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AJNR Am J Neuroradiol 1999, 20 (7) 1284-1286
http://www.ajnr.org/content/20/7/1284

AJNR Am J Neuroradiol 20:1284–1286, August 1999

Case Report

Intracystic Hemorrhage of the Middle Fossa Arachnoid Cyst and Subdural Hematoma Caused by Ruptured Middle Cerebral Artery Aneurysm

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Summary: We report a case of a cerebral aneurysm arising from the bifurcation of the left middle cerebral artery that ruptured into a left middle cranial fossa arachnoid cyst, associated with acute subdural hematoma. We discuss the relationships of aneurysm, arachnoid cyst, and subdural hematoma.

The most common cross-sectional imaging finding expected with aneurysm rupture is ordinarily subarachnoid hemorrhage. The intracranial cerebral arteries mostly are contained in the subarachnoid space; nevertheless, there are cases described in the imaging literature of ruptured aneurysm resulting in intracerebral parenchymal hematoma or subdural hematoma (1–3). We report a case of a cerebral aneurysm arising from the bifurcation of the left middle cerebral artery, which is associated not only with an acute subdural hematoma, but also suggests hemorrhage into a left middle cranial fossa arachnoid cyst.

Case Report

A 61-year-old woman came to the outpatient clinic of Koyanagi Memorial Hospital with an abrupt onset of a persistent mild headache. She underwent CT study, which showed a focal circumscribed hyperattenuating lesion in the left Sylvian fissure without associated mass effect (Fig 1). Of note, no specific evidence for subarachnoid hemorrhage was otherwise found. A thin left convexity and tentorial subdural hernatoma also was diagnosed at this time. At this point, in light of the hyperattenuating focus in the left Sylvian fissure in concert with the stated history, a partially thrombosed cerebral aneurysm initially was suspected. A CT examination had been performed 4 years prior to the stated admission and, according to the report, depicted a left middle cranial fossa arachnoid cyst (Fig 2). As a result of this additional history, follow-up MR imaging was suggested.

The following day, MR imaging and magnetic resonance angiography (MRA) were performed. MR imaging revealed a round lesion with regions of iso- and hyperintensity on Tl-weighted images and hypointensity on T2-weighted images (Fig 3A, B). This lesion was surrounded by a hypointense rim on Tl-weighted images and fluid attenuation inversion recovery (FLAIR) images (Fig 3C) corresponding with hyperintensity on T2-weighted images, presumably representing subarachnoid space CSF. MR imaging also revealed a hypoplastic left temporal lobe, left temporal operculum, and left frontal operculum. MR imaging also confirmed bilaterally thin-convexity subdural hematomas (Fig 3D). MR angiography delineated a presumed left middle cerebral artery aneurysm located at the superior pole of the Sylvian fissure hematoma. Confirmatory diagnostic angiography was performed and an anteriorly projecting cerebral aneurysm was confirmed in the suspected location (Fig 4). Successful aneurysm clipping subsequently was performed via a left pterional craniotomy under general anesthesia. The craniotomy revealed subdural hematoma arising from the left temporal convexity and extending to the skull base, and there was also intraoperative demonstration of adhesion of sphenoid wing dura to the anterior wall of the arachnoid cyst. After dissection and removal of the firm hematoma in the arachnoid cyst, the dome of the aneurysm was exposed, and the aneurysm dome was shown penetrating the medial wall of the arachnoid cyst. The surgery at this point consisted of opening the arachnoid cyst uneventfully to the suprasellar cistern, and uncomplicated clipping of the aneurysm neck. The patient was discharged 2 weeks later without any neurologic deficits.

Discussion

Intracystic hemorrhage of the arachnoid cyst can occur spontaneously (4). Previous reports have described middle fossa arachnoid cysts with subdural hematoma (5–9). This combination of diseases has been explained conjecturally as possibly related to the unsupported blood vessels that can be found surrounding an arachnoid cyst, which are most likely veins, and to the fragile surrounding supporting stroma, or lack of it. These may bleed spontaneously or after relatively minor trauma. As a result of this relative fragility, the injury may result in subdural hematoma or intracystic hemorrhage or both (4–6, 8). Perhaps as supportive evidence of this conjectural explanation is the fact that the incidence of subdural hematomas associated with arachnoid cysts in the middle fossa is higher than in other locations (5). In seeking to explain this coexistence, the literature has

Received in original form December 1, 1998; accepted after revision January 6, 1999.

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FIG 1. A noncontrast CT shows a well-circumscribed and rounded high-attenuation area in the left Sylvian fissure without clearly defined mass effect. This image depicts a thin crescent of surrounding CSF.

FIG 2. A noncontrast CT scan obtained 4 years prior to the current admission shows an arachnoid cyst in the left middle cranial fossa, without coexistence of the above-shown hyperattenuating finding.

suggested that the described arachnoid cyst may enlarge over time as a result of expression/production of fluid from the cyst walls and therefore the possible ensuing increased pressure may rupture into the subdural space and manifest as a hematoma if there is also accompanying vascular disruption (1, 2, 7).

An alternative mechanism has been suggested to explain the coexistence of aneurysms and subdural collections. A ruptured aneurysm may adjoin an adherent arachnoid membrane and, as such, may bleed directly into the subdural space through a local tear in the arachnoid membrane resulting from increased intravascular pressure and leading to a decompressing rupture (1–3). An association between aneurysm rupture and arachnoid cyst is rare. Only three case reports were discovered of this association from a comprehensive review of the literature in spite of the high independent incidence of both processes. Two described cases were that of subarachnoid hemorrhage accumulating within an arachnoid cyst caused by a ruptured cerebral aneurysm (10, 11). The third case, and our presented case, described an aneurysm ruptured directly into the arachnoid cyst without definite subarachnoid hemorrhage (12).

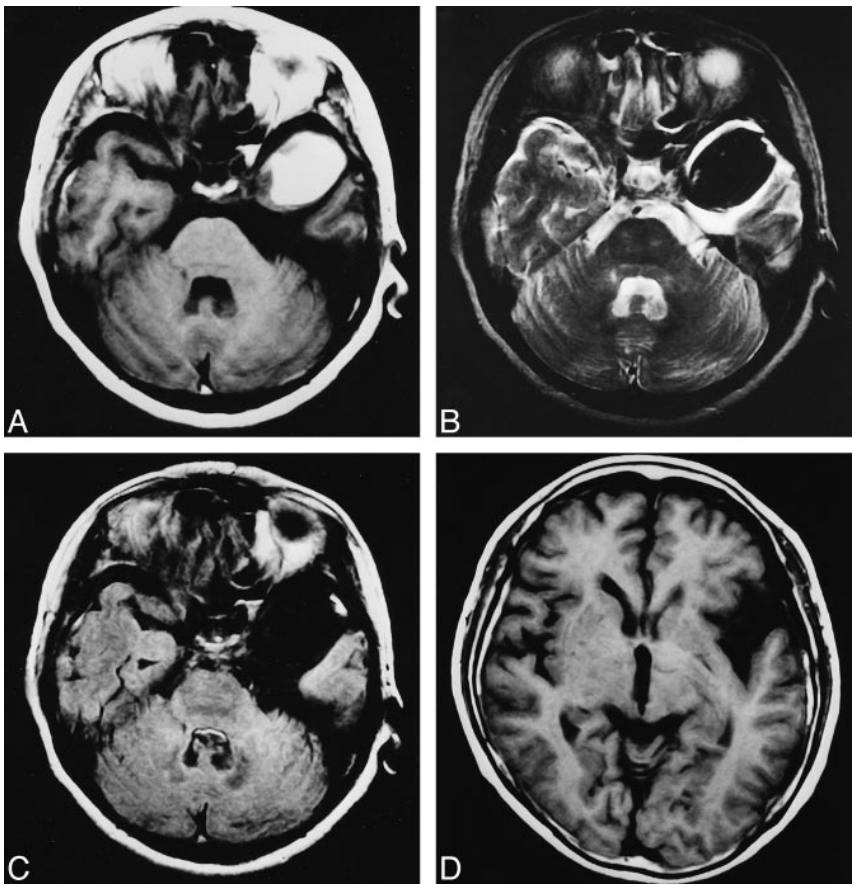

FIG 3. MR imaging after CT study.

A, MR imaging shows a marginally isointense and centrally hyperintense rounded lesion on T1-weighted images, surrounded by a clearly defined hypointense rim.

B, T2-weighted images depict the CT hyperattenuating focus as a hypointense lesion surrounded by thin marginal hyperintensity, which presumably is the CSF of the subarachnoid space.

C, Fluid attenuation inversion recovery (FLAIR) images help confirm the presence of CSF surrounding the hypointense rim. The marginal hyperintensity on T2-weighted imaging most likely represents CSF in light of the signal nulling, which is shown on the FLAIR sequence, as one would expect to see in an area of simple fluid.

D, MR imaging depicts thin bilateral convexity subdural hematomas as hyperintense collections on the Tl-weighted image. A hypoplastic left Sylvian fissure also is noticed.

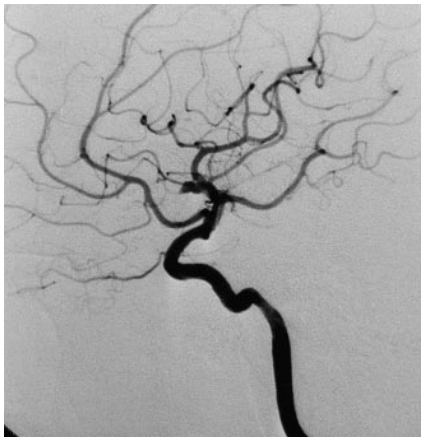

FIG 4. A lateral view of the left internal carotid angiogram shows an irregular anteriorly and laterally projecting aneurysm arising from the left middle cerebral artery bifurcation.

It is our opinion that the aneurysm ruptured initially into the middle cranial fossa arachnoid cyst, leading to increased pressure in the arachnoid cyst. We believe that the high pressure of the arachnoid cyst may very well have leaked to the subdural space through closely opposed regions of arachnoid and dura, such as may be found in a region of arachnoid to dural adhesion. In summary, this is the first reported case of a cerebral aneurysm rupturing into an arachnoid cyst, with adjoining formation of an acute subdural hematoma, and underscores the myriad potential relationships between the extra-axial and intravascular spaces.

References

1. Ragland RL, Gelber ND, Wilkinson HA, Knorr JR, Tran AA. **Anterior communicating artery aneurysm rupture: an unusual cause of acute subdural hemorrhage.** *Surg Neurol* 1993;40:400–402
2. Kondziolka D, Bernstein M, Brugge KT, Schutz H. **Acute subdural hematoma from ruptured posterior communicating artery aneurysm.** *Neurosurgery* 1998;22:151–154
3. Handel SF, Perpetuo FOL, Handel CH. **Subdural hematomas due to ruptured cerebral aneurysms: angiographic diagnosis and potential pitfall for CT.** *AJR Am J Roentgenol* 1978;130:507–509
4. Ide C, Coene BD, Gilliard C, et al. **Hemorrhagic arachnoid cyst with third nerve paresis: CT and MR findings.** *AJNR Am J Neuroradiol* 1997;18:1407–1410
5. Munk PL, Robertson WD, Durity FA. **Middle fossa arachnoid cyst and subdural hematoma: CT studies.** *J Comput Assist Tomogr* 1988;12:1073–1075
6. Cullis PA, Gilroy J. **Arachnoid cyst with rupture into the subdural space.** *J Neurosurg Psychia* 1983;46:454–456
7. Ergun R, Taskin Y, Ergungor F, Anasiz H, Beskonakli E, Okten Al. **Unusual complication of arachnoid cyst: spontaneous rupture into the subdural space.** *Acta Neurochir (Wien)* 1997;139:692–694
8. Ochi M, Morikawa M, Ogino A, Nagaoke K, Hayashi. **Supratentorial arachnoid cyst and associated subdural hematoma: neuroradiologic studies.** *Eur Radiol* 1996;6:640–644
9. Rakier A, Feinsod M. **Gradural resolution of an arachnoid cyst after spontaneous rupture into the subdural space.** *J Neurosurg* 1995;83:1085–1086
10. Jinkins JR, Holoubi,Siqueira EB. **Ruptured middle cerebral aneurysm with accumulation of subarachnoid blood within convexity arachnoid cyst.** *Comput Radiol* 1987;11:185–187
11. Hirose S, Kubota T, Kawano H, Hosotani K, Yamaguchi N, Shimada S. **Ruptured aneurysm associated with arachnoid cyst: intracystic hematoma without subarachnoid hemorrhage.** *Surg Neurol* 1995;43:353–356
12. Barker RA, Phillips RR, Moseley IF, Taylor WJ, Kitchen ND, Scadding JW. **Posterior communicating artery aneurysm presenting with haemorrhage into an arachnoid cyst.** *J Neurosurg Psychiatry* 1998;64:558–560