AN ANATOMICAL STUDY OF A NEW PORTAL FOR ANKLE ARTHROSCOPY

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We describe a medial midline portal between the tendons of extensor hallucis longus and tibialis anterior for arthroscopy of the ankle. We dissected 20 cadaver specimens to compare the risk of neurovascular injury using this approach with that of using standard arthroscopic portals. Compared with the anterocentral portal, the medial midline was a mean of 11.2 mm further from the nearest branch of the superficial peroneal nerve and 10.3 mm further from the dorsalis pedis artery.

This portal allows good access to the joint surface and intra-articular structures and has a lower risk of injury to the dorsalis pedis artery, deep peroneal nerve or the medial branch of the superficial peroneal nerve.

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Ankle arthroscopy is now a common and valuable procedure for diagnosis and treatment. Most series report a complication rate of 7% to 17%, with a third to a half of these being superficial nerve injuries.

The anteromedial and anterolateral portals are the most commonly used, allowing access to the respective sides of the joint. The anterocentral portal gives the best view of the trochlear surface of the talus, and can access both sides of the joint in a single sweep. It is, however, less popular because of the risk, 20% or more, to the neurovascular bundle of the dorsalis pedis.

The positions of these anterior portals and the proposed new medial midline portal are shown in Figure 1. Other approaches infrequently used are the posterolateral, posteromedial, medial transmalleolar and through tendo Achillis.

We describe a new portal, the medial midline, between the tendons of extensor hallucis longus and tibialis anterior. We have dissected 20 anatomical specimens to compare the proximity of neurovascular structures and the risk of injury at four anterior sites: anteromedial, anterolateral, anterocentral and medial midline.

MATERIALS AND METHODS

We used 20 ankles, ten formalin-perfused, four fresh-frozen amputated limbs, and six fresh postmortem specimens. Four portals were used: anteromedial (medial to tibialis anterior tendon); the new medial midline portal between tibialis anterior and extensor hallucis longus; anterocentral, just lateral to extensor hallucis longus; and anterolateral, lateral to the tendons of extensor digitorum longus and peroneus tertius (Fig. 1). The tendons were palpated to determine the site of entry and 20 ml of saline were injected into the joint to distend it using an 18-gauge needle. At each site shown in Figure 1 a portal was made by the senior author (IGW) using a 5 mm longitudinal skin incision and blunt dissection with scissors down to the joint. A 4 mm arthroscope was then inserted and replaced with a marker (a short wooden stick) so that the track would be easily identified.

The limb was then dissected by two independent observers (RAB, AJK) and the long saphenous vein, the dorsalis pedis artery and the saphenous, superficial and deep peroneal nerves were identified. Measurements were made of the interval between the extensor hallucis longus and the tibialis anterior tendons at the level of the portals and the distance from each portal to the adjacent nerve branches and arteries. The ramifications of the terminal branches of the superficial nerves over the dorsum of the foot were found to vary considerably as was the site of divergence of the saphenous nerve and vein. Where there were two branches of one structure the distance from the portal to the nearest branch was recorded.

RESULTS

Portal placement. On one occasion the arthroscope had passed through the tendon of tibialis anterior instead of...
The anterolateral portal had been made between the tendinous slips of extensor digitorum longus rather than lateral to it. Both specimens had been preserved in formalin and the surface anatomy was difficult to identify. All other portals were positioned correctly with respect to the tendons.

**Anteromedial portal.** The anteromedial portal was a mean of 5.7 mm lateral to the long saphenous vein. A laceration of the vein occurred in a specimen in which the portal had been placed through the tibialis anterior tendon. There was one case of damage to the saphenous nerve, but at a level where the branches are small in comparison with the superficial peroneal nerve. In addition, there were two cases of lacerations of small tributaries of the long saphenous vein.

**Anterocentral portal.** In 90% of cases the arthroscope touched the dorsalis pedis artery; in one instance it passed between the artery and the deep peroneal nerve and in another it lacerated the nerve. The track was a mean of 0.7 mm from the artery and 1.1 mm from the deep peroneal nerve. In all cases, it was in contact with a branch of the superficial peroneal nerve and in three cases there were visible lacerations.

**Medial midline.** In contrast to the anterocentral approach, this new portal was a mean distance of 11 mm (5 to 15) from the dorsalis pedis artery and 11.2 mm from the superficial peroneal nerve. There was one laceration of a small branch of the superficial peroneal nerve.

The mean distance between the tendons of tibialis anterior and extensor hallucis longus was 6.3 mm (5 to 8), adequate for the passage of a standard arthroscope.

**Anterolateral portal.** This was on average 0.5 mm from the lateral branch of the superficial peroneal nerve, and there were two cases of laceration.

**DISCUSSION**

A portal site between the tendons of tibialis anterior and extensor hallucis longus gives a very similar view to that of the anterocentral portal (Fig. 1) with easy manoeuvrability of the arthroscope. We recommend the routine use of this more medial site for two reasons. First, the gap between tibialis anterior and extensor hallucis longus is consistently large enough (minimum 5 mm) to admit an arthroscope. Secondly, this site is substantially further away from the structures which are at significant risk from the traditional anterocentral opening. Use of the medial midline portal gave one nerve laceration in 20 cases which compared favourably with the other portals (Table I) and with the findings of previous cadaver studies.

We recognise the limitations of cadaver models which will not detect traction injuries without visible damage and may underestimate the true risk of neurological complications. In practice, safe placement of portals may be facilitated by the preoperative marking of arterial pulses, bony landmarks and superficial nerves. The branches of the superficial peroneal nerve can be seen beneath the skin on plantar flexion and inversion of the foot or by transillumination of the skin with the fiberoptic light cable. These techniques cannot be used in cadavers, as was shown by the two misplaced portals in our study, which may have overestimated the neurovascular risks.

The new medial midline approach allows excellent views and manoeuvrability within the joint and we commend its use, instead of the anterocentral portal.

**REFERENCES**


