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Subarachnoid Hemorrhage in the Setting of Multiple Aneurysms: an Indication for Microsurgical Clipping?

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Introduction

When subarachnoid hemorrhage (SAH) is encountered in the setting of multiple intracranial aneurysms, the pattern of hemorrhage is generally the primary indicator of the ruptured lesion. However, when the bleed pattern is not definitive, determination of the rupture site typically relies on other aneurysm features associated with hemorrhage, notably size as well as morphology and location. Here we present a series of cases whereby typically-used predictors lead to misidentification of the site of rupture, subsequently determined only by open microsurgical evaluation. Coil Embolization of the presumed ruptured lesion would have resulted in failure to treat the source of hemorrhage.

Learning Objectives

To determine the best method of treatment when multiple aneurysms may be the source of a nondistinct subarachnoid hemorrhage pattern.

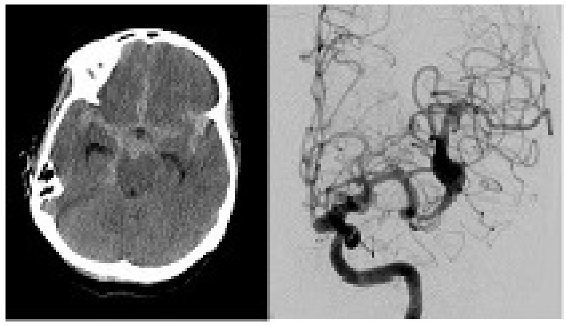
Methods

Subarachnoid hemorrhage cases with multiple intracranial aneurysms between January 1, 2007 and August 15, 2014, and incorrect initial presumption of rupture site were prospectively collected and reviewed for hemorrhage pattern from CT scan, and aneurysm features, including morphology and size based on digital subtraction angiogram. Aspect ratio, size ratio, parent-daughter angles and flow angles were also calculated. The findings were compared to the intraoperative determination of rupture site.

Results

5 operated cases with non-definitive hemorrhage patterns on CT were identified. Assignment of ruptured lesion based on size and/or morphology was found to be mistaken at the time of surgical exploration. Evaluation of other parameters associated with rupture risk, such as aspect ratio, size ratio and associated vessel angles were also unreliable in preoperative identification of the ruptured aneurysm.

Nondefinitive Subarachnoid Bleed Pattern



Noncontrasted head CT with Left ICA Angiogram Image

Representative Case

MD was a 41 year old female with a history of Sickle Cell Disease, multiple known aneurysms and a seizure disorder, who complained to her family of a headache before succumbing to a tonic-clonic seizure. Upon evaluation, she was found to have diffuse subarachnoid hemorrhage. Angiogram demonstrated the following aneurysms:

1. A stable 2 mm left superior cerebellar artery aneurysm.
2. A 2.7 mm right cavernous internal carotid artery aneurysm.
3. A 3 x 4 mm right ophthalmic internal carotid artery segment aneurysm.
4. A 2.8 mm anterior communicating artery aneurysm.
5. A 1.8 mm right M1 segment aneurysm.
6. A 10 mm left paraclinoid internal carotid artery aneurysm x 5 mm, amenable for endovascular coiling with balloon remodeling technique.
7. A 1.4 mm left anterior choroidal internal carotid artery segment aneurysm.
8. A 5.6 mm left middle cerebral artery aneurysm.
9. A 2.5 mm left M1 segment aneurysm.
10. A fusiformly dilated distal segment of the left superior division of the middle cerebral artery spanning a length of about 2 cm with the widest diameter of 8 mm.
11. Infundibular origin of both posterior communicating artery segments.

She had demonstrated a right hemiplegia on exam so a left source was suspected. Her 1cm paraclinoid aneurysm was the largest and the suspected source of hemorrhage. A left frontotemporal craniotomy for microsurgical clipping was performed. It was found that the anterior communicating artery had ruptured, as evidenced by surrounding clot. However, clipping was also performed of the unruptured left paraclinoid, left anterior choroidal, left M1, left MCA bifurcation, and right carotid ophthalmic aneurysm.

Conclusions

Morphological features, including size, cannot reliably be used to determine site of rupture in cases with multiple aneurysms and a non-definitive pattern of subarachnoid hemorrhage. Microsurgical exploration and clipping of the multiple aneurysms, confirming obliteration of the ruptured lesion, may be warranted in this setting, unless all lesions could be effectively and contemporaneously treated with coil embolization.

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