



## Review

# Talar head fracture: A case report, systematic review and suggested algorithm of treatment



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## HIGHLIGHTS

- Uncommon injury with a paucity of available evidence regarding its management.
- The commonest mechanisms of injury are axial loading in plantar or dorsiflexion.
- Undisplaced fractures should be treated non-operatively.
- Displaced intra-articular fragments should be removed if stable and involve <50%.
- Surgical fixation should be considered if displaced fragments >50% or instability.

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## ABSTRACT

**Introduction:** Talar head fractures are uncommon. This rarity contributes to the lack of structure and clarity in its management. The purpose of this systematic review is to analyse the published literature on management of these injuries and suggest a treatment plan that was followed in our case.

**Methods:** A search of Medline, EMBASE, AMED and Google Scholar was performed on 1st September 2014. Any article reporting case(s) of talar head fractures were included and studies of other anatomical types of talar fractures, stress fractures or paediatric cases were excluded. The paucity of data precluded data synthesis and instead a narrative synthesis was performed.

**Results:** Of 45 studies identified, five publications with seven case reports met the inclusion criteria. One occurred secondary to snowboarding, one wakeboarding, one inversion injury whilst walking and one gymnastic injury. Two patients were managed operatively and two non-surgically with one requiring surgery for a symptomatic mal-union.

**Conclusion:** Talar head fractures are rare and high quality literature regarding management of these injuries is lacking. A suggested algorithm for treatment is proposed, but further robust studies are required to substantiate this approach.

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## 1. Introduction

Fractures of the talus are uncommon, accounting for between 0.1% and 0.85% of all fractures [1,2]. Typically they occur secondary to high-energy injuries and may be associated with other musculoskeletal injuries. As 60–70% of the talar surface is covered by cartilage, a high proportion of fractures are associated with joint subluxation or dislocation. A lack of tendon or muscle attachments

limits the available blood supply placing the bone at risk of avascular necrosis after fracture. The extraosseous blood supply is formed by the anastomosis of posterior tibial, dorsalis pedis and peroneal arteries. The intraosseous blood supply from the dorsalis pedis superiorly and the artery to the tarsal sinus inferolaterally [3].

Talar head fractures are rarer, accounting for 2.6–10% of all talar injuries and can be compression or shear type [3–6]. The head of the talus is rich in its blood supply, which is derived mainly from the anterior tibial artery through its tarsal sinus artery and the lateral tarsal artery, therefore the incidence of avascular necrosis is approximately 10% [3–6]. Talar head fractures are difficult to diagnose with conventional radiographs, and often require oblique

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views to help identify injuries of the head and neck [4]. Canale and Kelly described a technique to obtain oblique radiographs with the clarity needed to visualise head and neck fracture of the talus [4,7]. The technique requires placing the foot in maximum equinus, and pronating the foot to 15°. The X-ray machine tube should then be directed cephalad at 75° from the surface top. Computed tomography has generally superseded these views and is essential to identify and define the extent of the injury (including associated fractures), clarify anatomy, and to help plan any surgical intervention [1,5,6].

A paucity of evidence is available regarding management of talar head fractures and therefore we present a systematic review of the English literature aiming to clarify the understanding and management of these injuries.

## 2. Materials and methods

A search of Medline, EMBASE, AMED, Google Scholar and web of knowledge search engines using the keywords “Talar head injury”, “Talar head fracture”, “Talus head”, “Talus head fracture”, “Talus head injury”, “Head of talus” and “Talar head” was performed on 1st July 2014. Searches were not limited by dates. Papers were reviewed by all four authors independently and any disagreements were resolved through discussion. Any article reporting a case or case series of talar head fractures including either the presentation, management or complications were included for review. Studies were excluded if they included other anatomical types of talus fracture, reported paediatric cases, stress fractures or were published in a language other than English.

This systematic review is fully compliant with the PRISMA guidelines for production of a systematic review [8] as shown in Table 1. The Methodological Index for Non-Randomised Studies (MINORS) was used for the critical appraisal and the quality assessment process [9]. Due to the heterogeneity of the reported data and the lack of comparative studies; only a narrative description of these data was conducted.

## 3. Results

A flow chart depicting the search strategy is shown in Fig. 1. After full article review five published reports of talar head fractures were identified and included. Despite providing only level IV evidence, the included studies were found to be of high quality according to the MINORS. A summary of the included studies is given in Table 2

## 4. Mechanism of injury

Previous literature has suggested that talar head injuries result from axial compressive forces through the talar head in a plantar flexed foot [3,4,6]. In 1952, Coltart [15] reported 228 cases of talar injuries of which six cases were talar head fracture. Four of these six cases occurred in flying accidents where the pilots' feet were in a plantar flexed position. Another mechanism is thought to be a hyperdorsiflexion, which results in compression of the head against the anterior tibial edge [1,5]. Four of the seven cases in this review reported a mechanism of injury; one during snowboarding, one wakeboarding, one due to twisting injury to the foot in downhill walking and one a gymnastic injury. The gymnast landed on the ball of his foot following a back handspring with the proposed mechanism a compressive force along longitudinal axis of the talus. The wakeboarding and snowboarding injuries are likely to have suffered axial loading in dorsiflexion whilst the exact mechanism after twisting injury is not clear.

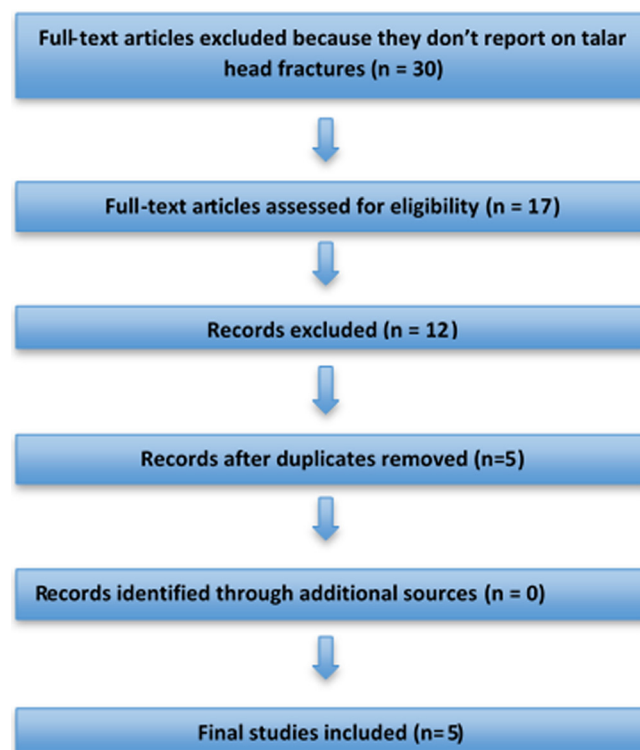


Fig. 1. PRISMA flow chart for the included studies and for constructing the systematic review.

## 5. Treatment

There are no comparative studies in the literature for the treatment of talar head fractures. Of the seven cases reporting treatment, two were managed operatively; one using inter-fragmentary screws and one with Kirschner wires. Two cases were managed non-operatively and advised to non-weight bear for 4 weeks. Three cases were diagnosed late on MRI scan after presenting with persistent pain, these patients received no initial treatment [10].

Mulligan [14] reported a 27 year-old male gymnast who, after landing awkwardly performing a back handspring, suffered an undisplaced horizontal talar head fracture. It was thought that the mechanism of the horizontal fracture was a compressive force directed along the longitudinal axis of the talus. As the fracture was undisplaced, the patient was treated in a short leg walking cast for 4 weeks, and was followed up for 21 months when he reported being symptom free and back to pre-morbid function.

Matsumura et al. [11] report a 26 year old gentleman who suffered a displaced fracture of the talar head whilst jumping into the sea on a wakeboard. Initially the injury remained unidentified and the patient was immobilised in a cast for four weeks. Due to ongoing pain, at 5 months post injury, imaging revealed a mal-union of the medial talar head, widening of the talonavicular joint and an impacted fracture of the navicular. The patient underwent surgery through a medial approach; the talar head was osteotomised, a tricortical bone graft from the iliac crest positioned and held with cancellous screws. The patient was immobilised in non-weight bearing for 3 weeks and partial weight bearing for a further 5 weeks. The authors report that by three months post-operatively he had returned to pre-injury activity level.

Vlahovich et al. [12] report a 33 year old female snowboarder who injured her foot when landing after a small jump. A computed tomography scan demonstrated a fracture of the middle facet of the talus with sagittal extension through the talar head. The patient underwent open reduction through a medial

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