Peroneal Artery Danger Zone With Syndesmotic Screw Fixation

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Purpose: Trans-syndesmotic screws (TSSs) are commonly used to treat syndesmotic injuries, particularly certain patient subgroups. To date, no studies have evaluated the range in which the peroneal artery (PA) and its deep perforating branch (dPA) are at risk with TSS fixation.

Methods: A retrospective analysis of lower extremity CT angiograms (CTAs) performed between 2021 and 2022 was performed. Inclusion criteria specified patients who benefit from multiple syndesmotic screw fixation (age ≥65 years, diabetics [A1c≥6.5%], active nicotine use, and obese patients [body mass index (BMI) ≥35]).
Exclusion criteria specified patients with arterial disease impairing the ability to visualize the PA or dPA bilaterally, fracture distorting anatomy, amputation, and abnormal anatomy secondary to arterial bypass procedure. CTAs were reformatted to be in the syndesmotic plane and the PA was deemed to be at risk if a templated 3.5-mm syndesmotic screw intersected its course. Measurements were taken from both the tibial plafond and fibular tip and included the level at which the PA entered and exited this danger zone, as well as the level of the dPA branch.

Results: 98 CTAs (196 limbs) were analyzed. 72 patients were age ≥65 (mean 75 ± 8), 52 had diabetes (mean A1c 7.3 ± 1.4), 16 were active nicotine users, and 16 had BMI ≥35. The PA was at risk in 98.5% of limbs (n = 195). On average, the danger zone 7.5 cm (±1.5 cm) is proximal to the tibial plafond and 10 cm (±1.5 cm) proximal to the fibular tip. Relative to limb length, this correlated to 20% of the limb length proximal from the plafond (±4%). The dPA branch perforated the syndesmotic plane at 3.6 cm proximal from the plafond (±7.5 mm) and 6 cm (±9.3 mm) from the fibular tip. Finally, the PA and dPA were out of the danger zone at 2.5 cm (±4 mm) proximal from the tibial plafond and 5 cm (±6 mm) from the fibular tip. No difference was found between inclusion subgroups nor between individual patients' contralateral legs.

Conclusion: The PA and dPA are at risk with TSSs, most notably in the distal fifth of the limb and ending approximately 2.5 cm proximal to the plafond. Knowledge of this zone can aid in planning for patients who would benefit from TSS fixation.