The Use Of External Fixator In The Management Of Gunshot Related Open Limb Fractures

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Objective: To review our experience on the use of external fixators in the management of open limbs' fractures caused by gunshot at Panzi Hospital over the last 4 years.

Patients and Methods: This retrospective study was done at Panzi Missionary Hospital located in Bukavu, Democratic Republic of Congo. External fixators were applied in 62 patients affected by limb war injuries with fracture. Upon admission patients were evaluated, stabilized and submitted to basic preoperative investigations. Under general, spinal or regional anaesthesia a wound exploration and debridement was performed followed by fracture stabilization with external fixators. These devices were removed and replaced by POP casts once soft tissue injuries had healed. Physiotherapy was started as early as 2nd post-operative days.

Results: A total of 17 complications were recorded. They included 2 cases of pseudoarthrosis, 10 osteitis, 4 limb gangrene and 1 tetanus case. Only 2 (pseudoarthrosis) could, possibly, relate to the use of external fixators and healed after bone graft. One patient died (the one who developed tetanus).

Conclusions: External fixators can be quite helpful in experienced hands in selected cases of war wounds of the limbs with fracture.

Introduction

Panzi Missionary Hospital is one of the three-referral hospitals of Bukavu in the Democratic Republic of Congo. It was recently built and opened its door few weeks after the rebellion started.

During the past two years the International Committee of the Red Cross (ICRC) has supported the hospital by providing surgical material, drugs and specific surgical training to improve the management of the war-wounded civilians and military. An "in ward" and "in OT" training is delivered, twice a year, by the ICRC Regional Surgeon from Nairobi. We, thus, started to apply ICRC advices and guidelines for the management of war wounded patients [1-4] and adapt our orthopaedic skills and knowledge to this special category of patients.

Patients and Methods

This was a retrospective study covering a four-year period, from September 1999 to August 2003, based on review of the patients' medical files. During this period 2012 patients were admitted in the surgical ward, 611 of who were trauma cases. 220 of these had been wounded by gunshot and 62 presented open fractures, which benefited of an external fixator.

Upon admission and after a comprehensive clinical evaluation, these 62 patients were stabilized haemodinamically (usually with IV crystalloids and colloids and, in rare cases, with blood transfusion). All of them received antitetanus serum and a boost of vaccine and antibiotic prophylaxis (Penicillin G 5 mega 6 hourly for 48 hours followed by oral Penicillin V for 3 days). Before operation they underwent the following preoperative investigations: x-rays of the affected limb, haemoglobin and blood grouping.

The anaesthesia used was either spinal, in case of lower limb injury, or regional (cervical or axillary block), in case of upper limb injury or general (Ketamine and Diazepam), in case of uncooperative or shocked patients.

The surgical procedure consisted of a systematic exploration of the wound, a tissue debridment, a fasciotomy in case of compartment syndrome risk, followed by a "de visu" fracture reduction and contention by external fixator.

Due to the significant oedema caused by the high-energy bullet injury combined with the surgical trauma, the wound was left open and dressed with a loose bulky dressing and the limb elevated. The patient was then taken back to the operation theatre and reviewed, usually after 5 days. Once the wound was clean, a delayed primary closure or, in case of tension, a skin graft was performed.

After healing of the soft tissues, the external fixators were removed and fracture stabilization obtained with plaster of Paris (POP) cast. All patients were encouraged to have early physiotherapy to promote a stronger callus, reduce the risk of joint stiffness, osteoporosis and bedsores.

Results

Table 1. Location of Fractures

Upper limb				Lower limb			
Arm		Forearm		Thigh		Leg	
Right	Left	Right	Left	Right	Left	Right	Left
2	6	1	0	6	5	18	24

Table 2. Complications of open Fractures.

Type	Number	Management
Pseudarthrosis	2	Osteosynthesis + bone grafting + POP
Osteitis	10	Antibiotic therapy according to antibiogram / sequestrectomy
Tetanus	1	Specific care
Gangrene	4	Amputation
Death	1	

Table 1 shows the location of the fractures. Forty-two patients were males and 20 females. The mean age was 40 year-old with a range between 9 and 72. External fixators were used in 62 cases of gunshot wounds with open limb fractures between September 1999 and August 2003:
A total of 53 external fixators were applied on lower limbs, 42 for leg injuries and 11 for thigh injuries. Nine external fixators were applied on upper limbs; 8 for arm injuries and one for forearm injury

Admission Time:

Due to insecurity and social reasons, the average admission time is undeterminable. Patients were forced to stay in the hospital even after treatment. The type of fracture and the damage of soft tissue were also responsible for large variation of admission time.
The shortest admission time was 45 days.

Discussion:

War wounds of the limbs with fractures do represent challenging situations even for experienced orthopaedic surgeons. The high-energy transfer related to war rifle's bullets causes extensive soft tissue damage and comminuted fractures with important loss of substance. These wounds are heavily contaminated[1,5]. The longer the delay of treatment, the higher the degree of infection.

For these reasons internal fixation devices cannot be applied. Basic, simple, cheap methods of fracture stabilization such as POPs, window POPs, bridge-POPs, skeletal traction, skin traction do offer acceptable results for the treatment of most of the limb fractures[3,4].

In special situations (ankle injuries, long bone injuries with important bone gap, bone graft) and in experienced hands, external fixator devices do offer a valid solution for the fracture stabilization[2,4].
Panzi Hospital has been provided, since its opening, with skilled orthopaedic surgeons, a good amount of external and internal fixation devices and a proper supply from Europe, a good level of sterility in the theatre and portable x-ray and fluoroscopy units.
When facing war wounded patients with limb fractures we tried to rely as much as possible on simple methods (POPs, skin and skeletal traction), reserving external fixators for special situations where they could clearly make a difference in terms of treatment outcome: ankle joint fractures, large soft tissue injuries,

large bone gaps, bone graft.

As far as the complications detected in our series are concerned, only the 2 cases of pseudoarthrosis could, possibly, relate to the use of external fixation. They, anyway, healed after bone grafting; same for the 10 cases of osteitis probably related to heavy wound contamination and insufficient debridement: they healed after antibiotic treatment and sequestrectomy.

The patient who developed tetanus died after a short while. The 4 cases that ended with amputation arrived to the hospital already with a compromised blood supply to the affected limb. In these cases the external fixator was applied to combine good fracture stabilization with better possibility of limb situation monitoring.

Conclusions:

External fixators proved to be very useful in our setting on this category of patients presenting comminuted and heavily contaminated or infected fractures where, clearly, internal fixation devices cannot be applied.

The main advantages of external fixators in the management of war wounded open fractures have been:

- Easy wound access.
- Early active limb and joints mobilisation.
- Absence of bedsores and their expensive management.

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