

## Original Research Article

# Evaluation of short term outcome on distal femoral fractures using distal femoral nail: revisiting the technique

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### ABSTRACT

**Background:** Distal femoral fractures account for 6 to 7% of all femur fractures. Ideal treatment of these fractures demands indirect reduction as well as stable fixation by implant which could tolerate the stress and strain forces till healing of fracture. Distal femoral nailing fulfills these demands.

**Methods:** Fifteen patients with seventeen fractures were treated by this method as a prospective study at the tertiary care institute in north india. Patients were evaluated post operatively with average follow up duration of 45.59±15.99 weeks.

**Results:** 88% of the patients were having associated trauma. Male/female ratio was 9/8. Mean delay in surgery was 21.86±23.85 days (1-64 days). Reduction was satisfactory in all patients. Average hospital stay was 18.71±8.23 days (6-34 days). Clinical union was seen in 16 out of 17 fractures by the end of six months with average period of 4.19±0.83 months. Radiological union lagged behind clinical union with average of 5.14±0.44 months. Post operatively 5 patients with delayed union needed dynamization, 2 needed bone grafting. One case of non union was seen. There were two cases of infection requiring debridement. Average knee flexion was 90.35±22.95degree (50-130 degree). Average extension lag was 3.88±2.88 degree (0-10 degree). Sanders function evaluation scale at final follow up showed 11.8% excellent, 47.2% good, 23.6% fair and 17.6% poor result.

**Conclusions:** Distal femoral nailing has good results in distal femur fracture as the fixation is more biological and stable allowing early healing and better outcome.

**Keywords:** Distal femur fracture, Distal femoral nail, Dynamization

### INTRODUCTION

Distal femoral fractures account for 6 to 7% of all femur fractures and are either result of high velocity trauma in young or low velocity trauma in elderly osteoporotic bone.<sup>1</sup> These fractures have high morbidity if not treated well owing to extension to knee joint either partially or fully. Surgery was accepted modality to treat such fractures as there were high percentage of poor outcome in conservative treatment as compared to surgery.<sup>2-4</sup> Treatment options till the end of last century and even

today in third world countries were plating with ABP (angled blade plate), CBP (condylar buttress plate) and DCS (dynamic condylar screw).<sup>5-7</sup> Owing to soft tissue stripping and poor purchase of screws in elderly osteoporotic bone, the thinking process was to develop an implant which could fix these fractures more biologically and with adequate purchase in osteoporotic bones too. Supracondylar nailing subsequently developed showing good results over plating but still the osteoporotic fractures were enigma.<sup>8-11</sup> Later on AO research group improved supra condylar nailing and came with distal

femoral nail (DFN) which had an option of spiral blade for better purchase in osteoporotic bone.<sup>12,13</sup> There was limitation to this implant as the condylar fractures in coronal plane (Hoffas', AO33B) and some of highly comminuted intra articular fractures (AO33 C3.3) could not be fixed with these nails. With the evolution of LCP (locking compression plating), more and more of these fractures started getting fixed with distal femoral locking plate.<sup>14</sup> There were many studies which compared the outcome of LCP and DFN showing equally good results.<sup>15,16</sup> Though plating still had risk of soft tissue stripping if not done biologically, the technique of fixation with distal femoral nailing was declining.

A revisit to this technique and outcome study is hereby submitted for rethinking on the use of this technique of fixation in appropriate trauma cases.

## METHODS

The study was a prospective study done at tertiary care institute in north India over a period of one year between December 2003 to December 2004. Patients who fulfilled the inclusion criteria were explained all types of techniques of fracture fixation and only those who signed the informed consent opting for this technique were enrolled in the study.

Inclusion criteria were skeletally mature patients with fractures AO 33A1 to A3 and 33C1 to 33C3.1. Patients with 33B and 33C3.2 and 33C3.3 (complex intra articular) were excluded from study. Patients with history of septic arthritis knee and inability to flex knee to 70 degree were also excluded from study. 17 patients with 19 fractures were enrolled in study. Two patients were lost in follow up and 15 patients with 17 fractures were followed up till June 2005. Minimum follow up was 22 weeks and maximum were 72 weeks. There were 9 males and 6 females with age range from 19 to 60 years. All fractures were high velocity injuries due to RTA (road traffic accidents) Fractures were classified according to AO classification.<sup>17</sup> Open fractures were classified according to Gustilo Anderson classification.<sup>18</sup> Clinical union was defined as absence of pain or tenderness at fracture site on loading and radiological union was defined as fracture margin haziness or bridging callus on three out of four cortices on AP and lateral X-rays. All patients were given appropriate emergency management and stabilized. A complete evaluation of patient including standard trauma radiology and haematological work up was done and patients were operated as soon as patient's condition permitted.

### *Surgical technique*

Patients were operated under regional or general anaesthesia on radiolucent table. Position was supine with injured limb flexed to 70 degree on folded towels. Closed nailing was done through transligamentar incision. Intra articular fractures were openly reduced and fixed with

interfragmentary screws anteriorly to passage of nail. Approach used was midline anterior skin and medial parapatellar exposure. Entry point for nail was just anterior to femoral attachment of posterior cruciate ligament. Entry point made with drill bit and position checked on C arm. After confirming appropriate position on C arm, entry point was enlarged with reamer and guide wire inserted up to lesser trochanter after reducing fracture. Successive reaming was done and nail inserted on standard assembly guide reducing the fracture in acceptable position. Acceptable reduction was less than 5 degree of angulation, less than 10 degree of rotation and limb length discrepancy of 1cm or less. Distal and proximal interlocking bolts were applied and wound closed in layers and antiseptic dressing applied.

Postoperatively, physiotherapy for quadriceps strengthening and knee range of motion exercises were started as soon as comfortable to patient. Non weight bearing crutch walking was allowed second postoperative day. Post operatively patients were evaluated every six weeks and assessed clinico-radiologically for fracture union and range of motion. Any fresh complication was assessed and intervened accordingly. Final outcome was assessed at minimum of six months post operatively on standardized knee evaluation score developed by Sander. Results were graded as excellent, good, fair or poor taking into account the range of motion, deformity, pain, walking ability and return to previous level of activity.

## RESULTS

Eight patients were AO33A1, five were AO33A2, two were AO33A3, and two were AO33C3. Out of seventeen fractures, thirteen were close and four were grade 2 open injuries. All patients except two had associated skeletal trauma varying from ipsilateral or contralateral, upper and lower limb trauma. Five patients also had associated other system injuries, four cases of head injuries and one case of blunt trauma abdomen. Time elapsed between surgery and injury was  $21.88 \pm 23.85$  days (range- 1 to 64 days). Mean duration of surgery was  $135.59 \pm 55.98$  minutes (range- 75 to 220 minutes). Intra operative fracture reduction was acceptable in all patients on radiological assessment, however limb length discrepancy of more than 1 cm was found in five patients. Average blood loss was  $226.47 \pm 100$  ml (range- 100 ml to 500 ml). Average duration of hospital stay was  $18.71 \pm 8.23$  days (range- 6 to 34 days). Average follow up duration was  $45.59 \pm 15.99$  weeks (range- 26 to 78 weeks) Union was seen in sixteen out of seventeen fractures by end of six months. Average clinical union was  $4.19 \pm 0.83$  months (Range-3 to 6 months). Radiological union was evident in only fourteen fractures by end of six months (average  $5.14 \pm 0.44$  months, range 3 to 6 months). Seven patients had delayed union for which five needed dynamization and two needed bone grafting. There was one case of non union. Three cases of postoperative infection were seen out of which two settled with debridement and one needed implant removal. Average

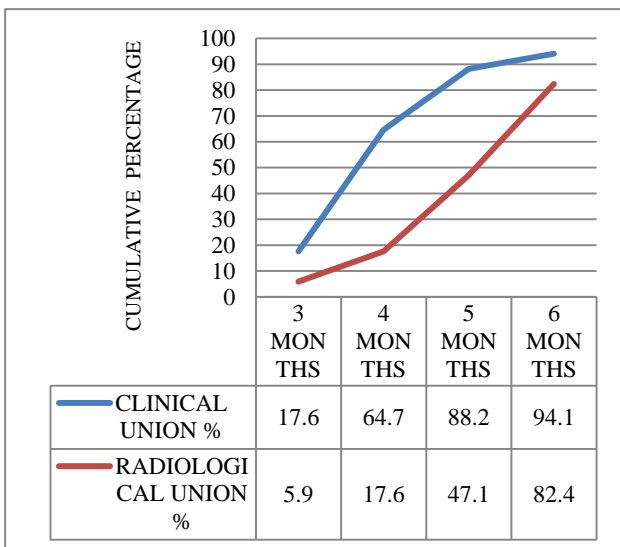
flexion was  $90.35 \pm 22.95$  (range- 50 to 130 degree). Average extensor lag was  $3.88 \pm 2.88$  (range- 0 to 10 degree). No unacceptable angulation or malroation was found on final follow up however LLD (limb length discrepancy) of more than 1cm was found in five patients. On Sanders functional evaluation score, 2 were rated excellent, 9 good, 4 fair and 2 rated as poor.

**Table 1: Associated injuries.**

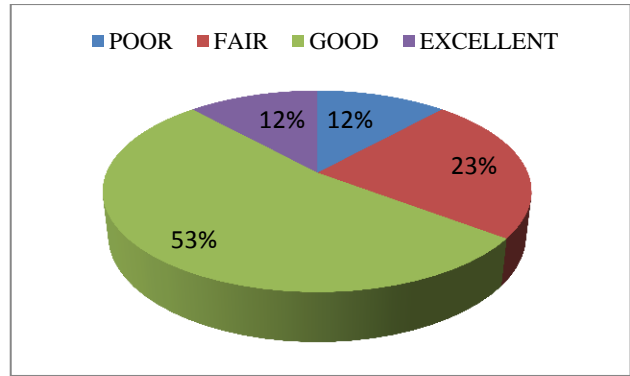
	Frequency	Percentage
Ipsilateral lower limb	2	11.8
Ipsilateral lower limb, contralateral lower limb	2	11.8
Ipsilateral lower limb, contralateral lower limb upper limb	1	5.9
Ipsilateral lower limb, upper limb	1	5.9
Ipsilateral lower limb, others	1	5.9
Contralateral lower limb	4	23.5
Upper limb other	3	11.8
Other	1	5.9
Nil	2	11.8
<b>Total</b>	<b>17</b>	<b>100</b>

**Table 2: Fracture profile.**

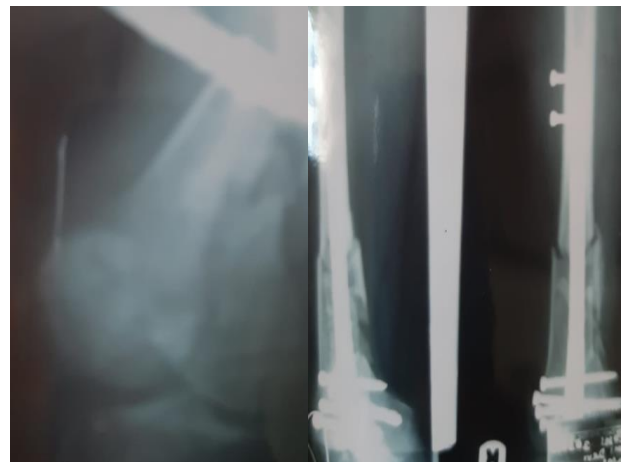
	Frequency	Percentage
A1	8	47.1
A2	5	29.4
A3	2	11.8
C2	1	5.9
C3	1	5.9
<b>Total</b>	<b>17</b>	<b>100</b>



**Figure 1: Clinical and radiological union.**



**Figure 2: Functional evaluation.**



**Figure 3: AO33C3 fracture (before and after surgery).**



**Figure 4: A) Grade 2 open fracture treated initially with debridement and external fixation. B) Postoperative radiology with DFN.**

**DISCUSSION**

As rightly said by Schatzkar that the best implant is still no guarantee for good surgical outcome.<sup>13</sup> According to Wilenegger, the implant is decisive in mechanical rest of fracture zone and the reduction technique is decisive in

preservation of vascularity.<sup>13</sup> Therefore it is the choice of implant as well as reduction technique which sets the course for fracture healing. With this concept in mind, the retrograde nailing for distal femur fractures was accepted as standard treatment modality as nailing could be done biologically maintaining the reduction till union.<sup>13,19</sup> Nailing being more biological and being load sharing device, the retrograde nailing through the intercondylar notch of femur has been shown to be effective in polytrauma patients even in diaphyseal fractures also as the supine position is maintained, technique is safe and quick.<sup>20</sup>

In the present study, the mean age of patients was 38±11.6 years (Range-19 to 60 years) which was comparable to literature. Eighty eight percent of fractures in present study were associated with other skeletal injuries and injuries to other systems like head injury and blunt trauma abdomen, which makes this study different from other studies reported in literature where associated injuries reported is 6 to 48 %.<sup>11,13,19</sup> The reason for this high percentage of associated injuries might be that the institute being tertiary care center, high velocity injuries with polytrauma patients were referred to this institute. This high percentage of associated injuries could be confounding factor in final outcome evaluation. There was delay in surgery in our study 21±88 days (Range-1 to 64 days) as compared to western literature 2.3 days (Range-0 to 44 days) by Grass et al and 2.4 days (Range-1 to 5 days) by Gellman et al.<sup>13,9</sup> It could be because three of our patients were compound fractures initially treated with debridement and temporary external fixator. They were taken up for definitive fixation after soft tissue healing and one patient with blunt trauma abdomen was operated after laparotomy wound stoma was well formed. Also, the lack of OT time due to increased work load was the reason where the closed fractures were put on traction and operated according to priority. Two of our patients required bone grafting and five needed dynamization as compared to western literature where need for bone grafting and dynamization was infrequent, 1 in 57 cases by Leung et al and no bone grafting by Grass et al.<sup>11,13,19</sup>

For final outcome, functional evaluation score system developed by Sanders et al was chosen as it took into account the fracture alignment and patient related factors like pain, range of knee motion and ability to walk.<sup>9</sup> In our patients, 11.8 % had excellent results, 47.2% good, 23.6% fair and 17.6% poor results. This was not comparable to western literature where 35% to 38% excellent results, 51% to 59% good results and 6% to 9% fair results were shown.<sup>11,13,19</sup> Reason for this might be associated injuries in our series in 88% of the cases.<sup>15</sup>

## CONCLUSION

The results were promising despite the heterogenous patient cohort with high percentage of associated injuries and open fractures. However, the sample size was small to eliminate confounding factors. More studies with

larger sample size are needed to eliminate the confounding factors and results are expected to improve. This technique is optimal operative treatment of supra condylar femur fractures providing rigid fixation and could be an important tool in the armamentarium of orthopaedic surgeon.

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