



Case Report

Surgical resection of a large posttraumatic middle meningeal artery pseudoaneurysm with associated epidural hematoma

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ABSTRACT

Background: Middle meningeal artery (MMA) pseudoaneurysms are rare but can occur secondary to trauma with an associated skull fracture and can present with a variety of hemorrhage patterns. Epidural, subdural, subarachnoid, and intraparenchymal hematomas have all been reported. Given the wide range of clinical presentations and radiographic findings, multiple treatment strategies have been employed, including surgical removal, endovascular intervention, and conservative treatment. MMA pseudoaneurysms typically range from 2 to 5 mm in size and have been shown to have unpredictable growth patterns.

Case Description: A 54-year-old male identifying as a Jehovah's Witness presented after a fall and was found to have an epidural hematoma with an accompanying temporal bone fracture. Imaging demonstrated a traumatic pseudoaneurysm of the MMA. Given the patient's religious preferences, the emphasis was made during surgical planning for the minimization of blood loss. The epidural hematoma was evacuated, and the MMA pseudoaneurysm was directly visualized and surgically excised after ligation of its tributaries. The patient tolerated the procedure well without significant blood loss and made a complete neurological recovery.

Conclusion: A well-circumscribed hypodensity on CT within a surrounding hyperintense collection should raise suspicion of MMA pseudoaneurysm in the setting of overlying temporal bone fracture as supported by previous imaging findings of large MMA pseudoaneurysms. The early detection of MMA pseudoaneurysm is imperative, as the presence may dictate more urgent intervention and changes in operative technique. Although not much is known about the nature and progression of these lesions, surgical excision has remained a safe, reliable method of treatment.

Keywords: Epidural hematoma, Jehovah's Witness, Middle meningeal artery, Pseudoaneurysm, Surgical resection

INTRODUCTION

Middle meningeal artery (MMA) pseudoaneurysms typically occur secondary to trauma and are frequently associated with overlying skull fracture.^[11] Patients with ruptured MMA pseudoaneurysms may present in varying clinical states which often correspond to the hemorrhage location. Epidural hematomas are the most common presentation, but cases of subdural, subarachnoid, and intraparenchymal hematomas have also been reported.^[2,7,9-11] The

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pseudoaneurysms in the literature tend to range from 2 to 5 mm, with a case up to 4 cm when allowed to progress.^[2,16]

Given the anatomical location, epidural hematomas and pseudoaneurysms may occur due to traumatic lacerations of the MMA.^[3] Classically, they present with a brief loss of consciousness, a lucid interval, and then a decline in consciousness as the hematoma expands.^[3] Epidural hematomas are seen as lens-shaped hyperdensities on computed tomography (CT) and treated by emergent surgical evacuation when presenting with a midline shift of greater than 10 mm, or volume greater than 30 ml.^[3]

MMA pseudoaneurysms causing small epidural hematomas can be detected using conventional angiogram, with CT angiography (CTA) representing a safe and reliable alternative.^[12] Due to the rarity of MMA pseudoaneurysms, not much is known about how the lesions progress. With lack of established treatment guidelines, both surgical and endovascular interventions have been used with success, although rare cases of conservative treatment followed by spontaneous resolution of these lesions have also been reported.^[9,12,14,15] Our case demonstrates that with early diagnosis and proper surgical planning, a surgical excision is a safe option for treatment of a large MMA pseudoaneurysm in a patient refusing blood products.

CASE REPORT

A 54-year-old male who identifies as a Jehovah's Witness presented to our hospital with an epidural hematoma after a fall from standing. The patient had persistent headache, nausea, vomiting, somnolence, and altered mental status. CT without contrast demonstrated an 18 mm thick right-sided epidural hematoma, minimal midline shift, accompanying right-sided temporal bone fracture, subarachnoid hemorrhage, and a contralateral temporal lobe hemorrhagic contusion [Figure 1]. CTA demonstrated a large broad-based 8.8 x 10 mm traumatic pseudoaneurysm of the right MMA [Figure 2].

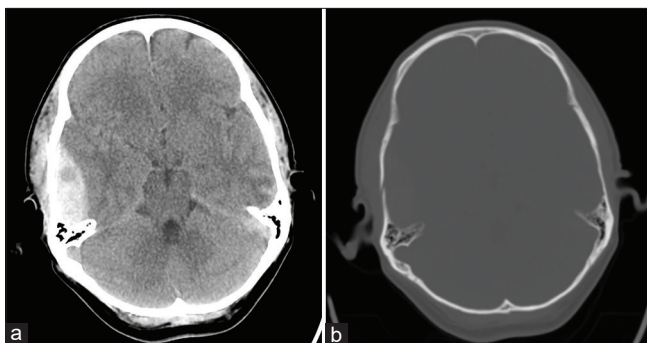


Figure 1: Preoperative computed tomography, axial view, demonstrating (a) right-sided epidural hematoma, and (b) overlying temporal bone fracture.

The patient did not exhibit any motor dysfunction; however, he reported severe headache. The patient had no focal deficit, and his epidural was moderate, but the discovery of the MMA pseudoaneurysm prompted more aggressive management of his lesion. Due to the patient's symptoms, high mortality associated with rupture (up to 20%), and large size of his MMA pseudoaneurysm a right-sided craniotomy with aneurysm resection was performed.^[2] The preoperative diagnosis of a MMA pseudoaneurysm allowed the operative approach to be tailored toward the management of the vascular lesion.

Given the patient's denial of blood products, the minimization of blood loss was imperative. After temporal craniotomy, care was taken to preserve the epidural clot around the aneurysm to minimize re-rupture. The MMA was subsequently ligated with cautery proximal to the pseudoaneurysm. The pseudoaneurysm was visualized and resected along with a portion of the dura, and the epidural hematoma was evacuated [Figure 3]. Intraoperative blood loss was minimal, and the patient recovered well following his surgery. At clinical follow-up, he was asymptomatic.

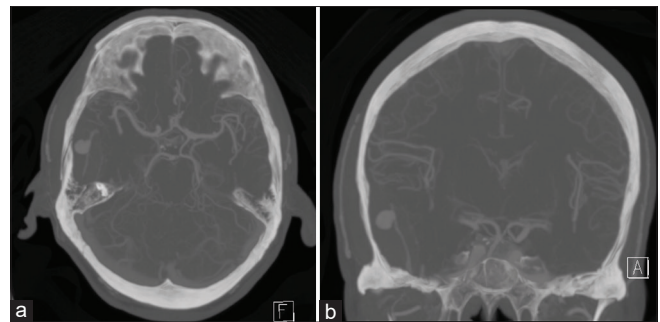


Figure 2: Preoperative computed tomography angiogram (a) axial view and (b) coronal reconstruction, demonstrating a right temporal skull fracture with a right middle meningeal artery pseudoaneurysm



Figure 3: Surgically excised middle meningeal pseudoaneurysm.

DISCUSSION

Posttraumatic pseudoaneurysms of the MMA are rare, with 56 cases reported from 1957 to the present.^[11,13] Given the low number of these cases, the natural history needs to be further elucidated. Previous reports suggest that these lesions tend to become larger, and therefore, treatment has been recommended without delay.^[8,16] However, other cases have described spontaneous aneurysm resolution with conservative management.^[14,15]

Diagnostic testing with CTA has been recommended in the case of a temporal rim fracture with accompanying hemorrhage as this appears to be correlated with MMA pseudoaneurysm.^[11] However, vascular imaging is not a common practice for this type of injury pattern. Figure 1 demonstrates an area of hypodensity within the epidural hematoma, which was initially interpreted as a “swirl sign.” Swirl sign is a contrasting hypodensity within a hyperdense hematoma that may represent an area of active extravasation, which can be associated with temporoparietal epidural hematomas.^[1-5] In this case, the hypodensity was discrete and circular in nature which raised the suspicion of a vascular lesion and prompted investigation with a CT angiogram [Figure 2]. This false swirl sign should raise the possibility of MMA pseudoaneurysm in these cases, and vascular imaging should be considered if time permits.^[6,16]

The pseudoaneurysm reported here was large, measuring 10 mm. The patient was awake and nonfocal on examination, but the presence of the MMA pseudoaneurysm greatly increased the risk associated with conservative management of the patient’s epidural hematoma. Given the risk of fatal re-rupture, the decision was to urgently treat this lesion. The patient’s status as a Jehovah’s Witness added additional importance to minimize intraoperative blood loss. Jehovah’s Witnesses do not accept whole blood transfusions, packed red blood cells, plasma, or platelets due to their beliefs.^[4] Witnesses’ beliefs do not, however, prohibit colloid or crystalloid or explicitly prohibit the use of blood components such as albumin, immune globulins, or intraoperative salvage which represent alternatives depending on case-by-case decisions by the patient.^[4] The information also altered the surgical technique.

Endovascular intervention of the MMA pseudoaneurysm was considered; however, we decided to pursue open intervention as this allowed treatment of the MMA pseudoaneurysm as well as the removal of the epidural hematoma for symptom relief. Preservation of the epidural clot around the MMA pseudoaneurysm minimized the risk of aneurysm re-rupture. We then ligated the MMA proximal to the aneurysm with cautery by incising the dura. The entirety of the aneurysm was then resected with a cuff of dura [Figure 3], and a dural patch graft was sutured into place. This technique allowed for

minimal blood loss. Therefore, the preoperative identification of MMA pseudoaneurysms influenced the decision to operate as well as the technique.

CONCLUSION

At this time, there are no established treatment guidelines, so the management of MMA pseudoaneurysms is primarily guided by patient status and clinical judgment. Endovascular treatments have been favored recently, but surgical resection or conservative treatments are options. In our case, surgical excision was elected due to the high risk of progression, the necessity of symptomatic epidural hematoma evacuation, and the unique challenge of the patient’s refusal of blood products. Surgical resection continues to be a safe treatment option for large MMA pseudoaneurysms.

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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