Accuracy in Identifying the Source of Subarachnoid Hemorrhage in the Setting of Multiple Intracranial Aneurysms



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## Introduction

When subarachnoid hemorrhage (SAH) is encountered in the setting of multiple intracranial aneurysms, hemorrhage pattern is generally the primary indicator of the ruptured lesion. When the pattern is not definitive, rupture site determination typically relies on angiographic features such as size, morphology and location. We examined the frequency with which such features lead to misidentification of the ruptured lesion, subsequently determined by open microsurgical evaluation.

#### **Illustrative Case:**

MB is a 45 year old male who presented with subarachnoid hemorrhage (SAH) 7 years prior, and underwent coil embolization of a basilar tip and left ICA terminus aneurysm. He then represented with acute-onset headache and vomiting, and was again diagnosed with SAH. He had multiple aneurysms present, including the prior two, and untreated aneurysms as follows: a left posterior communicating artery aneurysm, left anterior choroidal artery aneurysm, bilateral middle cerebral artery bifurcation aneurysms, a right ICA terminus aneurysm, a small left supraclinoid aneurysm, and a right paraclinoid aneurysm. There was neck expansion of the coiled left ICA terminus aneurysm. Due to the growth and blood pattern, the left carotid terminus aneurysm was suspected to be the cause of the new hemorrhage. The patient was taken to the operating room for a left modified OZ craniotomy for exploration and microsurgical clipping. Intraoperatively, the left carotid terminus aneurysm was inspected, but did not appear to have clot or other overt signs of hemorrhage around it, and had only a small lateral remnant of the neck. However, the left posterior communicating artery aneurysm was found to be of giant size, and clot was present, along with adjacent hemosiderin staining of the third cranial nerve, indicating rupture of this aneurysm.

# Methods

SAH cases that proceeded to craniotomy between January 1, 2004 and August 15, 2014 were reviewed, and cases with multiple intracranial aneurysms were identified. Initial head CT scans were reviewed to determine whether the SAH pattern was definitive for the source aneurysm. Those with "non-definitive" hemorrhage patterns were blindly evaluated by reviewing the characteristics of the aneurysms on angiography, and the original presumption of rupture site was also recorded. Operative reports were then reviewed to confirm or refute the imaging-based determination of ruptured aneurysm.

### Results

531 SAH cases undergoing craniotomy were identified; 151 had multiple aneurysms. 80 (53%) had "non-definitive" hemorrhage patterns on initial CT. Of the 71 with definitive bleed patterns, all had the assumed rupture site confirmed to be accurate at the time of surgery. In contrast, 14 (17.5%) of the cases with non-definitive hemorrhage patterns on CT had discordance between the assumed source on original or secondary radiological review, and the actual intraoperative determination of the ruptured aneurysm.

#### Conclusions

SAH cases with multiple aneurysms frequently demonstrate a bleed pattern that does not clearly delineate the source aneurysm. Morphological features cannot reliably be used to determine rupture site in these cases. Microsurgical clipping, confirming obliteration of the ruptured lesion, is warranted in this setting, unless all lesions can be contemporaneously treated with endovascular embolization.

# **Learning Objectives**

To determine the frequency of misidentification of source aneurysm in the setting of subarachnoid hemorrhage with multiple intracranial aneurysms.

### References

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