

Traumatic Injury to the Subtalar Joint



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KEYWORDS

- Subtalar dislocation • Talar fracture • Calcaneal fracture • Sustentacular fracture
- Talar process fracture • Cartilage • Arthritis

KEY POINTS

- Traumatic injury to the subtalar joint disrupts normal hindfoot motion and potentially leads to restricted global foot function.
- The subtalar joint is injured during subtalar dislocations, talar and calcaneal fractures, and fracture-dislocations.
- Anatomic reconstruction of joint congruity is essential for functional rehabilitation after subtalar joint injury.
- Failure to anatomically reduce the subtalar joint potentially leads to chronic instability, subtalar arthritis, and posttraumatic hindfoot deformity.

INTRODUCTION

The subtalar joint plays a central role in load transmission and movement at the hindfoot, especially when adapting the foot to uneven ground surfaces. Traumatic injury to the subtalar joint disrupts normal hindfoot motion and may significantly restrict global foot function.¹

The anatomy of the subtalar joint is complex. The posterior part (talocalcaneal joint) is composed of the posterior talar and calcaneal facets. The anterior part (talocalcaneonavicular joint) consists of the anterior and middle facets of the calcaneus, the posterior concave facet of the navicular bone, the spring ligament between the navicular bone, and the calcaneus, as well as the corresponding joint facets of the talus. Both

Disclosure Statement: The authors do not have any relationship with a commercial company that has a direct financial interest in subject matter or materials discussed in article or with a company making a competing product.

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Foot Ankle Clin N Am 23 (2018) 353–374

<https://doi.org/10.1016/j.fcl.2018.04.004>

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structures are divided by the sinus and canalis tarsi (tarsal canal), which contains the talocalcaneal interosseous ligament complex. The subtalar joint is stabilized by its natural bony structure and reinforced by numerous ligaments within the sinus tarsi, the tarsal canal, the posterior subtalar joint, and the talonavicular joint. The osseous structure of the joint itself is the most important inherent stabilizer of the joint. Because of its oblique axis, motion within the subtalar joint is 3-dimensional and properly summarized as inversion (lifting the inner margin of the foot = supination, internal rotation, and plantarflexion) and eversion (lifting the outer margin of the foot = pronation, external rotation, and dorsiflexion) of the midfoot and forefoot (the subtalar plate) with respect to the hindfoot.^{2,3}

The subtalar joint acts in conjunction with the talonavicular and calcaneocuboid joints while forming the triple joint complex. Normal function of the subtalar joint is critical for the ability of the foot to accommodate uneven or irregular surfaces. In addition, it bears an integral proprioceptive function of the foot and ankle.^{3,4}

Intraarticular fractures of the talus or calcaneus lead to cartilaginous defects and displacement of the articular surface. Displaced extraarticular fractures of the talus and calcaneus result in axial deviation and, therefore, eccentric loading of the subtalar joint. Subtalar and talonavicular dislocations result from rotational and shearing forces, and are frequently accompanied by peripheral fractures of the talus and calcaneus.⁵ Malalignment and instability of the subtalar joint alter the load distribution within the joint complex and potentially lead to subtalar arthrosis with pain and impaired function.⁶ In contrast, posttraumatic arthrosis with dysfunction of the subtalar joint may be the result of direct injury to the cartilage by grinding or shearing forces during dislocations, or secondary chondrocyte apoptosis resulting from compressive forces or avascular necrosis (AVN) in severe fractures.^{1,7} Relevant chondral injuries leading to degenerative changes are more likely to occur after dislocations accompanied by peripheral fractures than after pure dislocations of the subtalar joint.⁸ In the following, the 3 main traumatic injuries to the subtalar joint will be discussed with respect to the pathomechanism, evaluation and management:

- Subtalar dislocations with peripheral talar and calcaneal fractures;
- Central talar fractures with subtalar joint involvement; and
- Calcaneal fractures with subtalar joint involvement.

All of these injuries carry an intrinsic risk of posttraumatic arthritis for the abovementioned reasons. However, not all patients with radiographic evidence of arthritis become symptomatic and require subsequent fusion (**Table 1**).

Overall, there is a wide variety in the numbers for posttraumatic arthritis. The lowest rates of both arthritis and secondary fusion are seen after purely ligamentous subtalar dislocations.^{5,8} Posttraumatic arthritis increases over time and reaches 100% with

Type of Injury	Subtalar Arthritis (%)	Subtalar Fusion (%)	References
Subtalar dislocations	39–89	0–26	5,8,12,14,16,18,27,36,109,110
Talar neck and body fractures	16–100	3–18	3,31,51–56,111–115
Intraarticular calcaneal fractures	5–100	0–32	3,59,67,73,74,76,94,101,102,116

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