

# Surgical Treatment of Supracondylar Femoral Fractures

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## ABSTRACT

**Introduction:** In today's fast paced world high energy trauma is common. Supracondylar femur fractures are one of the common fractures encountered. The distal femur has wide medullary canal, thin cortex and often associated with comminution. Management of these supracondylar femoral fractures is a challenge to orthopaedic surgeons. Still there is controversy in the correct line of management to be selected. The surgeons will face difficulties in restoring the anatomical alignment and joint congruity.

**Materials and methods:** Between Jan 2009 to Jun 2014, 26 distal femoral fractures treated with supracondylar nail. 2 pts lost for follow-up. Of the remaining 24 fractures, 19 were closed fractures 5 were of open fractures. Average age was 54 yrs (20 to 84 yrs). 60 % of pts were older than 50 yrs of age. AO classification was used for these fractures (A type: 14, C type: 10). Open nailing was done in 6 cases (4 for nonunion, 2 for failed DCS). Bone grafting was done in 4 patients.

**Results:** Average follow-up was 14 months (6 - 24 months). Wt bearing was allowed depends on the progression of union radiologically and clinically. Functional assessment was done using a scale developed by Sanders et al for distal femoral fractures. 23 fractures healed well and 1 pt had nonunion. Average healing time was 16 to 18 weeks. 1 pt had malunion, 1 pt had infection at the fracture site, which went on for good union (grade IIIb compound). Knee stiffness was found in 4 cases (<60 degrees).

**Conclusion:** Supracondylar nail provides stable fixation in a region of femur where a widening canal, thin cortices, and poor bone stock make fixation difficult. The retrograde supracondylar nail is an excellent alternative to lateral fixation devices for supracondylar fractures of femur.

**Keywords:** Supracodylar, Femoral, Knee stiffness

## INTRODUCTION

Supracondylar femoral fractures are the fractures that occur within 7.5 to 9 cm<sup>1</sup> proximal to the articular surface of knee joint. These fractures predominantly occur in two patient populations: a younger male group with high energy injuries and an older osteoporotic female group with low violence injuries. Treatment of these fractures has long been a controversial issue. Watson Jones noted that "few injuries present more difficult problems than Supracondylar fracture of femur".

The problems in these fracture when they are surgically treated are, reduction and fixation of multiple fragments (of-

ten in Osteoporotic bone) restoration of alignment in three planes and equal limb length. Once all these are attained with good restoration of articular surface, stiffness may remain a problem. A complaint patient is required for early supervised mobilization and range of movement exercises.

In 1967 Neer et al<sup>2</sup> published a review of 110 supracondylar fractures treated with traction, casting, and several types of internal fixation. They concluded that these fractures were not suitable for internal fixation because of high incidence of wound complications, nonunion and knee stiffness. The methods of internal fixation in these patients, however, were not sufficient to eliminate postoperative immobilization. As implants and surgical techniques improved during the next 20 years, more success with surgical treatment was attained. In the 1980's several series reported on the treatment of supracondylar femoral fractures with lateral fixation devices. Various implants available for the usage are DCS, Condylar blade plate, Supracondylar buttress plate. All these implants need a large exposure and possible risk of soft tissue damage and devascularisation of fragments, increased chance of infection, stiffness of knee and the need for Bone grafting in more than 1/3<sup>rd</sup> of patients.

Supracondylar fractures tend to collapse into varus. During application of a blade plate or condylar screw the shaft of the femur is often pulled laterally, displacing the line of wt bearing lateral to the anatomic axis of the condyles. This often leads to varus displacement of the distal femur in elderly female patients, leads to fixation failure with screws and plates cutting out of the soft bone.

In 1990 Green SL<sup>3</sup>, Seligson D, Henry SL 1<sup>st</sup> reported the use of GSH nail for Supracondylar fracture. The advantage of intramedullary device is that it aligns the femoral shaft with condylar fragments, reduce the varus moment at the fracture site, possibility of closed procedure reduces the chance of infection and stiffness of knee joint. They advised this technique for comminuted / intraarticular fractures of distal femur and in cases of failed lateral fixation technique.

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### MATERIAL AND METHODS

Between January 2009 to June 2014, 26 supracondylar fractures were treated with supracondylar nailing. 2 patients lost for follow up. The age range was 20 to 84 years (average 54 years). Male to female ratio was 14:10. 14 patients are older than 50 years. 8 patients are younger than 50 years. 20 fractures were closed and 4 were open, of which 2 are Grade II and another 2 are Grade IIIb.

The fractures were classified according AO classification: The breakup is 14 were extra articular fracture. Among these - A1: 6, A2: 4, A3: 4. 10 were intraarticular fracture. Among these - C1: 6, C2: 2, C3: 2.

Open nailing was done in 6 patients and closed nailing was done in 18 pts. 4 pts were operated for nonunion of supracondylar fracture due to initial native treatment. 2 pts had implant failure with DCS which needed removal of DCS and supracondylar nailing. 4 pts needed bone grafting in this series. Average blood loss was 300 – 400 mg in open nailing. Average surgical time was 1 ½ - 2 hrs. Follow-up period was 6 months- 24 months. Patients were mobilized on the 3<sup>rd</sup> postoperative day with support and toe touch wt bearing. Knee mobilization encouraged from 2<sup>nd</sup> POD. Progressive weight bearing allowed depending on the radiological and clinical evidence of healing. Patients were followed up regularly in 6 weeks interval till union and good ROM was obtained.

### RESULTS

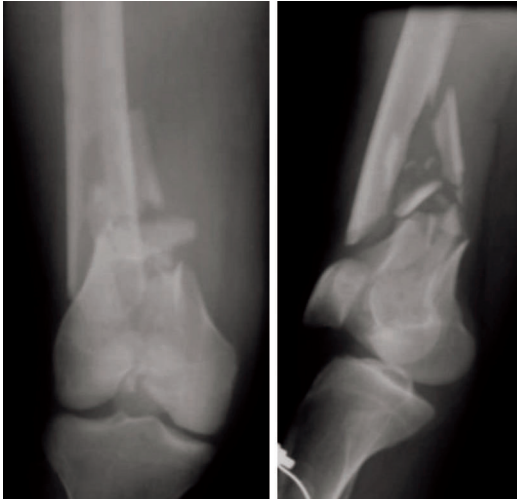
Functional assessment was performed using a scale developed by Sanders<sup>4</sup> et al for distal femoral fractures. Average healing time was 16 – 18 weeks. We had Implant failure in 1 patient with distal screw breakage, Infection in 2 patients, Malunion in two 2, Nonunion in 1, Knee stiffness in 4 cases who had ROM < 60°, shortening of 3 cm in 3 patients. Our study had average ROM 90 – 110 degrees. We used Sanders et al rating scale. We had excellent in 6 cases, good in 12 cases, fair in 4 cases and poor in 2 cases. Among the cases A type had excellent to good results in 12 out of total 14 cases. C type had excellent to good results in 6 out of 10. In 2 patients the distal locking screws missed the nail because of poor targeting device. Patellar impingement noticed in 2 patients, one patient had gross restriction of ROM of less than 30 degrees

### DISCUSSION

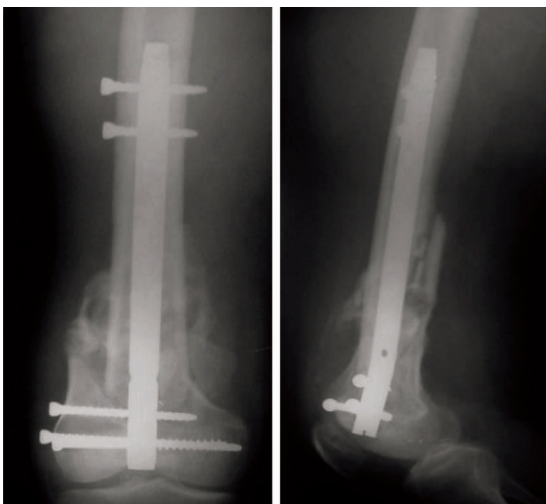
All fractures except one in the present study healed in 16 to 18 weeks. Previous studies using lateral screw and plate fixation report similar times to healing, but 25% to 35% needed bone grafting because of delayed union or non unions. In our study 4 patients needed Bone grafting because of non union of supracondylar fractures due to initial native treatment

which was treated with supracondylar nail. Several rating system for supracondylar fracture exists. Sanders<sup>4</sup> et al rating system (Table 1) was chosen because it emphasis the most important patient outcome factor pain and knee ROM. Patients with

Function	Result	Points
Range of motion - Flexion		
>125	Excellent	6
100 – 124	Good	4
90 – 99	Fair	2
<90	Poor	0
Extension		
0	Excellent	3
<=5	Good	2
6-10	Fair	1
>10	Poor	0
Deformation - Angulation		
0	Excellent	3
<10	Good	2
10-15	Fair	1
>15	Poor	0
Shortening (cm)		
0	Excellent	3
<1.5	Good	2
1.5 – 2.5	Fair	1
>2.5	Poor	0
Pain		
None	Excellent	10
Occasional or with changes in weather, or both	Good	7
With fatigue	Fair	5
Constant	Poor	0
Walking ability		
Unrestricted	Excellent	6
>30 minutes to <60 minutes	Good	4
<30 minutes	Fair	2
walks at home, is confirmed to wheelchair, or is bedridden	Poor	0
Stair climbing		
No limitation	Excellent	3
Holds rail	Good	2
One stair at a time	Fair	1
Elevator only	Poor	0
Return to work (A or B)		
A. Employed before injury		
Returned to pre injury job	Excellent	6
Returned to pre injury job With difficulty	Good	4
Altered full time job	Fair	2
Part time job or unemployed	Poor	0
B. Retired before injury		
Returned to pre injury lifestyle	Excellent	6
Needs occasional help	Good	4
Needs assistance at home with Activities of daily living	Fair	2
Moved in with family or Nursing home	Poor	0
Excellent: 36-40 points; Good: 26-35 points; Fair: 16-25 points; Poor: 0 -15 points		
<b>Table-1: Sanders scoring system</b>		



**Figure 1 and 2:** Pre-operative X-rays Showing Comminuted Fracture of Supracondylar Femur- AP and Lateral



**Figure 3 and 4:** Post-operative X-rays Showing Implant insitu with good fracture healing in reasonable alignment

preexisting osteoarthritis can lead to lower scores despite acquiring pre injury knee status. 4 patients had poor Knee ROM. 2 with distal migration of nail and in 2 pts because of adhesions both intraarticular and extra articular due to open reduction of the fracture and extensive comminution of fragments which prevented early mobilization.

3 patients had 2 cm shortening which did not affect the overall function of the limb. Infection was found in 1 patient who had a Grade III B compound fracture, which was initially stabilized with external fixator and wound debridement and later converted to nail.

Malunion occurred in 1 patient where the nail got rotated during insertion with a femoral shaft fracture near the proximal end of the nail which was treated conservatively with a POP. This patient had gross knee stiffness along with angular and rotational malunion. He had a poor score of 14.

Nonunion occurred in 1 patient who was obese with heavy smoking habit. He had failure of DCS for supracondylar fracture which needed removal of the implant and converted to SC nail with bone grafting. This patient had nonunion at

the fracture site, and he refused further surgery. He had a poor score of 10.

2 patients had nail migration distally in to the joint. One case was C2 fracture, in which the articular fracture was not fixed properly and the nail got migrated anteriorly through the fracture site impinging the patella and caused restriction knee ROM. One patient because of distal screw breakage and nonunion of the fracture site, the nail migrated into the joint. Both of them refused further surgery for removal of the nail.

We found excellent to good results in 18 pts (75%). Out of 14 A type fractures 12 had excellent to good results, 2 had fair and no poor results. Out of 10 C type fracture 6 had excellent to good results, 2 had fair and 2 had poor results.

Richard Gellman<sup>5</sup> et al (CORR: 1996: 332) in their study on 26 supracondylar femoral fractures treated with SC nail. They had 4 excellent, 15 good, 2 fair and 2 poor results. One pt needed bone grafting in their series. They found that supracondylar nail gives good functional outcomes comparable to lateral fixation devices with significantly less soft tissue dissection. Danziger MB et al in their study on 23 supracondylar fractures managed with SC nail, they had 94% excellent to good results at an average of 3.3 months.

Ingman<sup>6</sup> A et al developed an implant in which the distal (condylar) screws have a diagonal configuration so that the screws can be closer to the distal end of the nail, allowing more distal fractures to be fixed. It also utilizes the denser bone of the posterior condyles for more secure fixation in osteoporotic patients. The new implant was used for 24 extra-articular fractures and for 14 articular fractures. There was no significant difficulty with obtaining fixation in very distal fractures and in osteoporotic bone. All fractures united within 3 months except one which required a bone graft at 6 months. Average knee flexion at final follow-up was 101 degrees for extra-articular fractures and 106 degrees for articular fractures. Surgical exposure for nail placement requires significantly less periosteal stripping and soft tissue exposure than that of lateral fixation devices. The retrograde supracondylar nail is an excellent alternative to lateral fixation<sup>7-10</sup> devices for supracondylar fractures of femur.

## CONCLUSION

Supracondylar nail provides stable fixation in a region of femur where a widened canal, thin cortices, and poor bone stock make fixation difficult. We had excellent to good results in 18 pts (75%) and fair in 4 cases and poor in 2 cases. Orthopaedic surgeons experienced with intramedullary nailing will find the supracondylar nail a useful technique. The future prospect arthroscopically assisted method for the retrograde intramedullary nailing of supracondylar femoral fractures affords the potential benefits of intramedullary fixation of these fractures while avoiding the morbidity and complications associated with an arthrotomy.

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