



Talonavicular joint arthroscopic portals: A cadaveric study of feasibility and safety



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ABSTRACT

Background: The objectives of the study were to evaluate the safety of hypothetical arthroscopic portals from talonavicular joint and to evaluate their reproducibility and enforceability.

Methods: 19 cadaveric feet were marked and four arthroscopic portals were made (medial, dorsomedial, dorsolateral and lateral). The specimens were dissected in layers and the distances between neurovascular structures and the trocars were measured.

Results: Medial and dorsomedial portals were in average 8.3 and 8.7, respectively, to the saphenous vein and nerve. Dorsolateral portal was in average 8.1 mm to the deep peroneal nerve and dorsalis pedis artery, and 9.1 mm to the medial dorsal cutaneous branch of the superficial peroneal nerve. Lateral portal was in average 12.3 mm to the intermediate dorsal cutaneous branch of the superficial peroneal nerve.

Conclusion: Tested portals shown to have a good safety margin for the foot neurovascular deep dorsal structures and an acceptable safety margin for the superficial neurovascular structures.

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1. Introduction

The talonavicular joint is one of the most important of the hindfoot and also one that suffers most from varied pathology, traumatic, degenerative and inflammatory. As the degenerative pathology of multiple etiology the most common, the fusion procedure is probably the most common intervention in this joint, whether held in isolation or in combination with double or triple fusion of hindfoot.

Involvement of the talonavicular joint appears to be one of the earliest of the hindfoot joints to demonstrate deformity in rheumatoid arthritis. Major contributors to the early development of foot deformities include talonavicular joint destruction and tibialis posterior tendon dysfunction [1].

An isolated talonavicular joint fusion was originally described by Ogston to correct any midfoot deformities involving the talonavicular joint, including rheumatoid arthrosis, collapsing

pes planovalgus, and post-traumatic arthritis in adults. Astion et al., in a cadaveric study, showed that an isolated talonavicular fusion limits the subtalar joint motion by 91% of its original range of motion. This procedure can be used as an isolated procedure [2].

The talonavicular arthrodesis offers an effective limitation of motion by obstructing nearly all midtarsal and subtalar joint motion. In theory, arthrodesis of the talonavicular joint affords maximum stability [3].

Traditionally, it is an open procedure, which involves extensive soft tissue dissection. This may increase and introduce additional potential for complications. The talonavicular joint is the most common site of nonunion. It is probably related to the difficulty of reach of the plantar and lateral aspect of the joint and tendency of excessive bone resection in order to reach the deep part of the joint. With the advance of hindfoot arthroscopy, arthroscopic triple arthrodesis has been described and claimed to have the potential advantage of better intraarticular visualization, more complete cartilage debridement and preservation of subchondral bone, decreased soft tissue dissection and better cosmetic result [4].

The objectives of the study were as follows: (1) to evaluate the safety of hypothetical arthroscopic portals from talonavicular

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joint; (2) to evaluate the reproducibility and enforceability of this same portals.

2. Materials and methods

A total of 19 feet (below-knee specimens) of fresh frozen cadavers were utilized. The age and conditions of the specimens were not known, but without evidence of gross below knee pathologic conditions.

The specimens were stabilized in plantar flexion and neutral inversion/eversion. The anatomical landmarks were marked (Fig 1). They were, from medial to lateral: insertion of tibialis posterior tendon on navicular, saphenous vein (if visible), tibialis anterior tendon, extensor hallucis longus tendon, superficial peroneal nerve (if visible) and calcaneocuboid joint line. Talonavicular joint line was estimated by palpation while doing some inversion/eversion maneuvers and then marked.

The medial portal was placed dorsal to the distal insertion of the tibial posterior tendon; the dorsomedial portal was placed just medial to the tibial anterior tendon; the dorsolateral portal was placed just medial to the extensor hallucis longus; the lateral portal was placed dorsal to the calcaneocuboid joint line.

All portals were marked with an intramuscular needle, and correct intra articular position was tested by water injection and fluid reflow (Fig. 2). After, longitudinal skin incisions (4–5 mm) were made by a blade, and blunt dissection carried out with a small hemostat. Then arthroscopic blunt trocar (3.5 mm) was inserted into the joint in each portal. Finally the specimens were dissected in layers and the distances between neurovascular structures and the trocars were measured with a transparent precision ruler (Fig. 3).

3. Results

For all the specimens, the referred anatomical landmarks for the four portal placement were easily found and marked as reference. In six specimens the superficial peroneal nerve was not visible before dissection, as well as the saphenous vein in four cases. (Table 1).

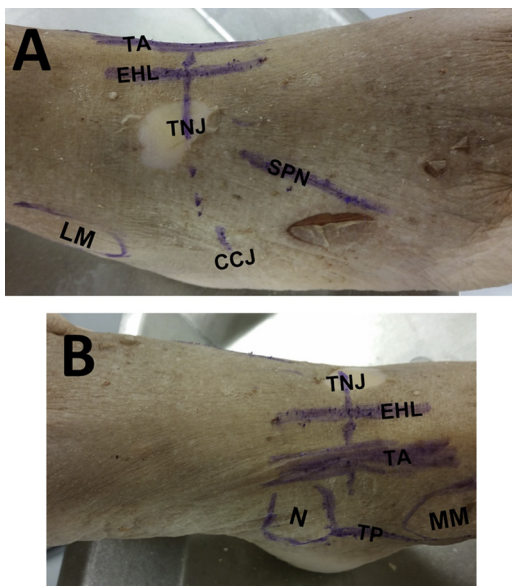


Fig. 1. Anatomical landmarks in relation with talonavicular joint, marked on a right foot. (A) Dorsolateral view (B) Dorsomedial view. (CCJ), calcaneocuboid joint line; EHL, extensor hallucis longus tendon; LM, lateral malleolus; MM, medial malleolus; N, navicular; SPN, superficial peroneal nerve; TA, tibialis anterior tendon; TNJ, talonavicular joint line; TP, tibialis posterior tendon).

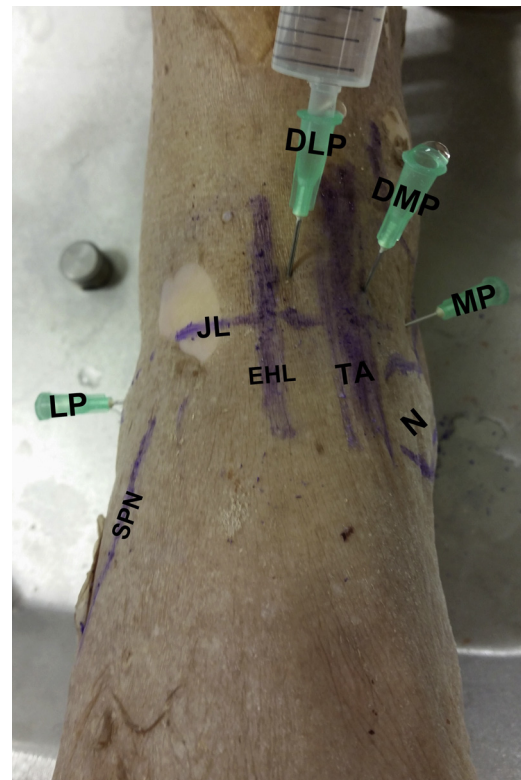


Fig. 2. Talonavicular joint portal placement marked with an intramuscular needle in a right foot. Water reflow visible in all portals. (DLP, dorsolateral portal; DMP, dorsomedial portal; EHL, extensor hallucis longus tendon; JL, talonavicular joint line; LP, lateral portal; MP, medial portal; N, navicular; SPN, superficial peroneal nerve; TA, tibialis anterior tendon).

The medial portal placed dorsally to the TP tendon was in average 8.3 (range 1–16)mm plantar to the saphenous vein and nerve (Table 2). The dorsomedial portal placed just medial to the TA tendon was in average 8.7 (range 1–13)mm dorsomedial to the saphenous vein and nerve. The dorsolateral portal placed between the TA tendon and the EHL tendon, just medial to the last, was in average 8.1 (range 5–14)mm medial to the deep peroneal nerve and dorsalis pedis artery, and 9.1 (range 0–25)mm medial to the medial dorsal cutaneous branch of the superficial peroneal nerve. The lateral portal placed dorsally to the calcaneocuboid joint, was in average 12.3 (range 4–30)mm plantar and lateral to the intermediate dorsal cutaneous branch of the superficial peroneal nerve. In four cases there was no intermediate dorsal cutaneous branch of the superficial peroneal nerve or had their terminal branches located proximally to the lateral portal.

4. Discussion

Since the first article description of talonavicular arthroscopy at almost 20 years ago, very little has evolved on this subject. Most of the few existent studies about talonavicular joint arthroscopy, proved that it is arthroscopically practicable to reach almost all of the articular surface of the navicular and much of that of the talus [4–7]. Which in theory leads to the possibility to handle much of the intra articular pathology of this articulation of the foot. But the problem is that there is no consensus about the arthroscopy portals to use. Mostly because of the risk of damaging the neurovascular structures that surround this joint.

The difficulty in having the ideal portals for the talonavicular joint arthroscopy relates to several aspects. Despite being a small joint it is very wide and takes up much of the dorsal and proximal aspect of the foot, which leads to be crossed by many important

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