Bilateral Acute Subdural Hematoma from Ruptured Posterior Communicating Artery Aneurysm

A Case Report

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Summary

Brain tumors, hematological diseases and vascular malformations like fistulas or arteriovenous malformations are the most well known causes of non-traumatic subdural hematoma (SDH)¹. Although spontaneous subdural hematoma from ruptured intracranial aneurysm has been reported², SDH with non radiographic evidence of subarachnoid hemorrhage is very rare^{3,4}. Moreover, a patient with acute and bilateral spontaneous subdural hematoma secondary to ruptured left posterior communicating artery aneurysm has not been reported to date. The clinical findings and etiologic mechanisms are discussed.

Case Report

A 44-year-old, right-handed woman experienced a sudden loss of consciousness. There was no history of hypertension, haemostatic diseases, head trauma or sudden onset headaches. The patient was found unconscious and admitted to our hospital sedated and intubated with slight anisocoria. Computer tomography (CT) scan revealed a bilateral acute subdural hematoma at the brain convexity without significant mass effect, and a hyperdensity on the tentorium cerebelli (Figure 1A). Magnetic resonance imaging (MRI) confirmed the bilateral

acute subdural hematoma as a 3-mm extra-axial collection extending from frontal, parietal and temporal lobe. This bilateral hematoma was isointense on T1-weighted images and hyperintense on T2-weighted MR images (Figure 1B). No evidence of arachnoid hemorrhage was noted on either CT or MR-Flair images.

Cerebral angiography confirmed the presence of a left posterior communicating artery aneurysm of 10 mm maximal diameter. The irregular aspect of the dome aneurysm on angiogram was very suggestive of a recent rupture. No vasospasm was present. (Figure 2A).

Surgical and endovascular treatment options were discussed with the patient's relatives, and after consideration of the risks, benefits and potential complications, endovascular treatment was decided.

Endovascular treatment by coiling was performed on the same day as admission using an endovascular technique with a microcatheter Prowler-J (Cordis Neurovascular, Miami, USA), a 0.012-inch glide wire (Terumo, Leuven, Belgium) and six Matrix coils (Boston Scientific Target, Ireland) with total exclusion of the aneurysm. (Figure 2B). The patient developed intracranial hypertension and an external ventricular derivation was placed. After 20 days in the intensive care unit the patient died from cardiovascular dysfunction secondary to adrenergic myocarditis.

Figure 1 A) Computed tomography showing a discrete bilateral subdural hematoma and a hyperdensity on tentorium cerebelli. B) Bilateral acute subdural hematoma on T2 MR (Flair).

Discussion

Intracranial bleeding due to the rupture of a cerebral aneurysm is frequently observed as subarachnoid hemorrhage (60%), intracerebral hematoma (30-40%) or intraventricular bleeding (12-19%)⁵. Spontaneous subdural hematoma (SDH) usually occurs after head trauma and its spontaneous or non-traumatic occurrence is extremely rare^{6,7}.

Acute spontaneous subdural hematoma is an uncommon manifestation of a cerebral aneurysm. Aneurysm of the internal carotid artery, middle cerebral artery and anterior cerebral artery are more commonly associated with the presentation of subdural hematoma^{5,8,9,10}.

The incidence of acute subdural hematoma (SDH) due to ruptured aneurysm occurs in 0.5% to 8% of cases^{7,10,11,12}. Of them, acute SDH without neuroimaging evidence of SAH is more rare^{3,4,13}.

Similar to our case, most cases of subdural hematoma due to the rupture of cerebral aneurysms reported in the literature were seen in females¹⁴. The majority of these patients presented with features suggestive of transtentorial herniation such as anisocoria, hemiplegia and altered consciousness¹⁴.

An initial 3D-CT angiography is useful to detect the presence of an aneurysm and an angiographic study can confirm the subjacent vascular pathology¹⁵. However, even when no aneurysm is recognized, the possibility of angiographically unvisualized aneurysm should be considered¹⁶.

Neuroradiological investigation can help to define the cause of an acute subdural hematoma in the absence of head trauma. CT scan suggests the differentiation between a subdural hematoma due to a ruptured aneurysm from one secondary to trauma¹⁴. For example, continuity between a convexity subdural hematoma and an interhemispheric subdural hematoma could be related to a ruptured aneurysm of ACA^{3,10}, and continuity between a tentorial hematoma and an interhemispheric subdural hematoma may indicate a ruptured aneurysm of an internal carotidoposterior communicating junction (IC-PC)⁷.

Clinical criteria are important to decide the treatment procedure. If a rapid clinical deterioration occurred, an emergency craniotomy for subdural evacuation should be performed before further investigations¹⁴. Exceptionally, during surgical procedure direct vascular visualization may reveal the aneurysm as the cause of

the hematoma¹⁷. Elective endovascular coiling can be proposed if the SDH is clinically well tolerated or after surgical evacuation of the hematoma.

Patients with unilateral or bilateral spontaneous acute SDH should be evaluated with CT-angiography, angio-MRI or conventional angiogram to seek the cause of bleeding. However, negative angiography does not categorically exclude this possibility, and if surgery is necessary an extensive brain surface examination must be performed¹⁶.

In the majority of cases with unilateral SDH secondary to ruptured aneurysm, the lesion was located in the middle cerebral artery along the convexity¹⁵ or in the anterior cerebral artery along the interhemispheric fissure and the brain convexity^{9,10}.

Three mechanisms have been proposed to explain how a ruptured saccular aneurysm can cause an acute subdural hematoma. First theory: successive small bleeding or sentinel hemorrhages can cause the adhesion of the aneurysm to the adjacent arachnoid membrane, and the final rupture occurs into the subdural spaces⁷. Second theory: the stream of blood may rupture through the arachnoid membrane at some distant weak-point^{12,13}. Lastly, the subdural hematoma may develop secondary to the decompression of an intracerebral hematoma into the subdural space following disruption of the arachnoid covering the cerebral cortex¹⁸.

Some cases with acute unilateral SDH due to ruptured IC-PC aneurysms have been reported^{3,13,19}. The adhesion of the fundus of the IC-PC aneurysm with the tentorium cerebelli should permit the extension of the hemorrhage into the subdural space without SAH³.

Bilateral acute subdural hematoma on the hemispheric convexity secondary to ruptured aneurysm is very rare, and has been described only with ACA or ACoA aneurysms^{9,20} and its presentation is generally with extension to the interhemispheric subdural spaces. To our knowledge, this case appears to be the first in the literature with bilateral acute subdural hematoma secondary to ruptured posterior communicating artery aneurysm. In our case, a particular anatomical configuration or the local fibrosis provoked by hypothetical previous small bleeding episodes of the aneurysm could facilitate the absence of SAH and the extension of the bleeding across the tentorium cerebelli and the bilateral subdural spaces.

Figure 2 A) Cerebral angiography showing an aneurysm arising from the left internal carotid-posterior communicating artery junction. B) Control angiogram after coil embolization.

References

- 1 Munro D: The diagnosis and treatment of subdural hematoma. *N Engl J Med* 31: 1145-1160, 1934.
- 2 O'Leary PM, SP: Ruptured intracerebral aneurysm resulting in a subdural hematoma. *Am Emerg Med* 15: 944-946, 1986.
- 3 Ishibashi A, YY Sakamoto M: Acute subdural hematoma without subarachnoid hemorrhage due to ruptured intracranial aneurysm-case report. *Neurol Med Chir (Tokyo)* 37: 533-537, 1997.
- 4 Nonaka Y, KM, Mori K, Maeda M: Pure acute subdural haematoma without subarachnoid haemorrhage caused by rupture of internal carotid artery aneurysm. *Acta Neurochir (Wien)* 142: 941-944, 2000.
- 5 Fox JL: Intracranial aneurysm, ed S Verlag Vol 1 New York 199-203, 1983.
- 6 Zimmerman RD, RE, Yurberg E, Leeds NE: Falx and interhemispheric fissure on axial CT: II. Recognition and differentiation of interhemispheric subarachnoid and subdural hemorrhage. *Am J Neuroradiol* 3: 635-642, 1982.
- 7 Ishikawa E, SK, Yanaka K et Al: Interhemispheric subdural hematoma caused by a ruptured internal carotid artery aneurysm: case report. *Surg Neurol* 54: 82-86, 2000.
- 8 McLaughlin J, KY: Acute subdural hematoma caused by a ruptured giant intracavernous aneurysm: case report. *Neurosurgery* 38: 388-392, 1996.
- 9 Hatayama T, ST, Okada Y: Ruptured distal anterior cerebral artery aneurysm presenting with acute subdural hematoma: report of two cases. *Neurol Surg* 22: 577-582, 1994.
- 10 Watanabe K, WS, Okuhata S, Nagai M: Ruptured distal anterior cerebral artery aneurysms presenting as acute subdural hematoma-report of three cases. *Neurol Med Chir (Tokyo)* 31: 514-517, 1991.
- 11 O'Sullivan MG, WM, Steers JW et Al: Acute subdural haematoma secondary to ruptured intracranial aneurysm: diagnosis and management. *Br J Neurosurg* 8: 439-445, 1994.
- 12 Friedman MB, B-ZM: Interhemispheric subdural hematoma from ruptured aneurysm. *Comput Radiol* 7: 129-134, 1983.
- 13 Kondziolka D, BM, terBrugge K, Schutz H: Acute subdural hematoma from ruptured posterior communicating artery aneurysm. *Neurosurgery* 22: 151-154, 1988.
- 14 Weir B, MT, Khan M et Al: Management of subdural hematomas from aneurysmal rupture. *Can J Neurol Sci* 11: 371-376, 1984.
- 15 Shenoy SN, KM, Raja A: Intracranial aneurysm causing spontaneous acute subdural hematoma. *Neurology India* 51(3): 422-424, 2003.
- 16 Hori E, OT, Hayashi N et Al: Case report: acute subdural hematoma due to angiographically unvisualized ruptured aneurysm. *Surg Neurol* 64: 144-146, 2005.
- 17 Fernandez-Carballal C, M.-FE, Garcia-Salazar F et Al: Hematomas subdurales de causa aneurismatica: estrategia terapeutica sin angiografia diagnostica. *Rev Neurol* 39: 335-338, 2004.
- 18 Hirashima Y, ES, Horie Y, Kosu K, Takku A: An anterior communicating aneurysm complicated by chronic subdural hematoma-a case report. *Neurol Surg* 9: 1041-1045, 1981.
- 19 Ranganadham P, DI, Mohandas S, Singh AK: A rare presentation of posterior communicating artery aneurysm. *Clin Neurol Neurosurg* 94: 225-227, 1992.
- 20 Krishnaney AA, RP, Masaryk T: Bilateral tentorial subdural hematoma without subarachnoid hemorrhage

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