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# An Insight of Complications of Talar Neck Fractures

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## Abstract

**Background**: The goal of talar neck fracture treatment is anatomic reduction, which necessitates careful attention to the neck's rotation, length, and angulation. The exact reduction of talar neck fractures leads to improved results, according to biomechanical investigations on cadavers. The contact parameters of the subtalar joint were found to be altered by displacements of as low as 2 mm in one cadaveric investigation, with dorsal and medial or varus displacement generating the most change. Contact stress was reduced in the anterior and middle facets but was more localized in the posterior facet when the weight-bearing load channel altered. Despite advancements in surgery time, procedures, and equipment, talar neck fracture complications are still common. The severity of the initial injury appears to have a strong influence on the incidence of complications, therefore the Hawkins categorization remains useful. Fracture comminution has also been recognized as a predictor of problems in recent studies

**Keywords**: Talar Neck Fracture

## Introduction

Despite advancements in surgery time, procedures, and equipment, talar neck fracture complications are still common **(1)**. The severity of the initial injury appears to have a strong influence on the incidence of complications, therefore the Hawkins categorization remains useful. Fracture comminution has also been recognised as a predictor of problems in recent studies **(2)**. The relatively good function that can be attained in the absence of osteonecrosis and other problems is also noteworthy **(3)**.

1) Skin Necrosis and Infection:

The skin of the ankle and foot is delicate and prone to injury. In both closed and open talus fractures, infection can be an issue. Without a doubt, deep infection is a fatal complication. The severity of this issue is noted in earlier literature. In 1848, Syme recorded a sequence of 11 deaths in 13 individuals with open talus fracture dislocations, all of which were caused by infection **(4)**. As a therapy option, he suggested a trans-tibial amputation. Deep infection has also been mentioned in more recent cases **(4)**.

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Treatment becomes extremely difficult after a deep infection has developed. The talus' avascular body functions as a vast necrotic sequestrum. To control the infection, surgical debridement, including talectomy, may be required. In terms of hindfoot alignment and stability, excision of the necrotic talus combined with delayed tibiocalcaneal fusion produces the greatest results **(5)**.

2) Osteonecrosis: Osteonecrosis is a condition that affects the bones

Osteonecrosis is a common consequence of talar neck fractures, with an overall prevalence of between 21% and 58 percent **(5)**. Osteonecrosis is a rare complication in Type I fractures, with a risk of 0% to 13%. The likelihood of osteonecrosis increases to 20% to 50% of Type II fractures and over 80% of Type III fractures when the fracture dislocates. The incidence of osteonecrosis varies depending on the diagnostic criteria employed in published publications, although it generally coincides with the Hawkins classification **(5)**. When the talar body shows increased density compared to the surrounding bone, which is vascularized and experiencing disuse atrophy, a radiographic diagnosis of osteonecrosis is obtained. (fig.39)

**Figure (1):** Radiographic diagnosis of osteonecrosis **(6)**.

Later, as the talar body revascularizes, the subchondral bone collapses partially or completely, the joint space narrows, and the talar body fragments.

The Hawkins sign is a well-described radiographic marker indicating talar body viability (Fig.41). Hawkins states that the presence of avascular necrosis [osteonecrosis] should be recognised between the sixth and eighth week following the fracture-dislocation. If the patient has been nonweight-bearing, widespread atrophy in the bones of the foot in the distal section of the tibia can be seen on a roentgenogram at this point. With the foot out of the plaster cast, an anteroposterior roentgenogram of the ankle indicates the presence or absence of subchondral atrophy in the talus dome. Avascular necrosis [osteonecrosis] is ruled out by subchondral atrophy **(6)**.

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**Figure (2):** The Hawkins sign **(7)**.

According to Daniels and Smith, the Hawkins sign has a high sensitivity but relatively low specificity **(8)**. In their investigation, Rodriguez-Paz S.et al. shown that a positive Hawkins sing excludes out avascular necrosis in the broken talus, but its absence does not rule it out **(9)**.

The amount to which the talar body is involved varies **(10)**. Partial osteonecrosis has been observed in some cases, notably in Type II fractures. The entire talar body's blood supply is disrupted in many Type III injuries, resulting in talar osteonecrosis. Tehranzadeh et al describe three examples of a partial Hawkins sign following talus fractures and speculate that the partial Hawkins sign may be related to end artery disruption within the talus's body. Recognition of a partial Hawkins sign should prompt further investigation and diagnostic testing **(11)**.

Technetium bone scans and magnetic resonance imaging are two more diagnostic methods used to assess osteonecrosis. The use of a pin-hole collimator **(12)** for bone scanning can be helpful, but MRI has mostly superseded it. MRI can be utilised as early as three weeks after an injury to determine the existence and extent of osteonecrosis, as well as the articular cartilage's state **(8)**.

Once osteonecrosis has been diagnosed, the prognosis and optimum treatment options are still up in the air. Even complete talar body osteonecrosis may result in an acceptable outcome. If the fixation is stable, union can occur even if there is osteonecrosis. Because the talus is revascularized slowly through creeping substitution of necrotic bone with vascularized bone, long durations of nonweight-bearing have been advocated. This procedure could take up to 36 months **(13)**. The amount of nonweight-bearing time required is unpredictable, impractical, and difficult for patients to stick to. A patellar tendon carrying orthosis is an alternative to surgery. In a study of patellar tendon bracing in Charcot arthropathy, Saltzman et al discovered that force transmission to the hindfoot was reduced by 37%. **(14)**. The brace also protects the hindfoot from varus and valgus strains. There are various surgical methods for treating osteonecrotic talus. Surgical treatment

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should be started right away, according to some authors. Primary triple arthrodesis **(5)**, whole talectomy with tibial calcaneal fusion **(14)**, talectomy alone, subtalar fusion **(15,16)**, pantalar fusion **(17)**, and primary tibiotalar fusion are some of the procedures that have been used.

In most cases, however, a reasonably conservative treatment is recommended, with osteonecrosis of the talus treated promptly and the talar body fragment preserved. Primary arthrodesis is not recommended since anatomic reduction and fixation are maintained.

In the literature, there are a few case reports and small series that describe successful attempts to revascularize the necrotic talus. Hussl present a technique for preventing iliac crest collapse utilising a vascularized corticocancellous iliac crest bone graft **(17)**. In 17 ankles with symptomatic nontraumatic osteonecrosis but no collapse, Mont et al conducted a version of core decompression of the talus **(18)**. However, patients with osteonecrosis frequently appear with concomitant collapse, in which case treatment focuses on pain reduction and alignment restoration.

Not all episodes of collapse are accompanied by symptoms. In rare cases, the entire talar body can collapse while the ankle joint remains largely coherent. These ankles do not function normally, although they may be acceptable to the patient. Partially collapsed talar bodies are frequently linked with severe hindfoot malalignment and articular cartilage abnormalities, necessitating further therapy to alleviate symptoms.

Unfortunately, osteonecrosis is frequently linked to the collapse of the talar dome and the onset of painful ankle arthritis. Ankle arthrodesis is recommended for these patients. Blair or modified Blair fusion, as well as tibiocalcaneal arthrodesis, have both been reported to be beneficial. In 1943, Blair introduced the technique of ankle fusion, which was created to treat osteonecrosis of the talus **(19)**. He suggested removing the avascular talar body and inserting a sliding corticocancellous graft from the anterior distal tibia into the talar head and neck that was still viable (Fig.41).

Screw fixation of the sliding anterior distal tibial graft, as indicated by Lionberger et colleagues **(20)**, and retention of the talar body are two modifications to this approach. Case series have been evaluated by authors such as Morris et al **(21)** and Dennis and Tullos **(22)** who advocate the modified Blair fusion as an acceptable reconstructive technique following severe talar injury. The Blair fusion has a number of advantages, including a natural-looking foot, little shortening, and the possibility of retaining some subtalar function. Tibiocalcaneal arthrodesis is an alternative in which the entire calcaneus is fused to the distal tibia, often with the assistance of intercalary graft material, to facilitate a hindfoot arthrodesis **(14)**. Canale and Kelly found that the results were superior than talectomy or ankle fusion **(23)**. The fusing of the tibia to the calcaneus, according to

proponents, may provide more stability than the sliding graft approach. If the appearance and length of the hindfoot are to be preserved, intercalary material must be used.

In conclusion, taloneurotic osteonecrosis is a serious condition. However, the radiographic appearance of osteonecrosis does not always correspond to persistent impairment. The presence of a subtalar dislocation can help anticipate the onset of osteonecrosis. When the subtalar joint was not dislocated, it never happened. When osteonecrosis develops, it frequently revascularizes without causing talar dome collapse **(24)**.

The current suggestion is to restore the talus with an anatomic reduction and stable fixation at the moment of damage. The use of a patellar tendon bearing orthosis can help with weight-bearing in the case of osteonecrosis. More surgical intervention should be focused on the patient's symptoms, as many individuals with osteonecrosis do not require additional surgery once healing and revascularization are complete.

**Figure (3):** Modified Blair fusion fixed by screws **(25)**.

Treatment should be aimed at alleviating symptoms where possible, with a Blair fusion or tibiocalcaneal arthrodesis being the most typical options.

3) Malunion: Because the talus is so important to the ankle, subtalar, and transverse tarsal joints' normal function, failure to diagnose fracture displacement or incorrect fracture reduction can result in a poor outcome. Malunion of the Varus is the most prevalent type of malunion **(25)**. To get a satisfactory result after a talar neck fracture, anatomic reduction is required. Peterson et al. had better results in Type III fractures than Type II fractures in a study of 46 individuals. The adequacy of first reduction was the most important factor, with patients with Type III fractures achieving a precise reduction more frequently **(26)**. The capacity to achieve and sustain an anatomical reduction (closed or open) is, according to Miller, the most essential determinant in predicting favourable results **(27)**. Hawkins stated that after anatomical reduction of a talus fracture dislocation that is not exacerbated by osteonecrosis, a good to outstanding result is expected **(28)**.

Malunion can manifest itself in a variety of ways. Obtaining an anatomic reduction, especially through closed techniques, might be difficult. To avoid an inadequate closure reduction, lateral radiographs and a Canale view are useful. To prevent causing a malreduction and provide enough stability, the fixation mechanisms should be carefully chosen. Compression screw fixation on the medial aspect of the talar neck, for example, will certainly result in a varus malunion in fractures with medial comminution. Additionally, in patients whose union is delayed to establish, the progression of a malunion is sometimes observed. As a result, patients should not move to full weight bearing until the union is stable.

With dorsal displacement of the distal fragment, malunion can ensue, resulting in limited dorsiflexion and a painful gait. Malunion in varus is common, and it is frequently accompanied by malrotation, resulting in a supination deformity of the foot. Canale and Kelly found that 14 of 30 patients treated in a cast for Type II fractures developed a varus malunion **(29)**. A high incidence of varus malunion has also been found in more recent publications. (fig.42)

A varus malunion emerged in 40% of individuals with high-energy fractures treated with screw treatment in one research **(30)**. Although there are currently no studies comparing the procedures, plate fixation may be associated with a decreased risk of malunion **(6,30)**. Malunion is treated in a variety of ways. Resection of the dorsal beak may be sufficient in the case of a dorsal malunion **(29,30)**. Reconstruction of the malunion, on the other hand, is frequently more difficult. For severe malalignment associated with degenerative changes, options include calcaneal osteotomy, calcaneal osteotomy combined with midfoot osteotomy, direct osteotomy of the talar neck **(32)**, and triple arthrodesis. In a cadaveric investigation, Daniels et colleagues found that removing a medially based wedge of bone from the talar neck resulted in varus deformity, hindfoot internal rotation, forefoot adduction, and loss of Subtalar mobility **(33)**.

**Figure (4):** Varus malunion **(34)**.

Malunion after a talar neck fracture is a difficult issue to deal with. It's certainly underdiagnosed, yet it's clinically significant. Malunion is a painful condition that causes subtalar stiffness and increased weight bearing on the lateral side of the foot. Associated soft tissue structures contract with time, and these contractures may need to be addressed during reconstructive osteotomy surgery. To achieve alignment and deal with secondary degenerative changes, subtalar or triple arthrodesis is frequently required. In the absence of degenerative signs, the hindfoot should be thoroughly examined for bone and soft tissue pathology to allow for easier restoration.

4) Nonunion and Delayed Union:

Fracture healing is less of an issue with this injury than one might assume. Nonunion is uncommon, but delayed union is prevalent (Fig. 43). Hawkins **(2)** discovered that union of the neck fracture occurred in all individuals with osteonecrosis after type II or type III injuries, but it was usually delayed. In their study, Lorentzen and colleagues **(5)** found just a 4% (5 of 123) frequency of nonunion. Delay union was characterised by Peterson and colleagues **(35)** as no sign of fracture healing 6 months after the injury, and six fractures in their sample of 46 had delayed union but no nonunion.

Because of the inadequate blood supply and the small amount of periosteum on the talar neck, this fracture is likely to result in delayed union. Endosteal callus development is required for fracture repair. Until there is evidence of bridging callus, the fracture should be safeguarded from weight-bearing forces. Local corticocancellous bone grafting should be done if there is no indication of healing 1 year following the fracture **(5).**

Migues et al. **(36)** described a technique for repairing talar neck nonunion using a posterolateral approach and indirect corticocancellous fibular grafting across the defect..

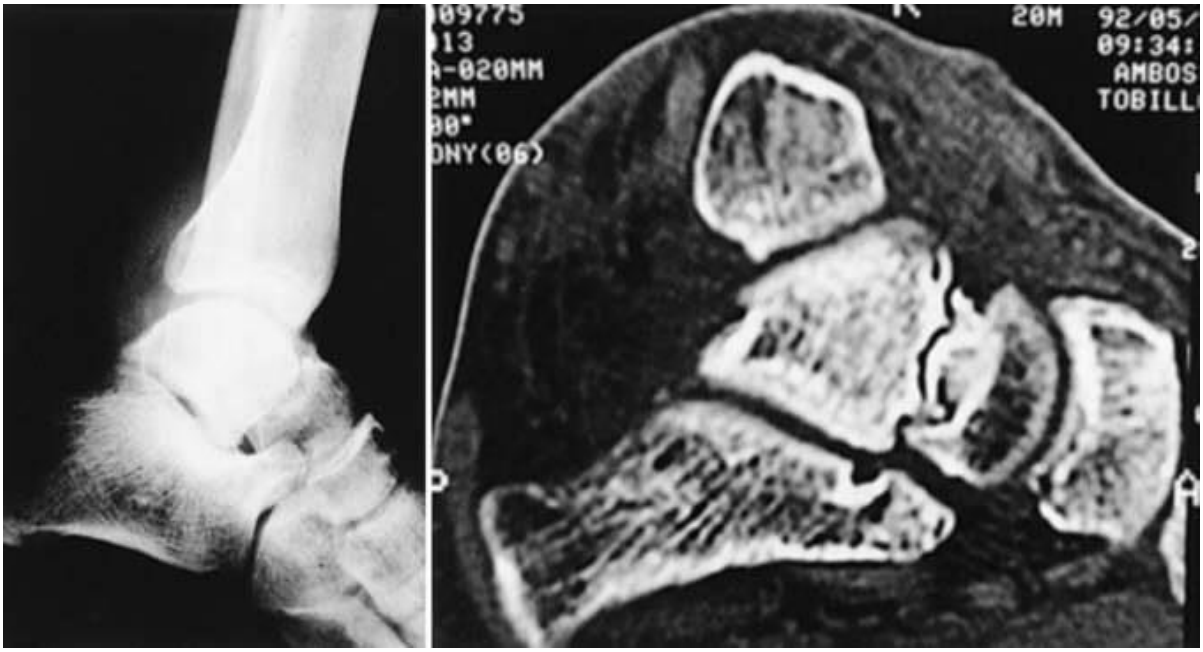


**Figure (5):** Nonunion of talar neck. **(37)**

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**5) Post-traumatic Arthritis:**

After talar neck fractures, post-traumatic arthritis of the ankle, subtalar joint, or both might develop. (fig.44a-44b). Subtalar arthrosis is a very frequent condition **(3)**. In the presence or absence of osteonecrosis, osteoarthritis can be detected..

**Figure (6):** Post-traumatic arthritis of the ankle and subtalar joints **(34)**.

In addition to osteonecrosis, cartilage loss, immobility, and misalignment are also causes of osteoarthritis. When a talar fracturedislocation occurs, the inferior articular edge of the talus articulating with the posterior facet of the subtalar joint is frequently damaged. This could be one of the causes of subtalar arthrosis. In addition to cartilage loss caused by the injury, prolonged nonweight-bearing and cast immobilisation can cause arthrofibrosis, articular cartilage nutrition problems, and subsequent osteoarthritis. As a result, a high incidence of arthritis in the peritalar joints is ensured by the combination of damage, osteonecrosis, and immobility. Even relatively undisplaced talar neck fractures have been shown to reduce ankle and subtalar joint motion, necessitate a considerable period of time off work, and have a high rate of unsatisfactory outcomes **(8)**. Radiographically, post-traumatic degenerative alterations in the subtalar joint are highly prevalent, occurring in 46 percent to 69 percent of patients **(38,39)**. Symptoms in the hindfoot are also prevalent, but they aren't necessarily linked to the onset of arthritis. Prior to undergoing surgical intervention, it is frequently required to pinpoint the cause of symptoms to the arthritic joint. As an aid to diagnosis, selective joint infiltration with local anaesthetic can be effective. To determine the precise needle placement, fluoroscopic localization may be required. A suitable indication for arthrodesis is a preoperative injection of a local anaesthetic into the bothersome joint or assumed symptomatic joint that offers total pain relief.

Treatment can begin once the arthritic joints have been pinpointed. Anti-inflammatory drugs, protected weight-bearing, and bracing may all be beneficial. If these conservative therapies fail, surgery, usually arthrodesis of the affected joints, is required. Standard procedures can be used to conduct subtalar fusion in the case of a talar neck fracture. Arthrodesis of the ankle can be done in the same way, though it's typically a good idea to make sure the talar body is perfused first.

If osteonecrosis is present, ankle arthroplasty may be contraindicated following a talar neck fracture if post-traumatic degenerative alterations are present. Ankle arthroplasty may be an alternate treatment for selected patients of post-traumatic arthrosis provided the talar body is properly perfused. The use of ankle replacement as a therapy option for post-traumatic arthritis in young, active patients, on the other hand, is fraught with controversy **(39)**.

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