Analysis of False negative CT angiograms in detection of cerebral aneurysm: Institutional analysis and systematic review of literature

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Introduction

Numerous studies have highlighted the comparison of CTA and DSA in aneurysmal SAH detection however systematic analysis of the false negative studies is lacking in the literature. The objective of this study was to perform an institutional review of false negative CTA in conjunction with systematic analysis of literature.

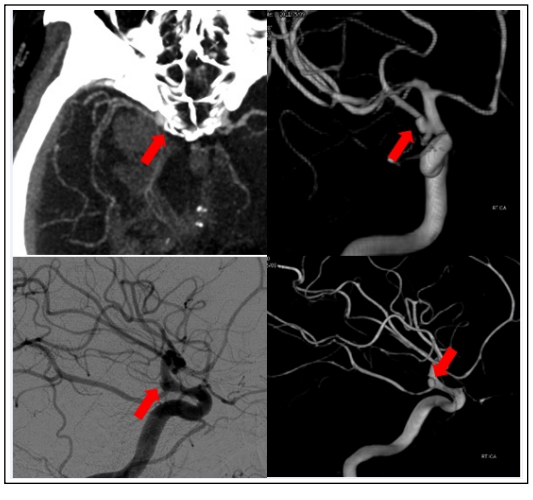
Methods

We performed retrospective review of all spontaneous subarachnoid hemorrhages at LSUHSC-Shreveport between the January 2010 to December 2011. Systematic review was performed from 1995-2013 using Pubmed, Cochrane database and Google Scholar.

Results

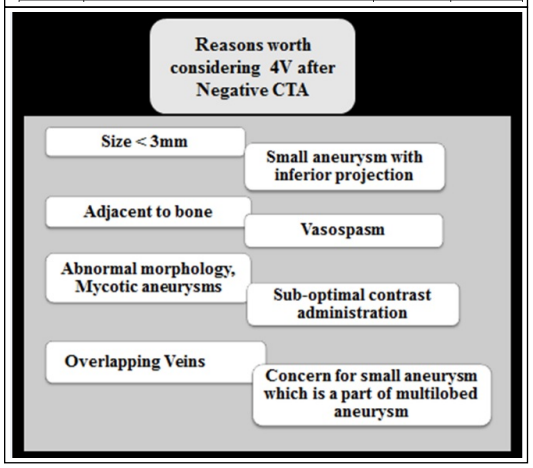
Out of 285 patients with spontaneous SAH, 25 patients had a negative CTA. On subsequent DSA, 10 patients (40%) had positive findings of 2 AVM and 8 aneurysms. The locations of the aneurysms were posterior communicating artery (3), anterior communicating artery (2), posterior inferior cerebellar artery, superior cerebellar artery, and anterior choroidal artery. Sensitivity 84.4%, specificity 91.6%, positive predictive value (PPV) 97.8%, negative predictive value (NPV) 57.9%.

In the systematic review, 43 studies were enrolled. Of the 3309 aneurysm, 115 were false negative 3.4%. 70.6% were anterior circulation aneurysms. 46.7% false negative were part of multiple aneurysms. Mean size was 2.6 mm (range 1-8 mm). Most common false negative in the group was middle cerebral artery aneurysm.



Plausible causes for False negative CTA

	Reason for false negative CTA	Size	Aneurysm
Patient 1	Vasospasm, inadequate visualization due to bone, small size	3x2x1.4	Pcomm
Patient 2	Inadequate contrast with abnormal morphology	5x6.3x1.9	Pcomm
Patient 3	Motion artifacts	5.5x7.1x2.8	Pcomm
Patient 4	Suboptimal contrast	7.2x5.5x4.9	MCA and AChoA
Patient 5	Blood clot masking the aneurysm in CTA, initially read as negative but with 3D recons it was visualized but by that time, 4V was already.	7.7x4.5x2.2	Acomm
Patient 6	Visualized retrospectively	4x3.8x2	Acomm and Pcomm
Patient 7	Two aneurysm, Very small aneurysm and fenestrated bleb like aneurysm	1.8x0.8x1.8	SHA + AChoA
Patient 8	Small size with vasospasm	2.6x2.2x1.8	SCA
Patient 9	Inadequate visualization due to bone	4.9x3.9x1.8	PICA
Patient 10	Small size	1.5x1.5x1	AChoA



Conclusions

CTA is an emerging alternative for DSA in the diagnosis of cerebral aneurysm however there is a concern of false negative result which was 3.4% in the literature analyzed. Prospective studies are warranted to better characterize false negative results of CTA. Generally, CTA is consistently reliable in aneurysms > 3 mm.

Learning Objectives

Reliability of CTA in diagnosing cerebrovascular pathology.