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Original research article

FUNCTIONAL OUTCOME OF MINIMALLY INVASIVE PERCUTANEOUS PLATE OSTEOSYNTHESIS AMONG PATIENTS WITH PROXIMAL TIBIA FRACTURES

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Abstract: *Proximal tibia fractures are complex injuries that pose significant challenges in orthopaedic surgery. Minimally invasive percutaneous plate osteosynthesis (MIPPO) has been increasingly adopted as a treatment method due to its potential benefits in reducing soft tissue damage and promoting faster recovery.* ***Objective:*** *To assess the functional outcome of minimally invasive percutaneous plate osteosynthesis (MIPPO) among patients with proximal tibia fractures.* ***Methods****: A prospective cohort study was conducted in a tertiary care hospital over a period of two years, from January 2021 to December 2022. Thirty-five patients presenting with proximal tibia fractures were treated using the MIPPO technique. The Schatzker classification was used to categorize the fractures. Functional outcomes were assessed using the Knee Society Score (KSS) at six months postoperatively. Data were analyzed using descriptive statistics and chi-square tests to determine the significance of outcomes.* ***Results:*** *The most frequent type of fracture, according to Schatzker's classification, was type I, followed by type II and type III. An excellent outcome was observed in 21 patients (60%), good outcomes in 8 patients (22.9%), fair outcomes in 5 patients (14.3%), and poor outcomes in 1 patient (2.9%). Postoperative complications included infection in 2 patients (5.7%).* ***Conclusion:*** *Minimally invasive percutaneous plate osteosynthesis (MIPPO) is a safe and effective technique for managing proximal tibia fractures, yielding excellent functional outcomes in most patients.*

Keywords: Fracture Fixation, Intramedullary; Fractures, Bone; Minimally Invasive Surgical Procedures; Tibia; Treatment Outcome

Introduction

Tibial plateau fractures occur when the upper part of the tibia bone is subjected to high force in the direction of its long axis. The occurrence of fractures and the amount of energy needed to create them vary depending on age. Fractures in younger patients are typically caused by high-energy trauma, such as falling from a height or being involved in a motor vehicle accident (1, 2). On the other hand, fractures in elderly patients are usually caused by low-energy trauma (3). Intra-articular fractures involving the proximal tibia affect a significant weight-bearing joint. If not properly treated, these fractures can lead to reduced functionality. The lateral condyle is affected in most injuries, accounting for 55-70% of occurrences. Medial condyle injuries occur in 10-23% of cases, while bicondylar fractures are observed in 10-30% of cases (4).

The minimally invasive technique is associated with both operative and non-operative approaches and produces excellent functional outcomes (5). The minimally invasive technique approach allows for unilateral fixation of the condyles and minimizes soft tissue manipulation, resulting in a favorable functional outcome (6). This technique helps to maintain the blood flow to the outer layer of the bone, reduces damage to the surrounding soft tissues, and allows for early movement and recovery (7). This less intrusive method decreases the likelihood of wound problems, infection, and delayed healing, accelerates the recovery process, and enhances patient contentment (8, 9).

In addition, minimally invasive percutaneous plate osteosynthesis provides flexibility in treating a range of proximal tibia fractures, such as fractures affecting the tibial plateau and metaphysis, fractures within the joint, and fractures accompanied by soft tissue injuries (10). This makes it a valuable technique for orthopedic surgeons to have at their disposal. Nevertheless, achieving favorable results in minimally invasive percutaneous plate osteosynthesis heavily relies on careful preoperative preparation, accurate intraoperative methodology, and thorough postoperative support. This highlights the significance of surgeon proficiency, interdisciplinary cooperation, and patient selection criteria in attaining the best possible outcomes (11, 12).

The area of orthopedic surgery is constantly changing, and minimally invasive percutaneous plate osteosynthesis is a surgical approach focusing on less invasive techniques to preserve tissue. It prioritizes patient-centered care, restoring function, and maintaining long-term joint health while treating proximal tibia fractures. By continuously conducting research, developing new ideas, and improving surgical methods, minimally invasive percutaneous plate osteosynthesis can enhance results, broaden the range of conditions it can treat, and transform how proximal tibia fractures are managed. Ultimately, this will improve patients' quality of life and functional outcomes in this challenging group. This study aims to determine the functional outcome of minimally invasive percutaneous plate osteosynthesis among patients with proximal tibia fractures.

Methodology

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This descriptive study was conducted at the Department of orthopedic surgery at Hayatabad Medical Complex Hospital, Peshawar, from September 2023 to March 2024 after obtaining ethical approval from the hospital. This study investigated the functional success of Minimally Invasive Plate osteosynthesis (MIPO) in tibial condyle fractures employing both locking and non-locking compression plates. The study comprised 35 instances of tibial condyle fracture observed in the emergency department. The results were gathered and examined using the Sanders 40-Point Functional Evaluation Scale. A comprehensive and meticulous assessment of the patient's condition, including the related injuries, was conducted. An evaluation was conducted to determine the condition of the nerves and blood vessels in the leg furthest from the body. The required x-rays (AP/Lat/Oblique) were acquired and assessed. CT scans were acquired as necessary. According to the protocol, intravenous fluids, analgesics, and antibiotics had been given. Tetanus prophylaxis was delivered as necessary. Physicians and anesthetists are required to conduct routine preoperative fitness assessments.

The patient was positioned supine on a radiolucent fracture table, with a sponge pack or sandbag put beneath the afflicted gluteal region to limit external rotation of the lower limb. A pneumatic tourniquet was used. The leg that was impacted was readied and covered with a cloth below the device used to stop blood flow. Postoperatively, intravenous antibiotics were administered throughout the surgery and maintained for five days. Subsequently, oral antibiotics were prescribed until the sutures were removed. A post-operative X-ray was performed to confirm the accurate alignment and stabilization of the broken bone pieces. Based on individual patient tolerance, patients commenced Quadriceps exercises and ankle mobilization on the 2nd or 3rd day after surgery. Gradual increase in weight-bearing was permitted based on the evaluation of callus formation observed in subsequent X-ray examinations. The patients were routinely monitored through outpatient visits and evaluated using clinical and radiological methods. Patients were permitted to bear partial weight on their toes one month after surgery and total weight on subsequent follow-up visits. The functional and radiological results determined the outcome. The result was assessed using Sanders' 40-point functional evaluation scale.

SPSS was utilized for analyzing the data, which was presented in the study as figures and tables.

Results

The mean age of thirty-five patients was 38.54±12.68 years. The mean time for the union was 14.09±2.20 weeks, while the mean operative time was 88.31±13.25 mins. Figure 1 presents the gender distribution of our patients, which clearly shows that male patients had higher frequency. Etiology of fractures showed that 18 (51.4%) patients had road traffic accidents, fall 14 (40%), and assault 3 (8.6%). The fracture in the right tibia was 20 (57.1%), while the left tibia was fractured in 15 (42.9%) patients. Table 1 shows Schatzker's classification; type I was the standard type, followed by types II and III. Excellent outcome was seen in 21 (60%) patients, good in 8 (22.9%), fair in 5 (14.3%), and poor in only one patient (2.9%). Postoperatively, only two patients developed an infection (5.7%) (Table 2)

Table 1: Schatzker's classification

Schatzker's classification	Frequency	Percent
Type I	16	45.7
Type II	8	22.9
Type III	5	14.3
Type IV	2	5.7
Type V	3	8.6
Type VI	1	2.9
Total	35	100.0

Table 2: Functional outcome

Functional outcome	Frequency	Percent
Excellent	21	60.0
Good	8	22.9
Fair	5	14.3
Poor	1	2.9
Total	35	100.0

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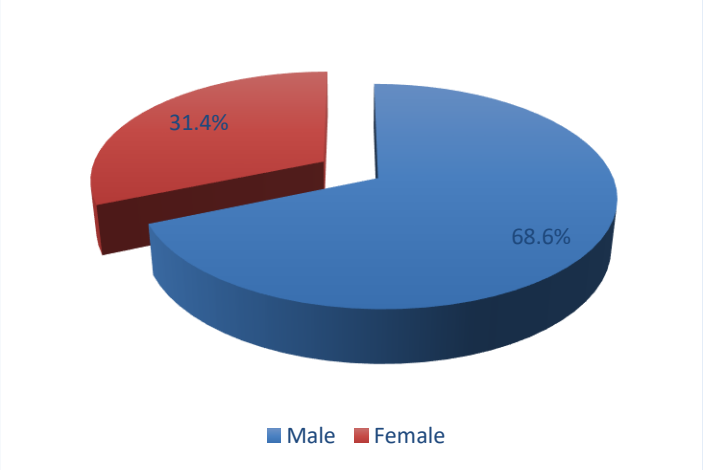

Figure 1: Gender distribution

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Discussion

The care of proximal fractures of the tibia needs specific decision-making to be an effective treatment. Although non-operative treatment is the most effective method for treating stable fractures involving little shortening, patients who have undergone treatment for these fractures have reported experiencing malunion, shortening, stiffness, and osteoarthritis of the surrounding joint, respectively. For anatomical reduction, open reduction of fractures in the distal tibia and fixing them internally with a plate necessitate a large incision, substantial soft tissue dissection, and periosteal stripping. Complications include infection (8.3% to 23%), delayed union, and non-union (8.3% to 35%).(13) It is important to note that these procedures have risks. The surgical dissection is necessary to achieve anatomical reduction, which results in stripping soft tissue and the drainage of the fracture hematoma, which can lead to infection, delayed union, or non-union. It is necessary to balance the decrease of anatomical characteristics and the removal of soft tissue to avoid these difficulties.(14)

When these problems are considered, the MIPPO approach emerges as an appealing option for treating proximal tibia fractures. These days, there has been a notable growth in the utilization of locking plates for treating proximal tibia fractures employing MIPPO. It is possible to obtain locking plates that have been anatomically pre-contoured for both the medial and lateral side plating.(15) There is ongoing debate over the fixation of bicondylar fractures. It is possible to employ a single lateral column locking plate on its own to stabilize the fracture. Alternatively, dual column plating, in which medial column plating is also performed in conjunction with the lateral column plating, may also be utilized. Research has shown that both management approaches are effective.(16, 17) To perform dual column plating, two distinct incisions are required, which means there is a significant possibility of soft tissue injury and periosteal injury.(18)

Thirty-five patients were taken for this study, having a mean age of 38.54±12.65 years; male patients had a higher frequency than female patients. The etiology of fractures in our study revealed that road traffic accidents had a very high frequency, followed by falling from height and assault. A similar pattern has been shown by a study that reported that road accidents accounted for the majority of the fractures in their patients.(19)

The classification of the type of fracture was based on Schatzker's classification. We observed that the majority of the patients were presented with type I fractures, followed by type II and then type III; a study showed that type I was the most frequent type of fracture observed in their research, followed by type II and then type III.(20)

The functional outcome in our study was based on Sandar's scale. We observed excellent functional outcomes in 60% of the cases, good in 8 (22.9%), fair in 5 (14.3%), and poor in only one patient. Postoperatively, only two patients developed an infection. Our results align with the study above, which reported excellent outcomes in most of their patients 63.33%, promising 20%, fair 13.3%, and poor in 3.33% of patients. In comparison, they reported infection in only 6.67% of cases.(20)

Conclusion

In conclusion, minimally invasive percutaneous plate osteosynthesis is a safe and effective technique for the management of proximal tibia fractures. It exhibits excellent functional outcomes in most of our patients and has a lower frequency of infection.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate.
Approved by the department concerned. (IRBC/HMC-023/2021-10-13)

Consent for publication
Approved

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Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

MUHAMMAD SAEED (Assistant Professor)
Revisiting Critically & Data Analysis
MUHAMMAD INAM (Associate Professor)
Final Approval of version
SHAFI UL HAQ (Assistant Professor)
Drafting & Concept & Design of Study

References

1. Ramponi DR, McSwigan T. Tibial plateau fractures. Advanced emergency nursing journal. 2018;40(3):155-61.
2. Trikha V, Gaba S, Agrawal P, Das S, Kumar A, Chowdhury B. CT based management of high energy tibial plateau fractures: A retrospective review of 53 cases. Journal of clinical orthopaedics and trauma. 2019;10(1):201-8.
3. Donovan RL, Smith JR, Yeomans D, Bennett F, Smallbones M, White P, et al. Epidemiology and outcomes of tibial plateau fractures in adults aged 60 and over treated in the United Kingdom. Injury. 2022;53(6):2219-25.
4. Agnew SG. Tibial plateau fractures. Operative techniques in orthopaedics. 1999;9(3):197-205.
5. Smith WR, Ziran BH, Anglen JO, Stahel PF. Locking plates: tips and tricks. Instructional course lectures. 2008;57:25-36.
6. Hak DJ, Lee M, Gotham DR. Influence of prior fasciotomy on infection after open reduction and internal fixation of tibial plateau fractures. Journal of Trauma and Acute Care Surgery. 2010;69(4):886-8.
7. Borade A, Sanchez D, Kempegowda H, Maniar H, Pesantez RF, Suk M, et al. Minimally invasive plate osteosynthesis for periprosthetic and interprosthetic fractures associated with knee arthroplasty: surgical technique and review of current literature. The Journal of Knee Surgery. 2019;32(05):392-402.
8. Falez F, Papalia M, Carbone S, Teti A, Favetti F, Panegrossi G, et al. Low complication rates in Minimally

Invasive Plate Osteosynthesis (MIPO) for proximal humeral fractures at 5 years of follow-up. Injury. 2019;50:S34-S9.
9. Wang B, Zhao Y, Wang Q, Hu B, Sun L, Ren C, et al. Minimally invasive percutaneous plate osteosynthesis versus intramedullary nail fixation for distal tibial fractures: a systematic review and meta-analysis. Journal of orthopaedic surgery and research. 2019;14:1-9.
10. Kim J-W, Oh C-W, Jung W-J, Kim J-S. Minimally invasive plate osteosynthesis for open fractures of the proximal tibia. Clinics in orthopedic surgery. 2012;4(4):313.
11. Wajnsztejn A, Pires RES, Dos Santos ALG, Labronici PJ, Fernandes HJA, Ferretti M. Minimally invasive posteromedial percutaneous plate osteosynthesis for diaphyseal tibial fractures: technique description. Injury. 2017;48:S6-S9.
12. Muzaffar N, Bhat R, Yasin M. Plate on plate technique of minimally invasive percutaneous plate osteosynthesis in distal tibial fractures, an easy and inexpensive method of fracture fixation. Archives of Trauma Research. 2014;3(3).
13. Sarmiento A, Latta LL. 450 closed fractures of the distal third of the tibia treated with a functional brace. Clinical Orthopaedics and Related Research®. 2004;428:261-71.
14. Janssen KW, Biert J, van Kampen A. Treatment of distal tibial fractures: plate versus nail: a retrospective outcome analysis of matched pairs of patients. International orthopaedics. 2007;31(5):709-14.
15. Im G-I, Tae S-K. Distal metaphyseal fractures of tibia: a prospective randomized trial of closed reduction and intramedullary nail versus open reduction and plate and screws fixation. Journal of Trauma and Acute Care Surgery. 2005;59(5):1219-23.
16. Aymen F, Youcef O, Aymen S, Issam A, Abderrazek A. Triplane fracture of the proximal tibia: a case report and literature review. Pan African Medical Journal. 2019;33(1).
17. Pulley BR, Gardner MJ. Bridge Plating of Proximal Tibial Metaphyseal Fracture by Limited Open Technique. Journal of Orthopaedic Trauma. 2019;33:S34-S5.
18. Wright DJ, Etiz B, Scolaro JA. Combined plate and nail fixation of bicondylar tibial plateau fractures. Injury. 2021;52(10):3104-10.
19. Gupta P, Tiwari A, Thora A, Gandhi J, Jog V. Minimally invasive plate osteosynthesis (MIPO) for proximal and distal fractures of the tibia: a biological approach. Malaysian orthopaedic journal. 2016;10(1):29.
20. Sandeep PK, Ramkumar MD, Ravi A, Kumar A, Subash Y. EVALUATION OF FUNCTIONAL OUTCOME OF MINIMALLY INVASIVE PLATE OSTEOSYNTHESIS (MIPO) IN PROXIMAL TIBIA FRACTURES.

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