

The Use of Computed Tomography Angiography to Predict Complications in Tibia Fractures: A Multicenter Retrospective Analysis

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Purpose: CT angiography (CTA) is a minimally invasive method to assess the vascular tree in tibia fractures after high-energy trauma. While CTA may identify vascular injuries in these fractures, vascular surgical intervention is typically reserved for limbs with inadequate distal arterial flow. The purpose of this study is to assess the ability of CTA findings to predict complications in limbs that do not require vascular surgical intervention.

Methods: A retrospective review was performed of all patients with tibial fractures (AO/OTA 42-43) treated with an intramedullary nail who underwent CTA at five Level I trauma centers from 2010 to 2021. All patients maintained a clinically perfused foot and did not undergo vascular surgical intervention. A minimum 6-month follow-up was required for inclusion. The patients were grouped by the number of vessels below the trifurcation that were injured (no injury, 1 vessel, or 2 vessels). Patient demographics, injury and operative characteristics, and surgical outcomes were compared. The primary outcomes included rates of superficial and deep infection, nonunion, compartment syndrome, and unplanned reoperation.

Results: A total of 246 tibia fractures were included (232 OTA 42 and 14 OTA 43) with 131 fractures in the control group, 75 in the 1-vessel injury group, and 40 in the 2-vessel injury group. Average follow-up was 2 years. There were no significant differences in demographics, AO/OTA fracture classification, open fracture rate, Gustilo-Anderson classification, or number of debridements prior to fixation between the 3 groups. Significantly higher rates of nerve injury and flap coverage after wound breakdown were observed in the 2-vessel injury group. The 2-vessel injury group had significantly higher rates of deep infection (40.0% vs 17.3% and 16.0%, $P = 0.003$), nonunion (45.0% vs 32.0% and 22.1%, $P = 0.016$), amputation (12.5% vs 1.3% and 3.1%, $P = 0.011$), and unplanned reoperation (72.5% vs 42.7% and 35.9%, $P < 0.001$) compared to the 1-vessel injury and control groups. There were no significant differences in rates of superficial infection or compartment syndrome.

Conclusion: Patients with tibia fractures complicated by arterial injury are challenging injuries even if the foot remains perfused. Tibia fractures with 2-vessel injuries found on CTA were associated with higher rates of deep infection, nonunion, amputation, and unplanned reoperation compared to fractures with 1-vessel injury or no vessels injured. CTA is usually ordered by other members of the trauma team, and may be overutilized, but its results can provide some prognostic information about patient outcomes, heighten surgeon awareness, and allow more effective patient counseling.