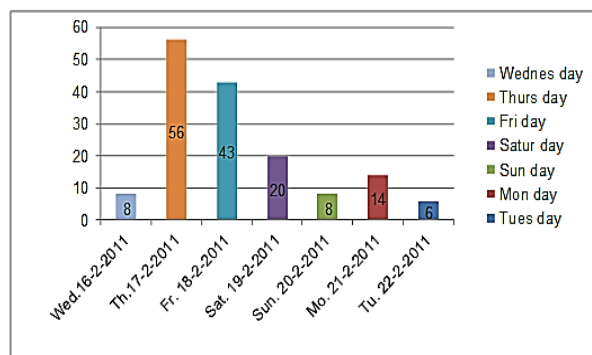


Figure: (1). Number of patient admitted in the first week of revolution.

We, as a team of orthopedic, vascular, and general surgeons, gained the exposure necessary to manage the different types of gunshot injuries explained in (Table.3).

Table: (3). Operations done by the general, vascular, and orthopedic surgeons.

Type of injury	Surgical operation	Number of patient
Abdominal gunshot (16) patients	Nephroctomy	(4) patients
	Nephroctomy + splenectomy	(1) patients
	Laprotomy with Bowel injury	(11) patients
Thoracic gunshot (21) patients	Chest tub thoracotomy	(11) patients
	Chest superficial	(5) patients
	Chest superficial	(5) patients
Vascular injury (12) patients	Vascular repair With fracture fixation	(7) patients
	Vascular repair without fracture	(5) patients
	Above knee amputation	(2) patients

The following treatment was offered to the patients by the orthopedic team; External fixation in 37 cases (27%), Ilizarov external fixation 5 cases (4%), K-wire in 5 cases (4%), screw in 2 cases (1%), dynamic compression plate (DCP) in 1 case (0.5%), proximal femoral nail (PFN)

in 2 cases (1%), debridement and gypsum splint application in 35 cases (24%), and superficial wound management done in 53 cases (38%) (Table. 4). Following treatment and stabilization of immediate life-threatening conditions, all patients were given antibiotics, but tetanus prophylaxis was not available.

Table: (4). Type of orthopedic fixations

Type of fixation	No. of patient
External Fixation	37
Iliizarov Ext.Fix	5
K.Wire	5
Screw	2
DCP	1
PFN	2
Debridement + Gypsum	35
Superficial injury (wounds)	53
Total	140

RESULTS

After a period of follow-up for 7 months, we get the following result; 12 patients had nerve injury, sciatic nerve in three cases, common peroneal nerve in two cases, median nerve in one case, radial nerve in five cases, and ulnar nerve in one case (Table.5).

Table: (5). Number of patients with nerve injury

Nerve injury	Number of patients
Sciatic nerve	3
Common peroneal nerve	2
Median nerve	1
Radial nerve	5
Ulnar nerve	1
Total	12

Our complications, encountered in our series of exclusively 140 patients, had musculoskeletal related gunshot injuries, vascular injury post-gunshots were 12 patients. Seven patients had fractures and 5 patients were without fractures, 2 patients had upper limb vascular injury and 10 patients had lower limb vascular injury; out of the 12 patients, 2 patients had above-knee amputations (Table.6).

Table:(6). Complications in the 140 musculoskeletal related gunshot patients

complications	No, of patients	Percentage
Infection after 2 weeks	30 patients	21%
Nonunion (7 months full up)	5patients	3%
Failed nerve repair (7 months full up)	5patients	3%
Stiff knee (7 months full up)	2 patients	1%
Amputation	2 patients	1%
Our orthopedic morbidity rate	12 patients	9%

One patient had a bad mutilating injury of the hand, which usually leads to amputation. We performed debridement and repair, including fixation of fractures by K.wires and plastic surgery in different settings which has resulted in a partially functioning cosmetically acceptable hand.

DISCUSSION

The range of primary blast injuries includes fractures, amputations, crush injury, burns, cuts, lacerations, acute occlusion of an artery, air embolism– induced injury, compartment syndrome, and others. Secondary, tertiary, and quaternary injuries are also commonly seen in extremity blast injuries. Severe contamination and tissue damage are the major problems (Bumbaširevic et al., 2006). During our work, we have done timely debridement, fracture fixation, post-operative follow-up for seven months, found reasonable results, and we agree with MSF USA (2016). Still, adequate staff, doctors, beds, materials, medicines, instruments, equipment, and orthopedic appliances would have helped us to achieve a much better result, and with the onset of armed conflict in 2011, many foreign workers left the country, so the health system is presently in a critical state.

The AAOS/OTA Extremity War Injuries (EWI II): Development of Clinical Treatment Principles symposium, held in January 2007. EWI II sessions focused specifically on four separate areas (Defense Casualty Report 2007):

- (1) Prehospital management of extremity wounds
- (2) Initial debridement
- (3) Early stabilization
- (4) Postoperative wound management during their evacuation process.

In comparison to the (EWI II) in our study, we missed the first stage because of the lack of experience and working under difficult conditions and we focused on initial debridement, early stabilization, and postoperative wound management.

Gunshot injuries to the musculoskeletal system in our study constituted 65%. (EWI II) published that 26% of these individuals had sustained fractures (Ficke and Pollak. 2007). Whereas (Covey, 2006) published that approximately 60% of war injuries involve the musculoskeletal system

Amputee care remains complex and challenging. Recent medical, surgical, rehabilitative, and prosthetic advancements have raised both patient and caregiver expectations for outcomes. The rate of major amputation, as a percentage of all battle injuries, was 1% in our study as two patients had above –knee amputations, which was 12% during the American Civil War (Potter and Scoville 2006).

We agree with Owens et al. (2006) Current treatment protocols favor the inclusion of timely and stable axial limb fixation, radical debridement of all compromised soft tissues and osseous structures, and early wound closure, in an attempt to minimize overall morbidity and to achieve the highest level of function possible.

CONCLUSION

Treatment of war or civilian unrest wounds, many of which are devastating in the scope of soft-tissue and bony injury, requires a team approach using hypotensive resuscitation, damage-control orthopedics, newer techniques of hemostasis and vacuum-assisted wound closure, and advanced reconstruction. Current challenges include prevention of infection, het-

erotropic ossification, good cosmetic and functional results, adequate rehabilitation, physical therapy, and occupational therapy services, as well as psychiatric, or other services, when necessary

We strongly recommend having a specialized trauma center with adequate facilities, material, and trained qualified personal.

We, as a team of orthopedic, vascular and general surgeons, gained very good exposure and experience to manage the war or civilian unrest victims in 2011.

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خبرة جراحة العظام في معالجة ضحايا الحروب

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المستخلص: جراحة ضحايا الحرب تختلف عن الجراحات التي تم التدريب عليها من إصابات المدنيين، فالجروح التي تحدث من إصابات الحروب دائما ملوثة للغاية مع تهتك في الأنسجة وكسور في العظام بسبب الصواريخ. إن مبادئ الجراحة الخاصة بمعالجة جروح الحرب كانت معروفة لعقود من الزمن ولكنها تحتاج إلى إعادة التعرف عليها من قبل الجيل الجديد من الجراحين العاملين في حالة حرب. لم يكن الناس مستعدين للقتال الجسدي. وبالمثل، لم تكن المراكز الطبية مستعدة بشكل خاص لبحر من الضحايا وبشكل فجائي. الهدف من الدراسة كان تحليل النتائج من خلال خبرتنا في المعالجة الجراحية للإصابات الناتجة عن الأعيرة النارية والتي تم ادخالها لمستشفى البيضاء التعليمي خلال الشهر الأول من الثورة الليبية لسنة 2011 م. حيث أن العدد الإجمالي للمرضى خلال الفترة من 2011\2\16 إلى 2011\3\16 وصل إلى 288 مريضاً. لقد قمنا بتنظيف الجروح وتثبيت الكسور على مراحل متعددة لمدة وصلت إلى 7 شهور من المتابعة، حيث وصل معدل اعتلال العظام إلى 9% بينما معدل الالتهاب والتي تم تسجيلها في 30 مريضاً 21%. وقد اكتسب فريق جراحة العظام والأوعية الدموية والجراحة العامة خبرة واسعة في التعامل مع ضحايا الحرب وإصابات المدنيين.

الكلمات المفتاحية: طيبب العظام، الطلقات النارية، المدنيين، الكسور.