

TO INVESTIGATE THE TREATMENT OF PILON FRACTURES USING DIFFERENT TECHNIQUES

Gaurav Dev Sharma¹, Abhishek², Nakul Khera³, Vaishali Satija⁴, Shanu Gupta⁵

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Corresponding Author:
Dr. Abhishek,
Email: dr.abhishekaarya@gmail.com.

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¹Assistant professor, Gouri Devi Institute of Medical Science and Hospital, India.

²Department of Orthopaedics, Shaheed Hasan Khan Mewati Government Medical College, Nalhar Nuh, India.

³Department of Orthopaedics, Shaheed Hasan Khan Mewati Government Medical College, Nalhar Nuh, India.

⁴Junior Resident, Department of Paediatrics, Pacific Institute of Medical Sciences, UDAIPUR, India.

⁵Secondary DNB Resident Artemis Health Institute Gurugram, India.

Abstract

Background: Orthopaedic surgeons have significant challenges when it comes to properly managing Tibial Pilon fractures. The primary difficulties in managing these fractures are reduced integumentary and soft tissue covering, comminuted fracture, fragment displacement, and fractures occurring in the metaphyseal region. **Aim:** To investigate the treatment of Pilon fractures using different techniques. **Material & Methods:** This research included a sample of 50 individuals who had both closed and open fractures of the distal tibia and were treated using different approaches. This research included patients between the ages of 18 and 65 who had pilon fractures and were willing to provide permission for the operation. **Results:** Out of the total of 50 patients, 31 (62%) were men and 19 (38%) were girls. Males outnumber females at a ratio of 1.63:1. The mean age of the patients is 39.85 ± 3.85 years. There were a total of 4 cases that were not pursued further. A total of 46 patients were evaluated for follow-up using the Karlsson and Peterson scoring method. In addition to subjective clinical judgement, ankle function was graded based on stability, weight-bearing, edoema, and gait. In this study there were 22 (47.83%) excellent, 14(30.44%) good, 4(8.69%) average, 6(13.04%) poor results. **Conclusion:** We propose a treatment strategy that involves a tiered approach to the fracture, starting with initial spanning external fixation and then proceeding to final fixation. The overall prognosis for these injuries is the general prediction or outlook for their likely outcome.

INTRODUCTION

The swift process of industrialization and the rapid tempo of modern life have resulted in both conveniences and disasters, such as road traffic accidents and different forms of high-speed trauma. The increasing diversity and unpredictability of fracture patterns provide a significant treatment problem for trauma surgeons. An example of such a fracture is a pilon fracture.^[1] Pilon fractures refer to ankle fractures that specifically impact the weight-bearing distal tibial articular surface. The prevalence of road traffic accidents and high velocity trauma has led to an increasing occurrence in recent times. Currently, it comprises 7% to 10% of the total number of tibial fractures. Despite the availability of several modern therapeutic methods, a definite therapy has not yet been developed. Until the early 1970s, there was a strong resistance to doing surgery on these fractures due to the high occurrence of

sequelae such as deep infection, osteomyelitis, and soft tissue devascularization.^[3] The treatment options that were approved included conservative methods such as skeletal traction, fracture manipulation, and external immobilisation using casts and cast bracings. However, these treatments encountered issues such as deformity, reduction in length, extended confinement to bed, rigidity, misalignment, improper healing, muscular atrophy, and the development of osteoarthritis after trauma. Over the last four decades, there has been significant development in the trauma surgeon's approach to this fracture.^[4]

The surgical treatment of pilon fractures involves four sequential steps: first, restoring the appropriate length and stabilising the fibula; second, reconstructing the articular surface of the tibia; third, inserting cancellous autografts; and last, stabilising the medial side of the tibia.^[5] These guidelines must be adjusted in cases of fractures

with extensive fragmentation and damage to the surrounding soft tissues.^[6] Attaining and maintaining anatomical alignment is technically challenging and sometimes unattainable.^[7] Due to the inherent nature of internal fixation, it unavoidably results in localised bone devitalization, which might subsequently cause further harm to the surrounding soft tissue. Soft tissue healing is influenced by the kind and timing of operation.^[8] In the past, tibial pilon fractures were often categorised using the AO/OTA and Ruedi Allgower classification systems. However, these methods rely on plain radiographs and are not effective for preoperative planning or predicting outcomes. Leonetti and Tigani presented a novel categorization system that takes into account displacement, the number of articular fragments, the plane of the primary fracture line, and the degree of comminution as seen by radiological examination.^[9-11] considering the aforementioned restrictions. The study continues, with unwavering endeavour to enhance clinical results in this challenging fracture that is resistant to treatment. Despite the use of modern surgical interventions, achieving a favourable result in pilon fractures is not always feasible, as shown by several studies reporting persistent high rates of complications. In our prospective research, we implemented several treatment methods for closed pilon fractures in individuals with little to no soft tissue damage. We then assessed the final functional score and rates of complications.

MATERIALS AND METHODS

Patients with tibial pilon fractures, with or without additional fractures in other areas, who sought treatment at the Department of Orthopaedics. Documentation is done to record the history of the mode of injury, time of injury, personal history, and treatment history. Preparation completed for surgical intervention. This research was conducted after the consent of the Ethical Committee of our institution. This research included a sample of 50 individuals who had both closed and open fractures of the distal tibia and were treated using different approaches. This research included patients between the ages of 18 and 65 who had pilon fractures and were willing to provide permission for the operation. The research eliminated instances of fractures in children, fractures associated with the spine, cases of multiple injuries, and patients who were not suitable for surgery.

Methodology

The management process started with the patient's arrival at our trauma ward. This included doing a first evaluation that included assessing the airway, breathing, circulation, and checking for spinal damage, while also simultaneously addressing shock and examining for any other injuries to the body's systems. The Thomas's splint is used to immobilise

the wounded lower limb. X-ray imaging is performed at the bedside. The blood tests conducted included of measurements for blood glucose, urea, blood HBsAg, HIV 1, and HIV 2.

The administration of spinal anaesthesia is followed by the administration of a prophylactic antibiotic. Additionally, a pneumatic tourniquet is administered and the patient is positioned. The area is then prepared by painting and draping, and the tourniquet is inflated. If the fibula is fractured and exposed via a postero-lateral approach, it may be repaired with a 1/3rd tubular plate. Tibial fracture was manipulated and reduced using closed techniques, and the procedure was confirmed using C-arm imaging. A little surgical cut is performed. A small incision is made just below the medial malleolus, along the periosteal plane. A distal medial tibial locking plate, equipped with a sleeve as a handle, is inserted into the decreased location of the fracture. Verify that the plate has fully traversed the fractured section and is palpable in the proximal segment, therefore avoiding any misalignment. The farthest holes are bored with a 2.7mm drill bit, and a 4mm regular cancellous screw is then secured. The placement of the distal screw is confirmed using a C-arm imaging device. A minor cut is performed on the fracture section closest to the point of origin in order to address the misalignment of the plate. The bone is bored with a 3.2mm drill bit and then secured with a 4.5mm standard cortical screw to bring it in close proximity to the plate. Next, the remaining holes closest to and furthest from the centre are filled with screws that may be securely fastened in place. The placement of the plate and screw in the proximal section is confirmed using a C-arm imaging device. The whole plate, which had a fracture, was visualised under a C-arm to ensure proper alignment. Several screws were used to fill the appropriate area. Conventional screws are replaced with locking screws. Wound closure and ultimate wound condition. The drainage tube, if required, is placed at the location of the fibular wound.

Statistics Analysis

In order to get reliable outcomes given the limited number of instances in each group, the permutation test and the Karlsson and Peterson scoring methods are used.

RESULTS

A total of 50 patients with closed and open fractures of the distal tibia, who underwent treatment using different approaches, were chosen to be included in the research. Out of the total of 50 patients, 31 (62%) were men and 19 (38%) were girls. Males outnumber females at a ratio of 1.63 to 1. The mean age of the patients is 39.85 ± 3.85 years, with a range spanning from 18 to 65 years. The majority of cases, 35 out of 50 (70%), are attributed to road traffic accidents (RTA), whereas falls from height account for 5 instances (10%) and unintentional failures

account for 10 cases (20%). There were 27 instances (54%) distributed on the right side and 23 cases (46%) on the left side.

Among the 50 instances, 12 cases (24%) belong to AO type A1, 15 cases (30%) are classified as AO type A2, 20 cases (40%) fall under AO type A3, and 3 cases (6%) are classified as AO type B1. Of the 50 cases in total, 46 cases were monitored for a duration of 1 year. [Table 1]

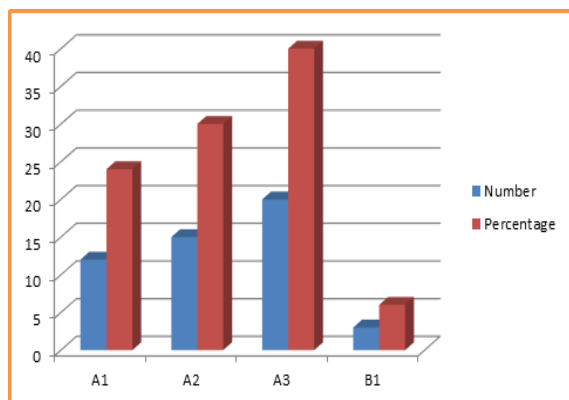


Figure 1: AO type

There were a total of 4 cases that were not pursued further. A total of 46 patients were evaluated for follow-up using the Karlsson and Peterson scoring method. In addition to subjective clinical judgement, ankle function was graded based on stability,

weight-bearing, edoema, and gait. In this study there were 22 (47.83%) excellent, 14(30.44%) good, 4(8.69%) average, 6(13.04%) poor results. The process of evaluating the healing of a fracture involves periodically capturing X-ray images from both the front and side angles. A radiological assessment is conducted to evaluate the alignment of the operated limb in comparison to the uninvolved leg, particularly in terms of valgus, varus, anterior, and posterior angulation. Subsequently, the conventional X-rays were juxtaposed with the surgically treated side in order to evaluate the precision of angulation. [Table 2]

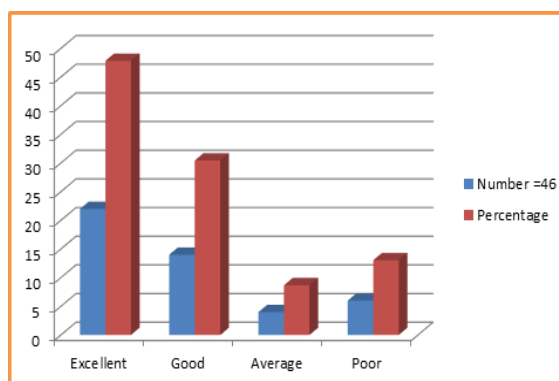


Figure 2: Outcome

Table 1: Basic parameter of the patients

	Number	Percentage	P value
Gender			0.15
Male	31	62	
Female	19	38	
Age in years			0.31
below 20	6	12	
20-30	11	22	
30-40	24	48	
40-50	5	10	
Above 50	4	8	
Mean Age in years	39.85±3.85		
Injury			0.17
RTA	35	70	
Fall from height	5	10	
Accidental fail	10	20	
Side distribution			0.11
Right	27	54	
lift	23	46	

Table 2: AO type

AO type	Number	Percentage
A1	12	24
A2	15	30
A3	20	40
B1	3	6

Table 3: Outcome

Outcome	Number =46	Percentage
Excellent	22	47.83
Good	14	30.44
Average	4	8.69
Poor	6	13.04

DISCUSSION

The treatment of fractures of the tibial plafond remains difficult and subject to debate. Despite the existence of several treatment methods and procedures, there is a lack of consensus on the most effective therapy for these complex injuries. The argument mostly revolves on treatment methods and procedures, as well as the delicate balance between the advantages of surgically restoring anatomy and the possible risks of further soft tissue damage and iatrogenic complications. The literature extensively documents the severity of these injuries, the intricacies of various treatment procedures, and the constraints of different management approaches. However, patients who have these fractures still struggle to achieve satisfactory long-term treatment outcomes.^[11] Out of the total of 50 patients, 31 (62%) were men and 19 (38%) were girls. Males outnumber females at a ratio of 1.63 to 1. The mean age of the patients is 39.85 ± 3.85 years, with a range spanning from 18 to 65 years. The primary aetiology in young people is vehicle accidents, but in older individuals, unintentional falls are more prevalent, sometimes attributed to the osteoporotic fragility of the bone. In this study there were 22 (47.83%) excellent, 14(30.44%) good, 4(8.69%) average, 6(13.04%) poor results. Jergesen et al,^[12] reported that asserted that open reduction and stabilization of serious tibial pilon fractures was impossible Fourquet et al,^[13] reported the overall poor result of pilon fracture after treatment. So for years, cast immobilization has been the most popular method of treatment. Ruedi et al,^[14] once again demonstrated a 75% success rate in achieving good and exceptional results with open reduction and internal fixation (ORIF). Heim et al,^[15] and later Ovadia and Beals,^[16] also reported positive outcomes in accordance with their concepts. Bourne et al,^[17] showed an 80% good outcome for type I and II fractures, but type III fractures had only a 44% satisfactory outcome. The common reasons of failure for this treatment method include inadequate alignment, unstable fixation, infection, lack of bone healing, and/or improper alignment. The trial conducted by Dillin and Slabaugh et al,^[18] revealed infection rates of 55% and wound sloughing rates of 36%. Ayeni et al,^[19] saw favourable outcomes with conservative management in type I fractures, unfavourable outcomes in type II fractures, and did not use cautious therapy for type III fractures. Furthermore, the incidence of post-traumatic arthritis was quite high, reaching 53% (10 out of 19 cases). All of these cases were classified as type II or III and were treated either with a plaster cast followed by open reduction and internal fixation (ORIF), or with ORIF alone. According to Mc Ferran et al^[20] 40% of patients had issues after undergoing open reduction and internal fixation (ORIF) for their pilon fractures. Teeny and Wiss,^[21] found that 37% of their patients suffered from

profound infections, whereas the incidence of ankle fusion in type III fractures following ORIF was 26%. In a prospective research conducted by Wyrsh et al,^[22] it was discovered that the ORIF group had a 28% infection rate and a 33% wound sloughing rate, whereas the external fixation group had a 5% infection rate and a 5% wound sloughing rate. In 1998, Sands et al. conducted a retrospective analysis of 27 out of 64 patients with plafond fractures who had open reduction and internal fixation (ORIF). They used SF-36 forms to assess the patients' health. The results indicated a drop in all eight categories, with a substantial decline in physical function and role restrictions related to physical health.^[23] Patterson & Michael,^[24] reported that 77% of the outcomes were classified as excellent, 14% as fair, and 9% as bad. No infections or problems related to soft tissue were seen. Bhattacharyya, Timothy,^[25] Discovered in 2006 during the use of stage ORIF with a posterolateral approach, a complication rate of 47% was observed, which included infection, non-union, and post-traumatic arthritis. Kline,^[26] The normal group exhibited a 19% infection rate and a 16% non-union rate, while the DM group showed significantly higher rates of infection (71%) and non-union (43%). Lisa,^[27] years old. During the treatment of 55 pilon fractures in 43 patients, Canada discovered a deep infection rate of 2% and a superficial infection rate of 5%. Justin and colleagues.^[28] The patients treated with ORIF in a staged operation had a reported infection rate of just 3.7% and a non-union rate of 3.7%, in contrast to the external fixation group which had an infection rate of 11% and a non-union rate of 22%. Among the 50 cases examined in our research, 12 cases (24%) were classified as AO type A1, 15 cases (30%) were classified as AO type A2, 20 cases (40%) were classified as AO type A3, and 3 cases (6%) were classified as AO type B1. Chris Cass evens categorises the partial articular undisplaced fracture as an extra-articular fracture. The average interval between the occurrence of an injury and the performance of a surgical procedure was 5.5 days. Three patients presented with Gustilo Anderson grade I open fractures. This research analysed the radiological and functional outcomes of 46 patients who had fixation treatment for pilon fractures. The ankle function was assessed using the Karlsson and Peterson grading method. 86.96% of patients get a favourable result, whereas 13.04% of patients have an unfavourable outcome. There are 35 individuals that have a distal fibula fracture on the same side. Prioritising the repair of concomitant fibular fractures enables us to achieve optimal limb length. However, managing the angulation proves to be challenging. The fracture fragments may be manipulated without the need for surgical incision using either a K-wire or a Steinmann pin. The preservation of fracture hematoma is the primary premise in plate osteosynthesis. Optimal alignment of anatomical structures and maintaining a stable environment contribute to improved production of

callus and facilitate effective healing. There were 35 instances where fibular fractures were present, even though the tibia was repaired using a non-invasive procedure. However, the fibular fracture was repaired using a surgical approach from the back and side, using a plate specifically designed for fractures that affect one-third of the bone. This fixation reached the same length as the fragmented pieces.

CONCLUSION

Orthopaedic surgeons have significant difficulties when dealing with distal tibial fractures, particularly when the soft tissue circumstances allow for it. In such cases, open reduction and internal fixation using minimally invasive procedures are the recommended approach. Our conclusion is that distal tibial fractures should be operated on soon following an anaesthetic examination. We propose a treatment strategy that involves a tiered approach to the fracture, starting with initial spanning external fixation and then proceeding to final fixation. The overall prognosis for these injuries is the general prediction or outlook for their likely outcome. Further investigation is required to enhance outcomes and enhance the well-being of people afflicted with pilon fractures.

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