

Anterior Anatomy of the Distal Leg Relative to Anterior and Anterior-Oblique Distal Locking Screws During Tibia Nailing: An Anatomical Risk Study Using CT Angiography

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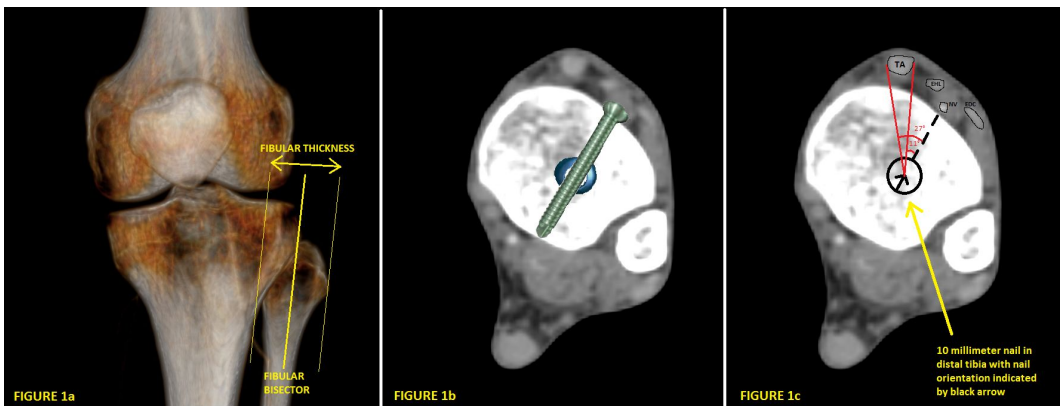
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Purpose: Our objective was to evaluate if there is a safe axis for insertion of distal tibia locking screws from the anterior or anterior oblique direction relative to the important anterior anatomical structures.

Methods: 20 patients with a CT of the lower extremity(ies) with contrast (CT angiography [CTA]) were evaluated. Exclusion criteria were any fracture below the level of the knee or vascular injury. Two and 3-dimensional CTA images (Phillips Intellispace) were manipulated to reflect the AP view of the proximal tibia used during intramedullary nailing (“fibular bisector radiograph”), shown in Figure 1. Using this view to determine the nail orientation, we simulated optimal nail placement in the distal tibia. Corresponding axial cuts were then used above the distal tibia’s articular surface at 10 mm, 20 mm, 30 mm, and 40 mm. The location of the tibialis anterior (TA), anterior tibial neuromuscular bundle (NV), extensor hallucis longus (EHL), and extensor digitorum longus (EDL) were measured in relation to the central AP line of the nail. Injury was predicted if these lines contacted anterior structures came into contact with the TA tendon, neurovascular bundle, or common extensor tendons (Fig. 2).

POSTER ABSTRACTS



Results: All AP screws (80/80, 100%) impacted the TA tendon, EHL tendon, and/or anterior tibial NV bundle between 10 mm and 40 mm cranial to the plafond. The neurovascular bundle was impacted by an AP locking screw in 53% of cases. Using the CT modeling and

estimating optimal distal nail positioning, a relatively consistent positioning of the distal leg anatomy was clearly seen. The medial extent of the TA tendon was greatest 10 mm cranial to the plafond and averaged 27° (95% CI, 22-33°) medial to the AP line. The maximum lateral border of the foot's common extensors, found 40 mm cranial to the plafond, averaged 71° (95% CI, 62-80°) lateral to the AP line.

Conclusion: The anterior tibial neurovascular bundle and foot and ankle extensor tendons are at high risk from AP-directed distal locking screws. The tendinous anatomy of the distal leg is at risk between 33° medial and 80° lateral to the AP axis of a tibial nail (Fig. 3). Our data indicate that distal locking screws placed from the AP direction should be thoughtfully applied and an open approach should be strongly considered.