

Prevalence and Pattern of Open Fractures in Level-II Hospital, Central Africa

Sen SK¹, Debnath S², Haque MM³

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Abstract

Introduction: Open fractures are known orthopaedic emergencies associated with healing problems and risk of infection. The open fractures are common cases because of motor vehicle and motorbike accidents, falls from height and sometimes gun-shot wounds. Significant morbidity and subsequent disability may happen, if not managed properly.

Aim: To evaluate the pattern of open fractures associated with healing problems and achieving sound bone union, avoiding infection and regaining full functional recovery of the limb.

Methods: This retrospective study included all the patients who were hospitalized with open fractures of lower limbs in a United Nations Level II Hospital of Bangladesh Medical Contingent at Kaga-Bandoro in Central African Republic from April 2015 to November 2018.

Results: There were 57 patients with open fractures resulting 17.8% of total trauma patients. The mean age was 31.8±11.6 years. Most patients were in the 20-39 years age group. The male to female sex ratio was 4.2:1. Road traffic accident was the main cause of open fractures (59.6%). Fractures of tibia-fibula and femur contributed 49.1% and 15.7% respectively and 89.4% satisfactory results were achieved after treatment.

Conclusion: The management of open fractures presents a challenge due to risk of infection, healing problems and subsequent morbidity. Adequate debridement and copious lavage remains one of the cornerstones of management of open fractures. The initial management of open fractures affects the ultimate outcome.

Key-words: Open fracture, Orthopaedic emergencies, Level-II hospital, Central Africa.

Introduction

Open fractures are a common and major public health problem that keeps the orthopaedic surgeons preoccupied. These usually have adverse effects on the economy of the patients. Initial management constitutes a principal step which has to be early and appropriate. The aims of treatment for open fractures include

achieving sound bone union, avoiding infection and regaining full functional recovery of the limb^{1,2}. The basis of treatment includes immediate, meticulous and repeated wound debridement with copious irrigation using normal saline, stabilization of the fracture, 'closure' of the wound, early parenteral administration of broad-spectrum antibiotics, and early bone grafting when indicated^{1,3-5}. Patterns of fractures vary within different communities as their occurrence depends on the type and the speed of activities in the local area. Similarly, the outcome of treatment will depend on the type of care given to the patient^{3,5-7}.

Materials and Methods

The Ethical Committee of the center approved this study having satisfied all issues about patients' confidentiality and the best practice methods concerning human research. This was a retrospective cross sectional study of patients admitted and treated in a United Nations level-II hospital of Bangladesh Medical Contingent, located at Kaga-Bandoro in Central African Republic for injuries between April 2015 and November 2018 by analyzing the relevant information contained in their medical case files as recorded. The admitted patients with limb fractures with or without other associated injuries and those with hemodynamic instability following their injuries around their limbs were included in this study. Those with pathological fractures and those who had received their initial wound debridement before arrival at this hospital were excluded from the study. Majority of these patients were local Central African treated as a part of Civil-Military Co-operation activities. The patients' folders within the study period were retrieved from the medical records. Data were also obtained from the operation registrars. The data analyzed included the age, sex, diagnosis, etiology, the part of the limb affected, the treatments carried out, complications, and the duration of hospital stay. Here, Tucker et al⁸ criteria was used for evaluation of the outcome. Analysis was done with the Statistical Package for Social Sciences version 20. Statistical significance was considered when p value is <0.05.

Results

The total number of patients with limb injuries admitted and treated within the period under review was 320. Among them, 17.8% of total trauma patients had open fractures. The majority of open fractures were in 21-40 years age group (61.4%) with significant

1. Lt Col Suman Kumar Sen, MBBS, MS (Ortho), Classified Orthopaedic Surgeon, CMH, Sylhet (E-mail: sksenmmc@gmail.com) 2. Dr Susmita Debnath, MBBS, MPhil, Assistant Professor of Pharmacology, Sheikh Hasina Medical College, Habiganj 3. Maj Md Maksudul Haque, MBBS, MS (Ortho), Orthopaedic Surgeon, Jaber Al Ahmed Armed Forces Hospital, Kuwait.

male predominance (Table-I). Common fractures were closed fracture Radius & Ulna (14.7%) and closed fracture Tibia (14.1%); 8.7% of total trauma patients had open fracture Tibia. Gustilo type II open fractures were 35.4%, type IIIa 23.5% and type IIIc open fractures were only 3.5% (Table-II). Road traffic accident was the main cause of open fractures (59.6%). A dangerous number of open fractures were due to gun-shot injury (15.8%) (Table-III). Irrigation, Debridement and Internal fixation was the main modality of treatment here (31.6%) (Table-IV). Wound infection was developed in 8.8% cases and no complication in 71.9% cases (Figure-1). About 64.9% patients had to stay in hospital for 2-4 weeks and 10.5% for more than 4 weeks (Figure-2). Excellent and good results were taken as acceptable and satisfactory results. Excellent result was found in 71.9% patients where good results in 17.5% cases, fair results in 7.1% and poor results in 3.5% cases. Therefore, the satisfactory results were 89.4% (Figure-3).

Table-I: Distribution of trauma patients and open fractures with age and sex

Age (Years)	Trauma Patients	Open Fractures		
	Number (%)	Male	Female	Total
0-10	6(1.9)	2	1	3
11-20	23(7.3)	3	2	5
21-30	129(40.1)	18	5	23
31-40	99(30.8)	10	2	12
41-50	40(12.6)	8	1	9
51-60	13(4.2)	3	0	3
>60	10(3.1)	2	0	2
Total	320(100)	46(14.4)	11(3.4)	57(17.8)
Mean \pm SD = 31.47 \pm 11.59		M : F = 4.2:1, p<0.05		

Table-II: Distribution according to Gustiloclassification (n=57)

Gustilo Type	Total (n,%)	Male (n,%)	Female (n,%)
Type I	12(20.3)	10(17.5)	2(3.5)
Type II	20(35.4)	16(28.1)	4(7.0)
Type IIIa	13(23.5)	10(17.5)	3(5.3)
Type IIIb	10(17.3)	8(14.1)	2(3.5)
Type IIIc	2(3.5)	2(3.5)	0
Total	57(100)	46(80.7)	11(19.3)

Table-III: Distribution according to etiology of open fracture (n=57)

Etiology	Total (n,%)	Male (n,%)	Female (n,%)
Road traffic accident	34(59.6)	29(50.9)	5(8.8)
Gun shot	9(15.8)	9(15.8)	0
Fall from height	3(5.3)	3(5.3)	0
Physical assault	4(7.0)	2(3.5)	2(3.5)
Occupation related	5(8.8)	2(3.5)	3(5.3)
Non specified trauma	2(3.5)	1(1.7)	1(1.7)
Total	57(100)	46(80.7)	11(19.3)

Table-IV: Distribution according to method of treatment (n=57)

Method of treatment	n	%
Irrigation, Debridement, Splintage with Window	14	24.5
Irrigation, Debridement, Skeletal traction	5	8.8
Irrigation, Debridement, External fixator \pm Flap coverage	11	19.3
Amputation	2	3.5
Irrigation, Debridement, fixed with K-wire	7	12.3
Irrigation, Debridement, Internal fixation	18	31.6
Total	57	100.0

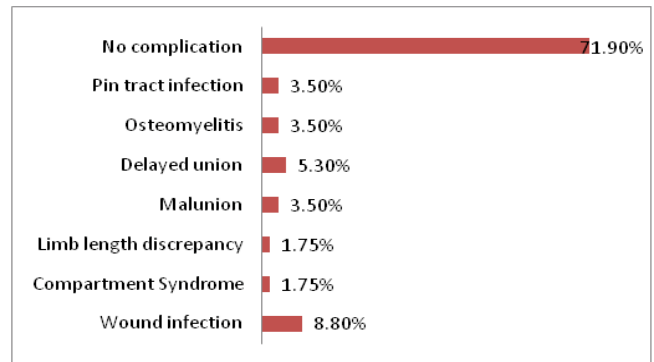


Figure-1: Distribution of patients according to complications (n=57)

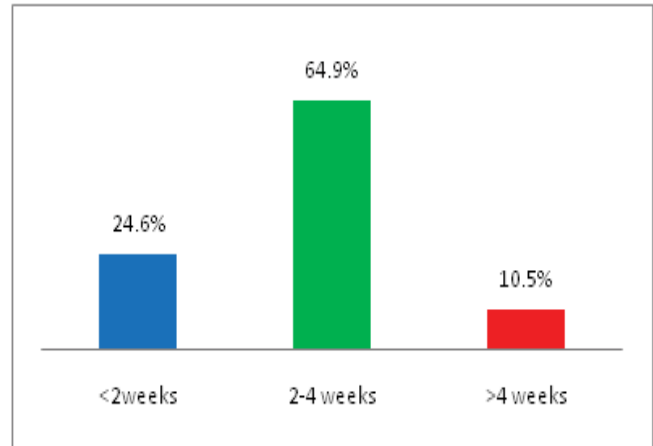


Figure-2: Distribution of patients according to duration of hospital stay (n=57)

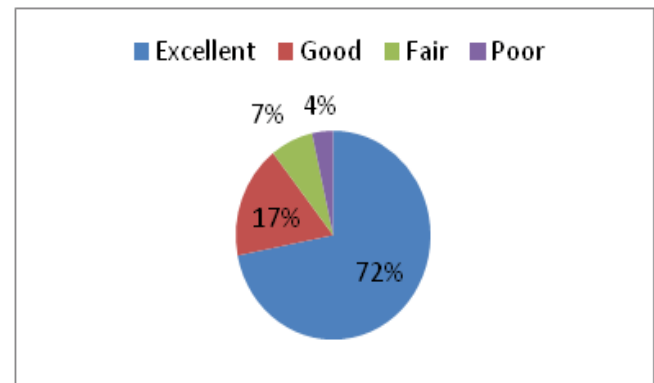


Figure-3: Final outcome of the study (n=57)

Discussion

The total numbers of patients with limb injuries admitted and reviewed within the period was 320. Out of them, 17.8% of total trauma patients had open fractures. The majority of open fractures were in 21-40 years age group (61.4%) with significant male predominance. Male-female ratio of Open fracture was 4.2:1, (p<0.05). In a study in Rwanda by Twagirayezu et al³, the majority of the patients (77.4%) was in the 18-44 years age group and males accounted for 77% of the cases giving a male to female sex ratio of 3.3:1. Srour et al⁹ enrolled 315 patients with open fractures who admitted to level-1 trauma center and they found mean age- 33.9+16.3 years; 79% were male. Clelland et al¹⁰ found 78% (n=156) of patients were male and 21-30 years was

the most frequently affected age group. Motor traffic accidents were the most common cause and accounted for 78% of fractures. It was found that 72% (n=143) of fractures were open, 19% (n=38) were comminuted and the most common site of injury was the distal-third of tibia-fibula. Open fracture tibia was 8.7% of total trauma patients. Gustilo type II open fractures were 35.4%, type IIIa 23.5% and type IIIc open fractures were only 3.5% (Table-II). Road traffic accident was the main cause of open fractures 59.6%. A dangerous number of open fractures were due to gun-shot injury (15.8%). In their review, Cozma et al¹¹ in Italy and Fal et al¹² in Abidjan found road traffic accidents causing open limb fractures in 74.1% and 67.3% respectively. In Nigeria, road traffic accidents were associated with open limb fractures in 55.5%. Kotisso et al¹³ in Ethiopia found road traffic accidents to be a cause in 47.2% of open limb fractures. Open limb fractures involved the leg bones in 69.4% of the cases compared to the 17.6% for the femur. Male was also found to predominate by Ikem et al¹ in Nigeria with a rate of 66.7%. They found higher rate for leg fractures 79.6% and 20.4% for femur fractures¹⁴.

In this study, treatment initiated within 24 hours in 75.8% cases. Delay in starting treatment had a negative effect on results. Open fractures are potentially infected. We utilized the antibiotics including Cephalosporine (Cefuroxime) and Metronidazole. Single antibiotic was given in 71.8% and in combination in 28.2% operated cases. Patsakis⁴ found in 62.1% of cases, micro-organisms could be treated by one antibiotic. Gustilo⁵ confirmed that early treatment with a broad spectrum antibiotic combined with surgical toilet significantly decreased frequency of infection from 12% to 5%. Ikem et al¹ in Nigeria found Staphylococcus in 61% of open fracture wounds; gram negative organisms were isolated in 39%. These were sensitive to a combination of Cloxacillin and gentamycin. Patsakis and Wilkims⁴ in USA recommend the use of active antibiotics to gram negative and gram positive. In their study, the infections which followed treatment with penicillin were reduced 5 times by cephalosporins. Brown et al² recommended the addition of anti-anaerobic antibiotic in case of compound fractures. In other studies the rates of infection were 33.1% in Nigeria¹ and 4.3% in Abidjan¹².

Bacteriological study of the wound was done in all cases and major infecting organism was Staphylococcus aureus in 43.8% (n=25) and no growth in wound swab culture was found in 29.8% (n=17) cases. Ali et al¹⁵ found the similar culture and sensitivity results. Irrigation, Debridement and Internal fixation was the main modality of treatment here (31.6%). Irrigation, Debridement, Splint with window was the treatment of choice in a good number of cases (24.5%) and 2 cases needed amputation due to unsalvageable limb. Clelland et al¹⁰ found the most frequently recorded treatments were surgical toilet and debridement (66%) and the application of back slab (34%). Islam et al¹⁶ treated 78% of open tibia-fibula fractures in their study by sufficient irrigation, debridement and immobilization by long leg plaster with making window, most of them falls in type 1

and type 2. In type 3 fractures, after sufficient irrigation and debridement, primary fixation gave the best result for better preservation of function. Twagirayezu et al³ mentioned the most utilized methods were splint (32%), then external fixators (31.6%). External fixators remain the most utilized method in Gustilo III grade^{1,10}.

In this study, the patients with femur fractures benefited from traction followed by External Fixators (EF) in 18.2% and intra-medullary nail (IMN) in 65.3% and DCP in 16.5%. The fractures of tibia were treated with EF in 34.6%, IMN in 44.2% and plaster in 22.2%. The fractures of ankle joint and foot bones were treated with pins and plasters. This variation in treatment which depends on the fracture site was also found in other studies^{1,17}. Wound infection was developed in 8.8% cases and no complication in 71.9% cases in this study. Compartment syndrome was developed in one case of open fracture tibia due to gunshot injury. Cozma et al¹¹ in their study on open fractures in Italy found the rate of infections was 13.8% for external fixators and 9.1% for intra-medullary nailing. Srour et al⁹ found that 4.4% patients developed early wound infections, while 3.2% developed late wound infections (after 30 days). About 64.9% patients had to stay in hospital for 2-4 weeks and 10.5% for more than 4 weeks. Some authors noted also that femur fractures treated by traction spend more than 10 weeks in the hospital³. According to Gustilo and Anderson⁵ External Fixators should be used for all fractures with wound. Seligson et al⁷ observed that EF constitute the treatment of choice for open fractures and that internal fixation, should be reserved for Gustilo I & II where infection risk is low.

Malunion was found in 15.7% in EF against 5.8% in IMN¹. Gopal et al¹⁷ in their study comparing EF and internal fixation on Gustilo-IIIa and IIIb with possibility of wound closure, the rate of infection was 13.1% with internal fixation compared to 37% for external fixation. In this study, the IF was preferable in Gustilo-I and II. The patients came late had to be treated for infection rather than prevention of it. For Gustilo III, EF remained the treatment of choice. Here, Tucker et al⁸ criteria was used for evaluation of the outcome. Excellent and good results were taken as acceptable and satisfactory results. About 71.9% patients had excellent result, good results in 17.5% cases, and fair results in 7.1%, poor results in 3.5% cases. Therefore, the satisfactory results were 89.4%. The outcome was influenced by the size of wound, method of stabilization and time of treatment. The rate of complications increased with advancing Gustilo grading. This influence was also noted by Chapman and Mahoney¹⁸ in their study. They obtained 10.6% overall complication against 21% in Gustilo-III. This study revealed that the fractures stabilized with external fixation had more complications. This association was statistically significant with a p value of <0.05. Gopal et al¹⁷ reported similar findings. In this study, we found a statistically significant association between risk of developing complication and delay in treatment (p<0.05).

Conclusion

The main cause of open fractures is road traffic accidents and males are affected more than females. The tibia-fibula was more affected than the femur. Higher risk of complications especially infection was associated with external fixation and delay in start of treatment. Additional research is required to fully evaluate and quantify the socioeconomic impact of open fractures.

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