ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 08 | August - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A PROSPECTIVE COMPARATIVE STUDY TO EVALUATE FUNCTIONAL OUTCOME OF SUPRACUTANEOUS LCP AND MIPPO FOR COMPOUND FRACTURE OF DISTAL TIBIA.

Orthopaedics

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ABSTRACT

Background: Due to increasing number of vehicles , accidents are very common nowadays. Fracture to tibia is one of the most common fracture encountered in a career of an orthopaedic surgeon. Because of the often high energy involved and the precarious soft tissue cover that surrounds the distal tibia, such fractures command watchful attention to the soft tissue cover for timing and method of surgical fixation. In recent years, the concept of biological osteosynthesis has gained a reputation in fracture treatment. And in order to maintain biology of the fracture and to expedite the healing process many institutions and surgeons are using minimal invasive methods for distal tibial fixation. **Aim:** The aim of this study is to compare the end result of using Supracutaneous LCP and using lcp as a MIPPO and see its effect on rate of union , average time taken for union, rate of infection, complications . **Methodology:** A complete of 50 patients(25 each) of compound grade I fractures of tibia underwent "supracutaneous plating" of the tibia using a LCP and using lcp as a MIPPO. Regular screw tract dressings were done. Average period of follow-up was 7 months **Results:** We found no difference in the time to union in weeks in the two groups (SCP-22 months, MIPPO 20 months). However, operating time was significantly longer in the MIPPO group (86.9 vs 81.2 minutes respectively). Patients who had SCP had Less pain and a better function, alignment and total AOFAS score than the MIPPO group. These results were statistically significant. There were more wound problems both superficial and deep infections in the MIPPO group. Total duration of stay was significantly shorter in SCP group {12 vs 19 days . AOFAS Score including pain and function score was better in SCP group as compared to MIPPO group. **Conclusion:** The high percentage of unions, the low rate of complications, comparatively less surgical time, easy implant removal and better functional scores suggest that using LCP in supracutanoeus mode can be a reasonable alternative to MIPPO for treating distal tibia fractures. Future prospective randomized studies may be able to clarify these issues.

KEYWORDS

Supracutaneous LCP, compound tibial fractures, MIPPO.

INTRODUCTION

The ultimate aim of management of open fractures is to stop bacterial proliferation in the wound and in the circulation, remove dead and nonviable tissues by extensive wound debridement, and ensure adequate coverage of exposed bone. The instability of the fracture after debridement will compromise eradication of infection and wound healing. Treatment options for tibial fractures vary according to the type of fracture, age group, bone quality, soft tissue status and associated complications(1,2,3,4,). The most accurate method of bony fixation and soft tissue management in open fractures still continues to be challenging in orthopaedic traumatology with the treatment options ranging from external fixators, Ilizarov fixators, nailing, plating, tibial synostosis, free or vascularized bone grafting along with allografts or bone substitutes, all having their own set of complications[18,19,20,]. The application of LCP as an external fixator is described as "supracutaneous plating technique.". It is simple, effective, adjustable, light weight and offers rigid stabilization of fracture fragments along with access to wound dressing[11,12]. For grade I fractures LCP can also be used as a MIPPO .

MATERIAL & METHOD

The present study was carried out in the department of Orthopaedics grmc gwalior Madhya pradesh from 1.01.2021 to 1.10.2022. 50 patients in age >18 yrs who had Gustilo and Anderson type 1 fracture of distal Tibia of both sexes were enrolled in this prospective study . They were randomized into 2 groups of 25 each according to the day of admission. Consultants looking after Tuesday Thursday and Saturday performed MIPPO on these patients. Author looking after Monday Wednesday and Friday performed supracutaneous plating. The patients were allocated a sequential study number and there were no exclusions after randomization. Patients with pathological fractures, non-osteoporotic osteopathies such as endocrine disorders, rheumatologic disorders, diabetes mellitus, renal disease, immunodeficiency states, mental impairment or difficulty in communication were excluded. Those with open fractures according to Gustilo and Anderson type II [12] or type III or fractures with a displaced intraarticular fragment were also excluded. Approval for the study was given by the Ethics Committee of our hospital and informed consent was obtained from all patients before operation The patients were selected based on those satisfying the inclusion criteria and were followed up in Post-operative period immediately and for one year. The distal tibia was defined as the area within two Müller squares of the ankle joint, in which the proximal and the distal segments of long bones are defined by a square whose sides have the same length as the widest part of the epiphysis [13. After Initial Toileting and debridement all patients were immobilized to relieve swelling. Intravenous antibiotics were started on admission and continued till 4th post operative day (9,10). Pneumatic tourniquets were used in both groups. Talar shift caused by an external rotation force was considered to be a sign of syndesmotic instability [5,6,7,8]. If syndesmotic instability was present the associated fibular fracture was fixed in both the groups.

Operative Procedure (SUPRACUTANEOUS LCP)

Anaesthesia

Spinal anaesthesia is used, the involved limb is prepared and draped with standard aseptic precaution.

Technique

Pre operative antibiotic were administered and intervention is carried out without tourniquet to allow adequate antibiotic perfusion.

- Thorough debridement and wound wash is given and fracture alignment achieved .
- Locking compression plate of appropriate length is chosen in line with the position of fracture.
- It is preferred to use at least 3 to 4 screws in both the proximal and distal fragments of the fracture.
- Plate is initially fixed to proximal and distal fragments with the assistance of k wire after fracture reduction under fluoroscopy guidance.
- LCP is placed at such distance from underlying skin such providing adequate space for swelling and wound care (dressing) and adequate mechanical stabilization.
- Usually a custom made spacer helps to keep equal distance of plates.
- Bi cortical screw fixation is completed with locking screw and plate fixed.
- After achieving satisfactory reduction subsequent holes are drilled through stab incisions using drill sleeves. It is preferable to put screws first in distal fragment followed by proximal fragment. The size, position and orientation of screws are confirmed under fluoroscopy.
- For comminuted tibial fractures, reduction of length and alignment were achieved by traction and percutaneous manipulation with k wires under fluoroscopy guidance.

- For the distal tibia, a minimum of four screws (4.5 mm) proximally and three to four screws (3.5 mm) distally is suggested. Stab incision were made on intact soft tissues and locking drill guides were placed. Successive holes were drilled over locking drill-guides. Screws were placed first in distal fragment and then in proximal fragment after ensuring adequate reduction.

Operative Procedure (MIPPO)

The patient was supine on the radiolucent operative table. An indirect reduction technique was carried out and alignment checked by fluoroscopy. Reduction was temporary stabilized with multiple k wires . An anterior-medial curved incision (about 3 cm-6 cm), exposing and protecting the saphenous vein. A proximal incision was made under fluoroscope for at least 3 screws in the proximal fragment (Figure 6). A subcutaneous extraperiosteal tunnel was created and follows by the insertion of a plate from the distal to proximal incision. The plate was tunneled proximally across the fracture site using the locking sleeve as a handle for insertion of the plate [14,15]. The plate was centered on the tibia, confirmed on AP and lateral views; cortical screws were inserted first depending on the need for reduction in proximal or distal fragment. After the reduction was confirmed, locking screws were inserted with aim of achieving a minimum of 6 cortices on either side of the fracture. Wound dressing is done.

The duration of surgery was recorded from the incision to wound closure. Postoperatively, IV 2nd generation cephalosporins and aminoglycoside antibiotics were continued for 4 days followed by oral antibiotics for 5 days along with limb elevation, analgesics, antacids and trypsin chymotrypsin. Post operatively below knee posterior slab was given which was removed on second postoperative day and passive ankle range of motion exercises were initiated. Weight-bearing was restricted for 6 weeks. Average stay in the hospital was recorded. Delayed wound healing and superficial infection were defined as persistent drainage from the wound for at least two days, or separation of wound edges to a width >1 cm and a length >1 cm [16,17,18]. Since implant removal in supracutaneous group was on outdoor basis no second surgery/hospital stay was needed. Stay for the subsequent implant removal in MIPPO group was added to total duration. Follow-up was done at 2 weeks, 6 weeks, 3 months and 6 months after discharge till the fracture united. In each determined follow up at and after 6 weeks, clinical assessment of range of motion, radiological evaluation for progression of fracture healing and complications were documented. The functional outcome of the ankle was assessed with the help of AOFAS score. Complications like surgical site infection, deep infection, delayed union, non-union and ankle stiffness were documented.

RESULTS

- We prospectively evaluated 50 (25each) cases of fresh compound grade 1 tibial fractures. The mean duration of surgery was 86.9 min for mippo and 81.2 minutes for supracutaneous lcp.
- In our study , both the groups achieved 100 % union Maximum patient achieved union between 20-22weeks. Mean time for union in weeks for SCP-22 weeks and MIPPO 20 weeks .
- Group 1 (MIPPO) Average age was found to be 36.12 years with a range of 18 to 55 years.
- Group 2 (LCP) Average age was found to be 36.44 years with a range of 18 to 55 years.
- Once biplaner radiographic cortical bridging was observed, full weight bearing for 1 month before implant removal was advised.

	SCP *	MIPPO†	p value
Mean (95% CI‡) operating time in minutes	81.2 (77.72 to 84.73)	86.9 (81.76 to 89.95)	0.001
Mean (95% CI) time to union in weeks	22 (14-28)	20 (12-28)	0.54
Patients with wound problems (%)	3(12)	6(24)	< 0.05
AOFAS§ mean (95% CI) score at one year	86.1 (83.7 to 88.6)	83.9 (81.7 to 86.1)	< 0.05
Pain	32.5	30.5	< 0.05
Function	44.3	42.2	<0.05
Alignment	9.1	9.1	<0.05

Case -A 40yr Old Man Presented With Compound Grade (ga Iiib) Fracture Anteroposterior View Showing Frcture Of Distal 1/3rd Shaft Tibia And Fibula Of His Right Leg .

DISCUSSION

Controversy is still present about the surgical merits of the different lines for treating distal tibia fractures; decision making is difficult, and no best treatment has been determined. It is the precarious soft tissue around the distal tibia that dictates the choice of reduction technique, choice of implant and mode of application of the implant so as to provide minimum insult to already depleted blood supply. Many studies have shown good results of locked plating with MIPO technique in distal tibial fractures with complication rates comparable to intramedullary nailing [20,21]. However, a few studies in recent literature have shown a high rate of soft tissue complications associated with the use of locked plates in distal tibial fractures [22]. So since newer studies are coming with high complication rates attributed to most commonly use procedure (MIPPO) in distal tibial fractures, and also emerging of literature regarding use of LCP in supracutaneous mode for distal tibial fractures we decided to compare these two methods of fixation in our study. To the best of our knowledge, only few previous prospective study has been performed to compare these two methods. In our study all the fractures in both groups went into union. However in MIPPO group one case had deep infection before fracture union which necessitated implant removal and secondary surgeries. Average union occurred at 22 weeks for SCP group and 20 weeks for MIPPO group. One significant finding in our study was higher operative time in MIPPO group 86.9 minutes vs 81.2 in SCP Group. This is due to need of creating proximal and distal entry ports and also time taking in suturing them back. There were more wound problems both superficial and deep infections in the MIPPO group. 2 patients in MIPPO group had deep infections. One had infection before fracture union so implant has to be removed and debrided thoroughly . Antibiotic beads were inserted and supracutaneous plate was applied for stabilization. After settling of infection bone grafting and supracutaneous plating was done . Incidence of deep infection was 10% in MIPPO group while no deep infection was seen in SCP group.. Moreover, in the present study, MIPPO was associated with a longer operative time, due to complicated indirect reduction techniques of MIPPO. A minimal incision cannot ensure minimal invasion because surgeons who are unfamiliar with the technique may repeatedly insert and pull out the plate, which will induce a dead space and increase infection risk or delayed union. Therefore, overall preoperative evaluation of the risks to soft tissue is very important, especially for those with high energy injury. Another highlight or benefit of using SCP is that Implant removal can occur as an outdoor procedure and no need for addition hospital stay or admission is required for implant

removal surgery. This is of paramount importance in developing countries like India especially in our teaching institution which is situated in one of the 115 backward districts of India. This tremendously brings down the cost factor associated. 90 percent of patients treated with MIPPO technique subsequently had removal of implant. AOFAS Score including pain and function score was better in SCP group as compared to MIPPO group. This signifies better functional outcome and better range of motion in patients operated with SCP plating. This can be a reason for poor functional outcome in MIPPO group as 2 patients had secondary surgery and also 90% of MIPPO group Patients got their implant removed. In our study, no fixation loss or implant failure was encountered.

CONCLUSION

Given the small numbers of patients in our study, we cannot draw any definitive conclusions. The high percentage of unions, the low rate of complications, comparatively less surgical time, easy implant removal and better functional scores suggest that using LCP in supracutanoeus mode can be a reasonable alternative to MIPPO for treating distal tibia fractures. Future prospective randomized studies may be able to clarify these issues.

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