Scientific Research Publishing

Surgical Science, 2023, 14, 618-625
https://www.scirp.org/journal/ss
ISSN Online: 2157-9415
ISSN Print: 2157-9407

Therapeutic Strategies and Evolution in the Short Term: Fractures by Firearms in Civilian Practice about 35 Operated Lesions

Dikongue Dikongue Fred[1*], Mohamadou Guemse[2], Hans Moevi Akue[3], Bahebeck Jean[2], Fondop Joseph[4]

[1]Department of Surgery and Specialties, Faculty of Medicine, University of Dschang, Dschang, Cameroon
[2]Department of Surgery and Specialties, Faculty of Medicine, University of Yaoundé 1, Yaoundé, Cameroon
[3]Faculty of Health Sciences of Cotonou, University of Abomey Calavi, National University Hospital Center of Cotonou, Cotonou, Benin
[4]Department of Morphological and Anatomopathological Sciences, Faculty of Medicine University of Dschang, Bafoussam Regional Hospital, Dschang, Cameroon
Email: *dikonguefred.fd@gmail.com

How to cite this paper: Fred, D.D., Guemse, M., Akue, H.M., Jean, B. and Joseph, F. (2023) Therapeutic Strategies and Evolution in the Short Term: Fractures by Firearms in Civilian Practice about 35 Operated Lesions. *Surgical Science*, **14**, 618-625.
https://doi.org/10.4236/ss.2023.1410067

Received: June 12, 2023
Accepted: October 23, 2023
Published: October 26, 2023

Abstract

Fracture by firearms is a surgical emergency. The aim of our study was to report our experience in the management of open fractures by firearms and monitoring with a decline of 6 months the lesions observed in peacetime. This retrospective study over 3 years (January 2007-November 2010), supplemented by a prospective (December 2010-November 2011) is based on an analysis of operative reports and clinical records of patients admitted to the Yaoundé Central Hospital. 29 cases were selected, including 35 lesions were observed. Our series consists of 27 men and 2 women, mean age 30 years. 40% of our patients were initially supported (debridement) before the 6th hour and 51.42% between the 6th and 24th hours. In terms of internal fixation, these figures were 66% between the 25th and 96th hours. The type of material was used as the external fixate (64.9%). Conversion processing by the establishment of an internal hardware, after 3 - 6 weeks and control NFS (numeration of blood count or blood count), VS (rate of sedimentation), CRP (C reactive protein). Unfortunately this has been possible only in two cases because of financial means. In 40% of cases, surgical outcome was simple, and complications to a type of osteomyelitis, shortening, suppuration in 42.7% of cases.

Keywords

Open Fractures, Firearm, Treatment, Surgery, Trauma Orthopedics, Public

Health, Africa

1. Introduction

The Fracture associated with a skin wound ranging from simple perforation to complex wound with serious vasculonervous lesions is open. The risk is infection, even in the case of punctiform perforation from inside to outside by the tip of a sharp bone fragment [1] [2] (**Figure 1**). Open fractures are emergencies trauma. When caused by a firearm, the damage is even more important that their prognosis depends on the therapeutic approach that should be fast (before 6 to 12 hours) and specialist (vascular microsurgery, neurosurgery, orthopedics, Plastic and Reconstructive Surgery) [1] [2] [3]. The firearm is one of the most formidable wounding agents in these lesions, because of the kinetic energy it carries, the latter resulting in massive tissue necrosis sometimes, when it is simply not beyond redemption. The prognosis for injuries is caused when the cause is often not the same. This work aims to study the therapeutic strategies and short-term evolution.

2. Patients and Methods

We conducted a retrospective study, completed by a prospective, descriptive and analytical and based on the analysis of operative reports and clinical records of patients admitted to the Yaoundé Central Hospital. 29 cases were selected, including 35 lesions were observed. They were 27 men and 2 women, giving a sex ratio of 0.075 with a mean age of 30 years ranging from 15 to 54.

2.1. Therapeutic Protocol Treatment

All our patients benefited from initial debridement and external fixation without wound closure. All patients were treated between the 3rd and 7th hour. Triantibiotic therapy consisting of 2nd generation cephalosporin, 5 nitro imidazole, and an aminoglycoside was instituted at entry.

2.2. Results Evaluation Method

Clinical criteria for infection were wound oozing with local signs of inflammation, localized pain or tenderness, spontaneous deep wound dehiscence with fever > 38˚C, or frank discharge of pus . The biological criteria for infection were a white blood cell count ≥ 10,000/μL on the complete blood count, a C reactive protein ≥ 5 mg/dL, and/or an erythrocyte sedimentation rate ≥ 20 mm in the first hour. Bone consolidation was evaluated clinically and radiologically on day 1, day 2, day 15, day 30, day 45, day 60, day 90, day 120 then every 3 months until healing. The clinical signs of consolidation were the absence of pain and healing. The radiological criteria for consolidation were the presence of a bony callus and the obliteration of the fracture line on at least three cortices on two

orthogonal radiographic views. The following elements were studied: the time of initial treatment and specific type of implant used and the surgical suites in the short term. The results and tables were obtained using the software EPI Info 2000 version 6.04, SPSS 12.0, Word 2010 and Excel 2010. (Tables 1-4)

3. Discussion

3.1. Therapeutic Procedure

Treatment of open fractures of the limbs, well known to the emergency trauma there are still issues in our developing countries. Cauchoix already recalled, from

Table 1. Distribution of patients by the time of initial PEC.

Processing time	Frequency	Percentages %
<5 H	14	40
6 h à 24 h	**18**	**51.42**
25 h à 120 h	2	5.71
241 h	1	2.86
Total	35	100

The initial pick-up time was 51.42% on the first day.

Table 2. Distribution of patients by the time of PEC Specific.

Processing time	Frequency	Percentages %
<24 h	3	8
25 - 96 h	**23**	**66**
97 - 168 h	7	20
169 h - 240 h	1	3
>240 heures	1	3
Total	35	100

Specific management took place between 25 ème - 96 hours in 66% of cases.

Table 3. Distribution of patients according to the type of equipment.

Material type	Frequency	Percentages %
central medular enclouage	5	13.5
external fixator (EF)	**24**	**64.9**
Amputation	**2**	**5.4**
EF + pinning	2	5.2
EF + arthrodesis	2	5.4
Steel wire	2	5.4
Total	37	100

The type of equipment was the most represented the external fixation (64.9%).

Table 4. Distribution of patients according to surgical outcome cost term.

Surgical evolution	Frequency	Percentages %
Joint stiffness	1	2.9
Gangrene	**2**	**5.7**
Vicious cal	1	2.9
Pseudarthrosis	1	2.9
Simple	**16**	**40**
Suppurations	2	5.7
Osteitis	8	22.9
Shortening-osteitis	2	5.7
Shortening-osteitis-suppuration	3	8.6
Pulmonary embolism	1	2.9
Total	37	100

In 40% of cases the evolution was simple, against 42.9% percent of infection.

the introduction of its communication to the Academy of Surgery November 6, 1957 [4], the importance in the prognosis of these fractures that initial treatment should be early and complete. This includes, in addition to debridement of the wound and soft tissue, bone stabilization and tight skin closure is not advised.

3.2. Surgical Debridement

Trimming of these lesions consisted of complete removal of foreign bodies… frequent source of suppuration and delayed healing [3] [5]. However the extraction of many superficial seals easily accessible or that resulted in a neurovascular injury [5] [6] [7]. The surgical debridement will be continued as in severe open fractures with abundant clean saline.

The views of our results, the fracture by firearms does not occupy its rightful place among the surgical emergencies.

Of the 29 patients in our study, only 44% received surgical debridement before the sixth hour. Mamouda, to HCY, found similar proportions [5]. He explained this by distancing populations specialized hospitals where delays in the consultation periods. In our case, although the majority of patients arrived within an acceptable time (63% in the first 5 hours), the problem remains and could be explained by our socio-economic status to the patient requiring a financial support personal and complete.

I. POUYE *et al.* blamed the delay on the intervention as a cause of treatment failure of open fractures in the African environment [2] [6] [8].

3.3. Bone Stabilization

The indication for bone stabilization was placed depending on the location, type of fracture and skin incision, but much more according to the habits of the

surgeon and the equipment available, finding already made by other African authors [5] (**Figure 2**).

The therapeutic delay was a significant factor in the results, although questioned by some authors [5]. In our series as elsewhere in Africa [5], only 29% of patients received initial treatment within 24 hours, 31% after 10 days. A study in Dakar noted a delay in treatment 67% of cases, the authors explains the predominance of conservative treatment [5].

The femur, the external fixator was used immediately in 11 cases out of 15 (40%) and internal fixation in 4 cases. We then converted by a 2 FE ECM. NGWENE.M has not been performed intramedullary nailing. But this treatment is recommended by NICHOLAS and Mc COY for open fractures gunshot femoral shaft [2] because it avoids the shortening of limb.

The use of external fixation as definitive treatment remains controversial [6] [9] [10]. VAN DER BOSSHE *et al*. reported an average time of bone union of 40.6 weeks in patients treated by external fixation secondarily replaced by an internal fixator. This time is considerably long compared to the time of union in our series (12 - 24 weeks).

On the leg, in addition to the anatomical location of the tibia, the therapeutic difficulties of this part may be related to the importance of bone crash [11] and associated lesions including vascular, whose initial diagnosis is not always possible in our climate due to lack of paraclinical explorations and socioeconomic [6] [8] [12].

Once again, the external fixator was the therapeutic method most used (50%). Many authors however in favor of nailing immediately or secondarily to an external fixator which renders great service to the leg, is not without disadvantage [1] [13] [14]: delayed union, within long healing, higher risk of joint stiffness and late functional recovery.

Nevertheless, the external fixator maintains indisputable indications leg namely type III open fractures Cauchoix and Duparc and especially in cases of vascular injury or in case of late treatment [5] [10]; classified type III B and C according Gustillo and Anderson (**Figure 3**). A descriptive study conducted in Peshawar [4] published in 2008 on a series of 68 patients benefited from an ECM indicated for femoral shaft fracture GA IIIA open shot from March 2002-March 2004. 64 patients have benefited from an ECM with closed 4 patients had a nonunion (5.88%) 42 patients had excellent results.

18 patients a poor result. A prospective study conducted in Kashmir published in 2009 on the prognosis of open fractures of the femur by high energy ball supported by two first time by an external fixator, a second ECM over a period of 2 years from 2005-2007, 37 patients identified: 21 left femurs, 16 right femurs 24 IIIA fractures GA (Gustilloandersson) 11 GA (Gustilloandersson) IIIB fractures02 IIIC fractures GA (Gustilloandersson) Delay between external fixator and ECM: 26 days 3 patients were not good consolidation after 24 weeks Very good.

Figure 1. XRay (face) of a fracture of two bones of the right forearm GAIIIC (Gustilloandersson IIIC) firearmin a young adult at close range.

Figure 2. XRay (face) and control of a fracture of two bones of the right forearm GAIIIC (Gustilloandersson IIIC) firearmin a young adult at close range.

Figure 3. External fixation and the first repair of the median nerve.

4. Evolution and Complications

4.1. Infectious Complication

The evolution was marked by infectious complications (48.6%). This figure is similar to that of MOYIKOUA 41.9% [8] and is significantly lower than the Mamouda HCY (central hospital of Yaounde) NGWENE.M in 1981 and 37.3% in 2004 [5]. All these abscesses remained localized in the soft parts. We only got 4 samples local events highlighting Staphylococcus aureus in one case and in the other enterobacteria.

The treatment of septic complications was provided by local care and antibiotics often probabilistic systemically [1] unlike the MOYIKOUA where local levies and antibiograms were systematic [5] [6].

At the time of consultation and treatment delays are usually add a torpid infection which explains the relatively long length of stay of most of our patients. Hennesy of 148 wounds, reports only two infections. But the wounded had been caught early in the first 24 hours. The high number of our septic complications revealed a flaw in the treatment of the wound.

4.2. Gangrene

5.7% of patients with fractures of type III C, were complicated by gangrene. Two amputations were primitive and two secondary (one at the lower 1/3 of the thigh and the other below the knee), this after failed revascularization attempt by the external fixator. This leads us to ask ourselves as RIBAULT [4] [13] [15] the following question: "Should we believe JUDET which states that the primary amputation is almost always a technical foul or should you follow when writing to DELCOULX patients concerned about the reconstructive surgery after lengthy hospital stays actually deceived husbands, alcoholics and the unemployed?"

4.3. Mechanical Complications

Functionally, we had a case of joint stiffness at 12 weeks. 2 cases persisted at week 24 for which a re-education through physical therapy was instituted.

4.4. Disorders of Consolidation

The healing was achieved within the normal in 14 cases (40%), delayed in one case and absent in 1 case. This nonunion was remedied by a screw plate fixation.

5. Conclusions

Debridement is a crucial time in the treatment of gunshot fractures, to consider the temporary cavitation of the ball and the effects of tilt and poly screening. This one must be careful and early, requiring well-trained team. The internal fixation (ECM) is considered, if the lesion is isolated and seen earlier.

Otherwise, the first reduction is in restraint and soft tissue repair. The conversion is possible depending on the clinical and paraclinical patient, but especially from her purse.

In our conditions the morbité remains important because the delay of care itself often has situations of extreme poverty and our patients will be tackled to reduce it.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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