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***Reply:***

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*AJNR Am J Neuroradiol* 2018, 39 (9) E104

doi: <https://doi.org/10.3174/ajnr.A5758>

<http://www.ajnr.org/content/39/9/E104>

This information is current as  
of April 19, 2024.

## REPLY:

We thank Drs Malhotra, Wu, and Seifert for their interest in our work and their comments regarding our recent article on blunt cerebrovascular injuries (BCVI).<sup>1</sup> As highlighted in our work, controversies exist regarding screening criteria, the modalities used for screening, and the treatment of these patients. The literature on the accuracy of CT angiography is diverse and is best studied by groups using both CTA and digital subtraction angiography for the diagnosis of BCVI in all patients.<sup>2–6</sup> The study by Eastman et al<sup>2</sup> showed that the overall sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of 16-slice CTA for the diagnosis of BCVI were 97.7%, 100%, 100%, 99.3%, and 99.3%, respectively, with a single false-positive of a grade I vertebral injury. While most other studies have shown a modest sensitivity with good specificity, for example, Goodwin et al<sup>3</sup> showed a sensitivity and specificity of 41% and 97%, respectively, combined for 16- and 64-slice CT, and Paulus et al<sup>4</sup> showed a sensitivity and specificity of 68% and 92% for CTA on 64-slice CT.

In another study comparing CTA (16-slice) and DSA for diagnosis, Malhotra et al<sup>6</sup> showed that the sensitivity and specificity of CTA was 74% and 84%, but all the false-negative CTAs were obtained in the first half of the study period. In the latter part, the specificity and the negative predictive value was 100%, and the most likely explanation was the learning curve of the radiologists reading the studies. Malhotra et al and Shahan et al<sup>7</sup> have reported high false-positive rates of CTA with an incidence of approximately 43%<sup>6</sup> and 45%, respectively. The reason for this high false-positive rate is poorly understood, and we agree that it could be related to overcalling from radiologists due to reported poor sensitivity of CTA. Whether this is best addressed by the radiology review process, improved awareness of this entity among radiologists, or a multidisciplinary team consensus will be an interesting topic for further studies. A systematic review of studies comparing CTA and DSA for the diagnosis of BCVI showed that the pooled sensitivity and specificity of CTA are 66% (95% CI, 49%–79%) and 97% (95% CI, 91%–99%), respectively.<sup>8</sup> Hence, the authors concluded that CTA may have a low sensitivity for adequately ruling out a diagnosis but may be useful to rule in BCVI among patients with trauma with a high pretest probability of injury as highlighted by the Drs Malhotra, Wu, and Seifert in their letter.

Finally, in a study looking at the cost-effectiveness of various modalities for BCVI screening, CTA was shown to be the best test from the societal perspective with the most cost-effective screening strategy for patients at high risk for BCVI. From an institutional perspective, CTA was shown to prevent the most strokes at a reasonable cost.<sup>9</sup> Hence, the use of CTA for screening, though imperfect, is likely the most widely used and is suggested as preferred (or equivalent) over DSA for screening for BCVI in the existing guidelines.<sup>10,11</sup>

A recent multicenter study on stroke evaluation in patients

with BCVI showed that most strokes occur in the first 72 hours after injury, and 22% of patients were on antithrombotic therapy when the stroke occurred.<sup>12</sup> Such findings highlight the need for early and accurate diagnosis of BCVI.

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