ORIGINAL ARTICLE

Pattern of femoral fractures and associated injuries in a Nigerian tertiary trauma centre

UE Anyaehie, OC Ejimofor[1], FC Akpuaka[2], CU Nwadinigwe

Department of Orthopaedic, National Orthopaedic Hospital Enugu, [1]Department of Anatomy, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, [2]Plastic Surgery Unit, St. Francis Hospital, Asata, Enugu, Nigeria

Abstract

Background: The femur is the strongest and largest bone in the human body. It therefore requires high-energy trauma for it to fracture unless there is an ongoing pathology that weakens the bone. Femoral fractures are thus associated with significant pain, deformities, bleeding and varying degrees of injuries. The aim of this study is to determine the pattern of femoral fractures and the associated injuries in our region while recommending possible means of averting these injuries.
Materials and Methods: A 10-year retrospective study was done in National Orthopedic Hospital Enugu from 1994 to 2003. The demographic data, etiology, the part of femur affected and associated injuries were collated from the hospital records/folders. The analysis was performed using descriptive statistics in Microsoft Excel 2007.
Results: A total of 562 cases were reviewed, 63.7% of all the patients were males and the most common etiological factor was road traffic accidents. The site of fracture varied with age and etiology with 26.5% occurring at the mid-shaft with an average age of 27.2 years and 16% occurring at the neck of femur, more in the elderly, with 55.6% following minor falls and trips. The most common associated injury was soft tissue injuries requiring secondary wound closure.
Conclusion: Femoral fractures are common and the pattern varies with age and the mechanism of injury. They are associated with other injuries that may be life-threatening.

Key words: Associated injuries, femoral fractures, Nigeria, pattern

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Introduction

Femoral fractures are a common injury seen at the accident and emergency section. The femur being the longest bone in the human body[1] has different parts among which are the head, neck, greater and lesser trochanters, shaft and the distal condyles, and therefore fracture can occur in any of these areas. As the strongest, largest and heaviest tubular bone in the human body,[2] it requires a considerable amount of force to fracture. It is one of the principal load-bearing bones in the lower extremity[3] and also one of the most frequently fractured bones in the body that is demanding on the surgeon during fixation. Femoral shaft fractures are generally caused by high-energy forces and are often associated with multisystem trauma.[1] The spectrum of the fracture ranges from nondisplaced fractures to severely communited and segmental fractures which vary according to the direction of the force applied and the amount of energy absorbed by the femur at the time of the fracture.[4] There may also be other bony injuries and multisystem involvement and hence the objectives of this study are to determine the pattern of presentation of femoral fractures and the associated injuries as well as recommend preventive measures.

Materials and Methods

This was a 10-year retrospective study from 1994 to 2003 done at our institution after ethical clearance. The medical records of all patients with femoral fracture admitted through

Address for correspondence:
Dr. UE Anyaehie
National Orthopaedic Hospital, Enugu, Nigeria.
E-mail: udo179@yahoo.com

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accident and emergency department were retrieved from the medical records department. Out of 4457 admissions for orthopedic conditions in the 10-year period, 571 patients had femoral fractures. A total of 562 patients with femoral fractures and complete records were selected for the study. The data obtained from their records were the age and sex of the patients, the cause of the femoral fracture, the site of the femur involved and the associated injuries. Inclusion criterion was every case of femoral fracture received at the casualty department, and that included all femoral fractures presenting within 2 weeks of the injury. Exclusion criteria were femoral fractures presenting at the outpatient department with nonunion, delayed union, malunion, and patients with incomplete data. The data were analyzed using Microsoft Excel from Microsoft Office 2007 developed by Microsoft. and the results presented as tables and figures.

Table 1: Relationship of fracture site to the age and sex of the patients

Fracture site	Age range (years)	Average age	Male	Female
Head	44-81	59.8	4	1
Neck (intracapsular)	7-94	64.2	43	47
Pertrochanteric	26-100	69.2	30	25
Subtrochanteric/proximal third	1-92	33.0	51	19
Junction of proximal and middle third	2-65	23.0	18	7
Mid shaft	3 days-75	27.2	101	48
Junction of middle and distal third	6-60	31.6	16	10
Distal third	1-95	38.5	58	29
Condylar region	8-38	27.1	10	4
Segmental	9-97	43.5	20	9
Bilateral	15-88	47.2	8	4

Table 2: Etiology of the femoral fractures

Etiology	Number of cases	Percentage
Motor vehicular collisions	230	40.9
Minor falls/trips	105	18.7
Fall from height	63	11.2
Pedestrian/automobile collisions	61	10.9
Motor to bike collisions	46	8.2
Gunshot injury	36	6.4
Bike to bike collisions	16	2.8
Sports injury	5	0.9
Total	562	100.0

Results

There were 358 (63.7%) males and 204 (36.3%) females giving a male: female ratio of 1.8:1. The age of the patients ranged from 3 days to 100 years with an average of 42.2 years. The average age was higher with pertrochanteric and intracapsular neck fractures, while for the shaft and condylar fractures the average age was lower. The fracture sites and the relationship with age and sex are shown in Table 1. Majority of the cases 62.8% (353) occurred as a result of road traffic accidents (RTAs) with 230 (40.9%) resulting from motor vehicular collisions. Other etiological factors are shown in Table 2. Table 3 shows the different sites of femoral fracture and the relationship between these sites and the etiology. The mid-shaft was the most common site to fracture with 26.5% (149), followed by the intracapsular neck of the femur with 16.0% (90) and the least site of femur involved was the head in 0.9% (5). RTA was the major cause of mid-shaft fractures and fractures of all the different sites of the femur apart from the intracapsular neck and pertrochanteric regions that resulted mainly from minor trips and fall. Most of the patients had associated injuries that involved other systems or limbs as shown in Table 4 while 178 patients did not have any associated injury. The incidence of open femoral fractures was 8.4%.

The modality for managing femoral fractures in our institution depends mainly on the age, the etiology, and the fractured personality and these vary depending on the site of femur involved. Other determining factors include the surgeon's preference, resources available in the institution and patient's request. These modalities include

Table 3: Fracture site and relationship with aetiology

Site of femur involved	Frequency	Road traffic accidents (%)	Minor falls/ trips (%)	Fall from height (%)	Gunshot injury (%)	Sports injury (%)
Head	5	2 (40)	2 (40)	1 (20)	0	0
Neck (intracapsular)	90	22 (24.4)	50 (55.6)	17 (18.9)	0	1 (1.4)
Pertrochanteric	55	17 (30.9)	30 (54.5)	4 (7.3)	4 (7.3)	0
Subtrochanteric/proximal third	70	44 (62.9)	8 (11.4)	7 (10)	10 (14.3)	1 (1.4)
Junction of proximal and middle third	25	19 (76)	0	6 (24)	0	0
Mid shaft	149	113 (75.8)	3 (2.0)	18 (12.1)	12 (8.1)	3 (2.0)
Junction of middle and distal third	26	25 (96.2)	0	0	1 (3.8)	0
Distal third	87	67 (77)	8 (9.2)	5 (5.7)	7 (8)	0
Condylar region	14	12 (85.7)	1 (7.1)	0	1 (7.1)	0
Segmental	29	23 (79.3)	3 (10.3)	2 (6.9)	1 (3.4)	0
Bilateral	12	9 (75)	0	3 (25)	0	0
Total	562	353	105	63	36	5

Table 4: Associated injury pattern

Associated injuries	Number of patients presenting with them
Minor bruises/lacerations	84
Multiple bruises/avulsions/large wounds requiring secondary wound closure	136
Fractures involving the leg and foot	60
Pelvic fractures	16
Hip dislocation	26
Fractures of ribs and vertebrae	15
Skull fracture	9
Upper limb fractures	36
Intra-abdominal injuries	5
Knee dislocation	7
Auto amputation of digits	1
Paraplegia	1
Shoulder dislocation	1
No associated injury	178

conservative management, open reduction and internal fixation (using plates and screws, nails, angle and condylar blade plates, dynamic compression plates and screws), hemiarthroplasty, and external fixation for some open fractures after debridement. For the elderly patients with fractures particularly with pathological fractures, surgical fixation if not contraindicated is done at the earliest possible time after the patient has been thoroughly investigated and optimized. Follow-up for patients include physical therapy, early mobilization, counseling and medical therapy, out-patient visits until consolidation, and then will implant removal be planned if need be.

Discussion

Knowledge of the possible means by which femoral fractures are acquired will help in planning preventive measures for some of these fractures while knowledge of the associated injuries will aid in the wholesome and adequate management of these patients.

Road traffic accidents accounted for the major cause of femoral fractures in our report comparable to another report in which almost two-thirds of the femoral fractures were due to RTAs.[5] This is probably because of the poorly maintained roads, ignorance of road safety guidelines and reckless disregard to traffic rules. Nigeria has a peculiar transport problem: The use of commercial motorcycles to commute passengers and the ease with which drivers licenses are obtained coupled with recklessness and speed used by some of these cyclists have contributed to an increase in RTAs[6] and thus to femoral fractures. From our study, reasons recorded as the cause of the RTA include over speeding and loss of control, bad roads and drunk drivers. Solagberu in his report gave reasons why RTAs are common in Nigeria and the causes of traffic accidents. He adjudged the main reasons to be the collapse of road infrastructure, burst tyres and failure of breaking systems of cars and buses.[6] Our findings of etiological factors are similar to other reports[7,8] and these include fall from height, gunshot injury and sports injuries. It can also be caused by low energy forces when the bone is diseased, and that is referred to as a pathological fracture. This is seen with minor tripping and falls in people with some metabolic bone diseases and metastatic bone diseases. Our study showed that 18.7% (105) of our patients had pathological fractures as they acquired the fractures following minor trips/falls.

In concordance with a previous study[8] the mid-shaft was the most common site involved, with a major cause being RTAs which are usually high-energy injuries. Similar reports show that femoral shaft fractures often result from high-energy forces associated with possible multiple system injuries.[1,3] The reason why the mid-shaft is the commonest part to fracture may be because it is the most exposed/extensive part that receives impact when there is trauma. It is important to note that not only high-energy injuries give rise to femoral shaft fractures. In this work, low energy forces also contributed to shaft fractures, and this has been reported in other works.[9] In most cases there were no associated injuries except where there was a direct impact to other areas of the musculoskeletal systems, but all the patients involved had an ongoing pathology involving the shaft. The head of the femur was the least part fractured probably because it is relatively hidden in the acetabulum and most likely will fracture following transmitted impact on it from forces from the femur or hemi pelvis and acetabulum. The major cause of upper femoral (intracapsular neck/pertrochanteric) fractures in this work was minor falls/trips. Minor trips/falls represent low energy injuries, which tend to occur more in the elderly female population with osteoporosis, a common predisposing cause of hip fractures in elderly postmenopausal women. Caucasian females have been reported as having a higher incidence of hip fractures[10,11] comparable to our work but with more females having intracapsular fracture neck of the femur and more men having pertrochanteric neck fracture. The male to female ratio was similar to other work.[12] The average age in this study compares with another finding.[13] For shaft fractures specifically, our finding of much younger age groups was also noted in other works.[14-16] This is probably because these age groups constitute the young active work force that go in search of work and means of livelihood and are thus exposed to RTA's. Our work also showed high average age groups for neck and pertrochanteric fractures which are commonly seen in the elderly age groups globally.[17,18] The elderly are more prone to these fractures following low energy forces mainly because of diminishing bone density from osteoporosis.[19] Preventive measures by early diagnosis with bone mineral density testing, dual-energy X-ray absorptiometry, and bone metabolism studies and treatment

of osteoporosis with calcium, Vitamin D supplements and biphosphonates are encouraged.[20]

In a work done by Adili *et al*. on organ injuries associated with femoral fractures, it was seen that patients with femoral fractures had a higher incidence of organ damage and increased incidence of upper and lower limb fractures.[21] This is similar to our work. Most of the femoral fractures resulting from RTAs particularly from motor vehicular collisions were high-energy injuries having fractures involving the lower and upper limbs, skull, ribs, vertebrae, joint dislocations, intrabdominal and other associated injuries. This is also in keeping with the work done by Salminen *et al*.[8] who reported that concomitant injuries were related to high-energy trauma. One hundred and seventy-eight patients did not have any associated injuries and majority were the patients with femoral fractures from low energy injuries like minor falls and trips which is to be expected going by the low energy force. This is similar to report by Salminen *et al*.[22] We also noted that the hip and knee dislocations were seen more with proximal and distal femoral fractures, respectively. This is due to the proximity of joints to those areas of the femur that received the impact of the forces. The incidence of open femoral fractures in this study over 10 years is 8.4% where other studies report a general frequency of 11.5/100,000 persons/year for open long bone fractures[23,24] (which is equivalent to 0.01%/year) with 40% occurring in the lower limb, commonly at the tibial diaphysis.[24,25] Comparing this to our finding of 0.84%/year for open femoral fracture, it is more common in our study. This may be due to problems of the roads and road users as mentioned above resulting in high-energy injuries, along with the absence of adequate prehospital care. Patients following RTAs are most often left to the help of passersby who assist them without due protection to the limb involved. Further trauma to an already injured limb during extrication from vehicle or accident scene can convert a previously closed fracture to an open fracture. Open femoral diaphyseal and distal femoral fractures tend to occur in the most seriously injured patients[23,24] and so associated injuries cannot be ignored. Therefore, a holistic assessment to confirm or rule out these injuries is vital to the ultimate and adequate management of these patients.

Conclusion

This study shows that femoral fractures are common, and the pattern follows certain age distributions and injury mechanisms. Femoral neck fractures and pertrochanteric fractures often occur in the elderly as a result of low energy trauma while shaft fractures are commoner in the younger age group and often follow RTAs. The associated injuries vary and can affect any body system and as such careful evaluation of these patients to determine these injuries and adequately treat them alongside the femoral fractures is important. Prevention should be directed at measures to reduce RTA's, and further work done to analyze the risk factors for femoral fractures following minor trips and falls in the elderly.

We recommend road maintenance, provision of protected sidewalks, education of road users, regular vehicular checks and use of safety gears to reduce accidents and protect drivers, passengers and pedestrians. The government and the federal road safety commission should work on these measures and administer sanctions as the case may be.

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