

Blair fusion with Ilizarov technique: a revolutionary approach for managing comminuted fractures and fracture-dislocations of the talus

Abstract

Comminuted fractures and fracture-dislocations of the talus present significant challenges in orthopedic trauma, often leading to complications such as osteonecrosis that can severely impact long-term outcomes. This study evaluates the effectiveness of the Blair fusion with Ilizarov technique in managing these complex injuries. Effective primary management and close monitoring for potential complications, particularly in displaced fractures, were prioritized. Utilizing anteroposterior radiographs at 6-8 weeks post-injury allowed for early recognition of osteonecrosis through the Hawkins sign. Surgical intervention involved excising necrotic talus tissue and performing Blair fusion with Ilizarov fixator. Results indicated significant anatomical restoration without limb shortening, high rates of arthrodesis, and preserved functional mobility at the subtalar joint

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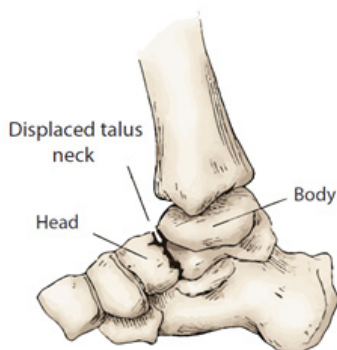
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Introduction

Comminuted fractures and fracture dislocations of the talus represent a complex challenge in orthopaedic trauma, often leading to significant morbidity if not managed effectively. The talus plays a crucial role in ankle stability and weight-bearing, making its preservation vital for maintaining function. Among these injuries, fractures of the neck of the talus are particularly concerning, as they frequently result in complications such as osteonecrosis, which can severely impact long-term outcomes.

Blair fusion with Ilizarov technique has emerged as a promising surgical approach for addressing these intricate fractures. By utilizing Ilizarov principles, this method allows for precise stabilization while promoting optimal healing conditions.^{1,2} However, satisfactory primary treatment alone is not sufficient; early recognition and management of potential complications, particularly osteonecrosis, are equally critical.

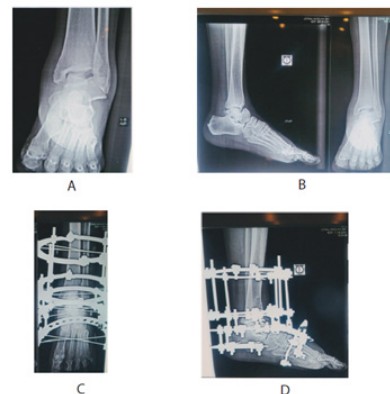


The talus, which has 60–70% of its surface covered in articular cartilage and no muscular attachments, is essential for ankle movement. Talar fractures are uncommon, making up 0.3% of all bone fractures and 3.4% of foot fractures, predominantly affecting males (up to 73%). These fractures typically occur in the neck of the talus and result in significant pain, swelling, and an inability to bear weight, with possible complications including avascular necrosis and post-traumatic arthritis.

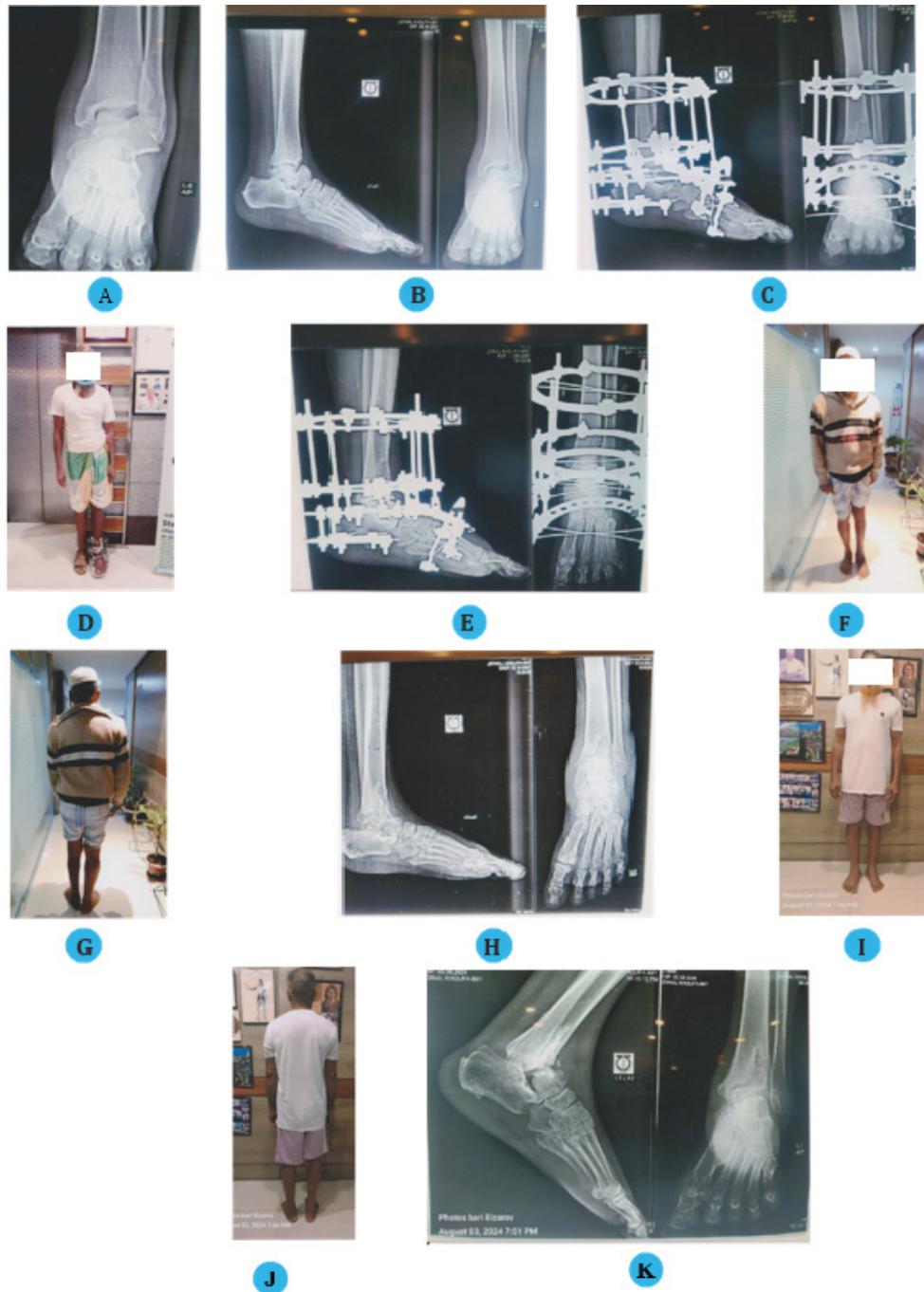
Materials and methods

From 1990 to 2023, we evaluated 64 patients with comminuted fractures or fracture-dislocations of the talar body, with a mean age of 27 years (range: 24–45), including 47 men and 17 women. In treating patients with fractures and fracture-dislocations of the neck of the talus, we prioritize effective primary management and closely monitor for potential osteonecrosis, especially in displaced fractures. Early recognition is key; we typically evaluate patients with anteroposterior radiographs between 6 and 8 weeks post-injury to identify any signs of osteonecrosis. The Hawkins sign, indicated by a thin line of subchondral lucency, can suggest vascularity and help us rule out this diagnosis.^{3–5}

When surgical intervention is necessary, we often excise the necrotic talus body and perform Blair type ankle fusion with Ilizarov, utilizing a sliding graft from the anterior tibia into the viable neck of the talus. We incorporate Ilizarov's technique alongside Blair fusion for enhanced stabilization and gradual correction of any deformities. To further improve anatomical integrity, we stabilize the calcaneus with an half ring. This technique ultimately leads to better outcomes for our patients.^{5,6}



A and B show osteonecrosis of the talus after a talar neck fracture. C and D depict the situation after the application of the Ilizarov fixator.



Case I

A&B) Comminuted nonunion of talus bone of left foot, 65 years old man (Front & Back view)

C) During treatment with Ilizarov technique

D) Patient with Ilizarov apparatus

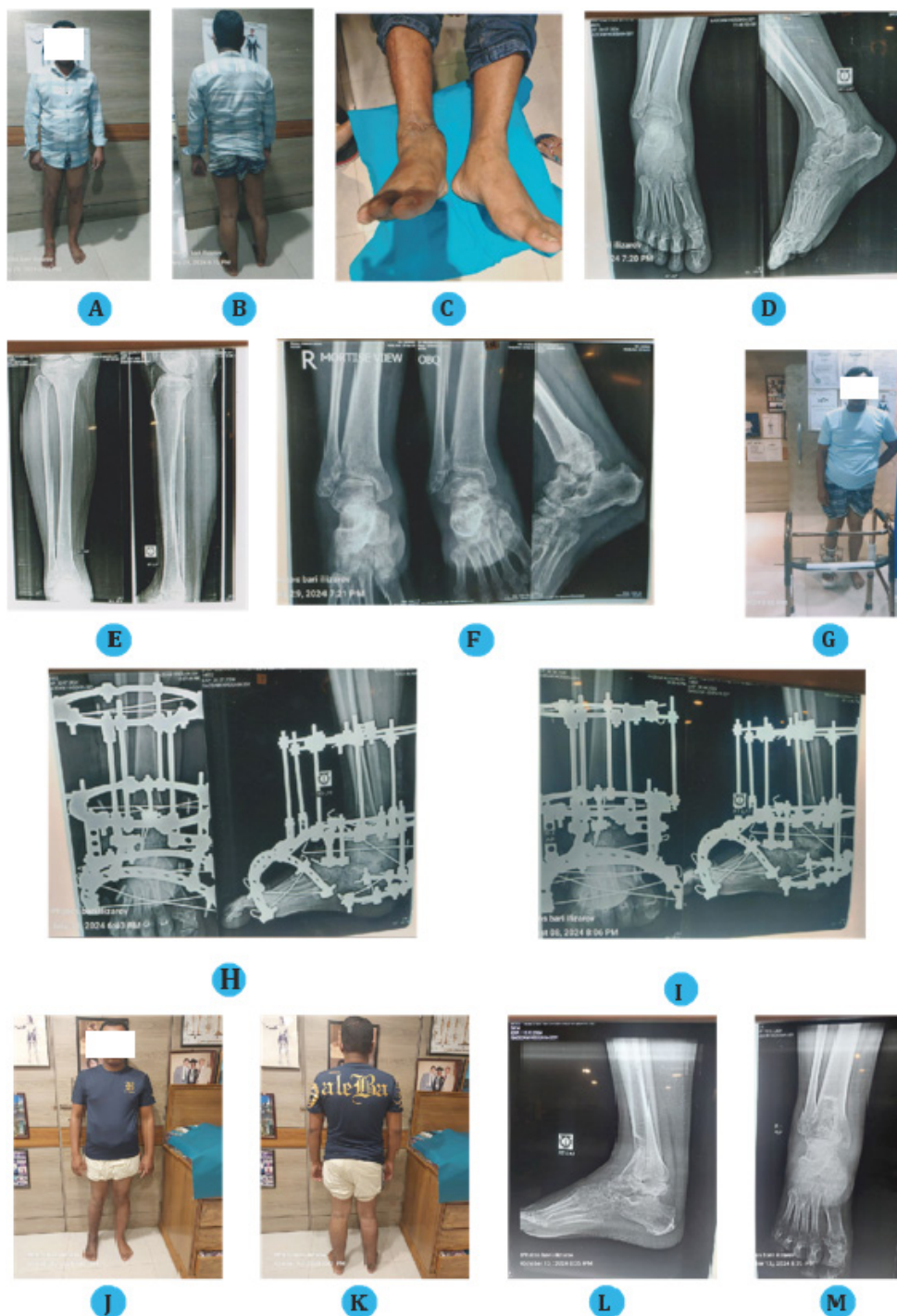
E) Radiograph of patient with Ilizarov apparatus after 1 month

F & G) Clinical appearance of patient after 3 month

H) Radiograph of patient after removal of frame, after 3 months

I & J) Final follow-up after 9 months (Front & Back view)

K) Radiographic result showing full correction after 9 months



Case 2

A, B & C) Old nonunion of Right talus, 33 years man

D,E, & F) Before surgery radiograph

G) Patient with Ilizarov apparatus

H) Radiograph of patient with Ilizarov apparatus

I) Radiograph of patient with Ilizarov apparatus after 1 month

J&K) Clinical appearance of patient after 2 months (Front & Back view)

L&M) X-ray showing full correction after 3 months of treatment

Goals of management

- i. Rapid reduction of dislocated joints
- ii. Relieve skin tension
- iii. Address any vascular compromise
- iv. Ensure proper anatomical alignment of fractures
- v. Provide stable fixation
- vi. Promote effective healing and union
- vii. Prevent potential complications

Results

Blair fusion with Ilizarov technique yielded positive outcomes in 64 patients with comminuted talus fractures. All patients achieved significant anatomical restoration without limb shortening, and a high arthrodesis rate was observed, with many retaining functional mobility at the subtalar joint.

Discussions

The management of comminuted fractures and fracture-dislocations of the talus presents significant challenges, particularly due to the risk of complications such as osteonecrosis. Our findings underscore the importance of prompt intervention and the use of advanced techniques like Blair fusion with Ilizarov technique. One key aspect of our study is the recognition that while nondisplaced talus fractures generally have a low incidence of complications, complete dislocations carry a high risk for osteonecrosis. Early identification through anteroposterior radiographs is essential, as complications can lead to poorer long-term outcomes.

The Ilizarov technique allows for precise stabilization of the talus, promoting healing osteogenesis. This is particularly beneficial for complex injuries, where traditional methods such as bone grafting and prolonged non-weight bearing have shown limited effectiveness. Our results demonstrate that this technique not only stabilizes the fracture but also enhances the likelihood of successful union and preserves function at the subtalar joint.⁴⁻⁶ Additionally, the absence of limb shortening in our patients indicates that Ilizarov's method maintains the foot-ankle relationship, which is critical for overall mobility and

quality of life. These positive outcomes reinforce the technique's role as a viable option in orthopedic practice, particularly for challenging talus injuries (Case 1 & 2).

Conclusion

In conclusion, Blair fusion with Ilizarov technique has proven effective in managing comminuted fractures and fracture-dislocations of the talus. Our study of 64 patients shows significant anatomical restoration without limb shortening, while emphasizing the importance of early detection and management of osteonecrosis. With high rates of arthrodesis and maintained functional mobility at the subtalar joint, this technique offers a reliable solution for complex talus injuries, highlighting its value in orthopedic practice for achieving favorable long-term outcomes.

Acknowledgments

None.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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