Section: Orthopaedics

Original Research Article

A PROSPECTIVE STUDY OF FUNCTIONAL AND RADIOLOGICAL OUTCOME OF EXTRACORPOREAL LOCKING PLATE IN COMPOUND TIBIAL FRACTURES USING AOFAS SCORE

Sudeep Tripathi[1], Ashish Sirsikar[2], Lakhan Singh Maravi[3]

[1]Post Graduate Student, Department of Orthopaedics, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India
[2]Associate Professor, Department of Orthopaedics, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India
[3]Professor and Head, Department of Orthopaedics, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India

Received : 24/12/2024
Received in revised form : 15/02/2025
Accepted : 01/03/2025

Keywords:
Extracorporeal LCP, compound tibial fractures, external fixation by plate.

Corresponding Author:
Dr. Ashish Sirsikar,
Email: drashishsirsikar@gmail.com

DOI: 10.47009/jamp.2025.7.2.34

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (2); 163-166

Abstract

Background: Tibial shaft fractures are the most common long bone fractures, around 24% of which are compound. This study aimed to analyze the functional and radiological outcome of extracorporeal locking plate as an external fixator in the treatment of compound (G.A. Grade I, II, IIIA and IIIB) tibial shaft fractures. **Materials and Methods:** This Prospective study was conducted in the Department of Orthopaedics, N.S.C.B. Medical College & Hospital, Jabalpur (M.P.) from 1st September 2022 to 30 June 2024. A total of 22 patients of compound tibial shaft fractures underwent extracorporeal plating of the tibia using a LCP. **Result:** In a total of 22 patients, majority were male (19 patients) with the age group from 18 years to 64 years with mean age of 42.09 years, the union rate was 90% (20 patients), average clinical union time of 15.54 + 4.66 weeks (range 9-24 weeks) and average radiological union time of 17.55 + 4.6 (range 12-28 weeks). Mean AOFAS score pre–operatively was (10.18 + 1.368) and at the end of 1 year mean AOFAS score was (92.04 + 11.116), the mean VAS score pre-operatively was (9.77 + 0.429) and at the end of 1 year, mean VAS score was (1.23 + 1.020). The plate was kept ex situ for a period of 12-28 weeks. Screw tract infection was the most common complication. **Conclusion:** Extracorporeal plating with LCP provides successful results for the treatment of extra articular compound tibial fractures with fewer complication rates in selected patients. As opposed to most external frames of lower leg which are bulky and cumbersome, extracorporeal LCP has adequate stability and is better accepted by the patients both cosmetically and functionally for ambulation. It also has the advantage of facilitating wound healing and plastic surgery procedures.

INTRODUCTION

Compound tibia fractures are complex injuries with different outcomes and variable prognosis. Most of the tibial fractures are prone to extensive soft tissue damage, maximum of which are Gustilo-Anderson Type III, indicating a wound of at least 10 cm big, which is susceptible to contamination. This is because of the proximity of the tibia to the skin.[1]

Modalities of treatment vary according to fracture severity which includes conservative management, internal fixation and the use of external fixation devices.[2-4] External fixators have conventionally been the choice of treatment for open fractures and in certain closed fractures with severe soft-tissue injuries. They can be used for temporary or definitive fixation. External fixators have an advantage of preservation of periosteum and in turn blood supply to the fractured bone and also allow for better soft-tissue management.

The use of locking compression plate (LCP) as an external fixator (Extracorporeal plating) has emerged with many advantages, which includes the possibility of contouring the plate close to the skin, better range of movements of adjacent joints, angular stability due to the locking-head mechanism of the LCP, decreased irritation because of its low profile as compared to conventional external fixators.[5] The plate can be masked under regular clothes which makes it cosmetically and socially more acceptable to patients.[6]

In this study we aim to study the functional and radiological outcome of extracorporeal locking plate in the treatment of compound tibial shaft fractures,

using AOFOS (American Orthopaedic Foot and Ankle Society) and VAS (Visual analogue scale).

MATERIALS AND METHODS

This prospective study was conducted in the Department of Orthopedics, NSCB Medical College and Hospital, Jabalpur (M.P.) from 1st September 2022 to 30st June 2024. 22 Patients (aged between 18 years to 65 years) with compound (Gustilo-Anderson Grade I, II, IIIA and IIIB) tibial shaft fractures were included in the study. These patients were operated upon by extracorporeal locking compression plate as an external fixator and were regularly followed up at 1 month, 2 months, 3 months, 6 months and 12 months.

Surgical Technique

- The locking compression plate was selected according to the site of the fracture (proximal 1/3rd, middle 1/3rd, distal 1/3rd) and comminution of fracture.

Figure 1: Proximal 1/3rd

Figure 2: Middle 1/3rd

Figure 3: Distal 1/3rd

- LCP is placed at such distance from underlying skin such that it provides adequate space for swelling and wound care and adequate mechanical stabilization.
- After achieving fracture reduction, LCP plate was fixed temporarily with k-wires.
- At least 3 to 4 bi-cortical screws are recommended in both proximal and distal fracture fragment.
- Screw tract and wound dressing was done.
- Knee and ankle range of movement is started immediately the day after surgery or as per severity of compound fracture.
- After 6 weeks partial weight bearing was allowed and complete weight bearing started according to stability of fixation and healing of fracture.

RESULTS

The mean age of the patients was 42.09 years (range 18-64 years), male to female ratio being (6:1). Mean clinical union time noticed in our study was 15.54 + 4.66 weeks (range 9-24 weeks). Proximal 1/3rd fracture showed mean union at (19.33 + 4.79) weeks, Middle 1/3rd fracture showed mean union at (13.42 + 2.57 weeks), Distal 1/3rd fracture showed mean union at (12.4 + 1.67 weeks). According to Gustilo Anderson Classification, G.A. I showed mean union of 12 weeks, G.A. II showed mean union of (16 + 4.67 weeks), G.A IIIA showed mean union of (20 + 3.464 weeks) and G.A. IIIB showed mean union of (13 + 4 weeks). Mean radiological union time noticed in our study was 17.55 + 4.6. (range 12-28 weeks). The mean time of plate removal was 20.13+5.709 weeks. (range 12-31weeks). Mean AOFAS score pre–operatively was (10.18+1.368) and at the end of 1year mean AOFAS score was (92.04 +11.116), the mean VAS score pre – operatively was (9.77+0.429) and at the end of 1year, mean VAS score was (1.23 +1.020).

DISCUSSION

Kloen et al,[5] were the first to describe the use of a locked compression plate as external fixator. They used the LCP as an external fixator in the

ISSN (O): 2687-5365; ISSN (P): 2753-6556

management of infected non-union. The authors concluded that this technique was versatile, low profile, and well tolerated by their patients. Although its indications are relatively limited, it can be a useful adjunct in the stage of treatment of complex reconstructive cases.[7,8] Locking plates have a low profile and thus are less likely to strike the contralateral lower leg in the swing-through phase of either leg during ambulation.[9] Zhang et al,[10] did one-stage external fixation using a locking plate in 116 tibial fractures and concluded that external plate fixation is effective for tibial fractures and especially for metaphyseal fractures. It has the advantages of being easy to perform and less invasive, and the plate is conveniently located for removal. Biser Makelov et al,[11] proved that single-stage externalized locked plating of unstable meta- diaphyseal tibial fractures provides adequate stability of fixation with promising clinical results and represents an attractive alternative to the conventional methods of external fixation when inclusion criteria and rehabilitation protocol are strictly followed.

IMMEDIATE POST-OP. X-RAY

X RAY AT 6 MONTH FOLLOW UP

Immediate Post-op X-Ray

X Ray 3 Months follow up

Clinical Pic

In our study, screw tract infection was the most common complication (5 out of 22 patients) which healed with regular dressing and antibiotics. Delayed union occurred in 4 patients, which united with bone marrow aspirate instillation. Mal-union occurred in 3 patients, which was acceptable and the patient was able to perform his routine activities. Non-union was seen in 2 patients, for whom internal fixation was performed. Screw loosening was seen in 3 patients,

ISSN (O): 2687-5365; ISSN (P): 2753-6556

pressure necrosis was seen in 1 patient, which healed with regular dressing and antibiotics.

In our study, the use of locking compression plate (LCP) as an external fixator (Extracorporeal plating) has shown better acceptability by the patient both cosmetically and functionally as they can be concealed under clothing. Ambulation is relatively easy; Better ROM can be achieved over adjacent joints. Moreover, secondary procedures like plastic surgery are easy to perform, also LCP provides relatively more stable construct.

CONCLUSION

Extracorporeal plating can give promising results in compound tibia fractures in terms of functional and clinical outcomes with better patient acceptance. Further experimental studies and randomized multi-centric clinical trials with larger series of patients are necessary to pave the way of its use in regular clinical practice.

REFERENCES

1. Nicolaides M, Pafitanis G, Vris A. Open tibial fractures: An overview. Journal of Clinical Orthopaedics and Trauma. 2021 Sep; 20:101483.
2. Ang BFH, Chen JY, Yew AKS, Chua SK, Chou SM, Chia SL, et al. Externalised locking compression plate as an alternative to the unilateral external fixator: a biomechanical comparative study of axial and torsional stiffness. Bone & Joint Research [Internet]. 2017 May 4 [cited 2023 Dec 29];6(4):216–23.
3. Zhou Y, Wang Y, Liu L, Zhou Z, Cao X. Locking compression plate as an external fixator in the treatment of closed distal tibial fractures. International Orthopaedics. 2015 Jul 17;39(11):2227–37.
4. Ma CH, Tu YK, Yeh JH, Yang SC, Wu CH. Using External and Internal Locking Plates in a Two-Stage Protocol for Treatment of Segmental Tibial Fractures. Journal of Trauma injury Infection and Critical Care. 2011 Sep 1;71(3):614–9.
5. Kloen P. Supercutaneous Plating: Use of a Locking Compression Plate as an External Fixator. Journal of Orthopaedic Trauma. 2009 Jan;23(1):72–5
6. Patil, Siddaram & Chinnamari, Rahul Reddy. (2013). Supracutaneous locking compression plate for type i & ii compound fracture in distal third tibia fractures.
7. M a CH, Wu CH, Yu SW, Yen CY, Tu YK (2010). Staged external and internal less invasive stabilisation system plating for open proximal tibial fractures. Injury 41(2):190–196.
8. M a CH, Yu SW, Tu YK, Yen CY, Yeh JJ, Wu CH (2010) Staged external and internal locked plating for open distal tibial fractures. Acta Orthop 81(3):382–386.
9. Tulner SA, Strackee SD, Kloen P. Metaphyseal locking compression plate as an external fixator for the distal tibia. International Orthopaedics. 2012; 1;36(9):1923-7.
10. Jingwei Zhang MD, Nabil A, Ebraheim MD, Ming Li MD, Xianfeng He MD, Jiayong Liu. One-Stage External Fixation Using a Locking Plate: Experience in 116 Tibial Fractures. 2015; 38(8):494-7.
11. Makelov B, Mischler D, Varga P, Apivatthakakul T, Fletcher JWA, Veselinov D, et al. Single-Stage Externalized Locked Plating for Treatment of Unstable Meta-Diaphyseal Tibial Fractures. Journal of Clinical Medicine. 2023 Feb 17;12(4):1600.

ISSN (O): 2687-5365; ISSN (P): 2753-6556