



Orthopaedics

STUDY TO EVALUATE THE RESULTS OF SUPRACONDYLAR AND INTERCONDYLAR FRACTURE OF DISTAL FEMUR TREATED BY CLOSED/OPEN REDUCTION AND INTERNAL FIXATION USING RETROGRADE INTRAMEDULLARY NAIL

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ABSTRACT **Introduction:** Condylar fracture of femur is common both in elderly with osteoporotic bones and in young patients after motor vehicle accidents. Treatment of these fractures is a challenging task for most orthopaedic surgeons. This study evaluated the surgical outcome of distal femoral fractures treated with retrograde intramedullary nailing.

Methodology: This study was carried out in the department of Orthopaedic surgery, Darbhanga Medical College and Hospital, Darbhanga. The surgical outcome of 20 patients who were treated with retrograde supracondylar intramedullary nailing for distal femur fractures between December 2017 to November 2018 were evaluated. All patients were assessed with regards to operative time, blood loss, shortening, angular deformity, knee range of motion, initiation of weight bearing and duration of union. Every patient was assessed clinically and radiologically post operatively at every 4 wks interval till 6 months and then as the case demands for 2-24 months.

Results: The mode of injury was motor vehicle accident in 16 (80%) and fall in 4 (20%) cases. 15 (75%) fractures were closed and 5 (25%) fractures were compound. Average operation time was 93.5 minutes and average blood loss was 300 ml. There were no cases of non-union; the mean union time was 2.5 months (5 – 7 months). There was 1 case of infection. There was shortening of 1.5 cm in 1 case was observed postoperatively. By the end of one year overall outcome based on functional evaluation scale developed by Lysholm knee score rating system was excellent-40%, good-40%, fair-15%, poor-05%.

Conclusion: Retrograde supracondylar femoral nailing for AO/ASIF type A and type C distal femur (supracondylar) fractures is a proven and reliable method of fixation. It also provides excellent results in selected comminuted fractures of the distal femur with a low complication rate.

KEYWORDS : Supracondylar Fracture, Internal Fixation, Intramedullary Nail, RTA, Muller

INTRODUCTION

Supracondylar femur fractures show a bimodal age distribution, occurring more commonly in young and old population groups. In the early 1960s, there was a great reluctance towards operative management because of high incidence of infection, non-union, malunion, inadequate fixation, and lack of proper instruments, implants, as well as antibiotics. Then, the traditional management of displaced supracondylar fracture of Femur was along the principle of Watson Jones and John Charnley^{1,2,3,4}, which comprised of skeletal traction, manipulation of fracture and external immobilization in the form of casts and cast bracings. These methods had complications like deformity, shortening, prolonged bed rest, knee stiffness, angulation, joint incongruity, malunion, quadriceps wasting, knee instability and post-traumatic osteoarthritis. The current trends of management include the use of AO blade plate, dynamic condylar screw and other implant systems like intramedullary supracondylar nails. Supracondylar fractures tend to collapse into varus. During the application of AO blade plate or dynamic condylar screw, the shaft of Femur is often pulled laterally displacing the line of weight bearing lateral to the anatomic axis of condyle. This creates rotational movements at the fracture site that causes pulling off the blade plate or condylar screws leading to fatigue fracture of the plates. Also, the presence of osteoporotic bone leads to fixation failures with screws and plates cutting off the soft bone. The obvious advantage of nail is that it aligns the femoral shaft with condyles reducing the tendency to place varus movement at the fracture site. And because bending movement of an intramedullary device is substantially reduced failure of fixation in osteoporotic bone should be less. In addition, a retrograde intramedullary supracondylar nail has got distinct advantages of preservation of fracture hematoma, decreased blood loss, minimal soft tissue dissection, less operative time and reduced rate of infection. The purpose of this study is to evaluate the results of supracondylar and intercondylar fracture of femur, treated by close/open reduction and internal fixation using retrograde intramedullary supracondylar nail.

MATERIALS AND METHODS:

In this study, 20 patients with supracondylar fracture and intercondylar fracture of Femur were studied. All the cases were treated in Darbhanga Medical College and Hospital, Darbhanga between December 2017 to November 2018. The duration of follow-up ranged from 6 months to 24 months. All the fractures in the series were post-traumatic, and no pathological fractures were included. Also pediatric group were not included. The study was restricted to fractures occurring at the region 9 cms proximal to lower end of Femur. After admission of patient, the fracture was stabilized with the use of well-padded Thomas splint. Once patient were stable, with no medical contraindication for surgery, they were operated under spinal anesthesia. We have used the Supracondylar nail for the fixation of fractures in all the 20 patients with cancellous screws as supportive fixation whenever needed. The supracondylar nails are fully cannulated, closed section, 316L stainless steel implant. The nails are available in 10, 11 and 12 mm outer diameter with expanded diameter of 13 mm at the distal end. The length of the nail ranges as 15, 20, 25, 30, 35 cm. These nails are having a 5 degree interior bend and bow for anatomic fit in the distal femur. The nails have 5 holes in all lengths, 2 at proximal and 3 at distal ends for placement of 4.9 mm interlocking screws. Fractures were classified with the help of radiographs according to the AO-ASIF classification. Pre-operative evaluation was done on radiographs to ascertain the length of supracondylar nail, maximum possible diameter and the lengths of interlocking bolts.

Open Technique: The decision to use an open technique was made preoperatively in fractures having articular extension i.e. type C1 and C2 for accurate reduction and fixation with supportive cancellous screws anterior and posterior to the nail which we called as limited open technique. In some fractures we needed to open the fracture site for achieving reduction in the metaphyseal region and for adding bone grafts. In this technique the knee joint was entered through a standard midline/Anterolateral/Swash- Buckler skin incision and medial parapatellar capsular incision. All intra articular fractures were

anatomically reduced and fixed with cancellous screws the 6.5 mm cannulated screws were placed over a guide wire in the anterior and posterior segments of the condyles allowing adequate space to place the nail centrally in the medullary canal. The screws could be placed from lateral to medial side. Then the entry point was made as mentioned before with a curved awl or cannulated cutter over a 2.5 mm guide pin and centralized with the condyles in anatomic alignment to ensure that alignment will not deviate in to varus or valgus position. The entry point and the subchondral bone were reamed 0.5 to 1 mm larger than the selected nail diameter to avoid displacing of the condyles when the nail was inserted. By extending the incision proximally we exposed the fracture in some cases, achieved reduction before advancing the nail and put bone grafts. The wound was closed in layers over a suction drain after completion of interlocking and confirmation of stability, alignment and length.

4) Close Technique: We employed the close technique in majority of our cases having distal shaft and supracondylar fractures without intercondylar or articular extension we took a 5 to 6 cm midline prepatellar incision after the reduction of fracture by closed manipulation, followed by splitting of the tendon vertically in midline. Small retractors were used to minimize trauma as the curved awl was positioned in the intercondylar notch. This was verified by AP and Lateral views on C-arm. After gaining a satisfactory entry, the awl was advanced proximally directing in a neutral position with respect to the condyles and not the shaft. The awl was removed after its advancement into the metaphysis and a standard ball tipped guide rod advanced through the portal, past the reduced fracture proximally into the shaft. The entry portal and medullary canal were enlarged with flexible reamers beginning at 8 mm and advancing with 1mm graduation till the desired diameter. Proximal segment reaming was necessary in narrow medullary canal. After the completion of reaming, the chosen nail assembled with the jig is advanced over guide wire. Traction was applied at that time to the condyles, the nail was countersunk below the articular surface with gentle blows over the distal end. The reduction of fracture and positioning of the nail was again confirmed radiologically. The guide wire was removed and proceeded with interlocking after confirming the length and rotational alignment of the femur.

Locking: Two 4.9 mm bolts were placed percutaneous with the help of mounted jig and drill guide after drilling with 4 mm drill bit, first either in proximal or distal fragment depending upon the quality of reduction and maintenance of the length. The wound was closed, no drain was kept and compression bandage was applied over the dressing. Then tourniquet was deflated.

Post-operatively, static quadriceps and active or assisted bedside knee mobilisation was started from the 2nd post-operative day. Stitches were removed on 14th day. Partial weight bearing was allowed after 6 weeks, followed by complete weight bearing from 10th week with the help of a walker.

RESULTS:

In this study, 20 patients were included with a follow-up ranging from 6 months to 12 months. Out of the 20 patients, majority of the patients were male (13). The ages ranged from 20 to 65, with a mean age of 39.7 years. Majority sustained fractures due to high velocity vehicular accidents, followed by fall from height. Type A1 constituted 6 patients, Type A2

presentation constituted 6 patients and type A3 included 3 patients. In this study 15 were closed fractures and 5 were open fractures. The average operative time was 93.5 mins. Average radiological union time was 14.6 weeks. Full weight bearing was achieved on an average in 11.68 weeks. The average range of motion of knee was 111.25 degrees.

Table -1: Type of fracture

SC AND IC FRACTURE	NO.OF PATIENTS	PERCENTAGE
MULLER A1	6	30
MULLER A2	6	30
MULLER A3	3	15
MULLER C1	3	15
MULLER C2	2	10



Knee flexion at 24 weeks



Knee extension at 24 weeks



Squatting at 24 weeks

DISCUSSION:

Supracondylar and intercondylar fractures of the distal femur are complex fractures that are difficult to treat. Successful treatment of intraarticular fractures especially in weight bearing joints, requires restoration and maintenance of the congruence of the articular surfaces. The use of plates and screws in the fixation of these fractures has the inherent drawback of producing a load -shielding device. The resultant osteopenia creates a substantial risk of refracture proximal to the plate. This is very much important in elderly patients who have osteoporotic bones. A condylar screw can somewhat improve reduction in the sagittal plane, but it will not improve varus/valgus alignment over the condylar blade plate.

So Retrograde intramedullary nailing has become the preferred method of treatment for the fractures of distal femur. Retrograde insertion of RIN from the knee stabilizes fractures below the isthmus and facilitates return of good knee function early compared to lateral fixation devices, interlocking neutralizes the rotation stresses and restricts the telescoping of fragments, thereby preventing rotational instability and shortening.

Twenty cases of supracondylar and intercondylar fractures of distal femur were studied after fixing them with RIN. They were followed up for 2-24 months. The purpose our study was to evaluate the end results of treatment in these patients a with Retrograde intramedullary nail.

Our study comprised of twenty patients with distal femoral fractures who were treated with RIN overall final outcome was assessed in terms of regaining the lost knee function using Lysholm scoring scale⁵.

Among the twenty cases studied in our series, thirteen were males and seven were females. The average age was 39.7 years ranging from 22-65 years. 16 of the fractures were caused by RTA and 4 were due to fall. This is because high mobility factor.

Comparing our results with standard studies of

1. Emmet Lucas et al (1993)⁶
2. Richard. E Gellman et al. (1996)⁷
3. Patel.K et al. (2004)⁸
4. Present study (2012)

In our study 20 cases were studied with 15 closed and 5 open cases, average age was 39.7 years, 16 cases were due to RTA and 4 due to fall.

In our study we found average union time 3.6 months comparatively less than **Lucas** and **Gellman** study and slightly more than **Patel** case study. In our study average ROM was 111.25% which is more than **Lucas** and **Gellman** study and less than **Patel K** case study. We had complications of 1 case of superficial infection.

CONCLUSION:

Retrograde intramedullary supracondylar nail is a good fixation system for the distal third femoral fractures, particularly the extra-articular type. The operative time is lessened with decrease in blood loss. Distal screw related local symptoms is a common problem, and is related to the implant and technique. Early surgery, closed reduction, at least two screws in each fragment, and early post-operative knee mobilisation are essential for good union, and good knee range of motion. There is not much difference in individual fracture type healing and weight bearing. Thus, it provides rigid fixation in the region of femur, where a widening canal, thin cortices and frequently poor bone graft makes the fixation difficult. Surgical exposure for nail placement requires significantly less periosteal stripping and soft tissue exposure than that of lateral fixation devices.

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