Research Paper

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Retrograde Femur Nailing Versus Locking Plate Fixation for Extra-Articular Distal Femur Fractures: a Comparative Study of Functional and Radiological Outcomes of The Two Techniques.

Medical Science

KEYWORDS : Distal femur, non-union, nailing, locking plate, minimally invasive plate osteosysnthesis technique.

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ABSTRACT

Background: Distal femur fractures have always posed a therapeutic challenge to orthopaedic surgeons over the years. Many implants and modalities and techniques of fixation have been developed over the years for management of these fractures.

Aim: To compare the radiological and functional outcome of the knee after fixation of extra-articular distal femur fractures with distal femur nail and locking plate using minimally invasive technique.

Materials and methods: A retrospective study from June 2013 to July 2015 was conducted in our hospital. Only extra-articular fractures were included in the study. A total of twenty patients, between the age group of 20-50 years, half of whom who underwent retrograde/distal femur nailing(DFN) and the remaining half who underwent distal femur locking plate fixation using the minimally invasive technique were included in the study. The patients were called in for examination and x-rays at postoperative month six. The radiological union of the fracture was done using the Hammer score. The functional union was graded as per the American Knee Society Score. Complications were noted. The results were tabulated using chi square test.

Results:

The results showed us that the retrograde femur nailing had higher Hammer scores as compared to the minimally invasive plating. But, the American knee society scores were noted to be nearly the same in both the groups.

Conclusion:

We conclude by saying that locking condylar plate fixation with minimal invasive technique and distal femoral nailing have nearly the same functional outcome at the end of six months. But, the radiological union of fracture is better in retrograde femur nailing than the minimal invasive plate fixation.

INTRODUCTION:

Distal femur fractures are very rare and considered as severe injuries. The account upto 0.4% of all fractures and 3% of all femoral fractures[1]. They are considered to have an equal male and female distribution[1]. The presentation in younger patients is primarily due to high energy injuries and can present in the elderly age group due to trivial trauma due to pre-existing osteoporosis[2].

Sufficient surgical stabilization is essential to withstand the static loading and dynamic muscular forces[3].

There have been many advancements of fixation techniques and improvement in surgical implants. But, long term disability in these patients can occur due to a variety of factors like bony comminution, severe soft tissue injuries, articular cartilage damage etc[4].

Despite so many advances in this field the ideal management still is an unanswered question.

AIM:

To compare the radiological fracture union and functional outcome of knee after fixation with distal femur nail and locking plate using the minimally invasive technique in extra-articular distal femur fractures.

MATERIALS AND METHODS:

A retrospective study was conducted in ARS hospital Tiruppur from June 2013 to July 2015. The AO classification was used in classifying the fractures which presented to us. All fractures of AO type A(A1,A2,A3-extra-articular fractures) were included in the study(Figure 1). AO type B and C were excluded from the study. Any fractures with associated fractures such as proximal tibia fractures or patella fractures were excluded from the study. Even cases with associated ligament or meniscal injuries were also excluded from the study. Pathological fractures were excluded from the study. Age group included in the study was 20-50 years. Consent for participating in the study was first obtained from all the patients. A total of 20 patients formed the sample size. 10 of the 20 patients had undergone locking condylar plate fixation with minimally invasive technique[Figure2(A) and (B)] and remaining half had undergone retrograde/distal femur nailing (DFN) [Figure3(A) and (B)].

In our centre, as a protocol, every patient who undergoes distal femur fracture fixation by either of the techniques are started on knee range of motion exercises on post operative week three depending on the status of union of the fracture. Full weight bearing mobilization was started at 6-8 weeks postoperative depending on the status of the fracture union noted in the x-rays .

We reviewed all patients who underwent locking plate fixation and retrograde femur nailing at 6 months post-operatively. They were assessed for knee function and x-rays were taken to assess the fracture union. The radiological union of the fracture was evaluated as per the Hammer score[5,6]. The knee function was assessed as per the American knee society score(AKSS)[7,8]. Complications such as valgus, varus deformities, osteoarthritis etc, were noted down. The results were tabulated and compared using the

chi square test.

RESULTS:
10 of the 20 patients were males and remaining 10 were females.

Two patients (10%) of the twenty patients were grade I as per the Hammer score for fracture union. Six patients (30%) were grade II. Seven patients (35%) were grade III, two patients (10%) were grade IV and three patients(15%) were grade V (Figure 4).

The distribution of the patients as per the AKSS was tabulated. It was noted that seven of the 20 patients presented with a score of 70 points (Figure 5). The inference as per the AKSS score showed two patients (10%) with excellent results, nine patients (45%) had good results, seven patients (35%) had fair and two patients (10%) had poor results (Figure 6).

On comparing the two surgical techniques with the Hammer scores, it was noted that, one patient who underwent plate fixation and one patient who underwent retrograde nailing, graded under Hammer grade I. Two patients under the plating category and four from the nailing category graded under Hammer grade II. Four patients under the nailing category and three patients under the plating category graded under grade III. Two patients under the plating category were grade IV. One under the nailing and two under the plating category were grade V (Figure 7). Hence, it was noted that more patients from the nailing category had higher Hammer scores than the plating category. This proved that retrograde nailing hade higher chances of radiological fracture union than locking plate fixation.

On comparing the American Knee Society Scores with the two surgical procedures. It was noted that one patient who underwent nailing and one patient who underwent plating had excellent scores. Five patients under the nailing category and four under the plating category had good scores. Three patients who underwent nailing and four patients who underwent plating had fair scores. One patient under each category had poor scores (Figure 8). These results showed that both minimally invasive plating and distal femoral nailing had nearly equal results in terms of knee function.

No complications like varus, valgus deformities, arthritis of the knee, non-union etc were noted.

DISCUSSION:
The rates of complications after fixation were brought down by the techniques employing biological fixation with minimal invasion of soft tissues[9]. The retrograde nailing is a method of biological fixation[10,11]. Locking plate has become popular in recent times as it can be used successfully in challenging injuries with minimal invasion of soft tissues[9].

There were some reports which state the fact that the locking plate constructs are stiffer and may reduce the amount of callus produced and thereby affect fracture union[12]. There have been some reports which state that the intramedullary nails are less stiffer than the locking plates [13,14].

Retrograde nailing have some similar advantages as locking plates like percutaneous location, indirect reduction and success in osteoporotic bones[15,16].

In our cases it was noted that radiological fracture union was noted to be higher in cases retrograde femur nailing than minimally invasive plating. This is comparable to studies by Gao et al[9]. This also supports the hypothesis of increased callus formation in retrograde nailing as compared to minimal invasive plating[9,17].

The knee function was compared between both the techniques it was noted that no significant difference was noted in the functional outcome of the knee at the end of six months. This was comparable to the results of Gao et al[9] and Markmiller[16].

Herera et al, in their series of 415 distal femur fractures reported a non-union rate of 1.5% with intramedullary nailing as compared to 5.3% with locking plates[18].

No cases of non-union or malunion was noted in our series.

Gao et al; in his study on comparison of fixation of 36 cases of extra-articular distal femur fractures concluded that the radiological union of distal femur fractures was higher in retrograde nailing than minimal invasive plating. The functional outcome which they noted was almost the same in both the procedures[9].

Henderson et al; in his series reported a less periosteal callus formation in retrograde nailing as compared to distal femur plating in management of distal femur fractures[12].

CONCLUSION:
The functional outcome of both the techniques show the same results at the end of six months in the management of extra-articular distal femur fractures but the radiological fracture union is better in retrograde femur nailing.

IMAGES:

1(A) 1(B)

Figure 1(A) and (B): Anteroposterior and lateral radiographs showin the AO type A3 distal femur fracture.

2(A) 2(B)

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Figure 2(A) and (B): Post operative anteroposterior and lateral radiographs after LCP fixation.

3(A) 3(B)

Figure 3(A) and (B): Post operative anteroposterior and lateral radiographs after retrograde/distal femur nailing.

Figure 4: Pie diagram showing the distribution of patients as per the Hammer score.

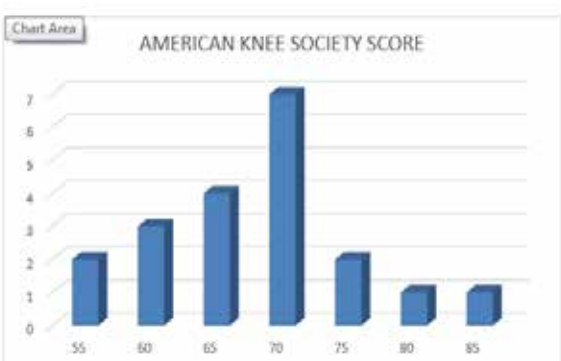

Figure 5: Bar graphs indicating the distribution of patients as per the AKSS score. Note that seven of the twenty patients were of the score of 70 points.

Figure 6: Distribution of patients according to the inference of the AKSS.

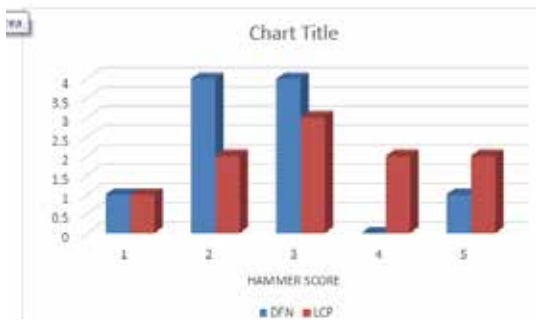

Figure 7: Comparison of Hammer scores indicating the grade of radiographic union of distal femur fracture at six months after retrograde/distal femur nailing(DFN) and Locking Condylar Plate(LCP) fixation.

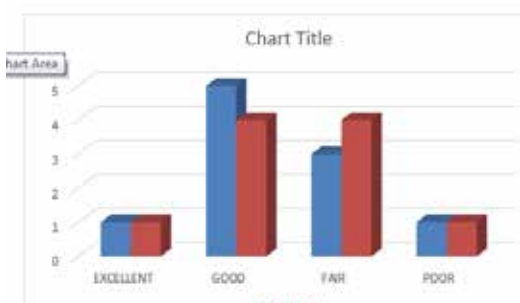

Figure 8: Comparison of the Inference of American Knee Society Score indicating the functional outcome of the knee at six months after retrograde/distal femur nailing(DFN) and Locking Condylar plate (LCP) fixation.

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