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RETROGRADE FEMUR NAIL;

OUTCOME OF RETROGRADE FEMUR NAIL, IS IT IMPLANT OF CHOICE FOR DISTAL SHAFT OF FEMUR FRACTURE?

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ABSTRACT… Background: Retrograde nailing for fracture of distal shaft of femur is common procedure but data about post-operative functional outcome in terms of knee range of motion, union and pain at 6 weeks, 6 months and 1 year follow-up is lacking. **Objectives:** The main aim of this study was to determine post-operative functional outcome after performing nailing in a retrograde fashion for distal disphyseal femoral fracture in terms of knee range of motion, pain and union at 6 weeks, 6 months and at least 1 year follow-up. **Study Design:** Descriptive case series. **Setting:** Orthopedics and Spine Centre, Ghurki Trust Hospital Lahore, Pakistan. **Period:** 1st July 2015 to Dec. 2016. **Materials and Methodology:** 140 patients of either sex and age with fractures of distal disphyseal femoral fracture and were operated using retrograde nailing were included in the study. All the data were analyzed using SPSS 17.0 version. **Results:** 140 patients were included with mean age of 31.81± 7.117 ranged from 16 to 75 years of age.97 patients (69.3%) were male and remaining 43 patients (30.7%) were female. Pain was significantly decrease in all patients on Visual analogue scale. Mean union were 32.3 ± 5.3 weeks, Knee range of motion after last follow up were more than 120^0 in 126 patients. **Conclusion:** Retrograde Nailing for distal diaphyseal fractures is an excellent option with good functional outcome. It should always be considered while managing such fractures.

Key words: Fractures, Distal Diaphyseal Femur, Retrograde Nail, Functional Outcome, Range of Motion.

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INTRODUCTION

Distal diaphyseal femoral fractures have been thought as complex to treat fractures because of the wider diameter of shaft, toggling of the antegrade nailing etc.[1,2] An estimated 6% of all fractures of the femur account for the distal part of the bone. Different techniques and implants were used at different time for the treatment of femoral shaft fractures. Among them, was the introduction of interlocking intramedulary nail in antegrade fashion, which was considered as gold standard.[3-7] But every technique and implant having some limitations. Similarly occurred with antegrade nailing when the distal femoral fractures were considered and this limitation had led the development of retrograde nailing for distal femoral shaft fractures. However the main challenges with this technique is the knee pain and union which take longer time as compared to mid shaft fractures.[8] Knee pain with this technique is common because of the reaming, surgical dissection and fracture in distal half. Younger age appeared to be a risk factor for knee pain. Heiney JP et all did a comparison analysis of using retrograde nailing and plating for distal femoral shaft fractures. They found no significant difference in knee pain using comparison with different variables like sex, injury severity score, AO type of fracture, associated injuries, open vs close fractures etc.[4]

As this procedure has not been studied in our population so the current study may help us determine the efficacy of retrograde nailing for fracture of distal shaft of femur. There are different treatment modalities being used for fracture

of distal shaft of femur in our hospitals but no local evidence is available about the functional outcome of either option. Retrograde nailing for fracture of distal shaft of femur is a cost effective technique but at same time there is indecisiveness regarding other modalities of fixation of fracture. The outcome will help end this confusion and will help in decision making in treatment of fracture of distal shaft of femur.

MATERIALS & METHODS

This study was conducted in Department of Orthopedics, Ghurki hospital, Lahore after approval from hospital ethical committee between 1st July 2015 to 31st Dec. 2016 after hospital ethical committee approval. The calculated sample size was 140 cases using non probability consecutive sampling, with 7% margin of error and 95% confidence level taking proportion of knee range pain (23%).[4] Patients of either sex and age between 16 – 75 years having isolated closed fracture of distal diaphysis of femur presenting within 72 hours of fracture were included in the study. While the patients having previous surgery or intervention for knee of same side determined by medical record, evidence of infected wound by clinical examination (presence of purulent discharge), advanced osteoarthritis of knee joint as diagnosed by x- ray showing osteophytes and reduced joint space, multiple fractures of other bones of same side as diagnosed by x-ray, any history of connective tissue disorders, metaphyseal and intra articular fractures, didn't give consent or lost in follow up were excluded from the study. After informed consent was taken and fulfilling the inclusion criteria the patient underwent retrograde nailing either close or open reduction by same team of orthopedics surgeons using same operation theatres. Two types of nail were used. SIGN Nail and Locally made nail. SIGN is a humanitarian organization that provides implant free of cost and it doesn't require the use of image intensifier while the Local implants available at our country need image intensifier. In 70 patients having SIGN nailing and 70 patients having local nail. All the surgeries were done under spinal anaesthesia and supine position keeping knee in flexion of about 45 – 60^0. Entery were made using drill bit and then reaming done with hand in all patients. In patients in whom close reduction were not possible, open reduction were done using lateral incision. Both proximal and Distal locking were done. The patients were managed in knee immobilizer for 3 weeks while keeping the patient ambulatory without weight bearing on affected side. Knee bending started after 3rd week and weight bearing after 6 weeks. The data contain age, sex, date of operation, co-morbidities, site of fracture, mechanism of injury, flexion at knee joint using Goniometer, union time by using radiographic findings at repeated intervals, knee pain (presence/absence) using Visual Analoque Score and complications was used as research instrument and all data was recorded by researcher himself. Visual analoque scale is a measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured. Its value ranges from 0 to 10.0 mean no pain, 1 - 2 mild annoying pain, 3 - 4 for uncomfortable, troublesome pain, 5 - 6 value for distressing, miserable pain, 7 - 8 for intense, dreadful pain and 9 – 10 for worst, unbearable pain. All the patients were followed for at least 1 year to determine the functional outcome. Data collected was entered and analyzed in the SPSS version 17. Results were projected using descriptive statistics e.g. mean with standard deviation in case of continuous variables like age and percentages and frequency in case of categorical variables like gender, flexion at knee joint, knee range of motion. A p value $\leq$ 0.05 was considered significant.

RESULTS

In our study population 140 patients were included with mean age of 31.81 $\pm$ 7.117 ranged from 16 to 75 years of age. 49 patients (35%) in our study population were below 30 years whereas rest of 91 patients (65%) were either 30 years or more in age. 97 patients (69.3%) were male and remaining 43 patients (30.7%) were female. 70(50%) having right femur involvement, 60 (42.86%) patients having left femur involvement while 10(7.14%) having bilateral femur involvement. 100(71.43%) patients having road traffic accident, 30(21.43%) patients sustained trauma due to fall while the

remaining having other causes. The patients were operated within 1 to 3 days of injury (average: 2.7 days) while the length of hospital stay was about 2-5 days. Maximum patients belong from urban are i-e 93(66.43%) as compared to rural area. Most of the patients having no co-morbidity. The patients who presented with us were mostly suffered fractures due to road traffic accident i-e 100(71.43%) (Table-I).

Frequency	140	
Mean age in years	31.81± 7.117	
Address	Urban	93(66.43%)
	Rural	47(33.57%)
Range of age in years	16 -75	
	<30	37(26.43%)
	30-45	67(47.86%)
	>45	36(25.71%)
Interval between admission and surgery in days	1-3 (avg 2.7)	
Co-morbidities	DM*	17(12.14%)
	HTN*,IHD*	12(8.57%)
	Renal	3(2.14%)
	Obesity	15(10.72%)
	Nil	93(66.43%)
Total Hospital stay in days	2-5 (avg. 3.8)	
Limb involvement	Right	70(50%)
	Left	60 (42.86%)
	Both	10(7.14%)
Mechanism of injury	Road traffic Accident	100(71.43%)
	Fall	30(21.43%)
	Others	10(7.14%)

Table-I. Demographic characteristics and other variables

Regarding the type of fracture. The fractures were classified according to the AO classification system. More than half of the patients were from Type "A" i-e A1 34(24.29%), A2 29(20.71%) and A 26(18.57 %). Remaining patients having Type "B" fracture i-e B1 20(14.23%), B2 11(7.86%) and B3 20 (14.23%).

Knee range of motion were measured using Goniometer. Only 28 patients (20%) among 140 had knee range of motion less than 120^0 at 6 weeks follow-up while after 1 year follow up only 14(10%) having knee Range of motion less than 120 degree. While among the remaining 14(10%), 5(3.57%) having knee ROM between 100 -120^0, 4(2.86%) having between 80-100^0 while the remaining 6(4.29%) having less than that. They need open manipulation under anesthesia and gained knee ROM above 100^0 except 2 patients who were managed later on with quadriceplasty. All these procedures were done in later follow up after 1 year.

The visual analogue scaling was done at 6 weeks, 6 months and after 1 year. Visual Analogue scaling were compared between both the patients in whom Local implant were used and in those in whom SIGN nail were used. There were no statistically significant difference in both of them. The visual analogue scale after 1 year follow up in patients in whom Local nails were used were 1.6 ± 0.9 while in SIGN Nail patients it were 1.4 ± 0.8. The union in Locally implant were achieved at 34.1 ± 7.4 weeks while in SIGN Nail patients it were 30.5 ± 5.3 weeks which was statistically significant. $p<0.05$. 12(8.57 %) patients having wound infection who were managed accordingly. The outcome between Local Nail and SIGN Nail are given in Table-II.

Variable	Sign Nail	Local Nail
Union Time in weeks	30.5 ± 5.3	34.1 ± 7.4
Infection, (n)	4	8
Broken Implant	NIL	5 patients with broken screws and 1 patient with broken rod
Knee ROM >120^0 (n)	66	60
Visual Analogue Scoring	1.4 ± 0.8	1.6 ± 0.9
Operation Time in mins	65 ± 25	90 ± 35
Image Intensifier	NIL	YES

Table-II. Outcome of the surgical procedure in both nails after 1 year follow up.

The knee society score in terms of function are excellent in 67 patients in SIGN Nail group as compared to 64 patients in Local nail. Similarly the score were good in 3 patients In SIGN Nail while in Local nails there were 5 patients in that range. The summary of the scoring are given in Table-III.

Score	Sign Nail Frequency (%)	Local Nail Frequency (%)
Excellent (80-100)	67(95.71%)	64 (91.42%)
Good (70-79)	3(4.29 %)	5 (7.14%)
Fair (60-69)	0(0%)	1 (1.42%)
Poor (Score below 60)	0(0%)	0 (0%)

Table-III. Frequency distribution of outcome of knee society score(Function) in both types of nails at last follow up

Figure-1 (a). 18 years old male presented with 8 hours history of road traffic accident and trauma to left thigh and knee region. X-rays shows femoral and patella fracture.

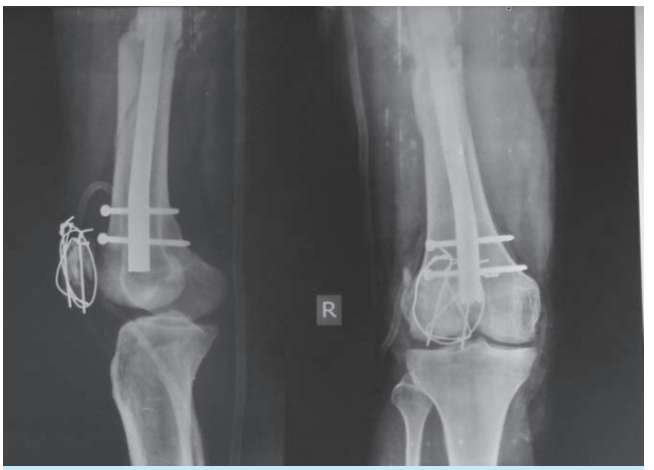

Figure-1 (b). Follow up x-rays after 8 weeks. X-rays shows mild callus formation at femoral site. The implant used for femoral fracture were locally made hollow stainless steel nail.

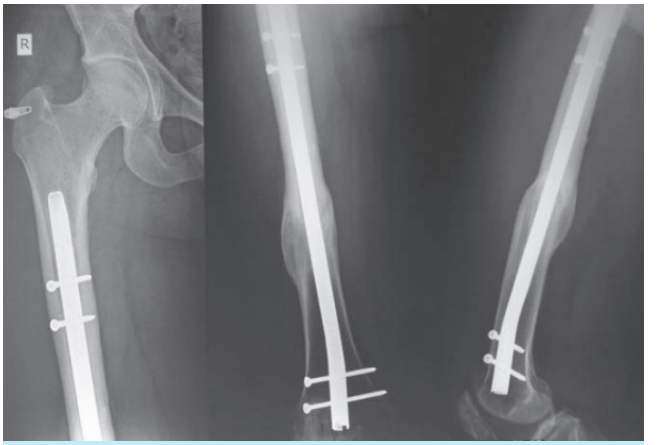

Figure-1 (c). After 4 months of using Local femoral nail. There is full callus formation at fracture formation. Tension band wiring and circlage wiring for patella were removed after 6 weeks of surgery.

Figure-1 (d). Last follow up image of the patient. Patient gain full range of motion at knee joint with a smiling face.

Figure-2 (a). 16 years old male presented with 1 day old trauma to his right thigh. X-rays shows 42A3 fracture.

Figure-2 (b). After 8 weeks of follow up there is good callus formation at the fracture site.

Figure-2 (d). 16 years old child with full knee range of motion and without pain after 8 weeks follow up.

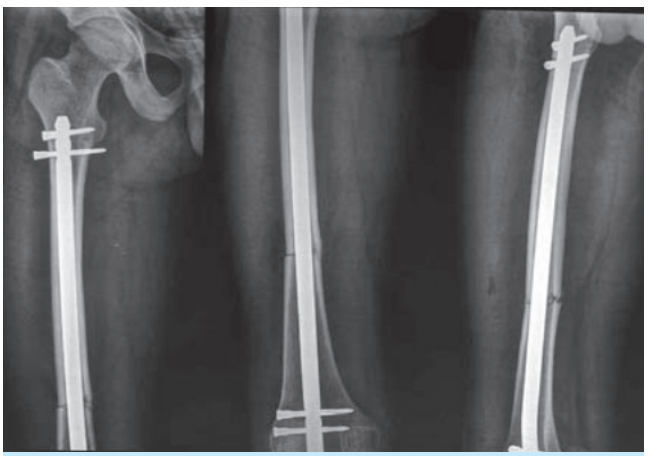

Figure-3. Follow up X-rays after 3 weeks. There is no callus formation at the fracture site. However there is good reduction. The implant used were SIGN Nail.

DISCUSSION

The human body comprises of different bones with different architectures and having different functions. Among them, femur is the largest and powerful (1) Femur articulates proximally with the acetabulum forming hip joint while distally making knee joint. Between the proximal and distal joints, there is femoral shaft. Distal femoral shaft fractures are ten times less common than proximal part. It makes the distal 9-15 cm of femur down to articular surface of knee.[9]

Fixation is needed in all types of femoral fractures. The main advantages of early fixating is early rate of union, lower complications and early mobilization of patients, which decreases the morbidity and mortality associated with it. The retrograde intramedullary nailing has the ability to give rigid fixation without disturbing the vascular supply to the bone and soft tissue, so giving the best results[10] Therefore, orthopedic consultation should be obtained in all cases of distal shaft femur fractures.

According to many orthopedic sources, standard treatment of a femoral shaft fracture is an antegrade reamed intramedullary nail. The use of the retrograde femoral nail for distal femur fracture is also used but the mean problem with it is the knee pain and knee range of motion. Proper technique and early mobilization will overcome this hurdle.

In our study the knee range of motion were measured using goniometer. Among sampled population, 125 patients (89.3%) had flexion greater than 120^0. Daglar et all did a comparative study of using antegrade and retrograde nail. They found that Mean knee flexion angle was 132 and 134 degrees in antegrade and retrograde groups, respectively[11] Garnavos C used the retrograde nail for AO type C fractures. According to their results the patients having normal full extension and flexion at knee joint were achieved upto 117.22°. They also used mean New Oxford knee scoring for it i-e 42.05 were concluded.[12] Similarly Kim J et all used the retrograde nailing in osteoporotic bone. They used the functional scoring system for data analysis. The knee range of motion at their follow up in osteoporotic bones were 116° (range, 110° to 125°) and average functional score at postoperative 1 year was 2.6 (range, 1 to 5).[5] Gao K did a comparative study between retrograde nailing and locking plate. They found that the mean range of motion at knee joint were 98.2 ± 21.5° (range, 20–120°) in the locking plate group and 103.5 ± 11.0°(range, 80–120°) in patients undergoing retrograde nailing respectively.[13] The controversies exists about the type of nail, diameter of nail, type of fracture and weight bearing which affects the outcome after retrograde nailing. Acharya K et all in their study solved this issue and found that there is minimum correlation between union time and variables of nail-canal diameter mismatch, functional length of nail, fracture geometry, or initiation of partial weight bearing ambulation.[14] Similarly the Gurkan V found that joint range of motion were almost normal or between 100^0 to 110^0 in maximum patients after retrograde femoral nailing.[15]

Retrograde nailing for distal femur shaft fractures having excellent outcome. There were some limitations in our study. We didn't describe other variables like comparison with antegrade nailing or use of DCS for comparison of results. So, further studies needed in our population for better results of using SIGN NAIL and local nail in retrograde fashion.

CONCLUSION

Retrograde nailing for Distal diaphyseal fractures is option of choice for such fractures. SIGN Nail is more effective as compared to local nails and preference should be given to it while doing retrograde nailing for better results.

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