Case Report

Traumatic Middle Cerebral Artery Aneurysm Secondary to a Gunshot Wound

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ABSTRACT

Traumatic intracranial aneurysms are rare lesions, accounting for less than 1% of all intracranial aneurysms. Formation of these lesions after a penetrating missile wound is very unusual, and diagnosis can be difficult due to the presence of associated lesions. In this article, we report a case of a woman who developed a middle cerebral artery aneurysm after a gunshot wound, and discuss potential pitfalls found during diagnostic work-up.

Keywords: Aneurysm, traumatic, gun.

Acceptance: Received September 6, 2010, and in revised form October 19, 2010. Accepted for publication November 4, 2010.

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Disclosures: The authors report no disclosures.

J Neuroimaging 2013;23:115-117.
DOI: 10.1111/j.1552-6569.2010.00570.x

Introduction

Traumatic intracranial aneurysms are rare lesions, accounting for less than 1% of intracranial aneurysms.[1] Formation of these lesions after a penetrating missile wound is unusual.[2,3] As presentation varies according to the underlying mechanism and to the presence of associated lesions, diagnosis requires both a high degree of suspicion and performance of appropriate imaging studies.

Case Report

A 29-year-old woman was brought to our emergency department after attempting suicide with a gun. Upon admission, physical examination revealed the point of entry of the gunshot on the left submandibular region, with active bleeding, and an exit wound on the left frontal region. Her initial Glasgow Coma Scale was 7 (E1, M1, V5). Head computed tomography (CT) (Fig 1, Acute) showed hemorrhagic contusions and a subdural hematoma on the left frontotemporal region, subarachnoid hemorrhage, pneumocephalus, and fractures of the left hemimandible, sphenotemporal region, and left frontal and parietal bones, with presence of bone fragments in the temporal region. A CT angiography (CTA) of the head and neck was also performed, but no evidence of vascular lesion was found.

The hemorrhage was initially controlled with cervical, pharyngeal, and nasal tamponade with Spongostan®. Patient underwent surgery with removal of the bone fragments, aspiration of detached brain tissue, and of the left frontotemporal subdural hematoma.

She was then admitted to an Intensive Care Unit and a slow process of rehabilitation was initiated, with gradual improvement. Serial imaging showed signs of absorption of the hemorrhagic contusions.

She was discharged about 2 months after admission, presenting at the time a slight right hemiparesis (grade 4+) and motor dysphasia.

Three months later, she came back to our institution for a control head CT scan (Fig 1, at 3 months). This exam showed almost complete absorption of the cerebral hemorrhagic contusions. However, a spontaneously hyperdense ovoid lesion was found on the left temporal region. A traumatic aneurysm of the left middle cerebral artery was suspected, and so a cerebral CTA was performed (Fig 2), which showed an aneurysm of an anterior M2 branch of the left middle cerebral artery.

Retrospective review of the last head CT scan performed prior to discharge (Fig 1, at 5 weeks) revealed that the aneurysm was already present then, but was mistaken for a hemorrhagic contusion. Of note, the aneurysm was increasing,

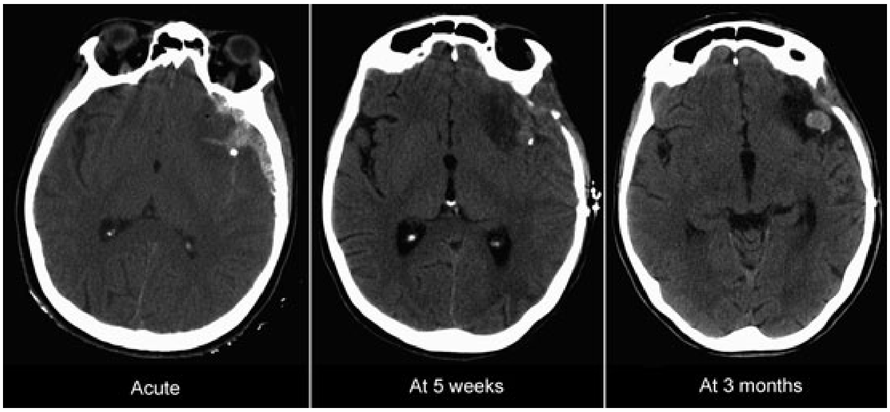

Fig 1. Initial head CT (acute) shows hemorrhagic contusions, subarachnoid hemorrhage, and a subdural hematoma on the left frontotemporal region, associated with pneumocephalus and presence of bone fragments in the temporal region, including the sylvian fissure. The last head CT performed prior to discharge (at 5 weeks) shows the aneurysm already present on the left temporal lobe, adjacent to the sylvian fissure. Head CT performed 3 months after discharge (at 3 months) shows that the aneurysm is increasing in size.

when compared to the previous exam. Therefore, surgical treatment was proposed to the patient, and clipping of the aneurysm was performed successfully.

Discussion

Traumatic intracranial aneurysms are rare vascular complications of blunt or penetrating trauma or of iatrogenic arterial injury during surgery.[3] Their real incidence is unknown,[4] and they are more frequently described in the pediatric population, accounting for about 30% of pediatric aneurysms.[1,4]

Unlike congenital aneurysms, these lesions usually lack a true wall, as they are the result of a complete disruption of all layers of the vessel wall, corresponding to a contained hematoma communicating with the arterial lumen and covered only by a thin membrane of connective tissue.[2,5] Presentation can be acute (minutes after formation) or delayed (several months or years),[1,6,7] and is usually related to the rupture of these aneurysms, with subarachnoid, intraparenchymal, subdural, and intraventricular hemorrhage being the most frequent findings.[6,7] Less commonly, as it was in this case, they are incidentally found on follow-up imaging.[7,8]

Diagnosis is based on imaging. Head CT is the exam of choice for the initial work-up of acute head injury, but because of the presence of associated brain lesions and metallic artifacts generated by the missiles, early diagnosis can be missed. Digital subtraction angiography (DSA) has been replaced by CTA for the initial evaluation of most intracranial vascular pathology, including traumatic aneurysms. With sensitivity and specificity approaching 100%,[9] CTA has the advantage of showing the trajectory of the missile, and, when present, its relation with the aneurysm. It is limited by the possible presence of metallic artifacts that can result in an inconclusive study.

There are some imaging features that can help distinguish traumatic from congenital aneurysms.[7,8] First, the location of the aneurysm, as congenital aneurysms are normally located at branching points, while traumatic aneurysms are found on unusual locations, more distally, on smaller branches. Second,

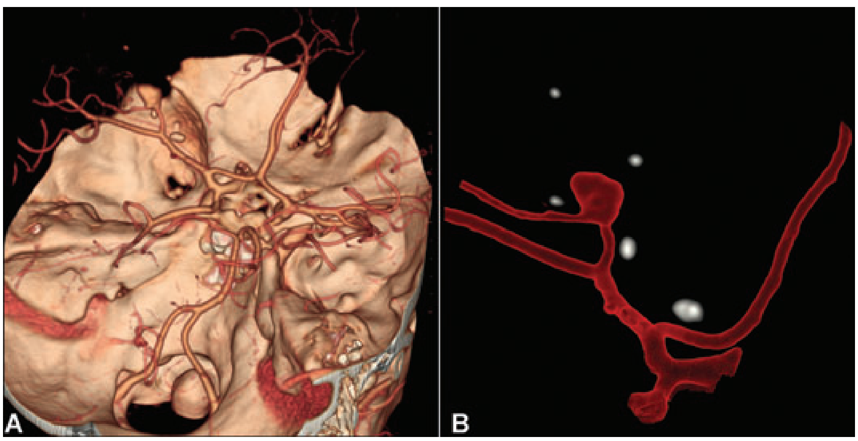

Fig 2. CTA. Volume rendering image, in oblique superior right view (A) confirms the presence of an aneurysm of a M2 branch of the left middle cerebral artery. Transparent volume rendering image, right view (B), shows the traumatic aneurysm with bone fragments (depicted in white) adjacent to its wall.

traumatic aneurysms tend to have an irregular neck and poorly defined shape. Third, on DSA, traumatic aneurysms usually have delayed filling and emptying of the aneurysmal sac.

Because of the lack of large published series, their natural history is not well understood. While some authors suggest that traumatic intracranial aneurysms can initially be managed conservatively, based on the evidence that many of these lesions will thrombose and close spontaneously,[9] the general consensus is that due to their highly unpredictable nature and potentially catastrophic outcome–the reported hemorrhagic mortality rate is of 30-50%–they should be treated as soon as possible.[1,4,6] In our case, the aneurysm was not stable as it was clearly growing, which is why we suggested treatment.

This case illustrates two potential pitfalls that can be encountered during the diagnostic work-up of traumatic intracranial aneurysms. First, due to the presence of associated hemorrhagic lesions, these lesions can be missed on head CT, or mistaken for a hemorrhagic contusion, because they are also usually spontaneously hyperdense. In the setting of penetrating head trauma, it is very important to keep these lesions in mind and to exclude them appropriately. Therefore, all these patients should undergo cerebral angiography, either DSA or CTA. DSA remains the gold standard but, in the acute stage, especially in an unstable patient, we favor CTA. Second, an early angiographic study can be negative and should not be used to completely rule out traumatic intracranial aneurysms. It has been suggested in the literature that the initial angiography study should be delayed to account for the time it takes for the aneurysm to develop. However, because these lesions have been reported to be present as early as 2 hours after trauma,[4] and considering the high mortality rate they are associated with when ruptured, we believe angiographic imaging should be performed as soon as possible and, when the initial study is negative, repeated 2 to 4 weeks later.

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