Lower Extremity CT Angiograms and the Effect on Kidney Function in Orthopaedic Trauma Patients

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Purpose: We hypothesize that our institution obtains CT angiograms (CTAs) to evaluate for vascular injury more frequently than indicated and that the likelihood of contrast-induced nephropathy (CIN) increases in patients with GFR (glomerular filtration rate) <60. CTAs are often obtained in lower extremity (LE) trauma to evaluate vascular injury. Commonly accepted indications to obtain CTAs in lower extremity trauma are an ankle-brachial index (ABI) <0.9 or hard signs of vascular injury. There is a paucity of literature regarding risk factors for CIN following LE CTAs in a trauma setting.

Methods: After IRB approval, patients with CTAs following LE trauma were identified using an imaging database between 2010 and 2018. Patients with CTAs following LE trauma with renal function labs were included in the study. Patient charts and imaging were reviewed for demographic data, injuries, kidney function labs, physical examination, treatments, and follow-up. Normality was assessed using Shapiro-Walk test and differences between variables were assessed using Wilcoxon signed rank test and Fisher's exact test.

Results: CTAs were performed on 257 LEs of 199 patients. Of the 257 CTAs, 162 (63%) LE CTAs were not indicated (no hard signs of vascular injury, ABI >0.9). Of the 95 indicated CTAs, 21 limbs (7.4%) had a positive finding on initial CTA (thrombus, occlusion, extravasation, or pseudoaneurysm) concerning for a vascular injury. Of these 21 patients with positive findings, 12 (4.7%) had an LE vascular injury requiring intervention. There was a statistically significant increase in creatinine after obtaining a CTA in these 257 patients ($P = 0.010$). Patients with initial GFR <60 mL/min were more likely to develop acute kidney injury (AKI) compared to patients with GFR >60 mL/min ($P = 0.001$). There was no difference in rate of AKI in patients with a higher ISS, in both groups of GFR >60 mL/min ($P = 0.15$) or GFR <60 mL/min ($P = 1.0$).

Conclusion: Our study demonstrates that CTAs are obtained more often than indicated. Patients who had CTAs after LE trauma were at an increased risk of developing AKI after contrast. Patients with initial GFR <60 mL/min were at the highest risk of developing AKI. ISS did not correlate to AKI, suggesting that CIN may play a larger role in the insult to the kidneys that we have previously recognized in the trauma patient.

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