Acute Pure Spontaneous Subdural Haematoma from Ruptured Intracranial Aneurysms

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Key words: subdural haematoma, intracranial aneurysm, angiography

Summary

Acute subdural haematoma (ASDH) is rarely caused by an aneurysmal rupture. We report four cases of pure acute subdural haematomas caused by ruptured intracranial aneurysms. Aneurysms were localized in the posterior communicating artery in two cases, in the anterior communicating artery in one case and in the middle cerebral artery in one other case. Possible mechanisms for this type of aneurysmal bleeding are discussed. A good prognosis for these patients can be expected with rapid evacuation of the haematoma (in case of high intracranial pressure and midline structure shift), and treatment of the aneurysm (surgical clipping or endovascular treatment).

Our report demonstrates the utility of angiography in the evaluation of nontraumatic acute subdural haematomas. Angiography has to be performed before haematoma evacuation or just after if the patient requires urgent surgery in case of intracranial hypertension. Aneurysms may require surgical clipping or endovascular treatment.

Introduction

Acute subdural haematomas (ASDH) are commonly considered to be caused by trauma. In these cases, the mechanism of the subdural bleeding can be a brain contusion, a tearing of

the bridging veins, and less commonly, arterial bleeding. Spontaneous ASDH is, however, very rare and can be due to the rupture of a cerebral arteriovenous malformation or aneurysm. Several cases have been reported in the literature, but it is very difficult if not impossible to determine the percentage of pure ASDH and the ASDH associated with subarachnoid haemorrhage.

We report four cases of spontaneous pure ASDH (ASDH without subarachnoid haemorrhage) caused by intracranial aneurysmal bleeding. The literature is reviewed and the possible mechanism of subdural bleeding after aneurysmal rupture is discussed.

Case Report (table 1)

Case 1

A 56-year-old man with a history of hypertension was admitted to the hospital for sudden headache and drowsiness. At admission the Glasgow Coma Scale was about 7. A computed tomography (CT) scan showed an acute subdural haematoma over the right frontotemporal region associated with a mass effect and midline displacement (figure 1). He underwent surgery with evacuation of the ASDH. Neurological improvement was seen after the operation with GCS about 11, 24 hours after surgery. Two days after the operation, a sudden neuro-

Figure 1 CT scan showing a right-sided ASDH with a mass effect.

Figure 2 Left carotid angiogram showing an anterior communicating aneurysm.

logical worsening was noted (GCS 6). A CT-scan showed major subarachnoid bleeding. Cerebral angiography showed an irregular anterior communicating aneurysm (figure 2). The patient was not operated because of his clinical grade (grade V of WFNS classification) and he died on the following day.

Case 2

A 28-year-old man, with no medical history (no history of head trauma), complained of sudden onset headache. On admission, he was alert and had no neurological deficit. A computed tomography (CT) scan showed a small acute subdural haematoma over the right frontotemporal region (figure 3). No blood was visible in the basal cisterns or subarachnoid spaces. Because of the absence of traumatic history, cerebral angiography was performed and showed a right posterior communicating artery aneurysm (figure 4). Twenty-four hours after admission, he underwent surgery via right frontoparietotemporal craniotomy, with ASDH evacuation and successful aneurysm clipping. At six month follow-up, the patient was neurologically intact and had returned to his normal life.

Case 3

A 39-year-old woman, was admitted to the hospital, after an acute onset of excruciating headache, followed by a transient weakness of the left thigh. Neurological examination showed that she was confused and restless with no focal neurological deficit. CT-scan showed a right frontotemporal ASDH with a moderate mass effect and displacement of the ventricular structures (figure 5). No subarachnoid haemorrhage was found. Cerebral angiogram demonstrated a right posterior communicating artery aneurysm (figure 6). Detachable coils (GDC) were used for a successful and complete endovascular treatment of the aneurysm. Six months later she had a normal neurological examination and a normal life.

Case 4

A 46-year-old man, with a history of polycystic kidney disease, had been found unconscious at home, without any history of trauma. On transfer to our department, he was intubated and ventilated, in a deep coma (GCS of 4) with anisocoria (right fixed and dilated pupil) but

the brain stem reflexes were preserved. CT-scan disclosed evidence of a right ASDH with an severe mass effect (figure 7). Because of his neurological status, urgent evacuation of the ASDH was indicated. During the operation, after removal of the subdural haematoma, a cortical tear was seen in the upper part of the superior temporal gyrus, close to the sylvian valley. Immediate postoperative angiogram showed a middle cerebral artery aneurysm (figure 8). A second operation was done with uneventful aneurysm clipping. The patient remained comatose with increased intracranial pressure (35 cm H₂O) and despite intensive medical management he died five days after admission.

Discussion

Aneurysmal rupture usually produces subarachnoid bleeding and/or intracerebral haematomas. The incidence of intracerebral haematomas, including intraparenchymal, intraventricular, subdural or a combination of these, varies from 4% to 71%⁶. It appears that middle cerebral artery aneurysms tend to cause an intracranial haematoma more frequently than other aneurysms¹⁰. The global incidence of SDH after aneurysmal rupture is estimated between 0.5% and 7.9%²⁴. The majority of these patients, showed evidence of blood in locations other than the subdural space. Frequency of pure SDH is less known: Barton¹ found no cases of pure SDH out of 11 patients with SDH after aneurysmal rupture, Weir⁹ reported only one case out of 18 patients (0.11%) and Kondziolka one out of two cases³. Novak et Al reported a series of five ASDH from ruptured intracranial aneurysm with only one pure ASDH caused by a middle cerebral artery aneurysm⁵. Reynolds et Al reported 2.92% of ASDH⁸ but their data concerned an autopsy series (table 2). Out of a total of 750 patients with aneurysmal subarachnoid haemorrhage treated in our department between 1982 and 1997, about four (0.5%) had a pure SDH. Two of these patients harbored a posterior communicating artery aneurysm, one had an anterior communication localization and the other a middle cerebral artery aneurysm. All of our cases had pure ASDH with no other blood collection (no subarachnoid or intracerebral haemorrhage).

Aneurysms at varying sites have been impli-

Figure 3 CT scan showing a small right-sided ASDH.

Figure 4 Right carotid angiogram showing a posterior communicating aneurysm.

cated in acute SDH. Middle cerebral and internal carotid artery aneurysms are more frequently reported⁷.

Several hypothesis have been proposed to explain how an aneurysm situated in the subarachnoid space can produce bleeding in the

Figure 5 CT scan showing a right-sided ASDH with a moderate mass effect.

Figure 6 Right carotid angiogram showing a posterior communicating aneurysm.

subdural compartment without any clot in the subarachnoid space. Adherence between aneurysmal sac and arachnoid caused by previous minor haemorrhage may reduce the subarachnoid space and eventually make it disappear. In that case, if an arachnoid tear occurs after aneurysmal rupture, bleeding will be localized in the subdural space and not in the subarachnoid compartment. We found an episode of acute headache in two of our patients three and five months before admission, corresponding probably to a minor episode of rupture.

Another mechanism suggests that high pres-

sure bleeding from an aneurysmal rupture may produce an arachnoid tear and a subdural location of the clot. This mechanism allows a satisfactory explanation for SDH associated with subarachnoid haemorrhage, but it is not acceptable concerning pure SDH. The trauma of the own height in patients found unconscious could be discussed like another hypothesis of SDH after aneurysmal rupture as well as the mass effect created by the SDH in concealing underlying ipsilateral subarachnoid haemorrhage.

Generally, patients with SDH due to an aneurysmal rupture, have poor neurological status on admission. Despite this, they may

Table 1 Summary of cases

Case	Age/ sex	initial state	Management	Aneurysm localization	Outcome
1	56 / M	headache, secondary coma	craniotomy, angiogram	Anterior communicating	death
2	28 / M	headache	angiogram, surgery	Posterior communicating	excellent
3	39 / F	headache, confusion	angiogram, GDC	posterior communicating	excellent
4	46 / M	deep coma	craniotomy, angiogram, aneurysm clipping	middle cerebral	death

Figure 7 CT scan showing a right-sided ASDH with a mass effect.

Figure 8 Right carotid angiogram showing an aneurysm of the middle cerebral artery.

have a good outcome and probably the medical prognosis of this type of patients has to be distinguished from the other type of aneurysmal rupture. Initial poor condition of these patients may be explained by the sudden increase in intracranial pressure due to the subdural collection. Therefore, urgent evacuation of the SDH is likely to reverse this condition. This fact explains the observed difference between the outcome of poor grade patients with ruptured aneurysms with and without pure SDH. On the other hand, absence of bleeding in the subarachnoid space (or intraparenchymal or intraventricular spaces) reduces the probability of vascular spasm and brain ischemia, and therefore improves the medical outcome.

Conclusions

SDH with no history of trauma requires a complete cerebral angiography to establish the cause of bleeding. Aside from moribund patients with pure SDH due to a ruptured aneurysm, all other patients have to undergo angiography and craniotomy for haematoma evacuation and aneurysm clipping. The angiography must be performed before the operation

Table 2 Summary of different series concerning ASDH after aneurysmal rupture

	ASDH after Aneurysmal rupture	Pure ASDH
Barton 1982	11	0
Weir 1984	18	1
Kondziolka 1988	2	1
Novak 1995	5	1
Reynolds 1981 (autopsy series)	22	6

if possible, and in this case blood removal and aneurysm clipping can be performed at the same time. Endovascular procedures must be considered for aneurysm treatment at the time of angiography. If the neurological status of the patient (increased ICP) requires urgent surgery and haematoma evacuation, angiography must be performed as soon as possible after the operation and the aneurysm must be excluded (surgical clipping or endovascular embolisation) rapidly. This guideline allows an optimal outcome of these patients and prevents secondary aggravation and death from rerupture.

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