

# Anatomy of the Subtalar Joint

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## KEYWORDS

• Subtalar joint • Spring ligament • Canalis tarsi • Coxa pedis

## KEY POINTS

- The subtalar joint may be divided into three separate anatomical parts: the talocalcaneonavicular joint and the talocalcaneal joint, separated by a conical interosseous tunnel (the canalis and sinus tarsi).
- The talocalcaneonavicular joint may be characterized as a ball-and-socket articulation, also called the coxa pedis.
- The ligaments are an integral part of the coxa pedis, most notably the spring ligament, the medial part of the bifurcate ligament and the dorsal talonavicular ligament. The spring ligament forms a central part of the acetabulum pedis.
- Three-dimensional motion in the subtalar joint complex (eversion/inversion) is guided by the axial alignment of the the talus, calcaneus and navicular, the ligaments, and the shape of the articular surfaces.

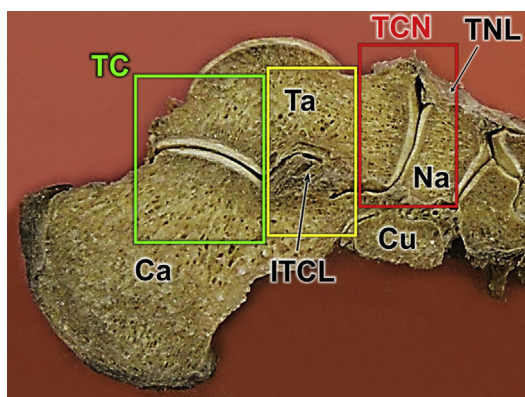
## INTRODUCTION: GENERAL FEATURES

A description of the talus and its articulation with the surrounding bones (calcaneus, navicular) is highly variable in both the anatomic and clinical literature.<sup>1–22</sup> The anatomic literature distinguishes between individual joints, that is, the talocalcaneonavicular (TCN) and the (posterior) talocalcaneal (TC) joints as 2 separate entities, and uses the term subtalar joint only for the posterior TC articulation (**Fig. 1**). In some textbooks, the subtalar joint complex also includes the calcaneocuboid (CC) joint. Actually, these 3 anatomically separate joints (ie, the TCN, the TC, and the CC) constitute 2 functional units. One of them, called the subtalar joint in the clinical literature, is formed by the TC and TCN joints, allowing a 3-dimensional motion of the

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**Fig. 1.** Sagittal section of the hindfoot. The subtalar joint complex consists of 3 separate anatomic parts: the talocalcaneonavicular joint anteriorly (*red*) and the talocalcaneal joint posteriorly (*green*), separated by the canalis and sinus tarsi (*yellow*). Ca, calcaneus; Cu, cuneiforme; ITCL, interosseous talocalcaneal ligament; Na, navicular; Ta, talus; TC, talocalcaneal joint; TCN, talocalcaneonavicular joint; TNL, talonavicular ligament.

distal foot (lamina pedis or foot plate<sup>13</sup>) in relation to the talus. The other unit, formed by the TN and CC joints and called the transverse tarsal or Chopart joint (articulatio tarsi transversa), is responsible for the motion between the hindfoot (the talus and the calcaneus) and the midfoot (the navicular and the cuboid). Together, the TN, TNC, and CC joints are also termed the triple joint complex because they closely interact with each other.

The subtalar joint may, therefore, be defined from a functional point of view as the osteoligamentous complex formed by 3 bones, that is, the talus, the calcaneus, and the navicular, and the corresponding ligamentous complex. The subtalar joint may be divided into 3 separate anatomic parts: the TCN joint (the anterior part), the TC (the posterior part), separated by a conical interosseous tunnel (the middle part) consisting of the canalis and sinus tarsi (**Fig. 2**). The ligament complex within the latter one is of great importance for the stability and simultaneous action of the TCN and the TC joints.

Function of the subtalar joint complex is determined by the spatial relationship between the talus and the calcaneus. Posteriorly, in the TC joint, the talus is situated directly above the calcaneus, whereas distally the longitudinal axis of the talus deviates by about 35° medially from the lateral aspect of the calcaneus. As a result, the head of the talus lies medial and proximal to the cuboid surface of the calcaneus (**Fig. 3**). This arrangement constitutes the basis of the 2 main columns of the foot, the medial (talar) and the lateral (calcaneal), as well as the medial longitudinal arch of the foot.

The anatomy and function of the subtalar joint have been described in a number of studies.<sup>12–19</sup> The first to publish an anatomic description was Josiah Weitbrecht (1702–1745) in 1742 (**Fig. 4**).<sup>1</sup> The clinical significance of the TNC joint in the pathomechanics of clubfoot (pes equinovarus) was pointed out by Antonio Scarpa (1752–1832) in 1806, who called the socket of the TNC joint the acetabolo.<sup>2</sup> The subtalar joint evolved from a single joint in early mammals into a complex joint with a more upright axis to adapt the foot to the ground for bipedal gait. Although marsupials still have a single compound inferior articular surface for the talus (the lamina pedis), insectivores and

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