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The Use of a Distal Tibial Locking Plate to Manage Distal Tibial Fractures: Our Experience

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ABSTRACT

Aim: stable fixation and early pain-free mobilization are becoming increasingly popular in fracture treatment. The findings of a prospective cohort research including distal tibial fracture repair using a distal tibial locking plate are presented in this paper, as well as their assessment in terms of precise anatomical reduction, secure fixation, and early functional restoration.

Materials and methods: Distal tibial locking device was used to treat thirty patients with distal tibial fractures ranging in age from 18 to 70. The American Orthopaedic Foot and Ankle Society's (AOFAS) ankle-hindfoot score was utilized in this research to predict the study's outcome.

Results: The findings of a prospective cohort research including distal tibial fracture repair using a distal tibial locking plate are presented in this article, with partial articular fractures accounting for 20% and full articular fractures accounting for 16%. Eight of the thirty patients had a superficial infection, whereas two had a deep infection. There were six instances when there was a union by 15 weeks, twelve cases by 21 weeks, eight cases by 29 weeks, and four cases had nonunion. Six instances had an AOFAS score of 30 to 70 at six months, while 24 cases had a score of 71 to 100.

Conclusion: This study's results are consistent with what is presently known regarding the treatment of distal tibial fractures using locking plates. As a result, a locking compression plate is a good way to keep a distal tibial fracture stable.

Clinical significance: For distal tibial fractures, locking plates are an effective therapeutic option, particularly when utilized in combination with proper intraoperative soft tissue therapy and patient involvement in the rehabilitation program. The study into this novel approach contributes to our existing understanding of how to treat distal tibial fractures.

Key words: Distal tibial fracture, Road accident, Union

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INTRODUCTION

Almost all human civilization's history has a chronicle of man's efforts to adapt to shifting environmental conditions. Roadside accidents are becoming epidemiologically one of the world's leading murderers and the most terrifying opponents of human beings all over the world, despite various technical advancements and a surge in motor traffic accidents in the current age [1,2]. According to trauma experts, the pattern of injuries is shifting dramatically in terms of severity, soft-tissue injury, and consequences [3,4].

One of the most common fractures encountered in orthopedic practice after an accident is a distal tibial fracture [5]. Treatment techniques that minimize hospitalization and recumbency are being developed all the time [6]. This is owing to the lengthy duration of recumbency and the economic cost that these fractures entail.

Based on the kind of fracture, severity, and soft-tissue injury of the tibia, several therapeutic techniques have been reported. The signs are there for surgical and Treatment of tibial fractures without surgery are constantly being updated and amended [7]. Nonoperative therapy is currently confined for closed, resilient, and slightly dislocated fractures produced by trauma with little energy, rather than all fractures, even though it was formerly widely utilized for all fractures [8]. A few of the advantages of surgical therapy include the ability to move more quickly, easier access to soft tissues, and the avoidance of problems associated with immobility [9]. Aims of therapy include restoring normal function to the knee and ankle joints, allowing the patient to bear weight without experiencing discomfort, and preventing the fracture from recurring [10,11].

In this paper, we discuss the usage of a distal tibial locking device to treat distal tibial fractures, as well as the surgery's functional success.

MATERIALS AND METHODS

The participants in this prospective study were 30 patients with distal tibial fractures who were hospitalized to the Department of Orthopedic , Ruth Pfau Fazaia Medical College Shahra e Faisal Karachi Pakistan from Jan 2020 to Jan 2021.

Participants had to be at least 18 years old and have a distal tibial fracture with or without a fibular fracture to be included. Compound grade III fractures with no soft tissue support for the implant and previous or ongoing infection in the affected limb were both ruled out as causes of the injury.

To participate in the research, participants had to be at least 18 years old and have a distal tibial fracture with or without a fibular fracture. Acute complex grade III fractures with no soft tissue support for the implant, as well as any previous or present infection in the afflicted limb, were also ruled out.

Each of the patients was sent to the hospital's emergency department, where they were thoroughly examined to see whether they had sustained any additional injuries. It was discovered that the afflicted limbs were neurologically and vascularly normal. The patient had wound lavage, dressing, and splintage, all of which were done in accordance with their original evaluation and damage. Analgesics, antibiotics, and intravenous fluids were administered in accordance with normal practice, and tetanus prophylaxis was given as needed. Tetanus prophylaxis was administered as needed. The most fundamental blood parameters had been determined at this point. Radiographs were used to ascertain the fracture configuration and to arrange the patient's surgical treatment. Overall, the results were promising. The fractures were classified according to the Rüedi and Allgöwer classification technique, which was developed in Germany and is still in use today. The patient was sent to the operating room for additional treatment after initial resuscitation, stabilization of vital signs, and a preanesthetic assessment and clearance.

Every patient had surgery on while lying supine on a radiolucent table, allowing for enhanced sight. With the use of a pneumatic tourniquet, the bleeding was stopped. While the patient was prepped and draped, an intraoperative fracture alignment evaluation was conducted through an incision in the patient's leg.

Before inflating the tourniquet, the patient was prepared and draped in preparation for the procedure. Traction and manipulation were used to try to achieve a close reduction. The provisional reduction was verified using image guidance. Following a successful reduction and alignment, the plate size was calculated with the aid of imaging guidance to ensure that the fracture was adequately fixed and stabilized after reduction and alignment.

The minimally invasive percutaneous plate osteosynthesis (MIPPO) approach was employed if appropriate reduction and alignment were obtained. If a satisfactory reduction could not be obtained, the fracture site was selected to be exposed using the standard medial technique. The procedure for open reduction and internal fixation was then followed as usual. Provisional fixation using K wires or screws was performed before proceeding with plate fixation to check that the right reduction had been accomplished, especially in the case of intraarticular fractures.

Making an oblique incision towards the very end of the medial malleolus, which is subsequently proximally stretched to enable entrance, is required for the MIPPO treatment to be successful. Percutaneous elevators were utilized to construct an extra periosteal tube for the plate, which was then sutured into place. C-arm imaging was utilized to make sure that the plate had made it to the fracture site in time. An incision was made near the plate's anticipated proximal limit, and the plate was removed after it was repositioned. The medial tibia's anterior and posterior margins were palpated, and the periosteum of the tibia was exposed by making a longitudinal incision along the middle of the tibial tuberosity. In the proximal incision, a submuscular plane was created and a tunnel was built to the fracture site, at which point the plate was pressed into place mostly by doctor's opposite hand. To ensure that the plate in the proximal incision was correctly inserted, the surgeon palpated it. A Kirschner wire was inserted into the plate via a fixation bolt, and the plate was then tightened with a screw to ensure that it was securely attached to the tibial surface. Imaging techniques such as anteroposterior and lateral imaging were utilized to verify that the implants were properly placed.

The fixation screws were inserted in the next step, Using the operating method for installing nonlocking and locking cortical screws, respectively. After installing all of the nonlocking screws, the next step was to install the locking screws, which were then installed after making the required reduction. To hold each main fracture fragment together, each piece included a minimum of four screws. The fundamentals of locking compression plates (LCP) must be adhered to during the installation, and this was no exception. The wounds were then treated with regular saline before being stitched together in layers to prevent infection. The technical problems and complications that arose throughout the operation were meticulously recorded.

After the procedure, an X-ray was taken to ensure that the fracture pieces had been properly reduced and stabilized. Ankle mobilization was started as soon as feasible after the fracture was discovered, depending on the patient's condition and degree of fixation. Antibiotics were given intravenously and orally.

The patient was examined in the outpatient department on a regular basis, where he had X-rays and had his functional results assessed using the American Orthopedic Foot and Ankle Society's ankle-hindfoot scoring technique [AOFAS score]. The data was analyzed and presented to the participants in the form of descriptive statistics.

Ethical considerations

This research was authorized by the regional Ethics Board and conducted in line with the HelsinkiDeclaration of the World Medical Association.

Each patient was given Consent to participate in the research must be in writing and informed.

RESULTS

The participants in this study were 30 patients with a distal end tibial fracture, with an average age of 39.06 (18–70) years.

Young and middle-aged individuals were found to have a higher prevalence of comminated distal end tibial fractures, with a larger frequency in the third and fourth decades of life (50 percent patients between 31-35 years of age). Our research comprised 30 patients, 21 of them were men and 9 females (male:female ratio 7:3), suggesting that males were more prone to suffer these injuries. The distribution of patients by age is shown in Table 1.

Table 1: Distribution of subjects in accordance with age.

Age (years)	No. of patients	Percentage of patients
18–30	8	26.67
31–40	9	30
41–50	6	20
51–60	5	16.67
61–70	2	6.67

The most often occurring injury in this research was a vehicle collision. A home accident resulted in the injuries of nine patients, and two of them were attacked. Five of the nine patients who were wounded in the accident were female, while four were male. 4 instances of head injury, 2 cases of chest injury, 2 cases of fracture patella and medial malleolus, 1 case of nasal bone fracture, 1 case of fracture patella, 1 case of avulsion over the opposite leg, and 1 case of ulna fracture were among the 30 patients in this research.

In this study, 30 distal tibial fractures were scored by the Verein Fur Osteosynthesis/ Orthopaedic Trauma Association. Extraarticular fractures accounted for most fractures (64%) in the research, with partial articular fractures (20%) and complete articular fractures (16%). 6 cases had union by 15 weeks, 12 cases by 21 weeks, 8 cases by 29 weeks, and 4 cases had nonunion. Malunion of the fracture was present in two cases. At 6 months, 6 instances had an AOFAS score of 30 to 70, and 24 cases had a score of 71 to 100. Tables 3 and 4 show the distribution based on time to union and total AOFAS score 9 (Tables 2 to Table 4).

Table 2: Distribution of subjects in accordance with typical fracture.

Infection	No. of patients	% Of patients
Superficial	8	26.67
Deep	2	6.67
Absent	20	66.67

Table 3: Distribution of participants in accordance with bony union time.

Time	No. of patients	Percentage of patients
By 15 weeks	6	20

By 21 weeks	12	44
By 29 weeks	8	28
Nonunion	4	8

Table 4: Distribution of participants according to total score.

Score	1 month	2 months	3 months	6 months
0–30	14	6	4	0
31–70	16	21	18	6
71–100	0	3	8	24

DISCUSSION

Fractures of the distal tibia have traditionally been challenging to treat, especially when they are coupled with soft-tissue injury and comminution. Functional result of the cases in this study, which was conducted in the United Kingdom, was evaluated using the AOFAS ankle and hindfoot score. Following the test, it was determined that after six months, the average AOFAS score was found to be 85.4 [12].

In a study, the mean American Orthopaedic Foundation for Amputation Research (AOFAR) score for 42 patients treated for distal tibial and Pilon fractures with the AO distal tibial locking plate was 88, indicating that the device was successful [13].

According to the American Orthopaedic Foundation for Sports Medicine (AOFAS), the ankle joint function was rated 80 to 95, in another prospective research of Thirteen patients with tibial fractures were treated with indirect reduction and percutaneous LCP internal fixation using a minimally invasive technique (92.4 on average) [14].

A prospective study was conducted to determine the clinical outcomes and long-term implications of low metaphyseal distal tibial fractures. These were treated featuring a locked medial tibial plafond plate of 3.5 mm and a hybrid screw design (locking and nonlocking), using the least intrusive plate osteosynthesis method at the time [15]. The patients were observed for an average of 32 months (12–48 months) in this study, depending on their age. The ankle grades from the AOFAS, Olerud, and Molander after two years varied from excellent to outstanding in 30 people [16].

Long-term issues include nonunion, malunion, angular deformity, implant fracture, shortening, and infection, to name a few. In this instance, the patient was followed for up to 6 months or until the fracture's bony union, whichever occurred first [17]. The findings were compiled and compared to prior studies. Any issues that occurred during or after the therapy were dealt with properly and quickly, as stated before. When locking plates were utilized to repair distal tibial fractures, the length to bone union, ankle range of motion, infection, number of future operations done, and implant failure were all assessed.

As a result, the results of this study are consistent with current literature on distal tibial fracture repair using different locking plates, which was the focus of our research. All factors to consider include preoperative antibiotic coverage, early surgical intervention, precise reduction, a rigorous aseptic approach, and early postoperative strenuous workouts.

CONCLUSION

Stabilizing distal tibia fractures with locking plates is a successful technique, particularly when combined with proper intraoperative soft tissue therapy and active patient involvement in the rehabilitation process. Despite this, it is a highly forgiving technology when the LCP principles and method formalities are properly adhered to. Caution: LCPs are highly specialized implants that should be utilized in combination with careful preoperative planning and surgical expertise.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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