Case Report

Acute nontraumatic subdural hematoma from ruptured accessory meningeal artery pseudoaneurysm

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INTRODUCTION

A nontraumatic acute subdural hematoma can be caused by rupture of a vascular malformation or of an intracranial aneurysm into the subdural space. There are several reports of nontraumatic subdural hematomas secondary to aneurysms that have an internal carotid artery (ICA) distribution.¹⁴,¹⁸

Aneurysms of external carotid artery distribution that is intracranial are rare. When present, they are diagnosed commonly in symptomatic patients. Few cases of middle meningeal artery (MMA) aneurysms leading to acute nontraumatic subdural hematoma have been described.¹ⁱ

The case described here is the first report, to our knowledge, to detail a nontraumatic acute subdural hematoma secondary to rupture of a pseudoaneurysm of the accessory MMA. Subsequently, the case was managed with endovascular coiling. Cerebral angiography including internal and external carotid artery injections is crucial, especially in young patients with a spontaneous subdural hematoma. A literature review is also presented.
CASE REPORT

A 46-year-old male with a history of hypertension was transferred to our facility after presenting with an 11-day history of nausea and vomiting after waking up with a right-sided sharp headache. The patient reported taking ibuprofen for the headache without significant relief. As a result of the ongoing headache, head computed tomography (CT) was obtained. The head CT revealed a right-sided acute subdural hematoma [Figure 1]. The patient denied any trauma, abrupt acceleration or deceleration.

A diagnostic cerebral angiogram including careful evaluation of the external and ICA circulations was undertaken. This revealed a small pseudoaneurysm of the right accessory MMA [Figure 2]. This was treated with endovascular embolization. Two platinum coils (Barricade, Irvine, CA) were placed proximal to the pseudoaneurysm, through a microcatheter (Headway Duo, Tustin, CA). He was discharged without any new medications, namely, he was not prescribed steroids or statins. Postprocedure angiography obtained at an outside facility confirmed obliteration of the aneurysm and the parent vessel. Postoperative follow-up head CT scan confirmed resolution of the subdural hematoma [Figure 3].

Literature analysis

A literature search of the PubMed/Medline databases was performed using the algorithm (“meningeal artery aneurysm” OR “spontaneous subdural hematoma” AND “nontraumatic”). Article titles and abstracts were then individually screened to populate articles of interest, and selected manuscripts were recorded digitally and tracked. To mitigate publication bias, referenced articles were utilized to identify other case reports and case series.

DISCUSSION

The first reported case of a MMA aneurysm was published by Berk in 1961; they described a 73-year-old female with Paget's disease who presented without trauma and endorsement of a 6-month headache.[2] A left MMA aneurysm was identified and surgically resected. Since that time, nontraumatic MMA aneurysms have proven to be rare. We conducted a literature search, which resulted in <20 reports [Table 1].[3-21] When identified, MMAs are most often accompanied by an underlying condition such as Paget's disease, moyamoya, meningioma, cavernous hemangioma, hypertension, posterior cerebral artery occlusion, dural arteriovenous malformation, or angioma.

To the best of our knowledge, there are no cases of an accessory meningeal artery aneurysm described in the literature. Given the rarity and unclear natural history of the aneurysms of the external carotid artery circulation, clinical decision-making can be challenging. Several studies recommend endovascular treatment of these aneurysms due to bleeding risk.[10] The evolving field of neurointerventional radiology, improvement in imaging quality, and increased frequency of superselective imaging has the potential to lead to increased identification of accessory meningeal artery
Table 1: Literature review of spontaneous nontraumatic intracranial bleeds due to middle meningeal artery aneurysms.

| Authors, Year | Age (years) | Sex | Associated disease | Aneurysm location | Symptoms | Radiographic findings | Treatment | Outcome |
|---------------|-------------|-----|---------------------|-------------------|----------|-----------------------|-----------|---------|
| Berk, 1961    | 73          | F   | Paget's             | Left MMA          | Headaches| ND                    | Resection | Not specified |
| Holland and Thomson, 1965 | 49 | F   | None                | Right MMA, posterior branch | EDH      | EDH                  | Resection | Intact |
| New, 1965     | 79          | F   | Paget's             | -                  | Stroke   | ND                    | -         | -       |
| Aggsat et al., 1965 | - | -   | -                   | -                  | ICA occlusion | ND                   | -         | -       |
| New, 1967     | 57          | F   | Paget's             | Right MMA, anterior branch | Headaches| ND                    | Ligation of ECA | No change |
| Sanchis et al., 1975 | 59 | F   | Dural angioma       | Right MMA          | EDH      | EDH                  | Resection | Improved |
| Bollati et al., 1980 | 50 | F   | None                | Left MMA          | Epilepsy | Old SDH               | Resection | Intact |
| Takahashi, 1980 | 10 | F   | M.Q.Y11119111. MMA, unspecified | MMA | Incidental | ND | |
| Jin et al., 1981 | 9  | M   | Asthma and MMA angioma | Left MMA, anterior branch | Headache and LOC | ND | Resection | Intact |
| Korosue et al., 1988 | 66 | F   | None                | Right MMA, posterior branch | SDH | Recurrent SDH | Resection | Intact |
| Ohta et al., 1991 | 47 | M   | Cavernous hemangioma of skull | Right MMA, anterior branch | Incidental | ND | Resection | Intact |
| O’Neill, et al., 1995 | 82 | F   | Meningioma          | Right MMA          | Incidental| ND | Coil placement | Resection | Died, RF |
| Ushikoshi et al., 1996 | 69 | M   | Hypertension and PCA occlusion | Right MMA          | IPH | ICH, IVH | |
| Zubkov et al., 1998 | 22 | M   | None                | Right MMA, anterior branch | SAH | SAH | Resection | Intact |
| Sandin et al., 1999 | 46 | M   | Mild hypertension and Dural AVM | Right MMA          | IPH | ICH | Resection | Intact |
| Nakahara et al., 1999 | 58 | F   | Dural AVM           | Right MMA          | LOC | ICH | |
| Kobata et al., 2001 | 77 | F   | Chronic heart failure b612.1111M11 | Left MMA, anterior branch | LOC | ICH, SAH | Resection | |
| Park et al., 2010 | 43 | F   | -                   | Left MMA           | Headache and LOC | ICH, SAH | Embolization | - |

AVM: Arteriovenous malformation, ECA: External carotid artery, EDH: Extradural hemorrhage, ICA: Internal carotid artery, ICH: Intracranial hypertension, IPH: Intraparenchymal hematoma, IVH: Intraventricular hemorrhage, LOC: Loss of consciousness, MMA: Middle meningeal artery, ND: Not disclosed, PCA: Posterior cerebral artery, RF: Renal failure, SAH: Subarachnoid hemorrhage, SDH: Subdural hemorrhage

For true meningeal artery aneurysms, historical treatment was surgical resection of the abnormality or ligation of the external carotid artery. However, a push has been made for endovascular treatment of these aneurysms by embolization to lessen bleeding risk.\(^{14}\) We propose the same treatment for accessory meningeal artery aneurysms and emphasize the utility of angiography of internal and external carotid arteries in a patient with an unexplained intracranial hematoma.

**CONCLUSION**

To the best of our knowledge, this is the first reported case of an accessory meningeal artery aneurysm causing a nontraumatic acute subdural hematoma. Angiography of the external carotid arteries allowed for the detection of a small accessory meningeal artery pseudoaneurysm in this patient, and after successful embolization of the lesion, the vessel was obliterated and the hematoma improved significantly on follow-up imaging.
Declaration of patient consent

Patient’s consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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