

# Review: Computed tomographic angiography and magnetic resonance angiography accurately detect intracranial aneurysms

White PM, Wardlaw JM, Easton V. Can noninvasive imaging accurately depict intracranial aneurysms? A systematic review. *Radiology*. 2000 Nov;217:361-70.

## QUESTION

In patients with suspected intracranial aneurysms, how do 3 noninvasive diagnostic methods (computed tomographic angiography [CTA], magnetic resonance angiography [MRA], and transcranial Doppler ultrasonography [DUS]) compare with intra-arterial digital subtraction angiography (DSA)?

## DATA SOURCES

Studies were identified by searching MEDLINE and EMBASE/Excerpta Medica (1988 to 1998). Reference lists of studies and review articles were checked, and journals not indexed in MEDLINE or EMBASE/Excerpta Medica that appeared in the reference lists were hand searched.

## STUDY SELECTION

Studies in any language were selected if they were published between 1988 and 1998, a noninvasive imaging examination was compared with DSA for diagnosing intracranial aneurysms, and  $\geq 10$  patients received both examinations.

## DATA EXTRACTION

2 reviewers independently reviewed the studies that met initial criteria by using a standardized quality assessment form with 26 to

27 items relevant to studies of diagnostic performance, including study design and examination methods, image-review process, and presentation of results. Studies had to score  $\geq 50\%$  to be included in the meta-analysis.

## MAIN RESULTS

38 studies (1765 patients) met the inclusion criteria and scored  $\geq 50\%$  on the quality assessment scale. 14 studies compared CTA with DSA, 18 compared MRA with DSA, 2 compared both CTA and MRA with DSA, and 4 compared DUS with DSA. Blinding of reviewers was explicitly stated in 34 (89%) of the studies. CTA and MRA each did well; the receiver operating characteristic (ROC) curves did not differ for either on a per-patient ( $P = 0.411$ ) or per-aneurysm

( $P = 0.09$ ) basis. Insufficient data existed to construct an ROC curve for DUS. The test characteristics for CTA, MRA, and DUS are in the Table.

## CONCLUSION

In patients with suspected intracranial aneurysms, computed tomographic angiography and magnetic resonance angiography perform similarly and with high sensitivity and specificity.

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## Pooled test characteristics for detecting intracranial aneurysms\*

Test	Basis	Number of studies	Sensitivity (95% CI)	Specificity (CI)	+LR	-LR
CTA	Per patient	11	92% (89 to 95)	94% (88 to 99)	15.8	0.09
	Per aneurysm	16	90% (88 to 92)	86% (79 to 91)	6.32	0.12
MRA	Per patient	18	87% (84 to 90)	92% (88 to 94)	10.3	0.14
	Per aneurysm	18	87% (84 to 90)	95% (91 to 97)	16.6	0.14
DUS	Per aneurysm	2	82% (67 to 92)	70% (35 to 93)	2.73	0.14

\*CTA = computed tomographic angiography; DUS = transcranial Doppler ultrasonography; MRA = magnetic resonance angiography. Diagnostic terms defined in Glossary; -LR calculated from data in article.

## COMMENTARY

Most of the studies identified for the review by White and colleagues were those with a high prevalence of aneurysm. In these cases, investigation almost always involves the use of angiography to identify aneurysms. Angiography is especially useful in planning endovascular treatments. In the acute phase of subarachnoid hemorrhage, MRA and CTA are not useful for identifying small intracranial aneurysms because such aneurysms can be obscured by subarachnoid blood. If multiple aneurysms exist, however, CTA and MRA can often help identify which aneurysm bled.

In assessing asymptomatic patients at increased risk for intracranial aneurysms, the situation is less clear. As the authors point out, with decreasing prevalence of aneurysms, the sensitivity and specificity of noninvasive testing is likely to be lower than that reported in their review. The risk for rupture in the International Study of Unruptured Intracranial Aneurysms (ISUIA) was lower than previously thought, particularly for small aneurysms (1). Furthermore, the morbidity and mortality associated with treatment of asymptomatic aneurysms are not insubstantial. The ISUIA study showed a combined morbidity and mortality of 13.1% to 15.7%, although this risk may be reduced with endovascular techniques (2). Asymptomatic patients should be assessed at a specialist center, where patient attitudes and such factors as age, smoking history, and hypertension that influence the risk for

rupture can be considered, rather than introducing blanket screening that is unlikely to be cost-effective (3, 4).

Developments in noninvasive imaging—including the use of contrast-enhanced, 3-dimensional subtraction MRA; multislice CTA; and contrast-enhanced power DUS—are likely to further increase the accuracy of noninvasive vascular imaging. These methods need to be rigorously evaluated in the presence of a symptomatic aneurysm and in the screening setting.

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