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"Prospective Comparative Study of the Surgical Treatment of Non Union Femur Shaft Fracture with Imil Nailing Vs Plating With Autogenous Bone Grafting"

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ABSTRACT:Objective: comparison of surgical outcome of IMIL nailing vs. Plating with autogenous bone grafting for femur shaft fracture nonunion
Design of study: Prospective study
Patients and setting :
Twenty patients (aged between 20-60 yrs) of femur shaft fracture nonunion treated with IMIL nailing or plating with bone grafting during June 2018-November 2020 were prospectively analyzed and followed up to November 2020 at Narayana medical college and hospital, Nellore. Follow-up was done on six weeks,12 weeks, and six months postoperatively. At every visit, check radiographs to be taken to assess the radiological union.
Intervention:nonunion were treated with either IMIL nailing or Plating and autogenous bone grafting.
Evaluation of outcome parameters: functional evaluation with the grading of Harris Hip Score and shortening and infection and duration of hospital stay and radiological evidence of fracture consolidation
Results and observation: All patients demonstrated radiographic evidence of fracture consolidation with a functional outcome ranging from excellent to good results. All were allowed immediate mobilization and range of motion exercises and reported decreased pain with increasing time with improved function. Three patients complained of pain in the gluteal and hip region, relieved after the analgesics prescription. Patients reported no pain with ambulation as related to the fracture site with IMIL nailing, 17 cases attained 120 degrees flexion, and 2 achieved 80-100 degrees flexion,1 case had shortening and infection with IMIL nailing, and 1 case had localized osteopenia with Plating and bone grafting. one of the patients with IMIL required additional operations for implant removal sequestrectomy procedures.
Conclusion :P –value calculated to be <0.5,no significant difference of functional outcome between IMIL Nailing or Plating with autogenous bone grafting as surgical treatment of femur shaft fracture nonunion.

I. INTRODUCTION:

Fracture of the femur's shaft is commonly encountered; however, the nonunion fracture shaft of the femur is relatively rare nowadays with increased public awareness about orthopedic treatments and demerits of traditional bone settings. Still, the illiterate rural population is more inclined towards the traditional bone setting techniques leading to malunion and nonunion of fractures. Plating or intra medullary nailing techniques with bone grafting have shown promising results for the treatment of nonunion of fractures, regaining knee motion, and preventing deformities.

NON UNION DEFINITION The US Food and Drugs Administration (FDA) defines a nonunion as a fractured bone that has not completely healed within nine months of injury. That has not shown progression towards healing over three consecutive months on serial radiographs. The exact time frame likely differs per fractured bone and location within the bone, soft tissue condition, and fracture type.

Radiographically, a nonunion is defined by the presence of the following criteria: the absence of bone trabeculae crossing the fracture site, sclerotic fracture edges, persistent fracture lines, and lack of progressive change towards union on serial radiographs. The presence or absence of callus is not a criterium since this depends on the fracture site and whether there is primary or secondary bone healing involved. Furthermore, there should be persistent pain or even motion at

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the fracture site. This is best elicited by weight bearing.

II. MATERIALS AND METHODS:

A prospective study of 20 surgical management cases of fracture femur nonunion treated with IMIL nail or plate with bone grafting during the period from June 2018- November 2020 and followed up to November 2020, at Narayana general hospital attached to Narayana medical college, Nellore.A follow-up to be on six weeks,12 weeks, and six months postoperatively. At every visit, check radiographs to be taken to assess the radiological union.

Selection of cases :

The patients in the age group 20 to 60 years who sustained a fracture of shaft of the femur and went into nonunion were selected.

Inclusion criteria:1) All patients aged between 20-60 yrs.2) Patients presenting with fracture femur nonunion,3) Patients willing to give consent

Exclusion criteria:1)Pregnant women,2)Patients with neurological deficits.3)Patients managed conservatively for other medical reasons. Patient general condition was stabilized, and the nonunion fracture limb was put on skeletal traction(high tibial traction with 1/10th of body weight over Bohler's splint) to distract the overriding fragments and to overcome soft tissue contractures. Serial skiagrams were taken to assess the distraction of overriding of fracture ends.

Surgery :

Preoperatively patients blood grouping and cross-matching was done, and 2 pints of packed red blood cells were put in reserve in case of emergency and

Ten patients of nonunion femur treated with **ORIF with IMIL nailing with bone grafting**

Ten patients of nonunion femur treated with **ORIF with Plating with bone grafting**

Bone grafting technique – autogenous iliac crest bone grafting used

Postoperative management –

In the postoperative period, we have not used any external immobilization like Thomas splint. Knee mobilization started on the second postoperative day itself. Which was managed to get by flexing the knee progressively, and knee extension was taught along with active knee extension and static quadriceps exercises. The drain tube was removed 48 to 72 hrs, depending upon the fluid collection in the suction box. Depending on the status of the wound, antibiotics were continued for 10 -12 days. Sutures were removed between 10 -12 days. Knee range of movements was allowed and mobilized on a wheelchair and non-weight bearing crutch, and they were discharged with advice to attend OPD for follow up once in three weeks. At the time of discharge, status of the wound, knee movements and quadriceps lag was noted, illiterate and rural patients were strictly warned about consequences of early weight bearing at the time of discharge.In the follow up the status of wound, the signs of clinical union and range of motion were noted. Radiologically amount of union was also determined. Depending on this the patients were advised partial weight bearing

Evaluation Methodology:

results evaluated with the following criteria and Harris hip score **Grading of harris hip score**<70-poor, 70-79 – fair, 80-89 – good, 90-100 excellent

As we noted shortening and infection and stiffness in some cases the following criteria were used.

Shortening –No shortening - excellent **,**0.5 to 2 cm – good, >2cm -poor.**Infection –** No infection - excellent **,**Superficial infection - good **,**Deep infection - poor **Stiff knee –** Full range of movements –excellent, Flexion 90˚- good **,**Flexion <20˚ - poor.

Radiological evaluation:presence of bridging callus ,fracture ends,fate of fracture line ,position of implant

III. OBSERVATION AND RESULTS :

Age and sex distribution –

Our study included patients age ranging from 18 – 50 years, adults between the age 20 and 30 years the most commonly affected. Male patients predominated over female patients, younger the age group better were the results.

Majority of the patients hail from low socio economic groups

Mode of accident – road traffic accidents are the commonest cause .

Side of injury – 15 patients had sustained fracture on right side and 5 on the left side

Radiological results : The duration of healing varied, the study reveals that 16 cases (80%) showed radiological union between 12-13 weeks. Earliest radiological union was seen in the 10th week and the longest was seen around 20th week. Average duration was around 15 weeks. After radiological union patients were advised to bear full weight.

Range of knee motion –

motion of 120˚ flexion, 2 patients had 80-100˚ flexion and 1 patient had 60-80˚ of flexion. Similar to both Plating and nailing We have not

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immobilised the knee externally in this series. Knee motion was started on 2nd post operative day and at the time of discharge patient had an average of 80˚ of movement.
Full range of movement was achieved within 8-12 weeks. In total 17 patients achieved knee

Ambulation – Patients were mobilised on wheel chair after 2 weeks and non weight bearing crutch walking advised after 3 weeks and partial weight was advised after 3 weeks and partial weight bearing was advised after 5-7 weeks. Full weight bearing was advised after 13-15 weeks depending on the radiological union, for both Plating and intramedullary nailing patients.

Complications –
Intermittent pain – 3 patients complained of pain in gluteal and hip region, which was relieved after analgesics prescription.

Shortening –One patients developed shortening of 0.5 to 1 cm and Since shortening of 1cm was not perceptible nor did it make any significant affection in patient's gait, it was ignored.

Infection –One patient treated with Plating had superficial infection on 8thpost operative day, culture yielded staphylococcus sensitive to ciprofloxacin

Re hospitalisation – . One case developed fever and induration of thigh on 5th post op day. It was drained by removing a suture and opening the wound with a sinus forceps. The discharge persisted and the culture yielded pseudomonas and anerobic

streptococci, resistant to routinely used antibiotics. Third generation cephalosporins, amikacin along with metronidazole were given. Inspite of this patient developed osteomyelitis later, but union of fracture progressed well and full union was achieved around 28 weeks. After 30 weeks sequestrectomy was done, after extracting the nail.
One patient who developed osteomyelitis was readmitted at 30 weeks time and intramedullary nail was extracted and sequestrectomy was done.

There was no evidence of non union, foot drop, break in nail, bent nail, or migration of nail.

Table – complications

Complications	No of patients of Plating	No of patients of nailing
Hadware related	0	0
Infections	1	1
Localised osteopenia	1	0
Stiff knee	0	0
Shortening	0	1
Re operation	0	1

Assessment of end result –
End result of the entire series was assessed and following groups defined excellent, good and poor results

Table :outcome

	Plating	Nailing
No of patients	10	10
Excellent	5	6
Good	4	4
Poor	1	0

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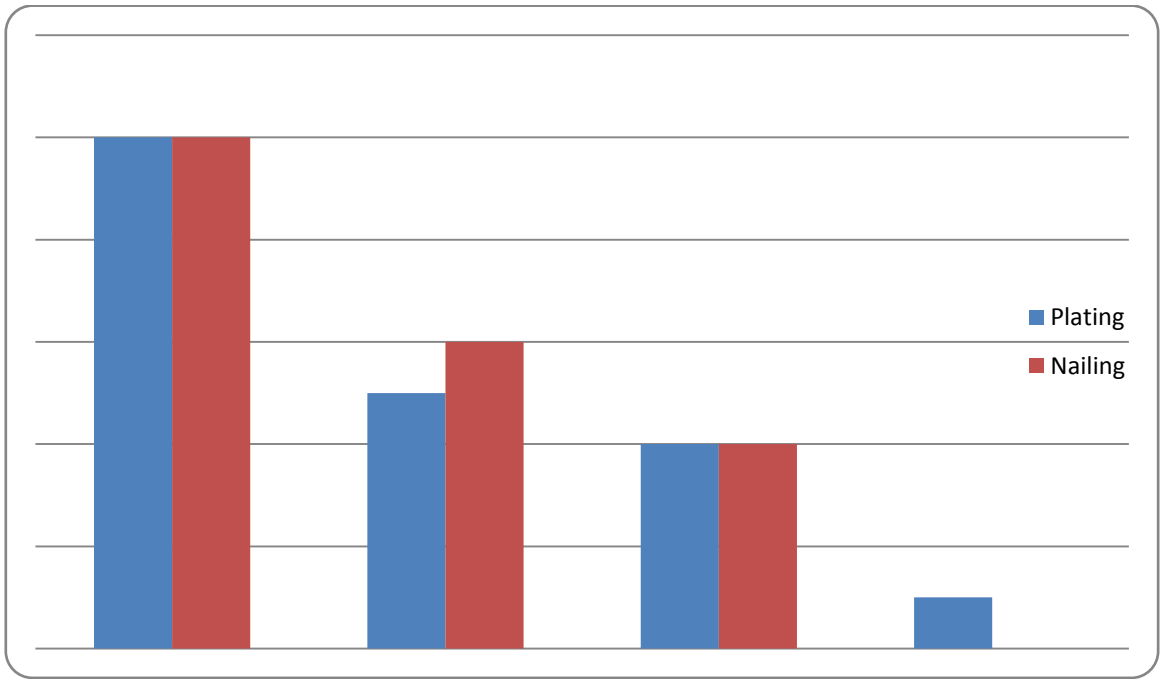
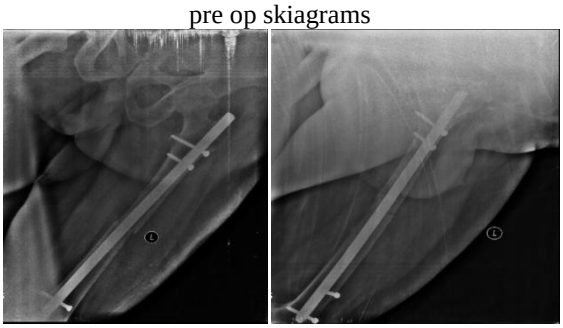
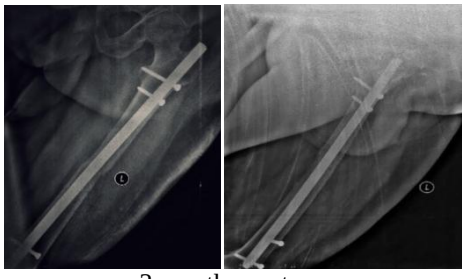


pre op skiagrams



Immediate post op skiagrams



3 months post op

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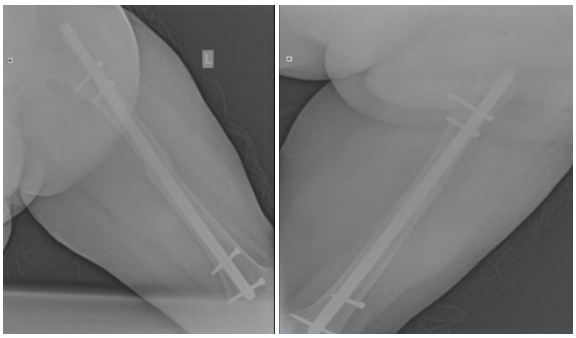
6 months post op



12 months post op skiagrams

Clinical photographs

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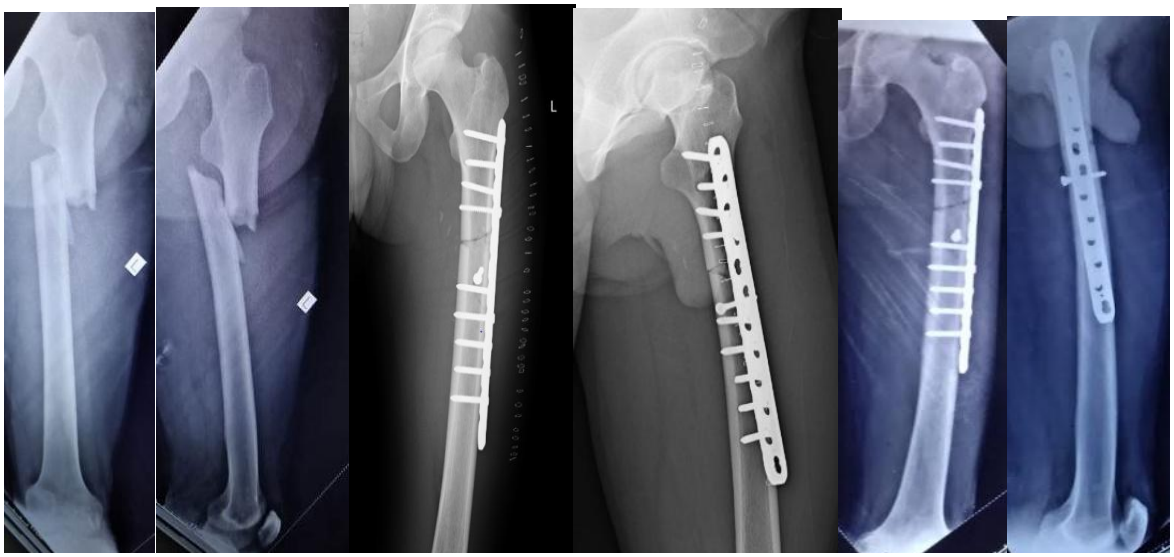
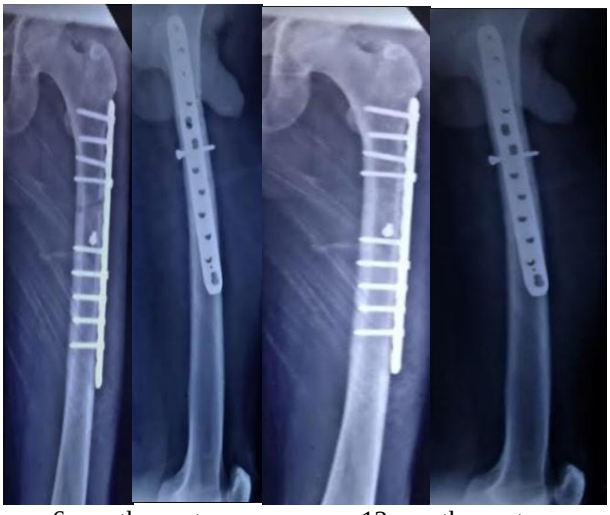
Case :2



Pre operativeskiagram Immediate post op skiagrams 3 months post op



6 months post op 12 months post op

Clinical pictures : – case no 2

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IV. DISCUSSION AND ANALYSIS :

Fracture of the shaft of femur are commonly encountered, however fracture non union shaft of femur is relatively rare nowadays due to increased public awareness about orthopaedic treatments and demerits of traditional bone settings. Still the uneducated rural population are more inclined towards traditional bone setting techniques leading to malunion and non union of fractures.

Plating or intramedullary nailing techniques with bone grafting have shown promising
results for the treatment of non union of fractures, regaining knee motion and preventing deformities.
et al (12) Mode of injury was road traffic accidents

the treatment of femur fractures non union can be effectively achieved with nailing with bone grafting or Plating with bone grafting,both the methods are widely used.they can differ in biomechanical properties of fracture fixation stability and post surgery ambulation and risk of infection and hence these can be significantly effect the duration of union of fractures .

In the present study RTA was responsible for 80% of fractures, Van Neirkerk
reviewed 91 cases of femoral fractures revealed that RTA was responsible for 90% of cases. According to shah

Study (nailing)	Average operating time	Study (Plating)	Average operating time
Current study	62.5 minutes	Current study	80 minutes
Van Nierkerk	58 minutes	Loomer et al	75 minutes
		Ashik et al	70 minutes

which was compatible to
Average operation time for nailing in the present study is 62.5 minutes and van nierkerk is 58 minutes. In contrast, the average surgical time in Plating is 80mins in the present study and 75 minutes in Loomer et al. study.

Study	Union rate (Plating)	Study	Union rate (>95%)nailing
Current study	15 weeks	Current study	24 weeks
Ashik et al. (62)	16.1 weeks	Kempf et al. (36)	28weeks
JPS walia et al (26)	14 weeks	Wiss et al (11)	26 weeks
Bae SH (65)	14.3 weeks	Thorensen (10)	16 weeks

The average union time in the Plating is 15 weeks in comparison to the 24 weeks in the present study. Ashik et al. study has 16.1 weeks, and JPS Walia et al. study average time is 14 weeks in plating procedures. In contrast,Kempf et al. study shows the 28 weeks average union time, and wiss et al.'s study union time average of 26 weeks.General methods for the treatment of nonunion were the removal of the original cause, stable re-fixation, bone grafting, and soft tissue coverage. The ideal implant is still locked intramedullary nailing, especially in the femur and tibia. Plating in long bones is easy but unsuitable for weight-bearing bones, especially in mid shaft fractures, the classic concept of autologous iliac crest bone grafting and compression plating is safe and effective with excellent clinical outcome and low incidence of long term complications.

V. CONCLUSIONS:

P-value calculated to be <0.5,no significant difference of functional outcome between IMIL Nailing or Plating with autogenous bone grafting as surgical treatment of femur shaft fracture nonunion. Hence we concluded that in suitable cases, when indicated and principles are followed carefully for Plating and nailing along with bone grafting, good results are bound to occur, and hence these surgeries are ideal in the treatment of nonunion femur. However, no significant difference was observed in the outcome of results when compared Plating with intramedullary nailing.

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Declaration Of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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