SAS Journal of Surgery ISSN 2454-5104
SAS J. Surg., Volume-2; Issue-6 (Nov-Dec, 2016); p-254-258
Available online at http://sassociety.com/sasjs/

Original Research Article

Management and Outcome of Long Bone Fractures Following Trauma

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Abstract: ***Background:*** Long bone fractures are common traumatic injuries that cause significant morbidity and functional impairment, particularly among young active individuals. Appropriate management and timely stabilization are essential to achieve optimal healing and functional recovery. This study aimed to evaluate the patterns of injury, management modalities, and outcomes of long bone fractures following trauma in a tertiary care orthopaedic setting. ***Methods:*** This descriptive cross-sectional study was conducted in the Department of Orthopaedic Surgery at Bangabandhu Sheikh Mujib Medical University over a one-year period from January to December 2015. A total of 120 patients with traumatic long bone fractures were included. Demographic characteristics, mode of injury, bone involved, fracture type, treatment modality, and functional outcomes were recorded using a structured data sheet. ***Results:*** Most patients were aged 21–30 years (39, 32.5%) and male (93, 77.5%). Road traffic accident was the leading cause of injury (67, 55.8%), followed by fall from height (31, 25.8%). The tibia (47, 39.2%) and femur (36, 30%) were the most commonly fractured bones. Closed fractures accounted for 85 (70.8%) cases. Internal fixation was the predominant treatment (73, 60.8%). Good-to-excellent functional outcomes were achieved in 90 (75%) patients, including 49 (40.8%) excellent and 41 (34.2%) good results. ***Conclusion:*** Traumatic long bone fractures predominantly affected young males and were mainly caused by road traffic accidents. Operative management, particularly internal fixation, resulted in favorable functional outcomes in most patients. Early stabilization and appropriate treatment are essential for optimal recovery in long bone fractures.
Keywords: Long bone fracture; Trauma; Internal fixation; Functional outcome; Orthopaedic management.

INTRODUCTION

Long bone fractures are among the most common and significant injuries encountered in orthopaedic practice, particularly following trauma [1]. They contribute substantially to morbidity, functional limitation, loss of productivity, and healthcare burden in developing health systems [2]. High-energy mechanisms such as road traffic accidents, falls from height, and interpersonal violence frequently result in fractures of major long bones including the femur, tibia, humerus, radius, and ulna [3]. These injuries predominantly affect the economically productive age group and are often associated with considerable soft tissue damage, complications, and prolonged rehabilitation requirements [4].

The management of long bone fractures has evolved considerably over recent decades with advances in surgical techniques, fixation devices, and principles of fracture stabilization [5]. Treatment options broadly include conservative methods such as casting and traction, as well as operative approaches including internal fixation and external fixation [6]. The choice of management depends on several factors such as fracture pattern, anatomical location, soft tissue condition, patient age, and associated injuries [7]. Early stabilization and appropriate alignment are essential to promote fracture healing, restore limb function, and reduce complications such as malunion, non-union, infection, and joint stiffness.

Despite improvements in orthopaedic care, long bone fractures continue to pose challenges in resource-limited tertiary care settings where high patient load, delayed presentation, and severe trauma patterns are common [8]. Lower limb fractures, particularly of the tibia and femur, are frequently encountered due to their subcutaneous location and exposure to direct impact forces. Open fractures remain a significant concern because of the high risk of infection and delayed union [9]. Functional recovery following fracture depends not only on the adequacy of fixation but also on timely intervention, postoperative care, and rehabilitation [10].

Evaluation of treatment outcomes is essential to determine the effectiveness of current management strategies and to identify areas requiring improvement [11]. Functional outcome assessment provides insight into the patient’s ability to return to daily activities and work, which is a key indicator of successful fracture management [12]. Analysis of complication patterns and healing rates also helps refine treatment protocols and optimize patient care.

Therefore, systematic assessment of the patterns of injury, treatment modalities, and outcomes of long bone fractures in a tertiary care orthopaedic setting is important for understanding the burden of these injuries and guiding evidence-based management approaches.

METHODOLOGY AND MATERIALS

This descriptive cross-sectional study was conducted in the Department of Orthopaedic Surgery at Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh over a one-year period from January 2015 to December 2015 to evaluate the management and outcome of long bone fractures following trauma. A total of 120 consecutive patients with traumatic fractures of long bones who were admitted and treated during the study period were included. Patients were selected by purposive sampling according to predefined eligibility criteria.

Inclusion criteria comprised patients of either sex aged ≥10 years presenting with radiologically confirmed fractures of long bones (humerus, radius, ulna, femur, tibia, or fibula) caused by acute trauma and managed either conservatively or operatively in the department, with at least 3 months of follow-up. Exclusion criteria included pathological fractures, old neglected fractures (>3 weeks), fractures associated with malignancy or metabolic bone disease, polytrauma patients requiring management in other specialties, and patients lost to follow-up before outcome assessment.

After admission, detailed history regarding age, sex, mechanism of injury, and time since trauma was recorded. Clinical examination and radiographic evaluation were performed to determine fracture site, type (open or closed), and associated injuries. Management modality (conservative, internal fixation, or external fixation) was documented. Patients were followed at regular intervals in the outpatient department to assess fracture healing, complications, and functional outcome based on clinical and radiological criteria.

All data were collected using a structured case record form and entered into a computer database. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 12.0. Descriptive statistics such as frequency, percentage, mean, and standard deviation were calculated. Results were presented in tables and charts to describe patterns of injury, management, and outcomes of long bone fractures in the study population.

RESULTS

Table 1: Age and sex distribution of patients (n=120)

Variable	Frequency	Percentage (%)
Age group (years)		
≤20	17	14.2
21–30	39	32.5
31–40	29	24.2
41–50	19	15.8
>50	16	13.3
Sex		
Male	93	77.5
Female	27	22.5

Table 1 shows the age and sex distribution of the 120 patients with long bone fractures. The majority of patients belonged to the 21–30 years age group (39, 32.5%), followed by 31–40 years (29, 24.2%). Male patients predominated (93, 77.5%) compared to females (27, 22.5%).

Table 2: Mode of injury of patients (n=120)

Mode of injury	Frequency	Percentage (%)
Road traffic accident	67	55.8
Fall from height	31	25.8
Assault	13	10.8
Sports injury	9	7.5
Total	120	100

Table 2 shows the mode of injury of the patients. Road traffic accident was the most common cause (67, 55.8%), followed by fall from height (31, 25.8%). Assault (13, 10.8%) and sports injury (9, 7.5%) were less frequent causes of long bone fractures in this series.

Table 3: Bone involved and fracture type (n=120)

Variable	Frequency	Percentage (%)
Bone involved		
Tibia	47	39.2
Femur	36	30
Humerus	23	19.2
Radius/Ulna	14	11.7
Fracture type		
Closed	85	70.8
Open	35	29.2

Table 3 shows the distribution of bones involved and fracture type among the patients. The tibia was the most commonly fractured bone (47, 39.2%), followed by the femur (36, 30%). Most fractures were closed (85, 70.8%), while 35 (29.2%) were open fractures.

Table 4: Management modality and functional outcome (n=120)

Variable	Frequency	Percentage (%)
Treatment		
Internal fixation	73	60.8
External fixation	19	15.8
Conservative	28	23.3
Functional outcome		
Excellent	49	40.8
Good	41	34.2
Fair	19	15.8
Poor	11	9.2

Table 4 presents the management modalities and functional outcomes of the patients. Most patients were treated with internal fixation (73, 60.8%), while conservative management was applied in 28 (23.3%) cases and external fixation in 19 (15.8%). Good-to-excellent functional outcomes were observed in the majority, with 49 (40.8%) achieving excellent and 41 (34.2%) good results.

DISCUSSION

Long bone fractures constitute a major component of orthopaedic trauma and predominantly affect young adult males due to greater exposure to high-energy injuries. In the present study, most patients were aged 21–30 years (32.5%) and males constituted 77.5% of cases. Similar age and sex patterns have been reported by Meling T et al., who demonstrated a clear predominance of traumatic long-bone fractures among young males in the active working population, reflecting occupational and mobility-related risk exposure [1].

Road traffic accident was the leading mechanism of injury in this series (55.8%), followed by fall from height (25.8%). This pattern is consistent with global trauma epidemiology where high-energy mechanisms are the principal cause of long-bone fractures. Giannoudis PV et al. reported that road traffic injuries account for the majority of femoral and tibial fractures in modern trauma practice, particularly in developing settings with increasing vehicular density and inadequate safety measures [13].

Regarding anatomical distribution, the tibia (39.2%) and femur (30%) were the most commonly fractured bones in this study. Lower-limb predominance has been widely documented because these bones are directly exposed to impact forces during vehicular collisions and falls. Giannoudis PV et al. emphasized that tibial fractures are particularly frequent due to the subcutaneous location and vulnerability of the bone, often associated with significant soft-tissue injury [14].

Most fractures in the present series were closed (70.8%), while 29.2% were open. Comparable proportions of open fractures have been reported in high-energy trauma cohorts. Open injuries are clinically important because they carry a higher risk of infection, delayed union, and non-union, as described by Calhoun JH et al., who highlighted osteomyelitis and impaired healing as major complications of open long-bone fractures [15].

With respect to management, internal fixation was the most common treatment modality (60.8%) in this study, followed by conservative treatment (23.3%) and external fixation (15.8%). This reflects the contemporary shift toward operative stabilization to achieve early alignment, mobilization, and functional recovery. Roberts CS et al. and Pape HC et al. have emphasized that definitive fixation or staged stabilization (damage-control orthopaedics) improves outcomes and reduces systemic complications in traumatic fractures [16, 17].

Functional outcomes in this study were encouraging, with good-to-excellent results in 75% of patients (excellent 40.8%, good 34.2%). These findings are comparable to those reported by MacKenzie EJ et al., who observed that appropriate fracture stabilization and rehabilitation lead to satisfactory long-term functional recovery in the majority of lower-limb trauma patients, although a subset may experience persistent disability [18].

The relatively favorable outcomes observed may be attributed to timely stabilization and adequate follow-up. Biological principles of fracture healing, including preservation of blood supply and stable fixation, are critical determinants of union and function as noted by Marsell R et al [19]. Furthermore, standardized fracture classification systems such as those described by Müller ME et al. and Marsh JL et al. facilitate appropriate treatment selection and prognostic evaluation in long-bone injuries [20, 21].

Limitations of the study

This study has several limitations. It was conducted in a single tertiary care center with a relatively small sample size, which may limit the generalizability of the findings to other settings. The follow-up period was short and primarily focused on early functional outcome, so long-term complications such as late non-union, post-traumatic arthritis, or persistent disability could not be fully assessed. In addition, the descriptive design without comparative analysis between treatment modalities restricts evaluation of the relative effectiveness of different management approaches.

CONCLUSION

Long bone fractures following trauma predominantly affected young adult males and were most commonly caused by road traffic accidents, with the tibia and femur being the frequently involved bones. The majority of fractures were managed operatively, mainly by internal fixation, and resulted in good-to-excellent functional outcomes in most patients. Appropriate fracture stabilization and timely management are essential for favorable recovery, and continued evaluation of treatment outcomes can help optimize orthopaedic trauma care.

Financial support and sponsorship: *No funding sources.*
Conflicts of interest: *There are no conflicts of interest.*

REFERENCES

1. Meling T, Harboe K, Søreide K. Incidence of traumatic long-bone fractures requiring in-hospital management: a prospective age-and gender-specific analysis of 4890 fractures. Injury. 2009 Nov 1;40(11):1212-9.
2. Johnson F, Semaan MT, Megerian CA. Temporal bone fracture: evaluation and management in the modern era. Otolaryngologic Clinics of North America. 2008 Jun 1;41(3):597-618.
3. Keating JF, Simpson AH, Robinson CM. The management of fractures with bone loss. The Journal of Bone & Joint Surgery British Volume. 2005 Feb 1;87(2):142-50.
4. Schenker ML, Yannascoli S, Baldwin KD, Ahn J, Mehta S. Does Timing to operative debridement affect infectious complications in open long-bone fractures?: a systematic review. JBJS. 2012 Jun 20;94(12):1057-64.
5. Center JR, Bliuc D, Nguyen TV, Eisman JA. Risk of subsequent fracture after low-trauma fracture in men and women. Jama. 2007 Jan 24;297(4):387-94.
6. Tzioupis C, Giannoudis PV. Prevalence of long-bone non-unions. Injury. 2007 May 1;38:S3-9.
7. Murray IR, Amin AK, White TO, Robinson CM. Proximal humeral fractures: current concepts in classification, treatment and outcomes. The Journal of Bone & Joint Surgery British Volume. 2011 Jan 1;93(1):1-1.
8. Calori GM, Tagliabue L, Gala L, d'Imporzano M, Peretti G, Albisetti W. Application of rhBMP-7 and platelet-rich plasma in the treatment of long bone non-unions: a prospective randomised clinical study on 120 patients. Injury. 2008 Dec 1;39(12):1391-402.
9. Corrales LA, Morshed S, Bhandari M, Miclau III T. Variability in the assessment of fracture-healing in orthopaedic trauma studies. JBJS. 2008 Sep 1;90(9):1862-8.
10. Jain AK, Sinha S. Infected nonunion of the long bones. Clinical Orthopaedics and Related Research (1976-2007). 2005 Feb 1;431:57-65.
11. Gillespie WJ, Walenkamp GH. Antibiotic prophylaxis for surgery for proximal femoral and other closed long bone fractures. Cochrane Database of Systematic Reviews. 2010(3).
12. Chalya PL, Mabula JB, Dass RM, Mbelenge N, Ngayomela IH, Chandika AB, Gilyoma JM. Injury characteristics and outcome of road traffic crash victims at Bugando Medical Centre in Northwestern Tanzania. Journal of trauma management & outcomes. 2012 Feb 9;6(1):1.
13. Giannoudis PV, Grotz MR, Tzioupis C, Dinopoulos H, Wells GE, Bouamra O, Lecky F. Prevalence of pelvic fractures, associated injuries, and mortality: the United Kingdom perspective. Journal of Trauma and Acute Care Surgery. 2007 Oct 1;63(4):875-83.
14. Giannoudis PV, Papakostidis C, Roberts C. A review of the management of open fractures of the tibia and femur. The Journal of Bone & Joint Surgery British Volume. 2006 Mar 1;88(3):281-9.
15. Calhoun JH, Manring MM, Shirtliff M. Osteomyelitis of the long bones. InSeminars in

plastic surgery 2009 May (Vol. 23, No. 02, pp. 059-072). © Thieme Medical Publishers.
16. Roberts CS, Pape HC, Jones AL, Malkani AL, Rodriguez JL, Giannoudis PV. Damage control orthopaedics: evolving concepts in the treatment of patients who have sustained orthopaedic trauma. JBJS. 2005 Feb 1;87(2):434-49.
17. Pape HC, Tornetta P, Tarkin I, Tzioupis C, Sabeson V, Olson SA. Timing of fracture fixation in multitrauma patients: the role of early total care and damage control surgery. JAAOS-Journal of the American Academy of Orthopaedic Surgeons. 2009 Sep 1;17(9):541-9.
18. MacKenzie EJ, Bosse MJ, Pollak AN, Webb LX, Swiontkowski MF, Kellam JF, Smith DG, Sanders RW, Jones AL, Starr AJ, McAndrew MP. Long-term persistence of disability following severe lower-limb trauma: results of a seven-year follow-up. JBJS. 2005 Aug 1;87(8):1801-9.
19. Marsell R, Einhorn TA. The biology of fracture healing. Injury. 2011 Jun 1;42(6):551-5.
20. Müller ME, Nazarian S, Koch P, Schatzker J. The comprehensive classification of fractures of long bones. Springer Science & Business Media; 2012 Dec 6.
21. Marsh JL, Slongo TF, Agel J, Broderick JS, Creevey W, DeCoster TA, Prokuski L, Sirkin MS, Ziran B, Henley B, Audigé L. Fracture and dislocation classification compendium-2007: Orthopaedic Trauma Association classification, database and outcomes committee. Journal of orthopaedic trauma. 2007 Nov 1;21(10):S1-6.