Case Report | Journal of Orthopaedic Case Reports 2026 September:16(9):Page 31-34

# Medial Malleolar Screw Fixation Causing Flexor Hallucis Longus Impingement: A Rare Case of Checkrein Deformity

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**Learning Point of the Article:**

Even minimal prominence of medial malleolar screws can cause mechanical impingement of the flexor hallucis longus tendon, leading to checkrein deformity; early dynamic imaging enables diagnosis and successful treatment through simple hardware removal.


## Abstract

**Introduction:** Checkrein deformity is a rare complication that manifests as dynamic flexion of the great toe during ankle dorsiflexion. Although most cases arise from adhesions or scarring of the flexor hallucis longus (FHL) tendon, mechanical impingement due to hardware placement has seldom been described.

**Case Report:** We present a 42-year-old male who developed checkrein deformity following open reduction and internal fixation of a trimalleolar ankle fracture. Dynamic ultrasonography revealed FHL tendon impingement beneath the medial malleolar screws. Hardware removal led to immediate resolution of the deformity, confirming the diagnosis. Post-operative rehabilitation restored full motion and function.

**Conclusion:** This case highlights the importance of considering tendon mechanics during medial malleolar fixation and of using dynamic imaging to differentiate between tendon adhesions and mechanical impingement.


**Keywords:** Checkrein deformity, flexor hallucis longus impingement, medial malleolar screw, ultrasonography, trimalleolar fracture.

## Introduction

Medial malleolar fractures are common lower extremity injuries that can result in a variety of complications, especially if not managed appropriately [1,2,3,4]. Among these complications, checkrein deformity is a rare yet functionally significant condition that may develop following trauma or surgery around the ankle region [4,5]. This deformity is characterized by abnormal motion of the hallux, typically manifesting as dynamic flexion of the great toe during ankle dorsiflexion and resolution during plantar flexion [6].

Checkrein deformity most often results from adhesions or entrapment of the flexor hallucis longus (FHL) tendon, secondary to scar formation, callus entrapment, or fibrosis after trauma [7,8,9,10]. Cases have been reported following fractures of the tibia, talus, and calcaneus, and after internal fixation procedures [7,11,12,13]. However, the development of checkrein deformity due to mechanical impingement of the FHL tendon beneath fixation hardware has been only rarely discussed in the literature [5,7,11,12].

Dynamic ultrasonography provides valuable diagnostic information in such cases, enabling real-time visualization of FHL motion and distinguishing mechanical impingement from adhesive tethering [7,13].

To the best of our knowledge, no previous report has described

Access this article online

Website: www.jocr.co.in

DOI: https://doi.org/10.13107/jocr.2026.v16.i09.7976

*Author's Photo Gallery*

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Submitted: 12/06/2026; Review: 02/07/2026; Accepted: August 2026; Published: September 2026

DOI: https://doi.org/10.13107/jocr.2026.v16.i09.7976

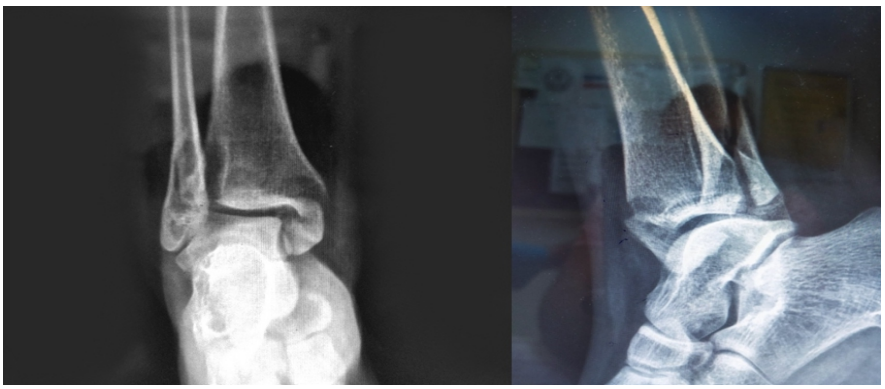

**Figure 1:** Emergency admission ankle anteroposterior and lateral radiographs of a 42-year-old patient with a trimalleolar fracture.

checkrein deformity caused by direct mechanical compression of the FHL tendon beneath medial malleolar screws. The present case highlights this rare mechanism, discusses its pathophysiology, and emphasizes the importance of dynamic imaging and early hardware removal in achieving a full functional recovery.

## Case Report

A 42-year-old male presented to the emergency department following a fall from height, sustaining a trimalleolar ankle fracture (Fig. 1). Initial anteroposterior and lateral radiographs revealed displaced fractures of the posterior, lateral, and medial malleoli. The ankle was temporarily immobilized in a below-knee splint until definitive fixation.

Open reduction and internal fixation were performed through standard approaches. For the medial malleolus, two cancellous screws were inserted after anatomical reduction (Fig. 2). The posterior and lateral malleoli were fixed with plate-and-screw constructs. After wound closure, a short-leg cast was applied, and the patient was instructed to remain non-weight-bearing for 4 weeks.

At the 1-month follow-up, after cast removal, the patient reported an abnormal motion of the great toe. During ankle dorsiflexion, the hallux developed a flexion deformity and could not return to neutral; this deformity resolved completely during plantar flexion (Fig. 3).

The patient experienced discomfort while walking, though ankle and lesser toe motion remained normal in the neutral position. Dynamic ultrasonography was performed to identify the cause of this phenomenon. The examination revealed impingement of the FHL tendon beneath the medial malleolar screws, producing mechanical compression during ankle motion. No peritendinous adhesions, fibrosis, or tendon rupture were observed. These findings confirmed a diagnosis of FHL impingement-induced checkrein deformity (Fig. 4).

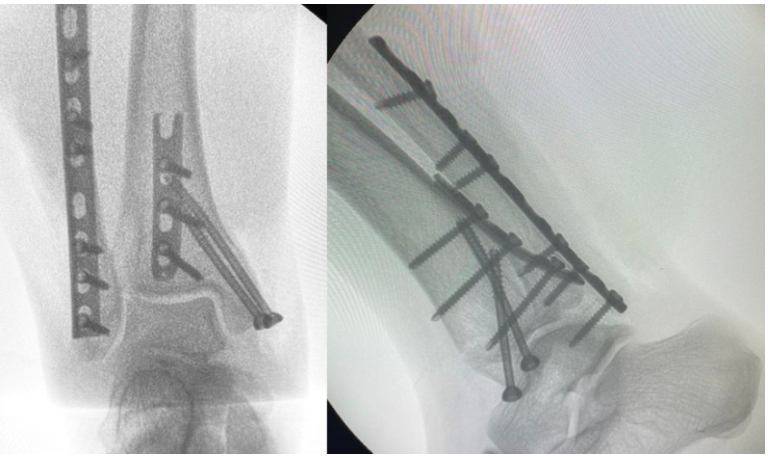

**Figure 2:** X-ray images taken in the operating room.

Figure 3: Checkrein deformity in the patient, which resolved during plantar flexion but appeared during dorsiflexion after cast removal at the 1-month follow-up.

Based on the imaging findings, hardware removal was planned to relieve the mechanical restriction. Under spinal anesthesia, both medial malleolar screws were removed through the previous incision. Intraoperative assessment showed immediate correction of the deformity when the ankle was dorsiflexed, confirming the mechanical nature of the impingement. No additional soft-tissue release was required. Postoperatively, the patient began early range-of-motion and strengthening exercises for the ankle and great toe. At 6 weeks after screw removal, full, pain-free movement of the hallux and ankle had been restored, with no recurrence of deformity. At the 6-month follow-up, the patient had returned to all daily activities without any functional limitations or discomfort.

**Figure 4:** Schematic illustration showing flexor hallucis longus tendon impingement beneath the medial malleolar screws during dorsiflexion.

## Discussion

Trimalleolar fractures are complex injuries that often require precise surgical intervention to restore joint congruity and prevent long-term dysfunction [8,9,10]. Although complications related to hardware or soft-tissue structures are not uncommon, impingement of the FHL tendon following internal fixation is exceedingly rare [5].

Checkrein deformity is typically caused by adhesions or tethering of the FHL tendon following trauma, fracture fixation, or soft-tissue injury [7,11,12,13]. The deformity manifests as flexion of the hallux during ankle dorsiflexion and resolution during plantar flexion, resulting from a dynamic restriction in tendon gliding rather than fixed contracture. Previous reports have described this condition secondary to entrapment of the FHL after talar or calcaneal fractures, or due to fibrotic adhesions around the tendon sheath [11,12,13].

In contrast, the present case demonstrates a purely mechanical cause of checkrein deformity, where the FHL tendon was directly compressed by the medial malleolar screws used for fixation. Dynamic ultrasonography allowed real-time visualization of the tendon impingement, confirming the diagnosis and differentiating it from adhesion-related pathology. This emphasizes the diagnostic advantage of dynamic imaging over static modalities in detecting subtle mechanical obstructions.

Immediate resolution of the deformity following screw removal further supports the mechanical nature of the problem and highlights the importance of understanding tendon anatomy and movement during surgical planning. Even minimal prominence or malposition of medial malleolar screws can result in tendon irritation or compression.

While tendon-related complications after ankle fracture surgery have been previously documented [8,14], this case represents a unique example of FHL mechanical impingement successfully treated by simple hardware removal. Awareness of this potential complication and early use of dynamic imaging can facilitate timely diagnosis, preventing chronic deformity and functional impairment.

## Conclusion

This case demonstrates a rare instance of FHL tendon impingement following medial malleolar screw fixation, resulting in checkrein deformity. Dynamic ultrasonography allowed accurate differentiation between mechanical impingement and adhesive restriction, enabling prompt diagnosis and targeted treatment. Hardware removal alone resulted in immediate and complete resolution of the deformity, confirming the mechanical etiology. Surgeons should consider the proximity of fixation screws to the FHL tendon during medial malleolar fracture fixation and remain vigilant for postoperative dynamic toe deformities.

### Clinical Message

In patients who develop a dynamic hallux deformity after medial malleolar fixation, mechanical impingement of the FHL by the fixation screws should be considered. Dynamic ultrasonography can identify this mechanical cause and may allow successful treatment with hardware removal alone, avoiding unnecessary tendon release.

**Declaration of patient consent:** The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

**Conflict of interest:** Nil **Source of support:** None

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**Conflict of Interest:** Nil
**Source of Support:** Nil

**Consent:** The authors confirm that informed consent was obtained from the patient for publication of this article

**How to Cite this Article**

Kahreman MA, Koluman AC. Medial Malleolar Screw Fixation Causing Flexor Hallucis Longus Impingement: A Rare Case of Checkrein Deformity. Journal of Orthopaedic Case Reports 2026 September;16(09): 31-34.