ORIGINAL RESEARCH PAPER

Orthopaedics

COMPARISION OF THE FUNCTIONAL OUTCOMES OF DISTAL FEMORAL FRACTURES (EXTRA-ARTICULAR) TREATED BY RETROGRADE INTRAMEDULLARY NAILING AND LOCKING PLATE.

KEY WORDS: distal femur fracture, DLCP, DFN, Neer's scoring, Muller's classification

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ABSTRACT

BACKGROUND:At present distal femur locking compression plate and distal femoral nailing is most common modality of treatment for distal femur fracture. Distal femur is an area that is particularly vulnerable to injury in nowadays modern life-style with high velocity transportation. The incidence of distal femur fractures is around 37/ 100000 patients per year[1].The optimal method for the treatment of extra-articular distal femoral fractures still remains debatable. Purpose of my study is to evaluate any difference between outcome of both the treatment modalities. **AIM AND OBJECTIVE:**To compare the functional outcome of distal femoral fractures (extra-articular) treated by retrograde intramedullary nailing and locking plates.**MATERIAL AND METHOD**:40 distal femur fractures were treated, of which 20 with DFLCP and 20 with RETROGRADE DFN from august 2013 to November 2015 at PMCH, Patna, between age group of 24 – 55 years,classified by using Muller's AO classification, followed at period of 6 weeks, 12 weeks , and 6 months. On each subsequent visit clinical and radiological examination was done. Functional outcome was assessed byNeer's knee scoring system.The results were tabulated using chi square test.
RESULT:DFN – excellent – 55%, good-30%, fair - 5%, poor – 10 %; DFLCP- excellent -65%, good -30%. , poor- 5%.
Conclusion: In our study,we do open reduction in LCP group still results are not significantly different from closed reduction in DFN group in term of union time,incidence of non-union,infection , full weight bearing and implant failure.

INTRODUCTION

Distal femur is an area that is particularly vulnerable to injury in nowadays modern life-style with high velocity transportation. The incidence of distal femur fractures is around 37/ 100000 patients per year[1].Nowadys most accepted classification for distal femur fracture is Muller's classification or AO/OTA Classification.

The optimal method for the treatment of extra-articular distal femoral fractures still remains debatable.

Previously treatment of choice for distal femur fracture was non-operative which include closed reduction with skeletal traction with or without subsequent cast bracing.[2,3]

Later,fracture distal femur was treated operatively with an anatomically contoured,but angular unstable (nonlocking) distal femur plate (e.g.,condylar buttress plate).But relatively high complication rates were reported,which adversely affect clinical results.[4,5]

After this there were also advances in plate-screw design where fixed angle implants such as the 95-degree angled blade plate and DCS,which provided dramatically improved stability compare to prior implants.

Nowadays Locked plating system have been developed in which screws are inserted that lock into plate,forming a fixed angle construct. This system was designed as an "internal fixator" in which the plates was applied using minimally invasive technique after fracture reduction.[6]

Retrograde intramedullary nailing is also a viable option for treatment of distal femur fractures.Similar to current plates,full length retrograde nails are usually inserted and offer multiple locking screw options including the ability to become a fixed angle construct. The main potential advantage is that they may be inserted through smaller,potentially less invasive surgical approaches than plates,and the devices are centrally placed so that bending forces may be resisted.[7]Also in nailing we do closed reduction which preserves fracture haematoma,minimal soft tissue dissection,less blood loss and decreased rate of infection.

The main disadvantage of retrograde nailing is that we may damage articular cartilage by entering into knee joint.

In modern time for distal femur fracture generally two implants are used-Intramedullary distal femur nail and Locking compression plate.

MATERIAL AND METHODS :

40 distal femur fractures were treated, of which 20 with DFLCP and 20 with RETROGRADE DFN from august 2013 to November 2015 at PMCH, Patna, between age group of 24 – 55 years, classified by using Muller's AO classification, , followed at period of 6 weeks, 12 weeks , and 6 months . On each subsequent visit clinical and radiological examination was done. Functional outcome was assessed by Neer's knee scoring system.

In DFN group there were 17 males and 3 females.The patient's age range from 24 years to 55 years with mean age of 40.70 years,13 fractures involved the right side and 7 involved the left side.

In LCP group there were 15 males and 5 females.The patient's age range from 20 years to 65 years with mean age of 41.5 years. 12 fractures involved right side and 8 involved the left side.

Muller's classification – DFN group-: A1-5 ,A2-9, A3-6 ; PFLCP group: A1-4, A2-10, A3-6

SURGICAL TECHNIQUE: After proper painting and draping with full aseptic and antiseptic precaution

NAILING:

- Fracture was reduced before nailing by indirect reduction methods
- A midline incision of 4 cm was taken from inferior pole of patella up to tibial tuberosity.The paratenon over patellar tendon was sharply incised and patellar tendon was split in the midline along the direction of its fibers.
- The femoral attachment of Posterior Cruciate Ligament is palpated and the bone awl is kept just anterior to the femoral attachment of the posterior cruciate ligament.
- On the lateral image the starting point is just anterior to the Blumensaat's line.
- An entry point was made.
- 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 and the nail countersunk several millimeters to prevent cartilage damage to the patellofemoral articulation.
- Distal locking bolts are placed through marking on jig.
- Proximal locking was done by free hand technique under image guidance

PLATING:

- A direct lateral approach was used .
- The skin incision starts from 6-8 cm proximal to fracture and extended along the shaft upto lateral epicondyle as per need. The fascia lata is incised in line with its fibers exposing the vastus lateralis, which is reflected off the intermuscular septum along the linea aspera in an anterior direction. Perforators are identified and ligated or cauterized. Minimal Stripping of soft tissue necessary for application of the plate and reduction of the articular surface is done.

Every patient who undergoes distal femur fracture fixation by either of the techniques are started on knee range of motion exercises on few weeks post operative depending on the status of union of the fracture. Full weight bearing mobilization was started at 6-8 weeks postoperative depending on the status of the fracture union noted in the x-rays .

We reviewed all patients who underwent locking plate fixation and retrograde femur nailing at 6 months post-operatively. They were assessed for knee function and x-rays were taken to assess the fracture union.

RESULT:

In DFN group there were 17 males and 3 females.The patient's age range from 24 years to 55 years with mean age of 40.70 years,13 fractures involved the right side and 7 involved the left side.

In LCP group there were 15 males and 5 females.The patient's age range from 20 years to 65 years with mean age of 41.5 years. 12 fractures involved right side and 8 involved the left side.

In this study most of the patients belonged younger age group, with average age being 40.7 years in DFN group and 41.5 years in LCP group.

In DFN group 16 fractures were due to RTA,and 4 fractures due to fall while in LCP group 17 fractures were due to RTA and 3 fractures due to fall.In both group all fractures were closed.

Average injury-surgery interval in DFN Group was 6.45 days and in LCP Group it was 5.9 days.

In our study, 17 patients (85%) in DFN Group and 18 patients (90%) in LCP Group show radiological union within16 weeks. One case in LCP Group developed non-union which united after bone grafting.In DFN Group one patient had implant failure which left our follow-up and one patient had peri-implant fracture.In peri-implant fracture unicortical locking plate with bone grafting was done while nail left in situ.

In our study, average knee flexion was 108.50 (Range 8-1350)in DFN Group and 1110 (Range 5-1350)in LCP Group.

In our study,out of 20 patients in each group, 5 patients in DFN Group had shortening, in which 4 pts.had shortening of upto 1cm and 1 pts. had shortening of >1cm, and in LCP Group 7 patients had shortening,in which 6 pts. had shortening of upto 1cm and 1 pts. had >1cm shortening. In both group >1cm shortening occur in Muller type A3.

In DFN group,varus malalignment occured in 2 patients and valgus malalignment in 1 patient.In all 3 patients it is not greater than 50. In LCP group,varus and valgus maialignment occurred in 1 patient each.In both case it is less than 50.

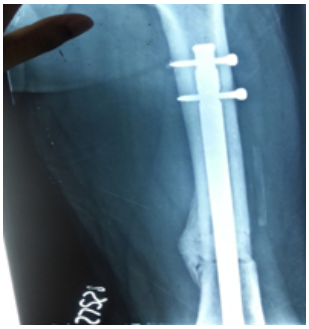
In DFN group 12(60%) patient regain work capacity as before accident whereas in LCP group 14(70%) patient regain work capacity as before accident.

FUNCTIONAL OUTCOME:

GRADE	DFN Group			LCP Group		
	A1 Group	A2 Group	A3 Group	A1 Group	A2 Group	A3 Group
Excellent	3	6	2	3	6	4
Good	1	2	3	1	3	2
Fair	0	0	1	0	0	0
Poor	1	1	0	0	1	0
TOTAL	5 Case	9 Case	6 Case	4 Case	10 Case	6 Case

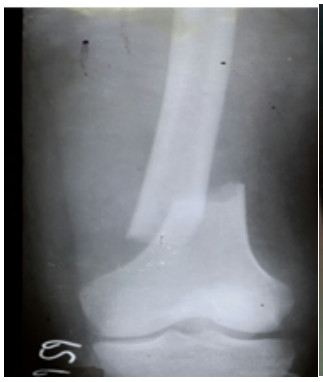
Complication	**DFN Group**			**LCP Group**		
	A1 Group	A2 Group	A3 Group	A1 Group	A2 Group	A3 Group
Superficial Infection	None	1	1	None	None	1
Deep Infection	None	None	None	None	None	1
Shortening	None	1	4	0	4	3
Implant Failure	None	1	None	None	None	None
Periimplant fracture	1	None	None	None	None	None
Non-Union	None	None	None	None	1	None
Valgus Malalignment	None	None	1	1	None	None
Varus Malalignment	None	1	1	None	None	1

Immediate Post-op



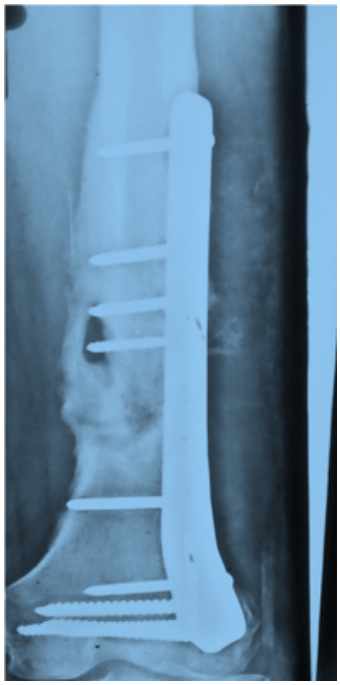
After 12Week Post-op

Pre-op



Pre-op

Immediate post-op



After 12 week

DISCUSSION :

In our study which was prospective consisted of 20 distal femur fractures treated with DISTAL FEMUR LOCKING COMPRESSION PLATE and 20 distal femur fractures treated with RETROGRADE INTRAMEDULLARY DISTAL FEMORAL NAIL.

In our study,mean age ± SD in DFN group is 40.70±10.23 years(range 24-55 years) and in LCP group it is 41.55±12.53 years(range 20-65years) which is comparable to that of study of Mark Weight,et.al[8] study of Early results of the less invasive stabilization system for mechanical unstable fractures of the distal femur,averagewas 44 years. Rong-Sen et. al.[9] in his study reported mean age of 46.9years.Majority of patients belonged to young age group. This reflects the mechanism of injury, which was high-energy trauma in 87.5% of patients most of whom were younger. High male ratio in this study is due to the fact that, males are mainly exposed to high-energy trauma in Indian scenario.

In our sudy,in DFN group 17 males and 3 females and in LCP group 15 males and 5 females so that out of total 40 patients there were 32(80%) males and 8(20%) females which is comparable to study by Mark Weight et.al.[8] study were 14 men(66.67%) and 7 (33.37) females, Kanda Gao et.al.[10] study were 25(69.4%) males and 11 (30.6%)females , SKV Gupta et.al.[11] study were 74(71.85%) men and 29 (28.15%) females, Christodoulou et.al.[12] study were 25(34.7%) men and 47 (65.3%) females.

RTA was the most common mode of injury and Muller's Classification was used to classify distal femur fracture.Out of 40 fractures in our study group 9(22.5%) fractures were Muller's Type A1, 19(47.5%) fractures were Muller's Type A2,12(30%) were Muller's Type A3.A.Kumar et.al.[13] in his study reported 4(25%) Type A1 fracture,11(68.75%) Type A2,1(6.25%) Type A3 fracture, Kregor et.al.[14] in his study reported 44 Type A fractures in which 8(18.18%) fracture were type A1,17(38.64%) fracture were type A2,19(47.5%) were typeA3.Kanda Gao et.al.[10] in his study reported 14(38.89%) type A1 fracture,15(41.67%) were type A2 fractures,7(19.44%) were type A3 fractures. Above studies show that type A2 and type A3 were more common type as Distal femur fracture occur more commonly after high energy injuries which lead to comminuted type A2 and typeA3 fracture more commonly.

In our study functional outcome is evaluated on the basis of NEER'S KNEE SCORE because it emphasizes on important patient outcome variables such as pain, functions as related to activities of daily living, range of motions, return to work, gross anatomic alignment and roentgen graphic evaluation of union and mechanical alignment. However no rating scale is validated to be superior to other. In DFN group,total 11(55%) cases are excellent,6(30%) cases are good, 1(5%) case fair and 2(10%) cases are poor.In LCP group total 13(65%) cases are excellent,6(30%) cases are good and 1(5%) is poor.Neer et.al.[15] in his study shows 31% excellent result,20.68% good result and 40.6% poor result, Christodoulou et.al.[12] in his study shows 51% excellent result,31% good result,9% fair result,9% poor result in his DFN group, Schatzker et.al.[16] 75% excellent or good result in his study if distal femur fracture fixation, Bolhofner et al.[17] shows 40% excellent result,44% good result and 16% unsatisfactory in his study .Our results are comparable with Neer's et.al.,Christodoulou et.al.,Bolhofner et.al. study.

In DFN group excellent results are less, might be due to less optimum result in type A3 fractures but statistically no significance between two groups found.It may be due to small sample size and shorter follow-up period.

CONCLUSION :

In our study, we do open reduction in LCP group still results are not significantly different from closed reduction in DFN

group in term of union time, incidence of non-union, infection , full weight bearing and implant failure.

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