Anterior Tibial Artery Danger Zone in Anterolateral Plate Fixation of the Distal Tibia: A 3D CT Angiogram Modeling Study

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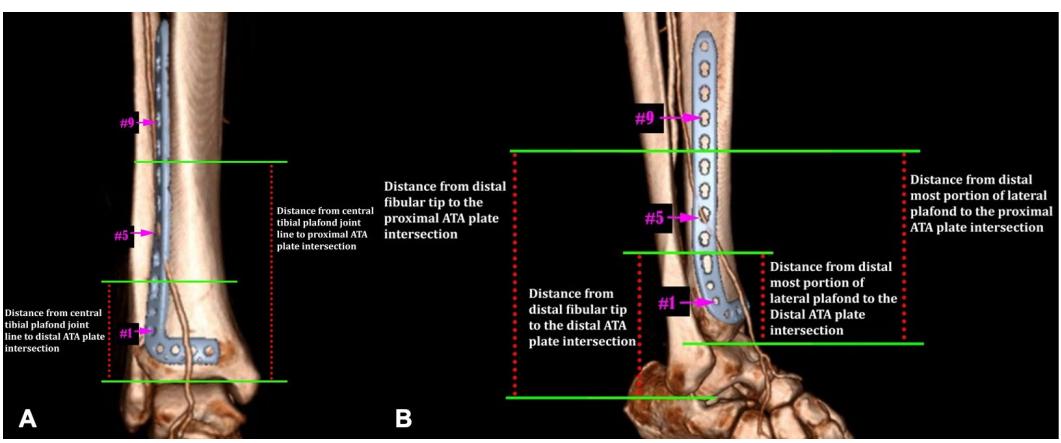
Purpose: The anterolateral approach to the distal tibia has become a workhorse exposure for pilon fractures. Smaller cadaver studies have demonstrated the anterior tibial artery (ATA) is susceptible to injury during anterolateral plating (ALP) of pilon fractures. However, no study to date has used computed tomography angiography (CTA) to preoperatively model the risk to the ATA with ALP. The purpose of this study was to define the danger zone where the ATA is at risk during ALP of the distal tibia using a novel 3D CTA modeling technique.

Methods: Using an institutional radiology database, we identified 116 patients (232 lower extremities) with lower extremity (LE) CTAs performed between April 2020 and April 2022. Patients with LE trauma, evidence of a previously healed tibia fracture, or poor visualization of the ATA were excluded. The remaining 92 patients (150 LEs) were modeled with a 3.5-mm LCP (locking compression plate) anterolateral distal tibia plate using Sectra ID7 software. The ATA and the levels at which the artery intersected the plate were identified. The distance of the ATA from bony landmarks was measured perpendicular to the level at which the vessel intersected the plate. In addition, the specific plate hole number at which the ATA was at risk for injury by screw placement was recorded.

Results: The ATA intersected the plate at a mean distance of 10.5 cm (confidence interval [CI] 10.1–10.8) proximally, and distally at a mean distance of 4.6 cm (CI 4.4–4.9) from the central plafond. The ATA was at risk for injury as distally as hole number 1 and as proximally as hole 14 of the plate.

Conclusion: The ATA is at risk when percutaneously placing screws in an anterolateral distal tibia plate. This 3D CTA study is the largest study to demonstrate the danger zone for the ATA in the distal tibia. The artery can be close as 4.4 cm and as far as 10.8 cm proximal to the tibial plafond and thus puts percutaneous screw placement at plate holes 1 through 14 at risk of injury to the ATA. Additionally, this technique can be used by surgeons to preoperatively identify patient-specific danger zones when a CTA is available.



The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device they wish to use in clinical practice.