Simultaneous Rupture of Two Intracranial Aneurysms: CT Diagnosis

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SUMMARY A case of simultaneous rupture of two intracranial aneurysms is reported. This is a rare event, and we found no CT reports of such a case. This case points out that the usual assumption of a single aneurysm rupture in a patient with multiple aneurysms may be erroneous and difficult to diagnose angiographically, but may lend itself to CT diagnosis.

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THE SIMULTANEOUS RUPTURE of intracranial berry aneurysms is a very rare occurrence with only four cases having been reported previously in the literature. From a clinical point of view, it is usually assumed that only one aneurysm has bled in patients with multiple intracranial aneurysms. Since the simultaneous rupture of more than one aneurysm would dictate repair of both lesions according to currently acceptable clinical practice, this diagnosis can be very important and should be considered in patients shown to have multiple aneurysms. CT offers a diagnostic technique for confirming this event. We report a surgically proven case of simultaneous rupture of two intracranial berry aneurysms.

Clinical History

The patient is a 37 year old right handed female who presented to her local doctor with complaints of acute, severe generalized headache and right arm and leg weakness and numbness. Blood pressure in the ER was 198/120 and responded to I.V. medication. The patient was noted to be alert and oriented with a mildly stiff neck. Pupils were equal and responsive to light and accommodation. Fundoscopic exam revealed mild hypertensive changes but no subhyaloid hemorrhage or papilledema. Motor and sensory exam was normal except for right lower facial palsy. Deep tendon reflexes were 2+ and equal bilaterally. Plantar reflexes were flexor bilaterally. CT scan revealed subarachnoid hemorrhage and cerebral angiography revealed five berry aneurysms (see radiographic findings). Due to vasospasm, surgery was delayed until the 25th day, at which time the left middle cerebral artery aneurysm was clipped. Clotted subarachnoid blood was found adjacent to the aneurysm. On the 36th hospital day, all three pericallosal aneurysms were clipped. Evidence of previous bleeding was found adjacent to the larger right pericallosal artery aneurysm. Rupture sites were identified at surgery in both the left middle cerebral artery aneurysm and the larger right pericallosal artery aneurysm. Four months after discharge, the patient underwent elective clipping of her right internal carotid artery aneurysm. Except for mild right facial weakness, the patient is neurologically normal.

Radiographic Findings

A CT scan performed on admission (fig. 1) shows blood in the left Sylvian fissure and in the anterior interhemispheric fissure, suggesting the possibility of simultaneous rupture of two aneurysms remote from each other. Post contrast CT scans (fig. 2a and 2b) show enhancing lesions in both these areas compatible with intracranial aneurysms, as well as a right internal carotid artery aneurysm.

![Figure 1](http://stroke.ahajournals.org/)

Figure 1. An axial CT section without contrast enhancement at the level of the frontal horns shows areas of increased attenuation in the anterior interhemispheric fissure (small white arrow) and in the left Sylvian fissure (large white arrow). These areas measure blood density and the extension to the right of the interhemispheric fissure (black arrow) represents thrombus in or around one of the pericallosal artery aneurysms.
carotid artery aneurysm. Angiography revealed five intracranial aneurysms: two involving the right pericallosal artery (fig. 3a and 3b), one each of the right internal carotid artery bifurcation (fig. 3a and 3b), the left pericallosal artery (fig. 4a and 4b), and the left middle cerebral artery (fig. 4a and 4b).

Discussion

The occurrence of multiple intracranial aneurysms is relatively common, found in up to 25% of patients presenting with subarachnoid hemorrhage from one of these lesions. Determination of which aneurysm bled is important since it is generally accepted that this is the lesion most likely to rebleed in the high risk period. The classic article by Ernest Wood in 1964 sets forth a number of angiographic criteria for making this determination which include:

1. Greater size is the most frequent common denominator among aneurysms that have bled in patients with multiple lesions.
2. Evidence of a mass denoting an associated intracerebral, subarachnoid or subdural hematoma, or an edematous cerebral infarct, is the most reliable radiologic indication that an aneurysm has bled.
3. The aneurysm with an uneven angiographic outline was the ruptured aneurysm in 76% of his cases.
4. Non-homogenous contrast filling is infrequently seen, but considered supplementary evidence of rupture.

This work included surgical and/or autopsy confirmation which showed a 95% accuracy. A similar paper by Heiskanen a year later showed an 88% accuracy in determining the bleeding site. On the basis of Wood's criteria, the largest of the pericallosal aneurysms (fig. 3a and 3b) would be the one most likely to have bled in our patient.

Determination of the bleeding site based on clinical presentation is less accurate than angiography and reported to be in the neighborhood of 37%. Use of EEG to determine the bleeding site is also less accurate than angiography and generally only helpful when two aneurysms occur on opposite sides of the head.

A number of papers have appeared in recent years assessing the value of CT in determining the site of hemorrhage from intracranial aneurysms. The overall accuracy of CT in detecting subarachnoid hemorrhage approaches 95% when both unenhanced and enhanced scans are performed. It is felt that small hemorrhages which do not produce a change in the attenuation of the subarachnoid space can be detected by enhancement of the meninges or surface of the brain following contrast injection. The accuracy of determination of the bleed-
ing site on CT varies with different locations. Criteria utilized include: location of the subarachnoid blood, location of any intracerebral hematoma, and actual visualization of the aneurysm either before or after contrast injection. The overall accuracy with middle cerebral artery aneurysms is 70%, with anterior cerebral aneurysms 92%, and with internal carotid artery aneurysms is 47%. The actual CT visualization of the aneurysms approaches 60%. In our patient, 3 of the 5 aneurysms were definitely identified on CT.

Because of CT identification of subarachnoid blood in two cisterns without blood in adjacent, connecting cisterns, simultaneous rupture of 2 aneurysms was diagnosed and surgically proven.

Because of the location of the ruptured aneurysms, CT proved the most accurate diagnostic procedure in determining the site of hemorrhage in our patient. Simultaneous hemorrhage from multiple berry aneurysms does occur, albeit, rarely. Using all diagnostic modalities, this possibility should be considered in patients presenting with subarachnoid hemorrhage in order to better plan treatment and to avoid disastrous surprises both before and at surgery.

References
FIGURE 4. Figures 4A and 4B are lateral and AP left common carotid arteriograms which show a small aneurysm of the left pericallosal artery (black arrow) and an aneurysm of the left middle cerebral artery.
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