



## “A CLINICAL STUDY OF THE SURGICAL MANAGEMENT OF SUPRACONDYLAR FRACTURE FEMUR BY RETROGRADE INTRAMEDULLARY (GSH) INTERLOCKING NAIL”

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### ABSTRACT

**Aim & Objective:** To study the clinical and radiological outcome of GSH interlocking nail in supracondylar femur fractures. To study and evaluate the results of the retrograde nailing in supracondylar femoral fractures in relation to knee flexion, mobilization of patients and early weight bearing. Study the postoperative rehabilitation of retrograde nailing in supracondylar femoral fractures.

**KEYWORDS :** Supracondylar Fracture Femur, Retrograde Intramedullary (GSH) Interlocking Nail, Moments of the Knee Joint, Fracture Union.

### INTRODUCTION

Supracondylar and intercondylar femoral fractures are often difficult to treat and they are notorious for many complications. In the early 1960s, there was a great reluctance towards operative management of this fracture because of high incidence of infection, non-union, malunion, inadequate fixation and lack of proper instruments, implant as well as antibiotics. The traditional management of displaced fracture supracondylar of femur was along the principle of Watson Jones<sup>1</sup> & John Charnley<sup>2</sup>. This comprised of skeletal traction, manipulation of fracture and external immobilization in the form of casts and cast bracings. These methods however, met with problems like deformity, shortening, prolonged bed rest, knee stiffness, angulation, joint incongruity, malunion, quadriceps wasting, knee instability and post-traumatic osteoarthritis.

The trend of open reduction and internal fixation has become evident in the recent years with good results being obtained with the AO blade plate, dynamic condylar screw and other implant systems like intramedullary supracondylar nails. Supracondylar fractures tend to collapse into varus. During 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 the obvious advantage of an intramedullary device is that it aligns the femoral shaft with condyles reducing the tendency to place varus movement at the fracture site. And because the 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.

### MATERIALS AND METHODS

A study was conducted on 20 patients with Supracondylar fracture femur admitted from OPD Clinic and Casualty clinic of GGH, Kurnool. The study was done over a period of 23 months from December 2014 to October 2016.

### INCLUSION CRITERIA:

1. Age between 15-70 years
2. H/O Trauma (RTA, fall from height).

### EXCLUSION CRITERIA:-

1. Mid shaft femur fractures
2. Non union.
3. Malunion.
4. Pathological fractures

The following protocol was observed for patients with supracondylar fractures of femur on arrival.

1. General and systemic examination as well as local examination of

the patient.

2. Thorough assessment of patient to rule out head/ chest/ abdominal/ spinal or pelvic injury.
3. **Evaluation of patients in terms of:**
  - a) Age
  - b) Sex
  - c) Mode of trauma
  - d) Period between injury and arrival.
4. Musculoskeletal examination of patient to rule out associated fractures.
5. Stabilization of patient with intravenous fluids, oxygen and blood transfusion as and when required.
6. Careful assessment of injured limb as regards to neurovascular status.
7. Primary immobilization of involved limb in Thomas splint with a cotton pad below the distal fragment and transport of patient to the Department of Radiodiagnosis in the same.
8. Radiological assessment: Anteroposterior and true lateral views of injured limb including complete knee joint and distal femur.
9. Thorough irrigation and lavage of compound wounds with hydrogen peroxide and normal saline followed by povidone iodine padded dressings.
10. Upper tibial skeletal pin traction with a Steinmann or Derham pin drilled under local anesthesia followed by continuous traction given over Bohler-Braun splint.
11. Compound injuries were taken for cleaning and debridement under anesthesia at the earliest with meticulous debridement. Fixation was delayed in all cases.
12. Injection ATS 1500 IU, Injection AGGS 20,000 IV, broad spectrum injectable antibiotics and analgesics were administered for compound injuries as and when required.

### Implant Used:

- The implant used was Orthocare supracondylar nail system with instrumentation set.
- The nails are available with outer diameter of 10, 11 and 12 mm
- The distal end is expanded to outer diameter of 13 mm.
- The nails are available in lengths of 150, 200 and 250 mm.
- There is 5 degree anterior bend and an anterior bow for anatomic fit.

All sized nails have five interlocking holes in all lengths two proximal holes and three distal holes, which accept interlocking screws of 4.9mm thread diameter.

### Operative Procedure:

The limb was scrubbed for 5 minutes with surgical betadine scrub followed by painting with povidone iodine and medicated spirit and draping with sterile drapes so that the knee joint and distal thigh were in the operative field.

A midline skin incision of 4 cm was taken from inferior pole of patella up to tibial tuberosity for closed method and Anteromedial incision given for exposure and fixation of femoral condyles for open method. The paratenon over patellar tendon was sharply incised and patellar tendon was split in the midline along the direction of its fibres. Bone awl was then inserted into the joint through the split tendon and positioned against the inter-condylar notch. Its position was checked under image intensifier and the distal fragment was drilled with a 6.5 mm drill bit inserted. The position of drill bit was checked under image intensifier in anteroposterior and lateral position. The drill bit was then removed and guide wire passed through the entry point. The bone awl was then removed and the fracture was reduced under image intensifier control and guide wire passed in proximal fragment. The distal fragment was then reamed with cannulated reamer provided with instrumentation set. The predetermined nail of adequate diameter and length was then loaded over the jig with the help of conical bolt keeping in mind the side to be operated so that jig was placed laterally and the convexity of nail facing anteriorly.

The nail was then inserted over the guide wire through the entry point made previously through distal and then proximal fragment. Its position was confirmed on image intensifier and then depending on the length of the nail, the proximal holes were locked with the help of corresponding markings on the jig. 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 4.5 mm drill bit were inserted through the fenestrations provided over the jig, through the stab incision flush with the lateral cortex. The lateral and medial cortex were drilled with 4.5 mm drill bit. Continuity of drill holes in both the cortices with the locking hole of nails was confirmed with sounding (tik-tik) technique.

The required length of locking bolt was measured with the help of depth gauge and self-tapping interlocking bolt of 4.9mm thread diameter passed from lateral to medial cortex engaging the locking hole in the nail. Either single or both holes were locked proximally. Similarly, the distal holes were locked in one, two or three numbers. The jig was then disengaged, the joint was washed thoroughly to remove the debris. Tourniquet was released, hemostasis achieved and incision closed in layers. Particular attention was paid to repair paratenon of patellar tendon.

#### Postoperative:

Depending on presence of concomitant ipsilateral other injuries, the patient was given a posterior above knee slab of plaster of paris bandage, with knee in extension.

In closed nailed patients, static quadriceps and active or active assisted bedside knee mobilization was started from second postoperative day. Suture removal was done on 14th postoperative day.

In patients with open reduction, the slab was discarded if wound was found to be healthy and active/ active assisted knee mobilization was instituted.

Patients were discharged on day 15 or 17th postoperative and were advised to follow-up after 4 post-operative weeks. In the mean time, between suture removal and discharge, patients were given crutch training and were made ambulatory on bilateral axillary crutches without weight bearing.

#### RESULTS

In this study 20 patients with supracondylar fracture of femur were admitted studies. All the cases were treated in Governmental General Hospital, Kurnool between the period of December 2014 to October 2016. The method used for fracture fixation was closed or open reduction and internal fixation with retrograde intramedullary supracondylar GSH nail. The duration of follow up ranged from 3 months to 23 months. Out of 20 patients, 1 patient developed knee sepsis, nail was removed immediately and patient was lost for follow-up. 65% good to excellent result were obtained using Neer's and Sander's evaluation scoring system.

In this study, the youngest case was 25 years old male and the oldest was 54 years. Overall mean age was 36.15 years. In males, it was 34.89 years and females it was 47.5 years. Most of the patients sustaining fractures due to vehicular accidents were between 21-40 years age group and equal number of cases were in the age groups 21-30 and 31.40 years. Males were involved fourteen times as compared to

females.

Seventy five (75%) percent fractures were sustained due to road traffic accidents and fall from height accounted for 25% of fractures. Maximum number of cases in the age less than 50 years were due to vehicular accidents.

In males, maximum number of cases (75%) were due to vehicular accidents, whereas in females, fall from height was the important cause of fracture in this study.

In the present study, there were 6 compound fractures, 4 being grade-II and 2 being grade-III according to Gustilo-Anderson's classification. Out of these 2 grade- III compound cases, one was type-IIIA and one was type-IIIB. Of the 6 cases, 3 were due to vehicular accidents and all were males and 3 were due to fall, of which one was male and 2 were females.

Six patients had associated injury as a consequence of trauma. Associated injuries musculo-skeletal and systemic injuries. Two patient had ipsilateral comminuted proximal tibial fracture. Two had fracture of tibial spine and two had undisplaced patellar fracture. There were no cases of any major systemic injuries. Internal fixation was considered after patient's general and medical condition was stabilized. Average injury-surgery interval was 10.30 days.

In majority of the fracture type of A1 and A2 were closed reduction was possible, while in A3 sub-type, 1 of 2 cases required open reduction.

Average radiological union time was 16.21 weeks of 20 patients, one patient went into deep infection after 2 months. Nail was removed in that patient and he was lost from follow-up after 12 weeks till that there was no radiological union and deep infection was present.

Average full weight bearing was achieved by 11.68 weeks.

#### Knee Flexion

Normal knee flexion is 140 degree. Laubethal has demonstrated that average motion required for:

Normal sitting 93 degree  
Stair climbing 100 degree  
Squatting 117 degree

Thus, acceptable knee flexion compatible with daily activity would be 110 degree.

Average flexion in this study was 105 degree with more than 50% patients having knee range of motion more than 1100.

#### Table: Knee Extensor Lag

Extensor Lag (Degree)	Number of cases	Percentage
0-5	11	58
6-10	4	21
>10	4	21

Average extensor lag in this study was 5.68 degrees

#### Shortening:

Out of 19 patients, 4 had shortening 2 shortening of 22 mm and 2 shortening of 25 mm.

Varus/ Valgus Malalignment:

Evaluated of AP and lateral roentgenograms.

#### Table: Complications

Complications	Number of cases	Percentage
Local Symptoms at distal screw	3	15
Impingement	1	5
Superficial infection	1	5
Delayed union	1	5
Distal migration of nail	1	5
Deep infection	1	5
Non-union	-	-
Distal screw breakage	1	5
Stress fracture	-	-
Implant failure	-	-

## DISCUSSION

In the present series, the mean age was 36.15 years. Out of 20 patients, 18 were below 50 years and of them, 14 were below 40 years age. In the present study of 20 patients, 15 had suffered road traffic accident with 14 being under 50 years of age.

In the present series, road traffic accidents accounted for 75% of cases and 25% resulting from fall. There was 6 compound fractures, 4 being grade-II and 2 grade-III according to Gustilo-Anderson classification. Of the 6 cases, 5 cases were male and one was a female. Among them 3 were due to road traffic accident and 3 by fall from height. Patients with Gustilo-Anderson Grade-II and III were operated after healing of the wound.

In the present series, 6 patients had associated injuries. Of the 6 injured patients, 2 with ipsilateral proximal tibial fracture

### Radiological Union:

19 out of 20 cases in the present study united at an average of 16.2 weeks. The patients which required more time for union were having some associated injuries, which delayed the period of mobilization and partial weight bearing.

### Knee Flexion:

In the present study, 8 out of 10 patients with A2-type had >110 degree knee flexion (80%), 3 of 7 patients with A1 type had >110 degrees flexion (42.86%) while no patient of 2 patient of type A3 had >110° knee flexion.

## CONCLUSION

1. Retrograde intramedullary supracondylar nail is a good fixation system for distal third femoral fractures, particularly extra-articular type
2. The operative-time is lessened with decrease in blood loss.
3. Closed reduction can be achieved by not disturbing fracture hematoma and soft tissue.
4. Even with open reduction, there is less soft tissue trauma and less postoperative stiffness.
5. Distal screw related local symptoms is a common problem and is related to implant and technique.
6. Utmost great care is required to avoid infection.
7. There is no non-union, less delayed unions and rates of angular or rotational malunions.
8. Non-requirement of bone graft decreases the morbidity associated with donor site.
9. Early surgery, closed reduction, at least two screws in each fragment and early post-operative knee mobilization are essential for good union and good knee range of motion.
10. There is no much difference in individual fracture type healing and weight bearing.

Thus, supracondylar nail is the optimal tool for many supracondylar fractures of femur. It provides rigid fixation in a region of femur, where a widening canal, thin cortices and frequently poor bone stock make fixation difficult. Surgical exposure for nail placement requires significantly less periosteal stripping and soft tissue exposure than that of lateral fixation devices. Orthopaedic surgeons experienced with intramedullary nailing will find the supracondylar GSH nail a useful technique, but requires attention to prevent complications.

## SUMMARY

Supracondylar femoral extra-articular fractures in 20 patients were treated in this study with retrograde intramedullary supracondylar nail after closed or open reduction. The AO-ASIF fracture classification was used. All extraarticular fracture A type were selected for study. Six were compound fractures according to the Gustilo-Anderson classification, the fracture was stabilized with the chosen system at an average of 10.3 days post-trauma, with an average operative time of 96.50 minutes. In 16 cases closed reduction was possible while 4 required open reduction. Post-operatively all patients were shifted to continuous passive mobilization with early toe touch walking and gradually progressive weight bearing with appearance of clinical and radiological signs of union. Evaluation was done according to the Neer's rating system and Sanders rating system. 65% good to excellent results were found.

In the present study, road traffic accident was observed to be the predominant cause of distal third femoral fractures in young patients.

All fractures had a sound clinical and radiological union with an average radiological union time of 16.21 weeks and 74% patients were able to bear weight, unsupported by 16 weeks. Average knee flexion was 105 degrees with an extensor lag of 5.68 degrees.

Sixty five percent good to excellent results were obtained according to Neer's rating and Sanders functional evaluation scale. Extra-articular fractures gave uniformly good results.

The results were affected by injury, surgery-interval and type of reduction, nail length and nail diameter, immediate continuous passive movement and early weight bearing. Compound nature of injuries did not seem to affect the outcome.

## REFERENCES

1. Leggon RE, Feldmann DD. Retrograde femoral nailing: A focus on the knee. *Am. J. Surg.* 14(2); 109: 2001.
2. Watanabe Y, Takai S, Yamashita F, Kusakabe T. Second generation intramedullary supracondylar nail for distal femur fractures. *International ortho (SICOT)*, 26:85-88, 2002.
3. Ingman AM. Retrograde intramedullary nailing of supracondylar femoral fractures: Design & Development of a New Implant. *Injury*, 33(8); 707-12: 2002 Oct.
4. Amrstrong L, Milliren A, Schrantz W, Zeliger K. Retrograde interlocked intramedullary nailing of supracondylar distal femur fractures in an average 76 year old patient population. *Orthopaedics*, 26(6); 627-9: 2003 June. Comment in *Orthopaedics*, 27(6): 545, 562, Author Reply 562, June 2004. Related Articles, Entrez.Pubmed.
5. Sears BR, Ostrum RF, Litsky AS. A mechanical study of gap motion in cadaveric femurs using short and long supracondylar nails. *J. Orthop Trauma*; 18(6): 354-6: Jul 2004.
6. Pao JL, Jaing CC. Retrograde intramedullary nailing for non-unions of supracondylar femur. *J. Formos Med Assoc.* 104(1): 54-9: Jan 2005.