Original Research Article

Comparative analysis of two different treatments by surgery: Distal femoral fractures, Government General Hospital, Nizamabad

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Abstract

Introduction: A controversial topic has been the treatment of distal femoral fractures and it was recently evolved towards indirect reduction and minimally invasive techniques.**Objective:** Comparing the results of the surgical treatment with the minimally invasive stabilization of distal femoral fractures with a plate with screws for appendage compression.**Material and methods:** Patients treated surgically between January 2016 and January 2018 with distal femoral fractures were evaluated retrospectively. From each patient record, the following variables were recorded: age, sex, fracture form and injury mechanism, type of implant used, operating time and postoperative bleeding. The Neer scale was used to comparing the anatomical, radiological, and useful outcomes of each technique.**Results:** the total number of patients was 59; 33 males and 26 females; 58 years was the mean age. A screw plate was used for appendage compression purposes in 36 patients and a minimally invasive stabilization system in 23 patients. The cases handled had a shorter operating time and less in traoperative bleeding with a minimally inbuilt stabilization system. The Neer scale analytical victimization results were similar for each of the modalities.**Conclusions:** Patients with distal third of the femur fracture managed with a minimally invasive stabilization system had higher outcomes, which were not vital on the Neer scale, mainly due to lower pain intensity, early mobilization and less functional impact.

Keywords: fracture, femur, knee, surgery, technique, comparative study.

Introduction

The prevalence and incidence of thigh bone fractures around total knee arthroplasties are not accurately estimated [1]. Throughout the historical evolution of orthopedic surgery, the treatment of distal thighbone fractures has not achieved clinical results with the remainder of the limb fractures having a high quality love. Skinny cortices,pathology, wide medullary canals, and fracture comminution make it difficult to get and maintain a stable fixation [2,3].The aim of the treatment of these fractures is that the anatomical reduction of the articular surface, restoration of the limb length, alignment and rotation, as well as allowing the associated degree of early limb mobilization to avoid articular rigidity and also the loss of muscle mass[4]. Long bone fracture surgical procedure has evolved emphasizing minimizing the additional biological damage caused by the surgical trauma. Indirect reduction techniques consisting of exercising traction through the soft tissues to achieve fracture reduction were introduced and replaced step-by-step open reduction techniques. This indirect approach is known as internal biological fixation[5,6].Recently, varied minimally invasive techniques are being enforced alongside the previous ones. The implant, called the Less Invasive Stabilization System (LISS), stands out among them and consists of a pre-contoured plate that will be inserted percutaneously when the fracture is closed[6,7].Osteopenia and gonarthrosis may complicate its management in the literature. Additionally, there is a high rate of open distal femoral fractures [8,9],the treatment of distal femoral fractures has long been an argumentable subject. The conservative approach was predominant towards 1950-1960[10], AO introduced the mounted angular plate for the treatment of distal femoral fractures [11, 12]. Distal fractures of the thigh bone treated with internal fixation using a 95 ° angular plate and a reinforced appendage plate [13].The aim of this study is to present the results of the surgical treatment of supracondylar femoral fractures (types A,B,C) in accordance with the AO / ASIF classification using two treatment modalities: an appendage compression screw plate and a less invasive stabilisation system.

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Material and methods

This observational, retrospective, cross-sectional study examined the clinical files of all patients who underwent surgery from January 2016 to January 2018 due to distal fracture of the femur at Government General Hospital, Nizamabad. The Hospital Review Board approved this retrospective study before the study began and granted a consent releaseThe criteria for inclusion were as follows: firstly, complete clinical records; secondly, patients with distal leg bone fracture together with all degrees of severity; thirdly, the fractures should be surgically treated either with open reduction and with an appendage compression screw or by indirect reduction and a less invasive stabilization system; fourthly, patients followed up as outpatients. Furthermore, patients but eighteen years of age were excluded as those with Associate in Nursing between the fracture and hence the surgery for more than one week, patients with a fracture treated with a special type of implant at the beginning, and people with periprosthetic fracture diagnosis.A total of fifty-nine patients were known to apply those selection criteria and set up the sample. The following variables were analyzed for each patient record: age, sex, fracture mechanism, AO / ASIF classification type of fracture [14], surgical modality, operating time and volume of intraoperative harm. On the other hand, the subsequent variables were recorded throughout the follow-up at operating weeks three, 6, nine and

twelve: pain prevalence and severity, varying ginglymic motion, radiological evidence of healing, and complications. The results obtained at postoperative month 6, on the other hand, were assessed using the modified neer scale [15].The statistical analysis consisted of descriptive statistics (percentage, range, mean, standard deviation using statistical software from Origin Pro 7.6), using standard methodologies. In the case of numerical variables, the comparison of variables between both treatment modalities was made using the chi-square test for the categorical variables and the Student t-test for the independent samples. Using the Kruskal-Wallis test, the comparison of ordinal variables of the neer scale was performed.

Results

The review included a total of 59 patients, 57.6% of whom were males (33/59) and 44% females (26/59). Patient age ranged between 18 and 78 years, with a mean age of 58 years; the distribution in age groups is shown in Fig 1.

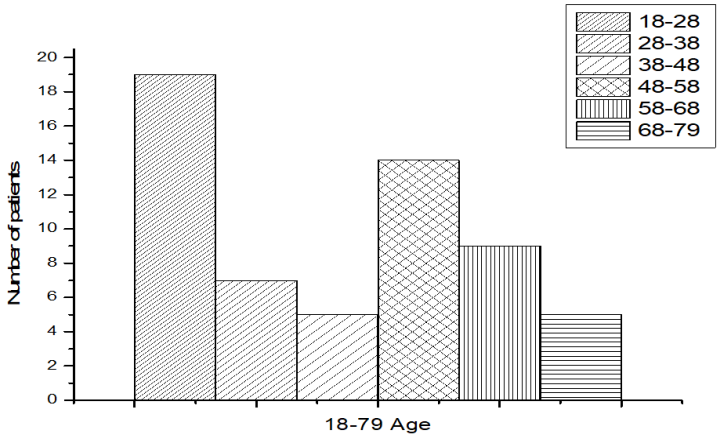

Fig 1:Distribution of patients by age group

In 71 percent of cases (42/59), a high-energy mechanism was reported as the cause of fracture, and 28.8 percent (17/59) of low-energy mechanism was reported. None of the patients had a bilateral fracture. According to the classification AO / ASIF, among the 59 fractures, the predominant type was 33A 1.1, 31% (18/59), followed by types 33A 1.2, 15% (9/59) and 33C 1.1, and 14% (8/59) frequency. Table 1 summarizes the distribution of fractures by frequency, based on the types included in this classification.

Table 1: Distribution of distal femur fractures according to the AO/ASIF classification

Type	Number of fractures	Relative frequency (%)
33 A 1.1	18	31
33 A 1.2	9	15
33 C 1.1	8	14
33 A 2.1	5	8
33 A 2.2	4	7
33 A 3.3	3	5
33 A 1.3	3	5
33 B 1.2	2	3
33 C 1.3	2	3
33 A 2.3	2	3
33 A 3.1	1	2
33 B 1.1	1	2
33 C 1.2	1	2
Total	**59**	**100**

76 percent (45/59) of the total number of fractures were closed, and 24 percent (14/59) were open. Type I was 5/16 open fractures, type II was 2/16, and type IIIA was 9/16, according to the gustilo classification [16]. Fifty-four percent (32/59) of the fractures involved the right pelvic limb, and 46 percent (27/59) of the left.Under the surgical treatment method for fracture fixation, an implant consisting of a plate with condylar compression screws (Group I) was used in 36/59 patients (61 per cent) and the less invasive stabilization system (Group II) was used in 23/52 patients (39 per cent).When comparing the overall characteristics of the patients in each group, no significant differences were found in age and sex. However, a significant predominance was found in the proportion of fractures caused by a high energy mechanism in Group I patients (Table 2).

Table 2:Patient characteristics and mechanism of injury

	Group I	Group II	*P* - Value
N	36	23	
Age	51.2±16.52	50.5± 19.36	0.65*
Gender	Males 21/36	Males 16/23	
	Females 15/36	Females 7/23	0.92†
Mechanism of injury	High energy 29/36	High energy 15/23	
	Low energy 7/36	Low energy 8/23	0.06†

** Student t-test; † Chi-square*

The distribution of fractures according to the AO/ASIF classification for each treatment modality is summarized in table 3.

Table 3:Distribution of fractures by group according to the AO/ASIF classification

Type	Group I	Group II
33 A 1.1	11/36	6/23
33 A 1.2	7/36	4/23
33 C 1.1	5/36	3/23
33 A 2.1	3/36	3/23
33 A 2.2	2/36	1/23
33 A 3.3	3/36	1/23
33 A 1.3	1/36	1/23
33 B 1.2	1/36	
33 C 1.3	2/36	1/23
33 A 2.3	1/36	1/23
33 A 3.1		
33 B 1.1		1/23
33 C 1.2		1/23

A longer duration of the surgical procedure was seen in Group I, with a mean of 2hrs 20minutes, compared with Group II, with a mean duration of 1hr 40 minutes, with a statistically significant difference. The intraoperative bleeding volume was greater in the cases in which the implant consisting of a plate with condylar compression screws was used (mean bleeding: 756 cc), compared with Group II, which had a mean bleeding volume of 320 cc, with a statistically significant difference between them. In Group I a graft was used in 52 percent of cases (19/36). Under Group II, no graft was used because the fracture site was intact.When the degrees of flexion obtained at postoperative months 1, 2 and 3 were compared, no significant differences were seen between both treatment modalities (Table 4).

Table 4:Evaluation of postoperative flexion (Degrees)

	Group I	Group II	*p* Value
Flexion at one month	33.26 ± 4.65	29.89 ± 2.98	0.98†
Flexion at two months	96.49 ± 6.96	98.84 ± 16.68	0.83†
Flexion at three months	104.55 ± 12.25	113.21 ± 18.96	0.52†

† Chi-square

The degree of bone healing was assessed at postoperative months 1, 2 and 3 for each of the groups; it is summarized in table 5.

Table 5:Evaluation of bone healing in both groups

	Group I		Group II	
	Grade	N	Grade	N
Healing at one month	Null	6/36	Null	11/23
	Incipient	25/36	Incipient	11/23
Healing at two months	Null	7/36	I	5/23
	Incipient	15/36	I-II	7/23
	Completed	16/36	II	15/23
Healing at three months	Incipient	3/36	Incipient	3/23
	Completed	23/36	Completed	20/23
Healing at six months	Delayed	3/36	Delayed	2/23

Patients who used a condylar compression screw plate stopped using crutches and used a cane or a walker after surgery for an average of 20 weeks. In comparison with the group of patients in which the less invasive stabilization system was used, who used a cane or a walker at an average of 9.6 weeks (p = 0.01), this figure showed a statistically significant difference.The Neer scale showed that 59 percent of patients in Group I (21/36) achieved excellent results. In 9/36 patients the functional results were affected by the need to use a cane or a walker due to the severity of their pain. Additionally, there was a valgus deformity of less than 5 ° in 4/36 patients, and two patients had a rotational deformity of 10 ° along with a deformity of 10 °. The results in Group II patients were excellent in 70 percent (16/23); 6/23 patients had functional restrictions due to the severity and on the nature of their pain. One patient (1/23) had a deformity of less than 5 ° in the valgus.

Discussion

Fractures of the distal femur are important injuries that regularly result in permanent disability. The magnitude of the functional loss results from the combination of injuries at the level of the distal femur, the articular cartilage and the surrounding soft tissues [17]. These fractures may include the femur shaft with limited knee effects, or they may occur at the level of the supracondylar metaphysis and remain as extra-articular, although they sometimes go all the way to the collateral ligament attachments (epicondyles). In other cases, a single condyle (monocondylar fractures) may be compromised by fracture with the other condyle, and the shaft remains intact. The fracture is often located at the supracondylar level, but may extend to the articular surface with different degrees of comminution inferior to that of supracondylar-intercondylar fractures [18].Recently, the treatment of these fractures has evolved towards a balance between the mechanical stability of the fragments and also the biological viability, the perception of the main principles of anatomical reduction of the body part surfaces and also the restoration of the length of the leg bone, as well as the articular alignment and rotation [4, 19].The mechanism of injury is related to two well-recognized patterns: high-energy injuries in young patients

and low-energy injuries in older patients. It is acknowledged that 45 percent of distal femur fractures in osteoporotic bones occur as a result of minor trauma, typically when an elderly patient falls on a flexed knee [20].In this paper we found that a high-energy mechaianism of fracture was predominant in patients treated with a plate with condylar compression screws. While this may reflect a difference in the severity of injuries between the groups and may be a characteristic inherent in retrospective studies, there are so far no reports distinguishing between the choice of treatment according to the fracture mechanism and the results gathered for analysis purposes [21]. For this reason we consider that this reflects the transition towards a predominant management of distal femur fractures with less invasive techniques in patients with osteopenia in whom a low energy mechanism of fracture is involved. This is recommended by some authors, including Wong *et al*., who published a series of 16 elderly patients with a mean age of 75 years, with a distal femur fracture, who were managed using a less invasive stabilization system. Only two patients had proximal fixation loosening in their paper and healing was complete in all cases and verified as a mean at postoperative week 30. Thus, these authors said this system was very effective in treating this type of fracture in osteopenic bones [22].

Assorted authors 'experiences have shown a shorter operating time and fewer injuries once the less invasive stabilization system has been used compared to the plate with compression screws conddylar. It is no surprise our study has shown an equivalent. In fact, such comparative knowledge was obtained even when a plate with outgrowth compression screws was placed minimally invasively [23].An important data point found during this paper was the shorter time needed for the first mobilization of patients in whom the less invasive stabilization system was used, since the latter favors the first quality of patients to walk and flex the knee, thus avoiding the delay in convalescing the ranges of motion resulting from muscular weakness.On the opposite hand, within the patients treated with a plate with outgrowthcompression screws, 2/36 fractures with delayed healing were rumored and 1/23 fractures with delayed healing within the cluster of patients treated with the less invasive stabilisation system. With regard to consolidation, Jeon *et al* [23] rumored complete healing in 94 patients in 16 distal leg bone fractures treated with an outgrowth compression screw plate.No statistically significant difference between the two treatment modalities was shown when the results were compared using the neer scale. However, it has been seen that prompt patient mobilization, lower soft tissue morbidity and lower pain intensity are important factors with the less invasive stabilization system for better patient outcomes.

Conclusions

Overall, the treatment of distal femur fractures represents a particular challenge for the orthopedic surgeon because of all the factors taken into account-such as the type of fracture, the quality of the bone, the length of time and the patient's overall status to obtain a suitable postoperative course.

The plate with condylar compression screws involves a greater invasion of the soft tissues, resulting in more bleeding and the need for bone deperiosisation to place it. This increases the risk in elderly patients with a thin metaphysal cortex and osteoporotic bone of postoperative complications. Thus the use of the less invasive stabilization system is preferred for distal fractures of the femur that are usually caused by mechanisms of low energetics and where one expects to find osteopic bone.There were no significant differences between the two modalities in the degree of bone healing or in the recovery of motion ranges.During the overall evaluation of the results using the Neer scale, no significant difference was found based on the implants used. However, a significantly earlier mobilization was observed in the patients treated with the less invasive stabilization system, thus avoiding the possible complica-tions that occur in patients who remain in complete rest for long periods of time. The main factor that influenced the results was the presence and severity of pain that had a direct impact on the rehabilitation of patients and their restoration of their activities.

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