Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies ***NLM ID:*** *101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

Functional outcome of minimally invasive plate osteosynthesis versus open reduction and internal fixation with locking compression plate in distal one-third shaft tibia fractures: A comparative study

Satish Chaudhary

Associate professor, Department of Orthopaedics, N C Medical College, Ishrana, Panipat, Haryana, India

ABSTRACT:

Background: The tibia is one of two bones that comprise the leg. Conventional open reduction and internal fixation (ORIF) techniques involve extensive dissection and periosteal stripping, which increase the risk of soft tissue complications. The minimally invasive plate osteosynthesis (MIPO) technique has gained prevalence in recent years. Hence; the present study commenced with the aim of comparing the efficacy and functional outcome of minimally invasive plate osteosynthesis versus open reduction and internal fixation with locking compression plate in distal 1/3rd shaft tibia fractures. **Materials & methods**: A total of 20 patients were analysed and were broadly divided into two study groups as follows: Group 1: Patients treated with MIPO, Group 2: Patients treated with open reduction and internal fixation (ORIF) with LCP plating technique. All the patients were treated according to their respective groups. Necessary intravenous antibiotics were given immediate preoperatively or during operation. Ankle mobilization was started from 3rd postoperative day. Follow-up was done and Tenny and Wiss criteria were used for evaluating the patients. According to these criteria, results were graded as follows: Excellent, Good, Fair and Poor. **Results**: Mean duration of surgery among patients of group 1 and group 2 was found to be 79.6 minutes and 73.2 minutes respectively. Significant results were obtained while comparing the mean duration of procedure among the patients of both the study groups. Mean healing time among patients of group 1 and group 2 was found to be 16.8 weeks and 17.3 weeks respectively. Non-significant results were obtained while comparing the mean healing time among the patients of both the study group. Non-significant results were obtained while comparing the mean TENNY and WISS score among the patients of the both the study groups at different time intervals. Majority of patients of both the study groups showed good to excellent results at final follow-up. **Conclusion**: Both ORIF and MIPO techniques are equally effective in terms of outcome in treating extra-articular distal tibia fracture.

Key words: Open reduction and internal fixation, Minimally invasive plate osteosynthesis, Tibia

Received: 24/07/2020 **Modified:** 24/08/2020 **Accepted:** 26/08/2020

Corresponding Author: Dr. Satish Chaudhary, Associate professor, Department of Orthopaedics, N C Medical College, Ishrana, Panipat, Haryana, India

This article may be cited as: Chaudhary S. Functional outcome of minimally invasive plate osteosynthesis versus open reduction and internal fixation with locking compression plate in distal one-third shaft tibia fractures: A comparative study. J Adv Med Dent Scie Res 2020;8(9):193-196.

INTRODUCTION

The tibia is one of two bones that comprise the leg. The proximal portion of the tibia consists of a medial and lateral condyle, which combine to form the inferior portion of the knee joint. The shaft of the tibia is triangular in cross-section with three borders and three surfaces. Distal end is shaped like a rectangular box which presents five surfaces; it is prolonged downward on its medial side as a strong pyramidal process, the medial malleolus. Fractures of long bones constitute the majority of emergency operating room procedures in most trauma centers. Tibial fractures are prone to complications. The lack of a circumferential soft tissue envelope around the bone makes the bone ends more likely to fail unit (nonunion). Distal tibia fractures are challenging injuries. Most of tibial fractures are closed. Diaphysis is the most common fracture site in tibia.[1-3]

Over the last couple of decades, surgeons have used 4 management approaches for tibial fractures: intramedullary nail fixation (interlocking intramedullary nails and simple intramedullary rods), plate fixation, external fixation and casting or functional bracing. The management of unstable distal

tibia fractures remains challenging for surgeons. The proximity to the ankle makes the surgical treatment more complicated than midshaft tibial fractures. Treatment selection is influenced by the proximity of the fracture to the plafond, fracture displacement, comminution, and injury to the soft tissue envelope. Conventional open reduction and internal fixation (ORIF) techniques involve extensive dissection and periosteal stripping, which increase the risk of soft tissue complications. The minimally invasive plate osteosynthesis (MIPO) technique has gained prevalence in recent years.[4-6] Hence; the present study commenced with the aim of comparing the efficacy and functional outcome of minimally invasive plate osteosynthesis versus open reduction and internal fixation with locking compression plate in distal 1/3rd shaft tibia fractures.

MATERIALS & METHODS

The present study was commenced in the department of orthopaedics of the medical institute with the aim of minimally invasive plate osteosynthesis versus open reduction and internal fixation with locking compression plate in distal 1/3rd shaft tibia fractures. A total of 20 patients were analysed and were broadly divided into two study groups as follows:

Group 1: Patients treated with MIPO

Group 2: Patients treated with open reduction and internal fixation (ORIF) with LCP plating technique

Following the admission of the patient, first aid was given in the form of splintage of the limb, anti-inflammatory drugs and analgesics according to the need. Radiographic examination was done to assess the type, pattern, extent and displacement of fracture. Preoperative assessment of all the patients was done; both clinical and radiological. All the patients were treated according to their respective groups. Necessary intravenous antibiotics were given immediate preoperatively or during operation. Ankle mobilization was started from 3rd postoperative day. Follow-up was done and Tenny and Wiss criteria were used for evaluating the patients. According to these criteria, results were graded as follows: Excellent, Good, Fair and Poor. All the results were recorded and analysed by SPSS software. For further analysis, Chi-square test and student t test was used.

RESULTS

Mean age of the patients was found to be 46.1 years and 47.8 years respectively. Primary mode of injury among patients of both the study groups was road traffic accident (RTA). Mean duration of surgery among patients of group 1 and group 2 was found to be 79.6 minutes and 73.2 minutes respectively. Significant results were obtained while comparing the mean duration of procedure among the patients of both the study groups. Mean healing time among patients of group 1 and group 2 was found to be 16.8 weeks and 17.3 weeks respectively. Non-significant results were obtained while comparing the mean healing time among the patients of both the study group. Non-significant results were obtained while comparing the mean TENNY and WISS score among the patients of the both the study groups at different time intervals. Majority of patients of both the study groups showed good to excellent results at final follow-up.

Table 1: Age-wise distribution of patients

Age group (years)	Group 1		Group 2	
	Number of patients	Percentage	Number of patients	Percentage
18 to 30	1	10	1	10
31 to 40	1	10	1	10
41 to 50	2	20	1	10
51 to 60	6	60	7	70
Total	10	100	10	100
Mean age (years)	46.1		47.8	

Table 2: Distribution of patients according to mode of injury

Mode of injury	Group 1		Group 2	
	Number of patients	Percentage	Number of patients	Percentage
RTA	7	70	6	60
Fall	3	30	4	40
Total	10	100	15	100

Table 3: Mean duration of surgery

Duration of procedure	Group 1	Group 2	p- value
Mean (minutes)	79.6	73.2	0.010 (Sig)
SD (minutes)	5.11	5.22	

Table 4: Mean healing time

Mean healing time	Group 1	Group 2	p- value
Mean (weeks)	16.8	17.3	0.09
SD (weeks)	2.9	2.6	

Table 5: Mean TENNY and WISS score at different time intervals

Mean TENNY and WISS score	Group 1	Group 2	p- value
6 weeks follow-up	66.8	69.1	0.11
3 months follow-up	80.4	76.8	0.27
6 months follow-up	88.1	87.5	0.23
9 months follow-up	92.1	89.4	0.85

Table 6: Distribution of patients according to TENNY and WISS criteria at final follow-up

Criteria	Group 1		Group 2	
	Number of patients	Percentage	Number of patients	Percentage
Excellent	5	50	5	50
Good	4	40	3	30
Fair	1	10	1	10
Poor	0	0	1	10
Total	10	100	10	100

DISCUSSION

Distal tibia fracture has been treated in various manners, including intramedullary nailing (IMN), external fixation, ORIF, and minimally invasive plate osteosynthesis (MIPO). One of the more readily used methods for fixation of distal tibia fractures is antegrade IMN. Studies have shown it to be a reliable fixation method but it does present with some significant complications. IMN for distal tibia fractures has displayed morbidity to the knee, which has been reported as high as 71%. Chronic anterior knee pain is among the most common issues, reported to be as high as 73.2%. IMN for distal tibia fractures has also shown to have a significantly increased rate of malalignment compared with plate fixation.[7- 9] Hence; the present study commenced with the aim of comparing the efficacy and functional outcome of minimally invasive plate osteosynthesis versus open reduction and internal fixation with locking compression plate in distal 1/3rd shaft tibia fractures.

In the present study, Primary mode of injury among patients of both the study groups was road traffic accident (RTA). Mean duration of surgery among patients of group 1 and group 2 was found to be 79.6 minutes and 73.2 minutes respectively. Significant results were obtained while comparing the mean duration of procedure among the patients of both the study groups. Gupta VSK et al assessed the surgical Management of Distal Tibial Fractures Treated with Locking Compression Plate by Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO) and Expert Tibial Nail. There were 56 patients with distal tibia fractures out of which 30 patients were treated with LCP by MIPPO and 26 patients were treated with Expert Tibial Nail and followed up for one year with clinical and radiological assessment based on ankle scoring system. 26 patients treated with expert tibial nail were analysed, out of which 22 cases (85%) had union in less than 20 weeks, 4 cases (15%) had delayed union and no cases had non-union. Hence, 54% had excellent results, 27% had good, 11% had fair and 8% had poor results. LCP by MIPPO is a safe, effective and reliable treatment option to achieve complete union of difficult tibia fracture.[10]

In the present study, mean healing time among patients of group 1 and group 2 was found to be 16.8 weeks and 17.3 weeks respectively. Non-significant results were obtained while comparing the mean healing time among the patients of both the study group. Balam KM et al evaluated the clinical outcome and advantages of percutaneous plate fixation for complex distal tibial fractures using locking compression plate-distal tibial plate (LCP-DTP). Twenty-seven adult patients, who met the inclusion criteria, with closed traumatic distal tibia with or without fibular fractures were treated using the minimally invasive plate osteosynthesis technique with LCP-DTP. Union was achieved in all of them within 12–20 weeks with an average of 16. Minimally invasive plate osteosynthesis for the distal tibia using the LCP-DTP is safe and effective in the treatment of complex distal tibial fractures.[11]

In the present study, non-significant results were obtained while comparing the mean TENNY and WISS score among the patients of the both the study groups at different time intervals. Majority of patients of both the study groups showed good to excellent results at final follow-up. Ahmed AK et al in 2019 compared the results of 2 groups of extra-articular distal tibia fracture treated by ORIF or MIPO technique. 40 patients included in the study, 20 patients randomly allocated to each group, including closed or open GI fractures in patients older than 18 years, both pre, post-operative and last follow up AP and Lat. radiographs was assessed, incidence of wound complications, fracture union, blood loss,

operative time and fluoroscopy time were reported. They believed that both ORIF and MIPO techniques are valid in treating extra-articular distal tibia fracture, although MIPO may have a longer operating and fluoroscopy time, but it has the advantage of less bleeding and minimal wound complications.[12]

CONCLUSION

From the above results, the authors that both ORIF and MIPO techniques are equally effective in terms of outcome in treating extra-articular distal tibia fracture.

REFERENCES

1. Sarmiento A, Latta LL. 450 closed fractures of the distal third of the tibia treated with a functional brace. Clin Orthop Relat Res. 2004;428:261–71.
2. Ruedi TP, Allgower M. The operative treatment of intra articular fractures of the lower end of tibia. Clin Orthop. 1979;138:105–10. 1
3. Court-Brown CM, Walker C, Garg A, McQueen MM. Half-ring external fixation in the management of tibial plafond fractures. J Orthop Trauma. 1999;13:200–06.
4. Bedi A, Le TT, Karunakar MA. Surgical treatment of nonarticular distal tibia fractures. J Am Acad Orthop Surg. 2006;14:406–16.
5. Maffuli N, Toms A, McMurtie A, Oliva F. Percutaneous plating of distal tibia fractures. Int Orthop. 2004;28:159–62.
6. Redfern DJ, Syed SU, Davies SJM. Fractures of the distal tibia: minimal invasive plate osteosynthesis. Injury. 2004;35:615–20.
7. Hazarika S, Chakravarthy J, Cooper J. Minimally invasive locking plate osteosynthesis for fractures of the distal tibia – Injury. 2006;37(9):877–87.
8. Hasenboehler E, Rikli D, Babst R. Locking compression plate with minimally invasive plate osteosynthesis in diaphyseal and distal tibial fracture: a retrospective study of 32 patients. Injury. 2007;38:365–70.
9. Hegazy G, Rashed RE, Al-shal EAE, Hassan MAE. Biological fixation of Distal Tibial Fractures by locking compression plate. J Am Sci 2015;11(5):179-184.
10. Gupta VSK, Goud VA, Chaudhari K. A Comparative Study of Surgical Management of Distal Tibial Fractures Treated with Locking Compression Plate by Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO) and Expert Tibial Nail. EC Orthopaedics. 2018; 9(9): 702-714.
11. Balam KM. Percutaneous locked plating for complex distal tibial fractures. Egypt Orthop J 2018;53:110-4.
12. Ahmed AK, Tarek AAD, Hamdy T, ElSayed S, Hesham R. Conventional Open Reduction and Internal Fixation (ORIF) Compared to Minimally Invasive Plate Osteosynthesis (MIPO) for Treatment of Extra-Articular Distal Tibia Fractures - A Prospective Randomized Trial. Ortho & Rheum Open Access J 2019; 13(4): 555867. DOI: 10.19080/OROAJ.2019.13.555867.