

Indications for CT Angiography of the Vertebral Arteries after Trauma

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Purpose: Vertebral artery injury (VAI) occurs infrequently with trauma to the neck and cervical spine. With increasing frequency, trauma providers are using CT angiography (CTA) to visualize vessels of the head and neck, including the vertebral arteries. However, CTA has associated risks of increased radiation exposure, renal injury from contrast dye, as well as higher cost and longer emergency department stay. The purpose of this project was to assess risks and benefits of CTA of the neck in the trauma setting. We propose to develop guidelines for providers to differentiate patients at medium/high risk of VAI from those who are at low risk.

Methods: We retrospectively analyzed all trauma patients seen at an urban, Level I trauma center over 4 months in 2013 (n = 1872). Mean age was 42.0 years, and 63% were male. Mechanisms of injury included motor vehicle collision (n = 533, 29%), motorcycle crash (n = 100, 5.3%), high-energy fall (n=233, 12.5%), low-energy fall (n = 356, 19%), pedestrian versus motor vehicle (n = 91, 4.9%), gunshot wound (n = 166, 8.9%), assault (n = 189, 10%), stabbing (n = 71, 3.7%), sports (n = 51, 2.7%), and other (n = 83, 4.4%). CTA of the neck was done in 144 (7.3%). Presence of VAI and other findings were noted. The presence or absence of subjective complaint of neck pain, physical examination findings, the number and type of cervical spine fracture/soft-tissue/vascular injuries were recorded. A two-proportion Z-test statistical analysis was performed for each category comparing those with VAI versus those without VAI.

Results: Patients without VAI included 138 of 144 patients with CTA (96%), or 1866 of the 1872 entire population (99.7%). All patients without CTA were assessed clinically for 2 years and no undetected VAI was noted. Six patients had VAI: 5 suspected dissections and 1 thrombosis. Three of them had no anticoagulation and died as a result of brain injury (n = 2) and exsanguination (n = 1); in one case VAI and brain injury were contributing factors. The 3 others were treated with aspirin, and 1 experienced transient hemiparesis, which resolved with heparin. One other died from head injury. Patients with VAI were older (56.3 years vs 42.0, P = 0.04), more likely to have subjective neck pain (67% vs 21%, P <0.001), more likely to have a positive finding on physical examination of the cervical spine such as laceration, step-off, subluxation, crepitus, tenderness to palpation (100% vs 29%, P <0.001), and more likely to have a cervical fracture (100% vs 4.3%, P <0.001). Of the 144 patients who had CTA of the neck, n = 82 (57%) had a negative diagnostic CT previous to the CTA; all were ultimately found to be without VAI.

Conclusion: CTA is performed frequently, but less than 5% of scans identified an injury. VAI is very uncommon (<1% of trauma patients), and adverse consequences of VAI are infrequent, occurring in 14%. Multivariate regression analysis identified factors associated with VAI as diagnosed by CTA: older age, neck pain, physical findings, or cervical fracture. We posit

that CTA is not routinely indicated for those without cervical fracture. This work highlights the importance of identifying patients who are at a higher risk for VAI and require CTA of the neck versus those who are at low risk and can be evaluated without CTA. The avoidance of unnecessary scanning would decrease radiation exposure, renal toxicity, and costs.

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.