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ORIGINAL ARTICLE

ANALYSIS OF RISK FACTORS FOR FAILURE OF LOCKED PLATE FIXATION OF DISTAL FEMUR FRACTURE

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ABSTRACT:
Background: It is quite rare as well as severe to seen commonly distal femur fractures. 0.4% and 3% is the estimated frequency of all fractures and femoral fractures. The gender ratio has changed and today there is a majority of women, and the population is also increasingly older; mean 61 years old at fracture and over 65 in more than half the cases. Hence; we planned this study to examine patients with distal femoral fractures which were treated with locked plates, to assess the various risk factors responsible for complications. **Materials & Methods**: The present study was carried out in department of orthopaedics and included 400 patients who were treated with open reduction internal fixation (OIF) using a lateral distal femoral locked plate construction. Prospective institutional databases were used to gather information on the fixation which included locked screws in the distal fragment and non-locked, locked, or a combination of locked and non-locked screws in the proximal fragment of the bone. Only the patients with unilateral fracture were included for the present study. All the patients were divided into three predominant groups for the sake of convenience of description, namely; the entire cohort group, group with closed fractures, and group with open fractures. Primary outcome measures included reoperation to promote union, deep infection, and construction failure. These dependent variables were used in statistical analyses. For the identification of the risk factors, the 3 separate groups (entire cohort, closed fractures, and open fractures) were used for each of these populations. **Results:** A little of 20% of the total fractures required re-operation. Diabetes and open fractures were found to be the independent risk factors for reoperation to promote union and deep infection. For implant failure, risk factors included open fracture, smoking and shorter plate length. **Conclusion:** It is more advantageous to use relatively long constructs for the treatment of supracondylar femur fractures
Key Words: Femur, Fracture, Locked plates

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INTRODUCTION

The incidences of the distal femur fractures are rare and severe. 0.4% and 3% is the estimated frequency of all fractures and femoral fractures. A peak in frequency in young men (in their 30s) and elderly women (in their 70s) is usually thereby exhibiting a classic bimodal distribution of patients. In a young patient and an elderly person, high energy trauma and a domestic accident is usually considered as the primary causes of it respectively. The gender ratio has changed and today there is a majority of women, and the population is also increasingly older; mean 61 years old at fracture and over 65 in more than half the cases.[1] Implants will be subjected to prolonged load cycling in patients with risk factors creating conditions for delayed healing and non-union, thereby increasing the chance for implant failure.[2] Hence; we planned this study to examine patients with distal femoral fractures which were treated with locked plates, to assess the various risk factors responsible for complications.

MATERIAL ANS METHODS

The present study was carried out in department of orthopaedics and included 400 patients who were treated with open reduction internal fixation (OIF) using a lateral distal femoral locked plate construction. All the patients reporting for treatment of femoral head fracture form June 2002 to July 2012 were included for the present study. Prospective institutional databases were used to gather information on the fixation which included locked screws in the distal fragment and non-locked, locked, or a combination of locked and non-locked screws in the proximal fragment of the bone. Only the patients with unilateral fracture were included for the present study. All the patients were divided into three predominant groups for the sake of convenience of description, namely; the entire cohort group, group with closed fractures, and group with open fractures. Each group was analyzed separately to determine risk factors, known at the time of the index OIF, for complications for that particular group. Reviewing of the operative records, charts, and radiographs was done to identify patient and fracture characteristics including their re-operations and complications. The mean age of the patients was 55 years and ranged from 18 years to 70 years. Out of all patients, 240 were females and 160 were males. Table 1 shows details of the patient characteristics for those with closed fractures and open fractures. Graph 1 and 2 highlights the fracture mechanisms for each of the groups. High-energy mechanisms, including crush, gunshot wound, motorcycle collision, motor vehicle collision, or pedestrian struck, were present in the majority of open fractures (more than 80%), and low-energy mechanisms, including a fall from a standing height or various other low-energy mechanisms, were present in the majority of closed fractures (more than 60%). OTA fracture classification was used to determine the fracture patterns (Graph 2). Open fractures were determined according to criteria of Gustilo et al[4]. Construct characteristics, including overall plate length (measured in holes proximal to the articular cluster), proximal plate length (number of plate holes located in the proximal fragment), plate working length (number of holes spanning the fracture zone between the most distal screw in the proximal fragment and the most proximal screw in the distal fragment), number of distal screws, number of proximal screws, number of proximal cortices engaged by screws, and the plate metal (titanium or stainless steel), are presented in Table 3. Because of bone defects, staged bone graft was planned in each of the patient fill the void and promotes union. Before bone grafting, the metaphyseal voids were left unfilled in 22 cases, filled with an antibiotic cement spacer in 9, and filled with ceramic bone void filler mixed with vancomycin in 6. Primary outcome measures included reoperation to promote union, deep infection, and construction failure. These dependent variables were used in statistical analyses. For the identification of the risk factors, the 3 separate groups (entire cohort, closed fractures, and open fractures) were used for each of these populations. All the results were analyzed by SPSS software. Logistic regression models and Chi-square test were used to evaluate the level of significance. P-value of less than 0.05 was considered to be significant.

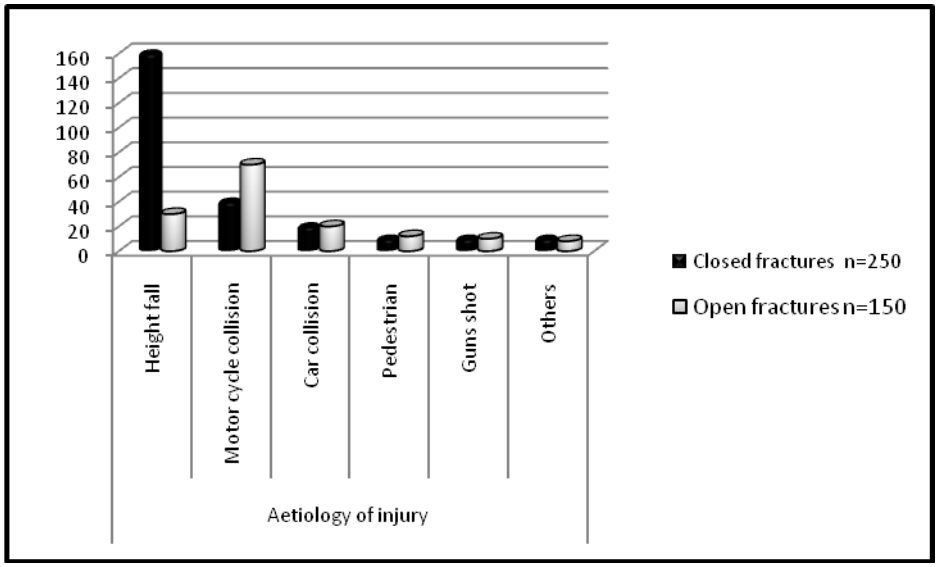
RESULTS

Table 1 highlights the demographic details of the patients. Out of total of 400 cases analyzed, 250 were of closed fractures whereas 150 were of open fractures. The mean age of the patients in closed fractures group was 63 years while in open fracture group, the mean age was 45 years. Graph 1shows distribution of the patients according to the cause of the disease. Maximum patients in closed fracture groups needed treatment due to fall from height whereas in other group, maximum patients had injury due to motor cycle collision. Graph 2 shows distribution of the patients according to the classification of fractures. Graph 3 shows distribution of patients according to post-operative analysis. In closed and open fracture groups, secondary infection and implant failure were the most common post-operative complications respectively.

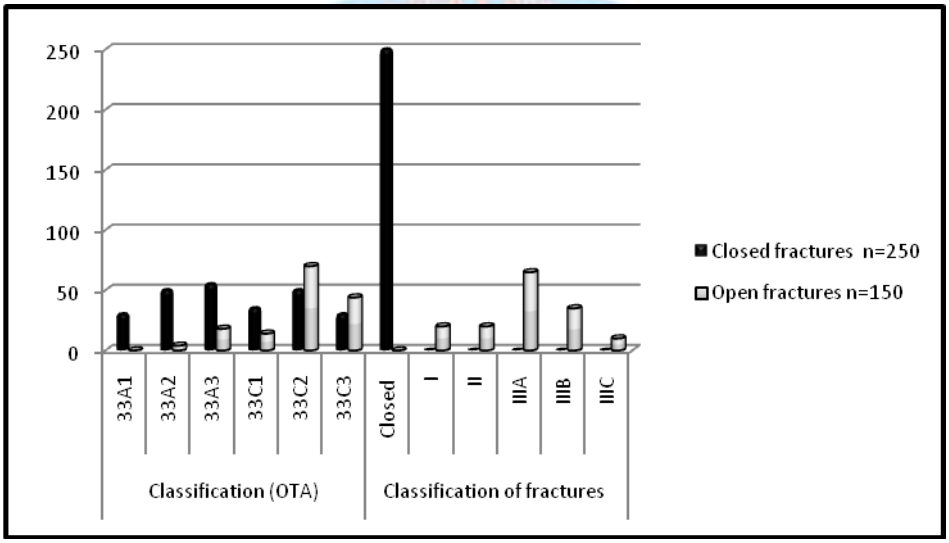
Table 1: Demographic details of the patients

		Closed fractures n=250	Open fractures n=150
Mean age (years)		63	45
Gender	Male	100	60
	Female	150	90
Mean BMI		28	26
Diabetic	Yes	80	45
	No	170	105
Smoker	Yes	50	55
	No	200	95

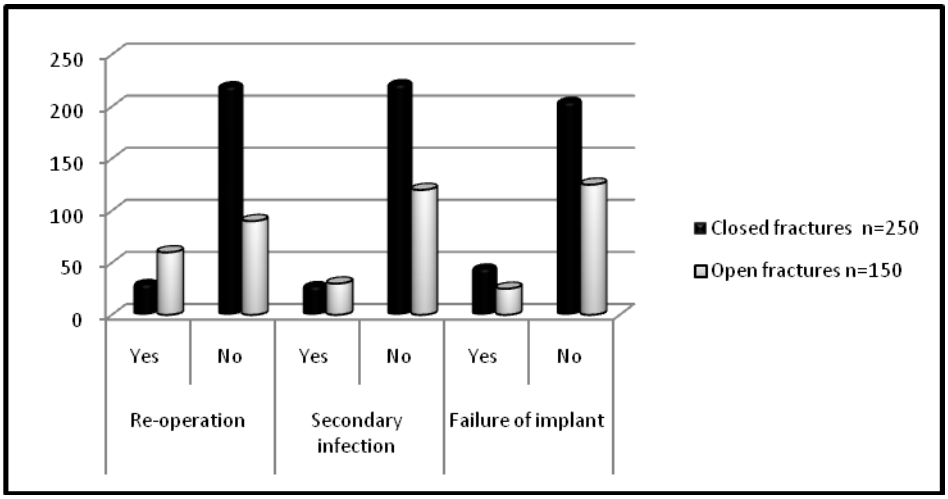
Graph 1: Distribution of the patients according to the cause of the disease.



Graph 2: Distribution of the patients according to the classification of fractures.



Graph 3: Distribution of patients according to post-operative analysis.



DISCUSSION

A typical bimodal pattern of occurrence is seen in distal femoral fractures which represent 6% of femoral fractures.[5] In young and in elder people, usually related to a high-energy and low-energy trauma respectively.[6] Ng et al. observed that distal femoral fractures represents approximately 30% of non-proximal femoral fractures, and their incidence had been growing up in the last couple of decades.[7] These fractures are associated to a very high morbidity and mortality in elderly people.[8] Smith et al. recently proposed to revise the standard of care of distal femoral fractures, applying the same principles applied to the proximal femoral fractures in terms of early surgery and universal ortho-geriatric involvement.[9] Plates, intramedullary nails, external fixations, and prosthesis are the available treatment strategies for distal femoral fractures. Intramedullary nailing and locking screw plates are among the most common options these days. Considering their proprieties in resisting to varus collapse and having multiple points of fixation, the use of locking screw plates is considered very helpful in treating osteoporotic distal femoral fractures.[10] Hence; we planned this study to examine patients with distal femoral fractures which were treated with locked plates, to assess the various risk factors responsible for complications.

The characteristics features of fracture found in the patient which is associated with the need for reoperation to promote union and deep infection included diabetes and open fracture. Fracture healing is known to be adversely affected by this factors.[11-14] Along with; further risk of secondary infections is also increased. As in the present series, a large number of the open fractures needed bone grafting after debridement; prediction for re-operation for the promotion of union was not an unusual procedure. Risk of diabetes was relative higher in closed fracture groups. In younger age, in the group of closed fractures, was associated with increased risk for reoperation to promote union is less clear. The higher energy mechanism is related with distal femur fractures in this population, but in independent risk factor energy of injury was not identified. Because each of the identified risk factors is known at the time of injury and these data are particularly useful for prognostication and patient counselling. The risk factor and fracture characteristic for implant failure in any patient that shifts the balance toward delayed fracture healing or causes more stress on the implants has the potential to increase the risk for implant failure. Another independent risk factor for implant failure was the higher BMI valued cases. In comparison with the lean patients, obese patients are likely to stress their implants. Without formationa of any post-surgical complications, it is very difficult to manage supracondylar fractures, particularly intraarticular fractures. Similar nonunion rates of 0%–20% for conservative treatment or internal fixation methods have been described.[15- 18] This finding was treatment independent. In addition, diabetic and obese patients seem to be at high risk for healing complications, infections, and specifically non-unions. Importance of the material of the implants is a matter of concern from a long time. In comparison to the titanium implants, a significantly higher nonunion rate for stainless steel plate implants.[19]

CONCLUSION

From the above results, it can be concluded that it is more advantageous to use relatively long constructs for the treatment of supracondylar femur fractures. However, futures studies are advocated in this field to further explore the better options for improving the prognosis.

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