CASE REPORT

Intracranial aneurysms after a stab injury

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Case report

A 17-year-old right-handed man presented to his local hospital with headache and a single episode of vomiting. He had been assaulted with a penknife whilst under the influence of alcohol and sustained a clean 1 cm laceration to his forehead (Fig. 1). On examination, he eye-opened spontaneously, was fully orientated and obeyed commands with no focal neurological deficit. He was admitted for overnight neurological observations.

The following morning his headache had worsened and he vomited several times. A CT brain scan showed a slot-like right frontal fracture with a crescentic fronto-temporal intracerebral haematoma, intraventricular haemorrhage and mild communicating hydrocephalus (Fig. 2). The patient was started on parenteral antibiotics and an anticonvulsant prior to transfer to our unit.

As the CT findings suggested the possibility of a cerebral arterial injury we performed CT angiography and a formal digital subtraction angiogram (DSA). These showed two false aneurysms of distal frontal branches of the right middle cerebral artery (Fig. 3). The patient was treated supportively with a planned repeat CT angiogram after 1 week, which excluded the development of further aneurysms. At this point, a fronto-temporal craniotomy was performed, the wound thoroughly irrigated and debrided, and the two aneurysms excised. Histopathology confirmed the presence of false aneurysms and a repeat DSA 1 week later was normal. At 1-year follow-up the patient had made an excellent recovery and had returned to work as a builder.

Discussion

Traumatic intracranial aneurysms are rare but their natural history is unpredictable and rupture potentially catastrophic. They can arise from blunt (70%) or penetrating (30%) head trauma and the majority are ‘false’ aneurysms in that the full thickness of the arterial wall is injured with a haematoma contained by the surrounding tissues. It has been estimated that up to 50% will rupture within a few weeks of the injury with a mortality rate of between 34% and 54%\textsuperscript{3,7} but traumatic aneurysms may also remain unchanged or regress.\textsuperscript{2,3,10,12,15} Prompt treatment can prevent rupture, so the diagnosis should be considered in any patient with a penetrating head injury.

Traumatic aneurysms caused by blunt injury typically involve the cavernous or proximal intracranial portions of the internal carotid artery in association with base of skull fractures. Penetrating injury can damage any intracranial vessel but smaller distal vessels are most often involved as they are nearer the brain surface. Penetrating head injuries can arise either from high velocity missiles, such as bullets or shrapnel, or from low velocity non-missile objects such as knives, scissors, screwdrivers or nails. These latter injuries may be difficult to diagnose as the entry wound can be small and seemingly innocuous.\textsuperscript{5,10,12,14} A CT brain scan must be performed in all patients with a known or suspected penetrating intracranial injury. Further vascular imaging should be considered in those with significant intracranial haemorrhage, where a weapon track is
likely to have passed near a major artery or venous sinus, when there is evidence of focal ischaemia indicating arterial occlusion, or when there is a delayed haemorrhage after trauma. Cerebral CT angiography may be performed but is still not as sensitive as formal angiography, which remains the gold standard for diagnosis. The timing of angiography is controversial. Some authors recommend it as soon as possible as traumatic aneurysms can develop rapidly and have a high mortality on rupture. Others recommend that angiography is delayed by 7—10 days after injury in order to allow aneurysms to develop.

Aneurysms caused by blunt trauma typically involve the internal carotid artery or other basal arteries and may require endovascular treatment, arterial reconstruction or bypass. Those caused by penetrating injuries are often more easily treated, particularly when involving distal vessels as in this case. Surgical clipping with preservation of the vessel lumen is not usually possible and they are treated by excision or coagulation of the whole vessel. Endovascular techniques to treat traumatic cerebral aneurysms are developing rapidly. At present, however, they are often used simply to occlude the parent vessel but the wider availability of stents for intracranial vessels may make it possible to treat the aneurysm and leave the vessel lumen intact.

In summary, traumatic intracranial aneurysm is a rare but potentially fatal complication of any head injury. As early diagnosis and prompt treatment can prevent rupture it is imperative the diagnosis is considered in any patient with a penetrating head injury.

References