A Prospective Study of Carbon Dioxide Digital Subtraction versus Standard Contrast Arteriography in the Detection of Endoleaks in Endovascular Abdominal Aortic Aneurysm Repairs

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Abstract

BACKGROUND:

The objective of this study is to compare intraoperative endoleak detection by carbon dioxide digital subtraction angiography (CO(2)-DSA) during endovascular aortic aneurysm repair (EVAR) with standard iodinated contrast angiography (ICA).

METHODS:

Between 2006 and 2010, 76 patients with abdominal aortic aneurysms undergoing EVAR were enrolled in a prospective study. After EVAR, both an ICA and CO(2)-DSA completion study were performed. Two blinded vascular surgeons who were not involved with the EVAR separately interpreted the ICA and CO(2)-DSA results for the presence or absence of an endoleak. Identified endoleaks were classified by types. A third, "tie-breaker" blinded observer was used to resolve differences in interpretations. The sensitivity, specificity, negative predictive value, and positive predictive value were calculated for the ability of CO(2)-DSA to detect endoleaks. Cohen's κ statistic was used to assess interobserver

agreement between the 2 initial interpreting surgeons.

RESULTS:
Of the 76 patients undergoing EVAR, 66 were men with average age of 76 years, a mean aneurysm size of 5.8 cm (range, 4-10 cm), and creatinine of 1 (standard deviation, 0.33). ICA identified 35 type I and 15 type II endoleaks, respectively, while CO(2)-DSA identified 40 type I and 10 type II endoleaks. Overall, CO(2)-DSA had a sensitivity of 0.84, specificity of 0.72, positive predictive value of 0.86, and negative predictive value of 0.69 of intraoperative endoleak detection, with respect to ICA as the criterion standard. The interobserver κ between surgeons for ICA was 0.56, for detection of any endoleak or type I endoleak with CO(2)-DSA was 0.58, and for detection of type II endoleak with CO(2)-DSA was 0.29.

CONCLUSIONS:
Interobserver agreement for the detection of endoleaks is superior with ICA compared to CO(2)-DSA. However, the sensitivity for detecting any endoleak and both the sensitivity and specificity for detecting type I endoleaks using CO(2)-DSA are acceptable. For detecting type II endoleaks using CO(2)-DSA, the sensitivity and positive predictive value are poor. Compared to ICA, CO(2)-DSA provides adequate images for endoleak detection during EVAR and is an acceptable alternative to ICA in patients at risk for contrast-related nephrotoxicity.