

A Study on the Management of Non-Union of Fracture Distal Femur with Locking Plates

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Conflict of interest: Nil

Abstract

Background: The incidents related to the fracture occurring in 37 per 100000 persons per year. Distal fractures are common but difficult to treat using the traditional method of implants due to high failure rate and secondary varus collapse. The consideration of distal femoral fractures in young age groups is most common as the high energy trauma while older age is associated with low energy trauma along with osteoporosis. The non-union as fracture bone that has not completely healed in 9 months since injury which not showed any signs of healing over 3 consecutive months on serial x-rays.

Aim: The study aims to analyze the management of non-union of fracture distal femur with locking plates.

Method: This was a multi-institutional case control study that conducted in tertiary referral hospitals of MKCG MCH, Berhampur, Odisha and BBMCH, Balangir, Odisha between March 2019 upto September 2021. This study was a prospective study that has included the patients with non-union of distal femur. The patients were admitted and examined according to protocol after obtaining the details of the patients and collecting the consent from the patients. Moreover, the permission from the institution was obtaining the ethical approval to complete the study. To analyze the condition of the patients the fracture was classified as per the AO trauma and non-union score were also assessed for individual. Now, for the current study, 72 patients were selected, and 40 patients were followed up and 32 patients have lost follow up.

Results: The right limb was observed among 60% of patients and 40% were found with the left limb. The observation study has found that 65% of fractures caused by the road accidents and rest 35% were fall from the height. Moreover, the 72% patients sustained trauma post road traffic addition and where 20% of patients were under the age of 50 years. 28% patients who fall from the height 2 were under the age of 50 years and 9 over the age of 50 years.

Moreover, the study has observed the patient with non-union time in which 30% patients were less than 18 weeks, 50% were 18-24 weeks and 20% were more than 24 weeks.

Conclusion: From the analysis, it has carried out that the operative treatment depends on the type of non-union and one and two steps procedure is used according to the principle of the diamond concept. The involvement of mechanical situation and local application of osteoconductive carriers is playing a significant role in managing the operations.

Keywords: Non-union Fracture, Distal Femur, Locking Plates

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Background

There are different types of issues related to the health influence the activities and action of the individual. Distal femoral fractures are common orthopaedic problem in all age groups of patients [1]. The incidents related to the fracture occurring in 37 per 100000 persons per year. Distal fractures are common but difficult to treat using the traditional method of implants due to high failure rate and secondary varus collapse [2]. The consideration of distal femoral fractures in young age groups is most common as the high energy trauma while older age is associated with low energy trauma along with osteoporosis[3,4]. The non-union as fracture bone that has not completely healed in 9 months since injury which not showed any signs of healing over 3 consecutive months on serial x-rays[5].

According to analysis, the operative treatment depends on the type of non-union and one and two steps procedure is used according to the principle of the diamond concept[6]. The involvement of mechanical situation and local application of osteoconductive carriers is playing a significant role in managing the operations[7]. A proper radiological evaluation with plain x-rays of the affected part in AP, lateral and both oblique views (45 degrees internal and external views) aids in the diagnosis and planning of management[8]. CT scan is more accurate modality than plain x-rays in diagnosing the non-union. Infection should be ruled out in all cases of femoral non-union[9,10]. Hence proper blood work-up

is must which should include complete blood count, ESR and CRP. Deep tissue culture at the time of secondary surgery is the gold standard for diagnosis of infection [11]. In addition to this, for treating infected non-union or non-unions with large defect gaps, Masquelet technique is recommended[12,13]. In our study we advocated to plate osteosynthesis for stabilization of the fracture with administration of bone graft from iliac crest with either a one stage or two staged procedures.

Aim

The study aims to analyze the management of non-union of fracture distal femur with locking plates

Method and materials

The study was conducted in tertiary referral hospitals of MKCG MCH, Berhampur, Odisha and BBMCH, Balangir, Odisha between March 2019 upto September 2021. This study was a prospective study that has included the patients with non-union of distal femur. The patients were admitted and examined according to protocol after obtaining the details of the patients and collecting the consent from the patients. Moreover, the permission from the institution was obtaining the ethical approval to complete the study. To analyze the condition of the patients the fracture was classified as per the AO trauma and non-union score were also assessed for individual. Now, for the current study, 72 patients were selected,

and 40 patients were followed up and 32 patients have lost follow up.

Inclusion criteria:

- Skeletally mature patients

Exclusion criteria:

- Comorbid patients or patients unfit for surgery
- Patients with previous deformity of femur
- Patients who did not consent to the study

For the current study, the pre-operative assessment was also done that involve the consideration of the history and clinical examination of the patients. Radiological investigation also involved in the analysis that includes the x-rays of thigh with ipsilateral hip joint and knee. Moreover, the CT scan of the patient was used for analyzing the body condition and other issues.

General investigations:

- Complete hemograms
- 25-hydroxy vitamin D
- Liver profile, renal profile
- Viral markers for HBV, HCV, HIV
- BT, CT, PT, INR.
- Chest roentgenogram
- Status of soft tissues and neurovascular structures was considered
- Status of the bones and type of non-union was considered

Intra-operative protocols:

For the study, all ORIF was performed with all patients to analyze the spine position after giving the general or regional anaesthesia. In addition to this, the lower extremity and iliac crest was developed and draped in a sterile fashion. The sample for the study was taken using the culture and sensitivity as well as fibrous tissue. For analyzing the implant position the C arm imaging was applied that assist with the reduction. Apart from this, a medial approach was used for selecting the patients for the application of

- Patients presenting with non-union of distal femoral fractures with or without osteoporotic changes
- Patients who gave the consent to be a part of this study

medial buttress plate. The parameters for evaluation used for the study involve the non-union score; NEER's scoring systems and knee society score.

Statistical analysis:

For the analysis, the data was captured and obtain in a customized format and transferred to MS Excel. The data was about the forage, fracture union time and assessment score of the patients to analyze the mean with standard deviation and 95% CI.

Results

For the current study, there were total 72 patients considered and 40 were followed and 32 have lost the follow up. Now, among the 40 patients 30 were male and 10 female. The mean age of the patients was 47.36 years considering the non-union. The symmetrical distribution of 18 cases in the age group from 17-49 years considered for analyzing the health status of the patients. The youngest patient in the study was 21 years and oldest case was 80 years. The right limb was observed among 60% of patients and 40% were found with the left limb. The observation study has found that 65% of fractures caused by the road accidents and rest 35% were fall from the height. Moreover, the 72% patients sustained trauma post road traffic addition and where 20% of patients were under the age of 50 years.

28% patients who fall from the height 2 were under the age of 50 years and 9 over the age of 50 years. Moreover, the study has observed the patient with non-union time in which 30% patients were less than 18 weeks, 50% were 18-24 weeks and 20% were more than 24 weeks.

Table 3 has provided the information related to the complication among the

patients. There were 2 patients identified with infection, non-union and implant

failure for each. Moreover, knee stiffness was identified for 9 patients.

Table 1: Patient profile

	No.	% (n=40)
Age group		
20-40 yrs.	16	40.0
41-60 yrs.	13	32.5
61-80 yrs.	11	27.5
Gender		
Male	30	75.0
Female	10	25.0
Mode of Injury		
RTA	26	65.0
Fall	14	35.0
Side affected		
Left side	16	40.0
Right side	24	60.0
Union time		
<18 wks.	12	30.0
18-24 wks.	20	50.0
>24 wks.	8	20.0

Table 2: Age score and union time

	Mean	Median	S.D.	95% C.I. for mean	Min.	Max.	Mann-Whitney 'U' test*	
							Z	p
Age (yrs.)	48.88	49.5	15.78	(44 to 54)	22	75	-	-
Union Time (wks.)	19.68	19.0	4.30	(18 to 21)	13	29	-	-
KSS part 1								
Pre-op	51.88	52.0	5.88	(50 to 54)	43	66	5.513	<0.0001
Post-op	81.73	82.0	5.18	(80 to 83)	70	90		
KSS Function								
Pre-op	46.63	45.0	10.65	(43 to 50)	25	65	5.535	<0.0001
Post-op	84.00	85.0	5.91	(82 to 86)	70	95		
Neer's Score								
Pre-op	60.40	61.0	4.36	(59 to 62)	53	69	5.514	<0.0001
Post-op	89.00	89.0	3.30	(88 to 90)	81	96		

Table 3: Complication of surgery

	No.	% (n=40)
Complication		
Infection	2	5.0
Nonunion	2	5.0
Implant failure	2	5.0
Knee Stiffness	9	22.5

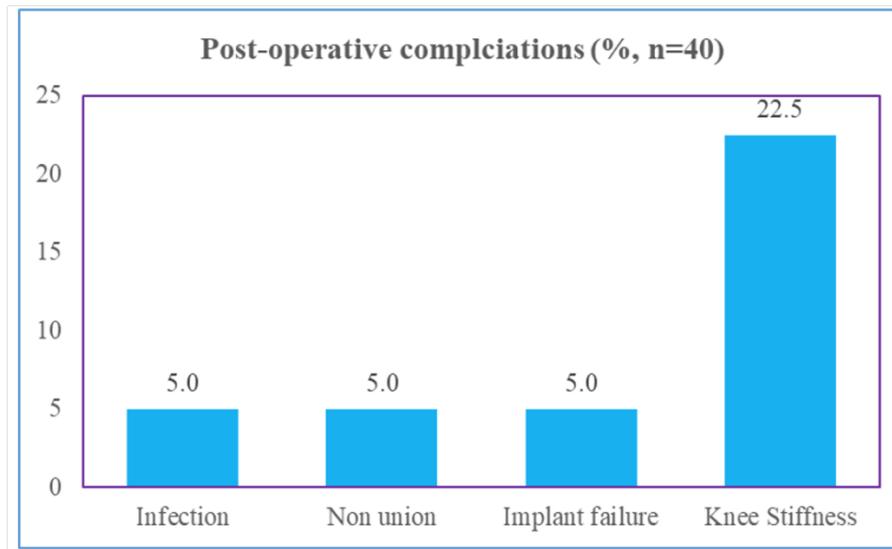


Figure 1: Post operative complications

Discussion

The incidents related to the fracture occurring in 37 per 100000 persons per year. Distal fractures are common but difficult to treat using the traditional method of implants due to high failure rate and secondary varus collapse. The consideration of distal femoral fractures in young age groups is most common as the high energy trauma while older age is associated with low energy trauma along with osteoporosis. The non-union as fracture bone that has not completely healed in 9 months since injury which not showed any signs of healing over 3 consecutive months on serial x-rays.

According to analysis of the study, the right limb was observed among 60% of patients and 40% were found with the left limb. The observation study has found that 65% of fractures caused by the road accidents and rest 35% were fall from the height. Moreover, the 65% patients sustained trauma post road traffic addition and where 20% of patients were under the age of 50 years. Moreover 35% patients who fall from the height 2 were under the age of 50 years and 9 over the age of 50 years. Moreover, the study has observed the patient with non-union time in which

30% patients were less than 18 weeks, 50% were 18-24 weeks and 20% were more than 24 weeks. Moreover, in 3 cases, there was persistent limping due to limb length discrepancy with shortening of about 1 cm due to inadequate restoration of length and incomplete restoration of the knee ROM with limited flexion range to about 90°.

As per the study outcome of the Adams, Tanner and Jeray (2015)[14], all of the non-unions united, at an average of 19 weeks (range 12 to 20 weeks). Union was defined as the presence of bridging callus of three of the four cortices and disappearance of the fracture line on the plain radiographs for a patient who was able to bear full weight, with the area of comminution bone graft completely incorporated, amalgamated, and remodeled with the proximal and distal ends of the comminuted fractures. Apart from this, the minimum follow-up period was for 1 year. The average Neer's score improved from an average of 60.4 points (range 16 to 44 points) preoperatively to 89 points post operatively (range 72 to 96) thereby indicating satisfactory outcome of surgery in total. 7 patients scored in range of 70 to 85; rest 33 patients scored above 85[15].

Conclusion

From the analysis, it has carried out that the operative treatment depends on the type of non-union and one and two steps procedure is used according to the principle of the diamond concept. The involvement of mechanical situation and local application of osteoconductive carriers is playing a significant role in managing the operations. In addition to this, for treating infected non-union or non-unions with large defect gaps, Masquelet technique is recommended.

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