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CORRECTIVE OSTEOTOMY OF THE FIBULA IN POORLY HEALED BIMALLEOLAR FRACTURE

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Abstract

Ankle fractures are among the most prevalent lower extremity fractures, with bimalleolar fractures accounting for 60% of cases. Proper classification using the Danis-Weber AO and Lauge-Hansen systems is crucial for guiding treatment decisions. This study presents a surgical approach for the correction of a bimalleolar fracture with fibular deformity, utilizing preoperative X-ray analysis and computer-aided calculations to determine the required osteotomy wedge dimensions. The procedure involved corrective osteotomy, plate fixation, and syndesmotic stabilization to restore anatomical alignment and joint stability. Surgical fixation remains the gold standard for unstable fractures, ensuring optimal functional outcomes. Postoperative rehabilitation plays a vital role in recovery, minimizing complications such as joint stiffness and arthritis. This case highlights the importance of precise preoperative planning, appropriate surgical techniques, and structured rehabilitation for successful management of ankle fractures.

Introduction

Ankle fractures are among the most common fractures of the lower extremities, comprising 9% of all fractures and representing a significant portion of trauma cases. The two most commonly used classification systems for ankle fractures include the Danis-Weber AO classification and the Lauge-Hansen classification [1].

Several methods for ankle fracture fixation exist, but the goal of treatment remains stable anatomical repositioning of the talus and correction of the fibula length, as lateral displacement of the talus in the ankle joint area reduces the contact surface by 42%, and displacement (or shortening) of the fibula by more than 2 mm will significantly increase the contact pressure in the joint [2]. Bimalleolar fractures are a type of ankle fracture involving the lateral and medial malleoli at the distal ends of the fibula and tibia, respectively. These two bones articulate with the talus to form the tibio-talar joint. Bimalleolar fractures account for 60% of all ankle fractures, with an incidence of 187 fractures per 100,000 people. Surgical treatment is the primary approach for bimalleolar fractures, as it involves an unstable fracture [3].

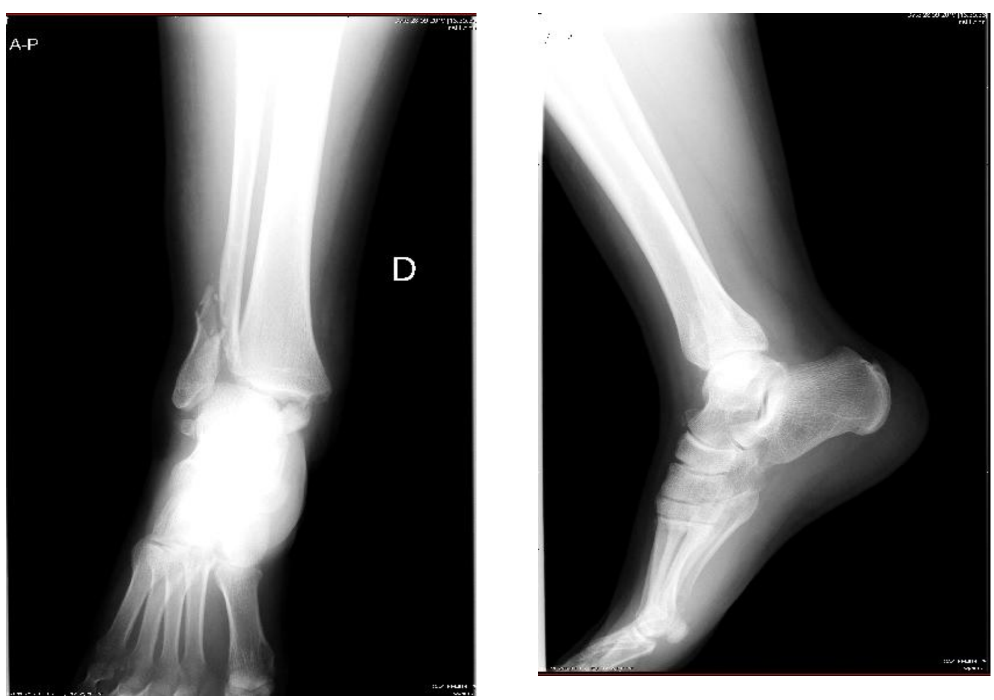

Figure 1. Initial X-ray

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Case

A 40-year-old patient injured their right ankle after a fall from the stairs, resulting in an open bimalleolar fracture. Routine clinical and diagnostic investigations were conducted (Figure 1), and indication for surgical treatment was established. The patient denied any relevant medical history.

Figure 2. Postoperative X-ray

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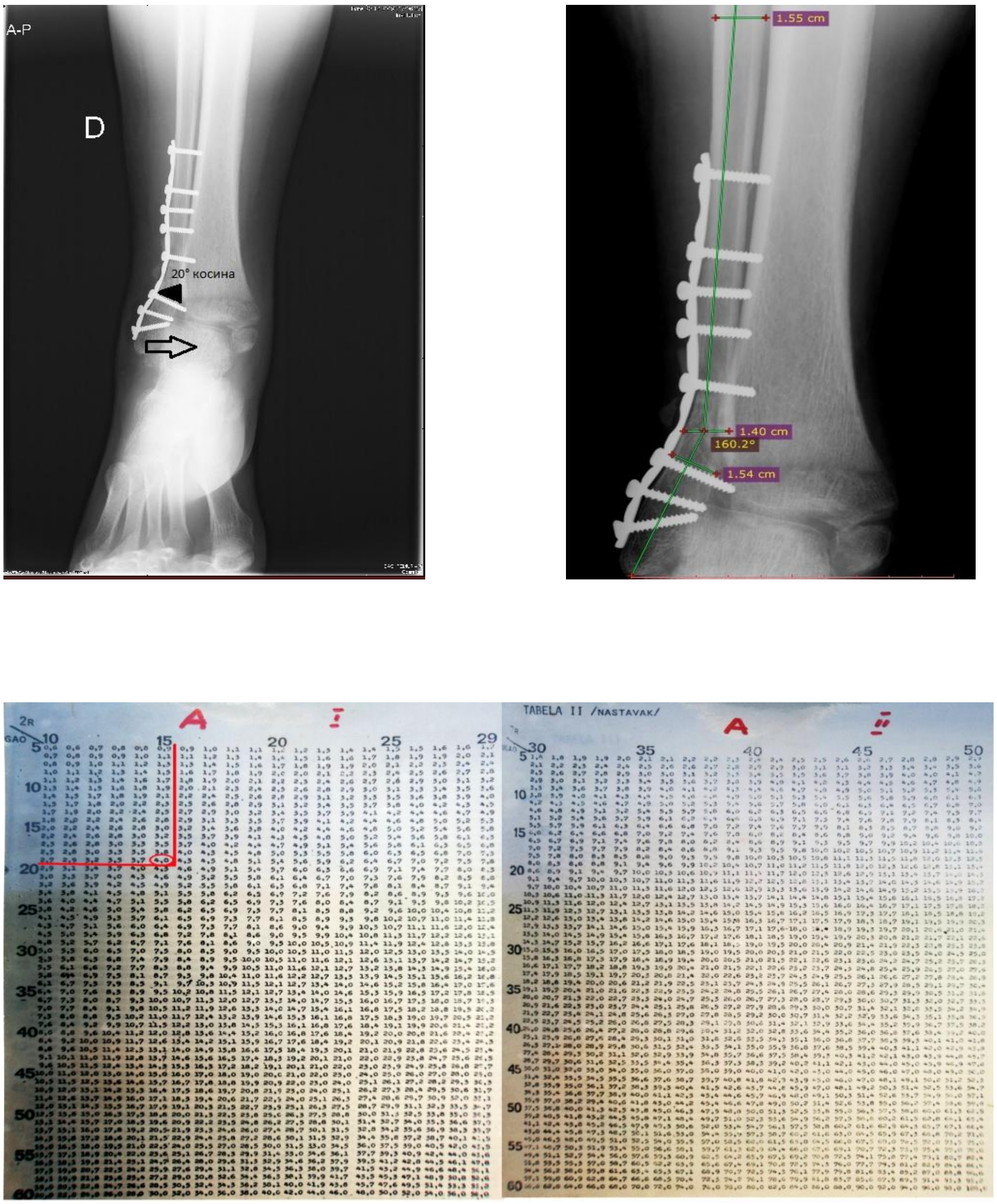

Figure 3. Computer processing of the preoperative X-ray

Initially, the medial malleolus was not operated on due to the open nature of the fracture, which had a skin defect on the medial side of the ankle and contused skin. The fibulo-tibial screw was removed in December 2019. After screw removal, the patient sustained another injury to the right ankle, tripping and loading the right leg with their full body weight. A corrective osteotomy was indicated (figure 2).

Treatment Planning

A corrective wedge with a medial base must be removed, and the entire ankle joint should be pushed medially. Correction of the fibula axis by 19.8 degrees is required. The diameter of the fibula at the osteotomy site is 15.4 mm. The height of the bone wedge with a medial base is 4 mm. Using the Ivan Djorik method, the preoperative calculation of the angle required for correction was made from the X-ray. Intraoperatively, the diameter of the cut fibula is measured. The height of the corrective bone wedge is shown in the table.

With computer processing of the preoperative X-ray, the angle of the fibula axis deformity and the fibula diameter at the osteotomy site are determined (Figure 3). The height of the wedge base is given in the corrective osteotomy table. A corrective osteotomy was performed on the fibula with the wedge base on the medial side. The old 2/3 plate was not removed. After correction, a new, shorter 2/3 plate was placed over the distal part of the old 2/3 plate. The shorter 2/3 plate was placed over the distal half of the old plate to increase its rigidity. A new fibulo-tibial screw was placed, passing through both 2/3 plates to maintain the corrected position of the ankle joint. A reduction and fixation of the medial malleolus were also performed using two Kirschner wires and a malleolar screw.

Discussion

Ankle fractures are one of the most common musculoskeletal injuries encountered in clinical practice. They often occur due to traumatic events such as falls, sports injuries, or motor vehicle accidents. The management of ankle fractures is crucial in minimizing complications such as chronic pain, instability, and arthritis, and in restoring function to the affected extremity [1].

In the presented case, the patient sustained an ankle fracture from a high-energy trauma, a common injury mechanism observed in similar cases. The classification of ankle fractures according to the Lauge-Hansen and[3] Danis-Weber systems plays a key role in guiding treatment.

These classifications, which take into account the direction of force and the level of fibular fracture, help predict fracture stability and guide decision-making regarding conservative versus surgical treatment. In our case, the fracture was classified as Danis-Weber type B, indicating a fracture at the level of the syndesmosis. This type is often associated with medial malleolar and syndesmotic injuries, which can complicate the healing process and increase the risk of long-term disability if not managed appropriately. The decision for surgical stabilization of the fracture was based on the instability of the injury and involvement of the syndesmosis, which required internal fixation to ensure proper alignment and anatomical repositioning. The treatment of ankle fractures has evolved over time.

Historically, many fractures were treated conservatively with cast immobilization. However, recent studies and evidence suggest that surgical intervention, particularly in cases of unstable fractures, is associated with better outcomes in terms of functional recovery and reduced complication rates. Surgical fixation with osteosynthetic material remains the gold standard for managing unstable fractures, as it provides anatomical repositioning and facilitates early mobilization, which is crucial in preventing joint contracture and muscle atrophy [4]. Postoperative rehabilitation is another critical aspect of managing ankle fractures. Early mobilization, partial weight-bearing, and physical therapy are essential for restoring range of motion and strength to the joint. In this case, the patient underwent a structured rehabilitation program, which included gradual weight-bearing exercises and range-of-motion activities [5]. Follow-up visits allowed monitoring of healing progress and adjustments to the rehabilitation program as needed.

Conclusion

Complications in the management of ankle fractures may include infection, nonunion, and post-traumatic arthritis. The presence of an open fracture, as seen in some severe cases, may increase the risk of infection. In this case, no signs of infection were present postoperatively, and healing progressed well. However, long-term follow-up is crucial for monitoring any signs of post-traumatic arthritis, which may develop in patients with a history of joint surface fractures. In conclusion, ankle fractures require a comprehensive approach to diagnosis and management, combining clinical examination, radio-diagnostic imaging, and appropriate classification to determine the most suitable treatment plan. Surgical intervention in cases of unstable fractures, followed by structured rehabilitation, is essential for optimizing functional recovery. Continuous postoperative monitoring ensures early detection of complications and supports the achievement of the best possible outcome.

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