

# Management of Concurrent Talar Body and Bimalleolar Fractures in Sagittal Plane: A Case Report

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## ABSTRACT

Talar fractures are relatively uncommon, with an incidence of 0.1% to 0.85% of all fractures and 3% to 6% of all foot fractures. Among these, talar neck fractures are more common than those of the talar body, typically occurring in the coronal plane. Restoration of joint congruity is necessary to reduce the incidence of osteonecrosis and post-traumatic osteoarthritis. Most fractures occur in the talar neck or body in the coronal plane. In the present case report, authors present a sagittal plane fracture of the talar body in combination with a bimalleolar fracture in a 45-year-old female, managed with open reduction and internal fixation using screws. In the present case, the dual approach, which is ideal, could not be performed due to the condition of the wound over the lateral aspect of the ankle. Proper planning regarding the timing of surgery, considering the swelling and soft tissue status, alongside proper anatomic reduction and rigid fixation with good surgical technique and postoperative rehabilitation, are key to achieving favourable clinical outcomes.

**Keywords:** Osteonecrosis, Post-traumatic osteoarthritis, Talus fracture, Vertical fracture

## CASE REPORT

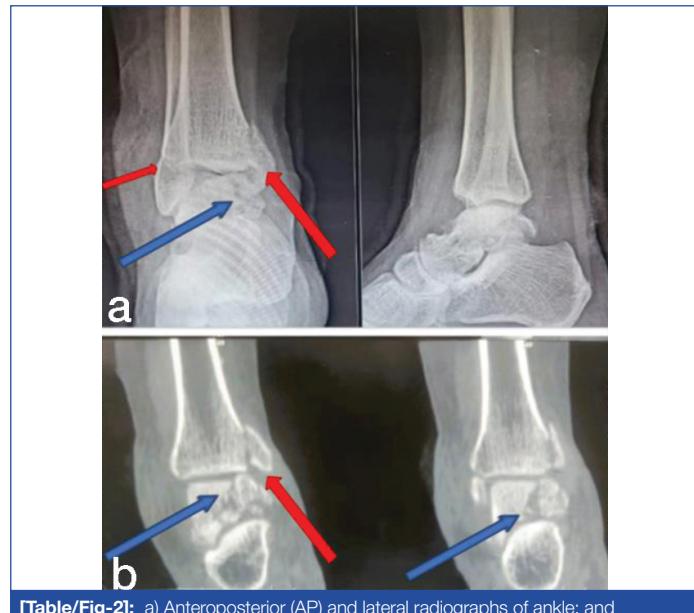
A 45-year-old female presented to the Emergency Department four hours following a road traffic accident, with a grossly swollen right ankle and foot, along with an inability to bear weight. Minor abrasions were noted over the lateral malleolus [Table/Fig-1]. The swelling was sudden in onset, firm in consistency and diffusely present around the medial and lateral malleoli, extending to the anterior aspect of the ankle joint and the dorsum of the midfoot. The distal neurovascular status was intact.



[Table/Fig-1]: Clinical picture of patient's ankle with abrasions over the lateral aspect.

Radiographs revealed a displaced vertical fracture of the body of the talus, a vertical fracture of the medial malleolus and a transverse fracture of the lateral malleolus [Table/Fig-2]. There was no past medical or surgical history, nor any previous surgeries. A preanaesthetic evaluation was conducted and fitness was given as American Society of Anaesthesiologists (ASA) grade 1. The patient was planned for open surgical fixation of the ankle.

With the patient in the supine position, a medial approach was utilised along the medial malleolar fracture line to expose the talar fracture. The deltoid ligament was protected along with the medial malleolar fragment. The minimally comminuted talar fracture was reduced and fixed with Arbeitsgemeinschaft für Osteosynthesefragen (AO) cancellous lag screws under fluoroscopic guidance. The reduction



[Table/Fig-2]: a) Anteroposterior (AP) and lateral radiographs of ankle; and b) Computed tomography coronal section of ankle showing fracture pattern. (Blue arrow showing talus fracture, Red arrow showing medial (large) and lateral (small) malleolus).

was optimal due to minimal resorption of the comminuted ends. The medial and lateral malleoli were also fixed with cancellous screws [Table/Fig-3,4].



[Table/Fig-3]: Intraoperative C-arm picture of fracture fixation.



[Table/Fig-4]: Immediate postoperative radiograph of right ankle AP and lateral.

Postoperatively, the patient was advised against weight-bearing for six weeks [Table/Fig-5], progressing to full weight-bearing by 12 weeks. At the end of one year, there was a terminal limitation of ankle movements.



[Table/Fig-5]: Postoperative radiograph of right ankle AP and lateral at six weeks postoperative.

## DISCUSSION

Talar body fractures are uncommon, accounting for less than 25% of all talus fractures [1]. Unlike talar neck fractures, the fracture line in talar body fractures extends into the articular surfaces of both the ankle and subtalar joints, leading to an increased risk of arthritis in both of these joints [2].

Inokuchi S et al., further classified vertical fractures into two groups based on the fracture angle in relation to the longitudinal axis of the talar trochlea. They categorised fractures with angles of less than 45 degrees to the talar trochlea as sagittal fractures, with 10-30 degrees in one group and 30-40 degrees in another group. In this case, the fracture line is about 20 degrees from the longitudinal axis of the talar trochlea. The fracture line is more clearly visible in the Anteroposterior (AP) view of the ankle X-ray for fractures in the 10-30-degree group, where the fracture line extends from the lateral sinus tarsi to the sulcus of the flexor hallucis longus [3]. The mechanism of injury varies based on fracture patterns.

The anatomy of the talus is unique with respect to its articulations, osseous structure and blood supply. Most of its surface is covered by articular cartilage and has no muscular or tendinous attachments. The main blood supply to the talar body comes from the posterior tibial artery, which gives rise to the artery of the tarsal canal, supplying the posterior and lateral two-thirds of the body. It also provides a deltoid branch that courses through the ligament and supplies blood flow to the medial aspect of the body [4].

In the present review of the literature consisting of 14 case reports, 7 cases (50%) were fixed through an anteromedial approach, 3 cases (21.4%) were fixed through a combined anteromedial and anterolateral approach and 2 cases (14.2%) were fixed through an anterolateral approach, one of which also required a lateral incision to fix a fibula fracture. Additionally, 2 cases (14.2%) were fixed through percutaneous fixation, one of which involved arthroscopic-assisted reduction [Table/Fig-6] [1,2,5-15].

Two-screw fixation of the talus was performed in 9 cases (64.2%), while single-screw fixation was done in 2 cases (14.2%). Three-screw fixation was used in 1 case (7.14%) and mini-plate fixation was applied in another case (7.14%). In 1 case (7.14%), a small fragment in the posteromedial body was excised.

Authors	Year and place for study	Pattern of fracture	Approach	Fixation	Follow-up	Outcome	Complications
Mendonca AD et al., [7]	2004 Wales, UK	Talar body fracture in sagittal and coronal plane with medial malleolus fracture.	Anteromedial	Talus fixed with one CC screw and medial malleolus fixed with 2 lag screws.	6 months	Full ROM	None
Geary NP [11]	2004 Wirral, UK	Talar body fracture in sagittal and coronal plane.	Arthroscopic assisted reduction and percutaneous fixation	Talus fixed with three CC screws.	Not mentioned	Not mentioned	Not mentioned
Shah K and Hakmi A [6]	2004 London, UK	Sagittal plane fracture of talar body with medial malleolus fracture	Closed percutaneous	Percutaneous two CC screw fixation for medial malleolus and talus fixed with two CC screws.	Not mentioned	Not mentioned	Not mentioned
Saidi H et al., [15]	2008 Marrakesh, Morocco	Talar body fracture in sagittal plane and medial malleolus fracture.	Anteromedial	Talus fixed with two screws and medial malleolus fixed with two screws.	6 months	Good, painless ROM	None
Clement ND et al., [10]	2010 Edinburgh, UK	Medial talar body fracture in sagittal plane with pan-talar dislocation, medial malleolus fracture.	Anteromedial	Malleolus fixed with single malleolar screw, Talar body is excised and calcaneocuboid fixed with k-wires, bridging external fixator.	15 months	Plantar flexion-20 degrees, dorsiflexion-10 degrees, inversion-20 degrees and eversion-10 degrees, with full power (5/5 MRC scale) in all planes	Minimal pain on prolonged walking, Ambulating using stick after 15 months
Mechchat A et al., [5]	2014 Morocco	Talar body and neck fracture in sagittal and coronal plane with medial malleolus fracture.	Anteromedial	Talus fixed with two CC screws and medial malleolus fixed with malleolar screw and k-wire.	14 months	Plantar flexion-20 Dorsiflexion-10 Inversion-20 Eversion-10 AOFAS- 87/100	Minimal post-traumatic osteoarthritic changes of the ankle joint, no collapse of the talar body and no joint incongruity

Arkesh M et al., [2]	2016 New Delhi, India	Talar body fracture in sagittal plane, medial malleolus fracture.	Anteromedial and anterolateral	Talus fixed with 2 Herbert screws from either direction and medial malleolus fixed with two partially threaded 4.5 CC screws.	6 months	Loss of 5 degrees terminal dorsiflexion compared to normal	Mild pain on prolonged walking
Oesman I and Nugroho A [1]	2019 Jakarta, Indonesia	Talar body fracture in both sagittal and coronal plane with medial malleolus fracture.	Anteromedial and anterolateral	ORIF with plate fixation for talus and tension band wiring for medial malleolus.	1 year	Full range of movements	None
Lahrach K et al., [9]	2019 Morocco	Talar body fracture in sagittal plane.	Anteromedial	Malleolus fixed with two malleolar screws; Talus fixed with two CC screws.	6 months	Full recovery	None
Chen KM et al., [14]	2020 Taichung, Taiwan	Talar body fracture in both sagittal and coronal plane with talar neck comminution, bimalleolar fracture.	Anteromedial and anterolateral	Mini-hook plate for lateral malleolus, tension band wiring for medial malleolus, single Herbert screw for talus fracture.	10 months	90 on the Baird and Jackson Scoring System and 95 on the American orthopaedic foot and ankle society ankle- hindfoot scale	None
Jha AK et al., [13]	2021 Jamshedpur, India.	Sagittal plane fracture of talar body and neck.	Anteromedial	Talus fixed with two cannulated screws and medial malleolus fixed with malleolar screws and k-wire.	14 months	AOFAS score- 87. plantar flexion-20 degrees, dorsiflexion-10 degrees and eversion-10 degrees	Minimal post-traumatic osteoarthritic changes of the ankle joint
Kumar PS [8]	2021 Navi Mumbai, India	Talar body fracture in both sagittal and coronal plane with medial malleolus fracture.	Anteromedial	Talus fixed with two Herbert screws and medial malleolus fixed with two malleolar screws.	1 year	Full range of movements equal to opposite side	Occasional pain on prolonged standing and walking
Van Rooijen JL et al., [12]	2023 Maastricht, Netherlands	Talar body fracture in sagittal plane with anterolateral intra-articulated tibia fracture and distal fibula fracture with syndesmotic injury.	Anterolateral and lateral	Emergency External fixation. 14 days later-talus fixed with two 4.5 Herbert screws, tillaux fragment fixed with 4 mm cannula tied screw, fibula fixed with 3.5 mm locking bridging plate and syndesmoses fixed with positional screw through the plate.	Online follow-up for 12 months	Full weight bearing in 3 months	Some of the hardware was removed due to irritation 12 months after the initial surgery

[Table/Fig-6]: Compilation of previous similar case reports [1,2,5-15].

CC: Cancellous compression; ROM: Range of motion; AOFAS: American orthopaedic foot and ankle score; ORIF: Open reduction and internal fixation; MRC: Medical research council

A total of 9 cases (64.2%) reported good outcomes with normal or near-normal range of movements, although two of these cases experienced minimal pain during prolonged walking as a complication. A total of 3 cases (21.4%) had poor outcomes with decreased range of movements at their final follow-up, with two cases exhibiting osteoarthritic changes in the ankle joint. The outcomes for the other 2 cases (14.2%) were not mentioned.

Through the present review, the most preferred approach was the anteromedial approach with osteotomy of the medial malleolus, which preserves the blood supply of the talar body through a branch to the deltoid ligament. In the present case, the anteromedial approach utilised the fracture window of the medial malleolus. The usual fixation for sagittal fractures involves either a single screw or double screw fixation, performed from the medial side or from both the medial and lateral sides.

Sneppen et al., defined sagittal fractures as those with a vertical line closer to the sagittal plane [15]. Complications such as avascular necrosis and post-traumatic osteoarthritis are common in talar body fractures due to the involvement of the articular surfaces on either side, particularly in Sneppen type C (sagittal shearing) and type D (posterior tubercle) fractures [15]. However, this specific pattern of sagittal shear fracture of the talar body, along with the medial malleolus, has an advantage due to the intact deltoid ligament, which preserves the blood supply on the medial side.

## CONCLUSION(S)

Considering the rarity and associated complications, the fixation of talar body fractures in the sagittal plane, along with bimalleolar fractures, is challenging. Proper planning must be done regarding the timing of surgery, taking into account the swelling and soft tissue

status. Adequate anatomic reduction and rigid fixation, combined with good surgical techniques and postoperative rehabilitation, are key to achieving favourable clinical outcomes.

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