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Original Research Article.

Management of Fracture Distal Femur Using Retrograde Supracondylar Nail: A Prospective Analysis at a Tertiary Care Centre

Rakesh Verma[1], Kapil Kumar[1*], Amit Saraf[2], Vishal Sidhu[3]

[1]Senior Resident, [2]Professor, [3]Assistant Professor, Department of Orthopaedics, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, UP, India.

ABSTRACT

Background: In the past two decades, the open reduction and internal fixation has gained good result in the management of distal femur fractures. The present study has been undertaken to evaluate the overall functional outcome of patients treated by supracondylar nail.

Materials and Methods: The present study was conducted at Department of Orthopaedics, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, UP, India. All the patients admitted in the department of Orthopaedics with fracture distal femur and managed by intramedullary supracondylar nail were included. Final assessment of results was done based on modified Mehrotra's grading based on the assessment of the final functional results and also taking into consideration, the complications if any.

Results: Average duration between injury and surgery was 3.38 days. In only 8% of the cases open reduction by additional parapatellar incision was required. Average duration of surgery was 52.6 minutes. Most common complication we encountered was knee stiffness in 16 cases followed by local symptom at distal screw site in 12 cases. Superficial infection was seen in 9 & deep infection in 2 cases. In 2 cases shortening was more than 2.5 cm. Average range of movement at the knee joint in our series was 110.93 with 40 cases having full range of movement. Final results were excellent in 61 of the cases. Good in 23% Fair in 11%, Poor in 5%.

Conclusion: Finally we conclude that intramedullary supracondylar nail should be the treatment of choice for distal femoral fractures. As it has all the advantages of closed treatment like minimal blood loss, less soft tissue stripping, preservation of fracture haematoma and minimal complications. This operation is particularly suited for Type A, C1 & C2 types of fractures as shown by the final functional results of this study.

Keywords: Distal Femur Fractures; Open Reduction; Supracondylar Fractures.

***Correspondence to:**

Dr. Kapil Kumar,
Senior Resident,
Department of Orthopaedics,
TMMC & RC, Moradabad, UP, India.

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INTRODUCTION

Supracondylar femur fractures show a bimodal age distribution, occurring more commonly in young and old population groups.[1] The anatomy of the distal femur explains the three major types of fracture. Because of the anatomy of the distal femur, only surgical treatment is indicated to stabilize the fracture. A non-surgical is a rare option. Sufficient stabilization to withstand static loading forces on bone and dynamic muscular forces can only be obtained with surgery. An orthopedic treatment is rare: it is proposed in bedridden patients and/or in patients with reduced autonomy in fractures with little or no displacement.[2] In the past two decades, the open reduction and internal fixation has gained good result in the management of distal femur fractures. There are various implants like condylar blade plate, DCS, screw, plate, interlocking nail antegrade or retrograde and external fixator are used in the operative management. Each implant has its own advantage and disadvantage and different treatment outcome.[3] 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.[1] Keeping in view the promising results reported by various authors with the use of intramedullary supracondylar nail, the present study has been undertaken to evaluate the overall functional outcome of patients treated by supracondylar nail.

MATERIALS AND METHODS

The present was conducted at Department of Orthopaedics, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, UP, India. All the patients admitted in the department of Orthopaedics with fracture distal femur and managed by intramedullary supracondylar nail were included in the study.

All the patients were subjected to a detailed history with particular emphasis on mode of injury, time of injury, interval between injury and reporting and nature of treatment taken prior to admission.

Inclusion Criteria

- Who presented within three weeks of injury.
- Closed fracture of distal femur.
- Grade 1/11/111 A/111-B compound fractures (Gustilo Anderson classification)1s.
- Those who have fracture of distal femur Type -A, Type C1, Type C2 as per A.O. Classification.
- Highly comminuted supracondylar fractures.
- Fractures that require opening the knee joint to stabilize the femoral condylar segment.
- Distal fracture in Osteoporotic bone.

Exclusion Criteria

- Who presented more than three weeks after the injury
- Active infection
- Fixed Deformity at Knee Joint.
- Obliterated medullary canal due to previous fracture or infection.
- Supracondylar fractures extending up to isthmus. AO type C3 fractures.

Good preoperative radiographs of the injured femur were be used to estimate nail length and develop an approach to supplemental fixation.

Open Technique

In the open technique, knee joint was entered through the standard midline incision and medial parapataller capsular incision. All Intra-articular fracture fragments were anatomically reduced and fixed with screws in anterior and posterior segments of condyles, allowing adequate space to place the nail centrally in the intramedullary canal. Entry point was made in intracondylar notch just anterior to the origin of the posterior cruciate ligament. Entry into the intercondylar notch was made with a curved awl. Entry point should be centralized with the condyles in anatomic alignment to ensure that the alignment will not deviate into a varus or valgus position. The entry point was reamed 1.0 mm larger than the selected diameter nail to avoid displacing condyles when the nail is inserted.

Percutaneous Technique

The percutaneous technique was best indicated in supracondylar femur fractures without intra articular involvement or with minimal intra articular comminution. After stabilization of intercondylar fracture, make 4 cm midline incision from inferior pole of patella up to tibial tuberosity. The paratenon over patellar tendon was sharply incised & patellar tendon was split in the midline in the direction of its fibers. Small retractors were used to minimize trauma as the awl was positioned in to the inter- condylar portal. This was verified by A-P and lateral view in C- Arm. The entry portal was approximately 2.0 to 5.0 mm anterior to the posterior cruciate ligament. In fluoroscopy, the point of entry should be in line with the long axis of the femoral shaft in both the AP and coronal planes. Blumensaat's line was used for identification of the point of entry in the lateral view. (The Blumensaat's line is a linear shadow on lateral radiograph of the knee that correspondents to the roof of the intrercondylar notch).

Once the awl was properly positioned, it was advanced deep into the metaphysis. The awl was removed and guide wire advanced with the 8 mm reamer, past the reduced fracture and proximally into the shaft.

The entry portal and medullary canal were enlarged with intramedullary reamers. Begin remaining at 8 mm and advance to 1 mm larger than the nail selected. Reamers were advanced by 1 mm increments. Proximal reaming may be necessary if the isthmus was narrow and when using the 12 and 13 mm nails.

The predetermined nail of adequate diameter and length was than loaded over the Jig with the help of conical belt keeping in mind the side to be operated so that the jig was placed laterally and the convexity of the nail faces anteriorly. Nail guide assembly was advanced over the guide wire into the distal condyles. Traction was applied at this time with gentle pull behind the gestrocnemius with knee in 60 to 80 degree of flexion. Once the nail was in the distal condylar fragment, it was advanced with an pressure over the guide wire until the distal end of nail is countersunk 1-2 mm below the articular surface. Its position was confirmed on Image intensifier. 2 or 3 distal locking were done first. After taking stab incision over the corresponding lateral skin, the soft tissues were separated by blunt dissection with the help of hemostat and drill sleeve and drill guide for 4 mm drill bit were inserted through the fenestration provided over the jig, through the stab incisions flush with the lateral cortex. The lateral and medial cortex were drilled with 4mm drill bit. Continuity of drill holes in both the cortices with the locking holes of nails was confirmed with sounding (tik-tik) technique. The required length of cancellous screw (5mm) was measured and passed through sleeve. Similarly second or 3rd distal locking done. Their position confirmed by image intensifier.

The nail bolt was then removed to disengage the nail. At this point, the knee should be taken through the full range of motion to ensure articular function. The knee joint was copiously irrigated with normal saline, incision closed in layers. Compression bandage applied.

After discharge from hospital patients were followed upto regular interval. Usually after 5 day of post-operative. hospitalization they were asked to report after 10 days for stitch removal and then after every two weeks for 6 months.

At every follow up a detailed clinical and radiological assessment of the patients was done as the assessment chart given in the proforma. A minimum of six month follow-up was done before assessment of final result.

Final assessment of results was done based on modified Mehrotra's grading based on the assessment of the final functional results and also taking into consideration, the complications if any. Conclusions are drawn regarding feasibility of using supracondylar nail for management of fracture distal femur.

RESULTS

Patients were operated from as early as within 24 hours to as late 13 days. The average duration between injury and surgery in our study was 3.38 days (table 1).

Closed reduction could be achieved in majority of cases 92% in the present study. Only 8 cases required open reduction (table 2).

Table 1: Duration between Injury and Surgery

Duration	n	%
<24 Hr.	14	14%
1-4 days	64	64%
5-7 days	16	16%
>7 days	6	6%

Table 2: Duration between Injury and Surgery

Injury	n	%
Closed	92	92
Open	8	8

Table 3: Duration of Surgery

Duration	n	%
<30 Min	4	4%
30-60 Min	80	80%
60-90 Min	12	12%
>90 Min	4	4%

Table 4: Duration of Surgery

Complications	n
Knee Stiffness	16
Patellar Impingement	6
Local symptom at distal screw site	12
Infection	11
Delayed	5

Table 5: Range of Movement at Knee

ROM	n	%
Full	40	40
>90	44	44
<90	16	16

Table 6: Shortening.

Shortening	n	%
No. Shortening	94	94
< 2.5 cm	4	4
> 2.5 cm	2	22

Table 7: Final Results

Grade	Score	n	%
Excellent	25 to 27	61	61
Good	21 to 24	23	23
Fair	15 to 20	11	11
Poor	09 to 14	5	5

Average duration of surgery in the present study was 52.6 minutes (table 3).

Most common complications observed by us is knee stiffness in 16 cases and local symptoms at distal screw site in 12 cases (table 4).

Average range of movement at knee in our series was 1 10.93, 40 cases were having full range of movement at knee (table 5).

In 94% of cases there was no shortening while 2% cases had shortening more than 2.5 cm causing a visible limp and 4% cases have shortening less than 2.5 cm. Cases in which shortening present were of Type A_2 = 1, A_3 = 2. C_2 = 3 (table 6)

Final assessment of result was done according to modified Mehrotra's criteria talking into consideration pain, ability to walk, muscle wasting, shortening infection, range of movement at knee, ability to squat, sitting cross leg and visible limp. 84 cases in the present study had either excellent or good results. Fair and poor result were seen in only 16% cases (table 7).

DISCUSSION

Management of fracture of distal femur is still debatable. Various methods have been tried for the management of fracture distal femur with each method having its merits and demerits. These methods include either conservative management by cast or traction in Thomas splint or surgical management by external fixators, angled blade plate, dynamic condylar screw, locking distal femoral plates or supracondylar nail.

The main aim in the management of any fracture around knee is to achieve anatomical reduction with reasonably rigid internal fixation thus promoting early union, early knee mobilization and early return to work with minimal complications. In order to achieve this goal newer and newer methods of management are being introduced to the orthopaedic surgeons. Intramedullary Supracondylar Nail is one such device, which has the advantage of percutaneous and reasonably rigid internal fixation with minimal complications. The present study was undertaken to evaluate the results of management of fracture distal femur with this versatile nail. Average duration between injury and surgery in our series was found to be 3.38 days. This was because many a times patient come late, otherwise also we manage all closed fractures in routine operation theater where delay of one or two days is possible. If more than three days of delay in surgery was anticipated patient was put on skeletal traction to avoid any problem in closed reduction of fracture during surgery. Maximum delay of 13 days was seen in one case of associated chest injury.

We could achieve satisfactory closed reduction in majority 92% of cases. Open reduction of fracture by additional parapatellar incision was done in only 8,-cases (12%). Lauri Handolin et al[4] in his series reported open reduction by additional lateral incision in 30% of the cases, which was quite high as compared to our study.

The duration of surgery varied with the complexity of fracture and became less with experience. The average operative time in our series was 52.6 minutes (ranging from 36 minutes to 110 minutes). In his series Lucas SE et al[5] the average operative time was 156 minutes whereas Henry SL et al[6] in his series of management of Supracondylar fracture femur with percutaneous retrograde nail, reported mean operative time of 76 minutes. As we have used percutaneous techniques in most of our cases mean operative period of our series is almost equal to that reported by Henry SL et al.[6]

Stiffness of knee joint was the most common complication in our series Gellmen RE et al[7] also reported knee stiffness as one of the major complication in his series. He reported 8% cases with knee stiffness. Kumar et al[8] also reported knee stiffness in 5% of the cases operated by supracondylar nail.

Knee stiffness in our study could be attributed to the fact that most of the patients at our centre come from rural background where

facilities of proper physiotherapy and continuous passive movement (CPM) are not available. Most of our patients also are from low socio-economic and low educational level and motivating them to do proper physiotherapy is a bit difficult. Thus lack of proper physiotherapy usually lead to increased chances of knee stiffness. Local symptom at distal screw site due to prominent distal locking screws causing pain was the second most complication in our series. Lucas SE[5] stated the most common complication was prominent distal locking screws or condylar screws that required removal for local symptoms. Gynning JB[9] reported no screw breakage but in 5 of his patients, distal screw backed out and were removed under local anesthesia after fracture union. Kumar A et al[8] reported a case of loosening of distal screw in 1 patient 4 weeks after surgery which was removed without affecting final outcome. In our series there were 12 patients who complain of pain at the site of distal screws, who required screw removal after fracture healing.

Patellar impingement was seen in 6 cases (6%) in our series. Gellmen R.E. et al[7] reported three cases (11%) with patellar impingement. Danziger MB[10] reported 1 patient (4%) with impingement of nail in the intercondylar notch.

In the initial phase of our study the instrument we were using were not appropriate and caused the protrusion of nail in the knee joint thus causing patellar impingement, leading to persistent pain and reduced range of movement at knee joint.

9 cases in our series developed superficial infection which was controlled by antibiotics.2 cases developed deep infection in which after radiological union, implant removal done.

Stress fracture at the proximal end of nail was not seen in our series. Complications have been reported previously after using lateral devices by Seliski et al,[11] Sanders et al[12] and by IMSC nail by Lucas SE,[6] Henry SL et al[6] and Kumar et al.[8]

Two main causes of stress fracture are;

(a) Stress shielding at the proximal end of nail.
(b) Missed hole during proximal interlocking.

Delayed union was seen in 5 cases while there was no case of nonunion in our series. Innacone WM[13] has reported high incidence of non-union in his series (10%). Henry SL et al[6] has also reported that nonunion 1ncreases significantly in the cases treated by open reduction and internal fixation (39%) as compared to those who were treated by percutaneous technique (7%).

There was no implant failure in our study. Previous reports of nail fracture were reported by Henry SL et al,[6] Innacone WM[13] as they were using nails with 6.4 mm distal interlocking screw holes. Interlocking screws were subsequently changed from 6.4 mm to 5 mm, there by greatly reducing the incidence of implant failure. In our series we have used intramedullary supracondylar nail with distal locking screw of 5 mm diameter.

We noted shortening in 6 of our cases, two with Type A3, one with Type A2 fracture and 3 with type C3 fracture. This we feel was because of compound comminuted fracture with loss of bone piece from the wound.

Secondary intervention was performed in 8 cases. In 6 cases nail was removed due to impingement problem and in 2 cases due to deep infection after fracture had united. In one case quadricepsplasty was done along with nail removal.

Final results in our series were assessed according to Modified Mehrotra's criteria (1990), we feel that this criteria is most suited to Indian scenario because it takes into account activities like squatting and sitting cross legged which were very important for Indian patients.

In our study we observed excellent result in 61% of cases, good result in 23% cases, fair in 14% of cases and poor in 5% of cases. Average range of flexion in our series was 110.93 and average time of union came out to be 13.76 weeks.

Gelleman R.E et al[7] used functional evaluation scale developed by Sander's et al.[12] for evaluating his results. He reported 4-excellent, 16good, 2-fair and 2 poor results. Average range of movement in his series was 106°± 22° and average union time was 3 months.

Janzing H.M. et al[14] reported 72% excellent, 20% good, 4% fair and 4% poor results. They evaluated their results as per relative Neer's score. Kumar et al[8] reported that average- time to union of 3.6 month and average range of movement at knee to be 116°. Denziger MB[10] in his series reported 94% cases with excellent and good results with average union time of 3.3 months and average range of motion at knee of 109°.

From out study we advise following tips during surgery to minimize the possible complications and to achieve better results.

- Use of pre-operative skeletal traction in cases where delay is anticipated due to some associated injuries, medical or surgical problems.
- Use of continuous traction while locking the nail to minimize chances of loss of reduction.
- Proper counter sinking of the nail to prevent its impingement in the knee.
- Patients and attendants to be properly educated regarding the role of physiotherapy in achieving full functional recovery.
- Be on safe guard for possibility of stress fractures especially in osteoporotic bones and in cases where there is preexisting femoral implant.

CONCLUSION

Finally we conclude that intramedullary supracondylar nail should be the treatment of choice for distal femoral fractures. As it has all the advantages of closed treatment like minimal blood loss, less soft tissue stripping, preservation of fracture haematoma and minimal complications. This operation is particularly suited for Type A, C1 & C2 types of fractures as shown by the final functional results of this study.

REFERENCES

1. Loya LS, Quadri M. Retrograde intramedullary interlocking nailing for supracondylar fractures of femur: A prospective study. International Journal of Orthopaedics. 2019;5(2):35-8.

2. Ehlinger M, Ducrot G, Adam P, Bonnomet F. Distal femur fractures. Surgical techniques and a review of the literature. Orthopaedics & Traumatology: Surgery & Research. 2013 May 1;99(3):353-60.

3. Senthil Kumar, A. T. Management of Supracondylar Femoral Fractures by Retrograde Nailing Technique: A Retrospective and Prospective Study. Indian Journal of Science and Technology 2016;9(39):1-5.

4. Handolin L, Pajarinen J, Lindahl J, Hirvensalo E. Retrograde Intramedullary Nailing in Supracondylar Femoral Fractures–The Töölö Hospital Experience. Blood. 2007 Apr 5;169(44):22.

5. Lucas SE, Seligson DA, Henry SL. Intramedullary supracondylar nailing of femoral fractures. A preliminary report of

the GSH supracondylar nail. Clinical orthopaedics and related research. 1993 Nov(296):200-6.
6. Henry SL, Seligson D. Management of supracondylar fractures of the femur with the GSH supracondylar nail: the percutaneous technique. Techniques in Orthopaedics. 1994 Oct 1;9(3):189-94.
7. Gellman RE, Paiement GD, Green HD, Coughlin RR. Treatment of supracondylar femoral fractures with a retrograde intramedullary nail. Clinical Orthopaedics and Related Research (1976-2007). 1996 Nov 1;332:90-7.
8. Kumar A, Jasani V, Butt MS. Management of distal femoral fractures in elderly patients using retrograde titanium supracondylar nails. Injury. 2000 Apr 1;31(3):169-73.
9. Gynning JB, Hansen D: Treatment of distal femoral fractures with intramedullary supracondylar nails in elderly patients. Injury 1999;30:436.
10. Danziger MB, Caucci D, Zecher SB, Segal D, Covall DJ. Treatment of intercondylar and supracondylar distal femur fractures using the GSH supracondylar nail. American journal of orthopedics (Belle Mead, NJ). 1995 Sep;24(9):684-90.
11. Siliski JM, Mahring MA, Hofer HP. Supracondylar-intercondylar fractures of the femur. Treatment by internal fixation. The Journal of bone and joint surgery. American volume. 1989 Jan;71(1):95-104.
12. Sanders R, Regazzoni P, Ruedi TP. Treatment of supracondylar-intracondylar fractures of the femur using the dynamic condylar screw. Journal of orthopaedic trauma. 1989;3(3):214-22.
13. Iannacone WM, Bennett FS et al. Initial experience with the treatment of supracondylar femoral fractures using the supracondylar intramedullary nail: a preliminary report. Journal of orthopaedic trauma. 1994 Aug;8(4):322-7.
14. Janzing HM, Vaes F, Van Damme G, Stockman B, Broos PL. Treatment of distal femoral fractures in the elderly results with the retrograde intramedullary supracondylar nail. Unfallchirurgie. 1998 Apr 1;24(2):55-9.
15. Healy WL, Brooker JA. Distal femoral fractures. Comparison of open and closed methods of treatment. Clinical orthopaedics and related research. 1983 Apr(174):166-71.

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