



Outcome of Fractures of Distal Femur Treated Using Retrograde Multidirectional Interlocking Nail

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Abstract

Background: **Aims:** To study the "Outcome of Fractures of Distal Femur Treated Using Retrograde Multidirectional Interlocking Nail". Study design: A prospective study. Place and duration of study: Department of Orthopaedics at Government Medical College, Amritsar between November 2018 to December 2020. **Methods:** The study included a total of 30 cases of either sex >20 years old with a mean of 44.33 years with closed fracture of distal 1/3rd femur type A admitted in Department/Casualty of Orthopaedics at Government Medical College, Amritsar treated with retrograde multidirectional intramedullary interlocking nail. **Results:** Mean union time in our study was found to be 18.62 weeks. In 56.67% of the patients (17 patients) knee flexion was between 111 to 120 degrees. Mean knee flexion of the patients was 113.23°. excellent to good results were seen in 80 percent of the patients (24 patients) while fair to poor results were seen in 20 percent of the patients (6 patients). **Conclusions:** Retrograde multidirectional nailing is a good option in the management of distal femoral fractures (especially type A fractures) due to less invasive procedure and hence lesser blood loss and infection, lesser operative time and exposure to c-arm radiations, early mobilization and weight bearing with very decreased overall complications and good anatomical and functional outcome.

Keywords:- Distal 1/3rd femur fractures, AO type A fractures, retrograde multidirectional nailing.

INTRODUCTION

Femoral fractures are an injury commonly seen in the emergency room. As the longest bone in the human body, the femur is divided into several different parts including the head, neck, greater and lesser trochanters, shaft, and the distal condyles. Fractures can occur in any of these areas. The fracture site is determined by

the force, impact point, and how the forces are transmitted

through the bone.^[1] In addition, the fracture site of the femur may also be determined by the structure and strength of the bone. The site of femoral fracture can be categorized according to the Arbeitsgemeinschaft für Osteosynthesefragen (AO) classification as proximal femoral (type A: trochanteric; type B:

neck; and type C: head), femoral shaft and distal femoral fractures.^[2] Determination of the influence of age on the incidence of femoral fractures in any given part of the bone is complex, because many age-related factors, including gender, trauma mechanism, body weight, and bony density, would also have impact on the occurrence of the femoral fracture. The factors influencing femoral fracture site are interrelated and are not independent. For example, increasing age is associated with osteoporotic bony changes, which are believed to increase the rate of femoral fracture; falls occur more frequently in the elderly but traffic-related fractures caused by motorcycle or bicycle accidents occur more often in younger adults and the rate of its occurrence differ between genders.^[3,4,5]

In a fall accident, the force directly impacts the posterolateral aspect of the greater trochanter, but the impact point is not limited to only this site in a non fall accident. Therefore, proximal type A and B fractures are predominant in falls, but in motorcycle accidents, femoral shaft fracture comprises the most common fracture site, followed by distal femoral fractures.^[4] The incidence of distal femoral fractures is approximately 37/1,00,000 person per year. Distal femur fractures make up to 6% of all femoral fractures. Most high energy distal femoral fractures occur in males in the age group 15-50 years and low energy fractures occur more commonly in osteoporotic women more than 50 years.^[6]

Fractures in the distal third of femur continue to perplex the surgeon whether they are transverse, oblique, comminuted, supracondylar or intracondylar fractures in a T or Y fashion. Additionally, the mortality for elderly patients

who sustain these injuries may be as high as 18.4%, 39.1% and 48.8% at one, three and five years respectively.^[7,8,9] Distal femoral fractures are often complex, intraarticular, comminuted, irrespective of etiology and thus making the adequate reduction challenging. Special care must be taken to avoid disrupting the soft tissue envelope to reduce the risk of nonunion.^[10]

MATERIAL AND METHODS

This was a prospective study of 30 cases of either sex >20 years old with closed fracture of distal femur type A admitted in the Department of Orthopaedics at Government Medical College, Amritsar to assess the outcome of treatment of fracture of distal one-third of femur with retrograde multidirectional intramedullary interlocking nail during the period between November 2018 and December 2020. The patients in the emergency were resuscitated and vitals were stabilized and after proper investigations and preanaesthetic check-up the patient was operated with retrograde multidirectional nailing. The study was undertaken after approval of Institutional Ethics Committee, Government Medical College, Amritsar. Written informed consent of the patient was obtained before inclusion in the study.

Inclusion Criteria:

- All type A fractures as per A.O./ASIF classification.
- Closed fracture of distal one third femur.
- Age > 20 years.

Exclusion criteria:

- Open fractures.
- Age < 20 years.
- Pathologic fractures.

As soon as the patient was fit, the patient was placed on a radiolucent table in supine position

and under proper anaesthesia with proper painting and draping of the parts the affected knee was flexed at 60°. Transpatellar approach to the knee was used and the insertion point at the intercondylar notch anterior to Blumensaat's line along the femoral shaft axis was marked using image intensifier. Entry was made with the help of straight owl. Guide wire was passed through the distal and proximal fragment after reduction and medullary canal was reamed in 0.5 mm increments until cortical contact appreciated. All fractures were reduced by closed methods. All fractures were statically locked. Postoperatively, spinal precautions (elevation of the foot end) were applied and regular monitoring of vitals was done which were found to be stable. Range of motion exercises were initiated on 2nd post op day. On the third post operative day, aseptic dressing was done in the ward and the stitch line was found to be healthy. Non weight-bearing mobilization was allowed immediately. Alternate stitch out was done on 10th post operative day and full stitch out was done on 12th post operative day and the patient was discharged in satisfactory condition. Weight bearing was gradually promoted to full weight bearing as bridging callus and union was noted on X-rays at follow ups. Patients were followed up at 4 weeks interval for 1st 6 months and 6 weeks interval for next 3 months. Patients were followed with X-rays and Modified Knee-Rating Scale of Hospital for special surgery for assessing the clinical and functional outcome.

The following parameters were noted in the proforma:

- Time taken for fracture union defined by radiography showing bridging callus on at least 3 cortices.
- Secondary procedures performed if needed.
- Complications of the procedures like pain, angular deformity as on anteroposterior and lateral radiographs, rotational deformity and limb length discrepancies as measured clinically.
- Knee function as measured by modified knee-rating scale of the hospital for special surgery.

RESULTS AND DISCUSSION

Most common age group in our study was 31-50 years which involved 56.7 percent of the patients (17 patients). Mean age of the patients of the present study was 44.33 years. Males outnumbered females in sustaining such fractures as they are more involved in outdoor road, industrial and assault activities. 70 percent of the patients (21 patients) were males whereas 30 percent (9 patients) were female. In 80 percent of the patients (24 patients), mode of injury was road traffic accident, while in the remaining patients, the mode of injury was fall. In 60 percent of the patients (18 patients), right side involved while in the remaining 40 percent of the patients (12 patients), left side was involved. In 36.7 percent of the patients (11 patients), type 33A1.3 fracture were present while in the 26.7 percent of the patients (8 patients), type 33A3.3 fracture were present. In 53.3% of the patients (16 patients), the duration from trauma to surgery was <1 day. In 36.7% of the patients (11 patients), the duration from trauma to surgery was between 1-3 days. Mean duration between trauma and surgery was 1.63 days. Mean union time in our study was found to be 18.62 weeks. [Table 1] In 56.67% of the patients (17 patients) knee flexion was between 111 to 120 degrees. Mean knee flexion of the

patients was 113.23°. Mean Modified Knee Rating Scale Score among the patients was 97.27. Among the patients, excellent to good results were seen in 80 percent of the patients (24 patients) while fair to poor results were seen in 20 percent of the patients (6 patients). [Table

2] Knee pain was seen in 6 patients (20 percent), surgical site infections were seen in 10% of the patients (3 patients) and delayed union and non-union was seen in 1 patient (3.3 percent) each respectively.

Table 1: Union Time (Weeks)

| Weeks | No. of cases | Percentage |
|----------------------------|--------------|------------|
| 12-16 | 4 | 13.33 |
| 17-20 | 17 | 56.67 |
| 21-24 | 6 | 20.00 |
| >24 | 2 | 6.67 |
| Non union (after 39 weeks) | 1 | 3.33 |
| Total | 30 | 100.0 |
| Mean+SD | 18.62±3.91 | |

Table 2: Outcome

| Outcome | No. of cases | Percentage |
|-----------|--------------|------------|
| Excellent | 15 | 50.0 |
| Good | 9 | 30.0 |
| Fair | 5 | 16.7 |
| Poor | 1 | 3.3 |
| Total | 30 | 100.0 |



Figure 1: Pre operative X ray AP and lateral view



Figure 2: Post operative X ray AP View



Figure 3: Post operative X ray lateral view



Figure 4: Follow up X-Ray At 4 weeks



Figure 5: Follow Up X Ray At 24 Weeks



Figure 6: Range of Motion. (a) Standing (weight bearing). (b) Extension at knee.(c)squatting.(d) Flexion of knee

Although their treatment evolved during the last years, distal femoral fractures still remain challenging injuries for orthopedic surgeons, due to their high complication rate and negative impact of those complications upon the function of the lower limb. The incidence of these fractures is around 37/100,000, representing 4-6 % of all femoral fractures.^[1] The diversity of surgical options for the management of distal femoral fractures reflects the challenges inherent in these injuries. These fractures are frequently cominuted and intra-

articular, and they often involve osteoporotic bone, which makes it difficult to reduce and hold them while maintaining joint function and overall limb alignment. Surgery has become the standard of care for displaced fractures and for patients who must obtain rapid return of knee function. The goal of surgical management is to promote early knee motion while restoring the articular surface, maintaining limb length and alignment, and preserving the soft-tissue envelope with a durable fixation that allows functional recovery during bone healing. A

variety of surgical exposures, techniques, and implants has been developed to meet these objectives, including intramedullary nailing, screw fixation, and periarticular locked plating, possibly augmented with bone fillers. Recognition of the indications and applications of the principles of modern implants and techniques is fundamental in achieving optimal outcomes.^[10] 56.7 percent of the patients of the retrograde multidirectional nailing group belonged to the age group 31-50 years. This is probably due to the fact that this is the most active and productive age group with individuals involved more in outdoor and job related activities. Mean age of the patients of the retrograde multidirectional nailing group was 44.3 years. 70 percent of the patients of the retrograde multidirectional nailing group were males while the remaining were females. In the present study, mean union time among the patients of the retrograde nailing group was 18.62 weeks. Mean knee flexion among patients among the patients of the retrograde nailing group was found to be 113.23°. The variation in knee flexion among the patients was probably due to the variation in patient compliance and the degree of postoperative knee pain. At 9 months follow-up excellent results were obtained 50% cases (15 patients), good results were obtained in 30% cases (9 patients), fair results were obtained in 16.7% cases (5 patients)

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and poor results were obtained in 3.3% cases (1 patient).

CONCLUSIONS

From this study we conclude that retrograde multidirectional nailing is a good option in the management of distal femoral fractures (especially type A fractures) due to less invasive procedure and hence lesser blood loss and infection, lesser operative time and exposure to c-arm radiations, early mobilization and weight bearing with very decreased overall complications and good anatomical and functional outcome.

Consent

All authors declare that “written informed consent was obtained from the patient(or other approved parties) for publication of this case report and accompanying images. A copy of the written consent available for review by the Editorial office/Chief editor/Editorial board members of this journal”

Ethical Approval

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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