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Mycotic cerebral aneurysm: A rare complication of infective endocarditis

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Abstract
Mycotic aneurysms are a rare cause of intracranial aneurysms that develop in the presence of infections such as infective endocarditis. They account for a small percentage of all cerebral aneurysms with a high-mortality rate when ruptured.
We report a case of a 48-year-old man who presented with ruptured mycotic cerebral aneurysm caused by infective endocarditis of the aortic valve. The MA was suspected and treated early by antibiotic therapy with a good involvement. The patient was surgically treated with open craniotomy and aneurysm clipping.

Keywords: mycotic cerebral aneurysm, endocarditis

Introduction
Mycotic cerebral aneurysm (MA) is a rare complication of infective endocarditis, and is associated with high morbidity and mortality due to cerebral haemorrhage. The clinical features of this entity have not been sufficiently clarified. Ruptured aneurysms must be treated immediately by surgical or endovascular procedures. Unruptured infectious aneurysms should be followed by serial cerebral imaging under antibiotic therapy [1]. We report a young man presented with infective endocarditis and a cerebral mycotic aneurysm complicated by haemorrhage.

Case report
A 48-year-old man presented to the emergency department with left hemiparesis and seizures, with 2 weeks history of fever and chills. On examination, he was febrile. The pulse rate was regular (111/min) and blood pressure was 120/60 mm Hg. Cardiac auscultation revealed a grade 3/6 diastolic mumur of aortic regurgitation. A cerebral CT scan showed a right temporal hemorrhage with oedema. Haemogram revealed leucocytosis (15 000/mm3) with predominant neutrophillia (80%).Urine examination, renal function test and liver function test were normal. The cerebral CT scan and MRI demonstrated a ruptured mycotic anevrysm with a right temporal hematoma and a cerebral angiography was performed showing a right Sylvian mycotic distal aneurysm measuring 7.41 x 6.42 mm.

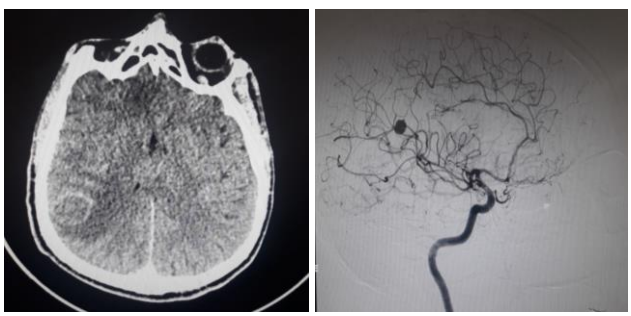

Fig 1: A: CT scan of brain on presentation: sagital view showing acute right side temporal lobe hemorrhage B: a *cerebral angiography showing* a sylvian *mycotic distal aneurysm measuring* 7.41 x 6.42 mm

Transthoracic echocardiogram revealed mobile filiform vegetation (1.9 cm) attached to the aortic valve with perforation. The Blood cultures returned positive for streptococcus aureus and antibiotic therapy was initiated (Ceftriaxone with Getamycin).

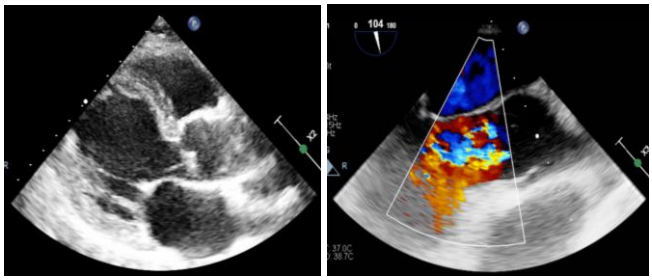

Fig 2: Transthoracic echocardiogram showing mobile filiform vegetation (1.9 cm) attached to the aortic valve with a left coronary cusp perforation

We noted a clinical and biological improvement by week 6 of intravenous antibiotic therapy, with neurologic recovery and a size reduction of the vegetation. After assessing the benefit/risk ratio the cardiac surgery was not performed. The patient was admitted on the neurosurgery department and a surgical therapy with open craniotomy and aneurysm clipping has been achieved.

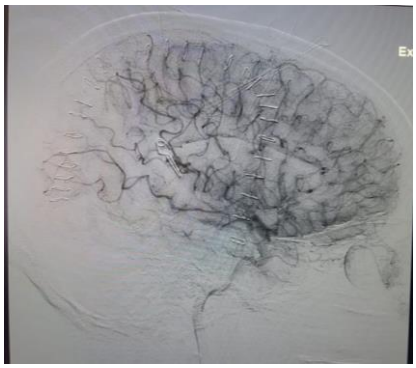

Fig 3: cerebral angiography after surgical therapy with open craniotomy and aneurysm clipping

Discussion

Mycotic aneurysms develop in IE when friable cardiac vegetations give rise to septic emboli that lodge in intracranial vessels at branching points and distal branches. These emboli may occlude vessels, cause cerebral infarction, or promote infection [2]. The vasa vasorum theory is the most accepted mechanism of pathogenesis. The bacteria from septic emboli escape through the vasa vasorum and cause severe inflammation of the adventitia [3]. The arterial pulsation against the weakened vessel wall eventually results in aneurysm formation. The aneurysms are usually fusiform and eccentric, without saccular characteristics, and are more common in the anterior circulation [4]. Histologically, MAs are characterized by acute neutrophilic infiltration, along with marked intimal proliferation and internal elastic lamina destruction. Although a wide variety of bacteria, mycobacteria, viruses, and fungi may cause mycotic aneurysms, Streptococci and Staphylococcus aureus are the most common etiologic organisms [5].

In a large case series by Kannoth *et al*. 25 patients with infectious intracranial aneurysms presented with symptoms of headache (83%), fever (67%), vomiting (50%), ocular palsy (25%), seizures (21%), behavioral changes (21%), hemiparesis (21%), drowsiness (17%), and loss of consciousness (17%) [6]. A scoring system has been proposed for the diagnosis of MA, it is based on the presence of specific clinical and radiographic findings. Points are given for the presence of clinical markers, such as IE, meningitis, orbital cellulitis, cavernous sinus thrombophlebitis, persistent fever, age less than 45, recent lumbar puncture, and radiographic evidence of aneurysm multiplicity, distal location, change in size, and fusiform shape [7].

Cerebral vascular imaging is available through CT Angiogram, Magnetic Resonance Angiogram (MRA), and conventional Angiography. Angiography, remains the gold standard and should be performed when non-invasive techniques are negative and suspicion remains [8]. The advent of Multidetector CT scan has increased the resolution of CT Angiogram, allowing for complete visualization of the intracranial vascular tree. When compared to conventional Angiography, CT Angiogram had a sensitivity of 90% and specificity of 86% in recent meta-analysis [9]. MRA When compared to CT Angiogram, it is 87% sensitive and 95% specific; however for aneurysms smaller than 3 mm, its sensitivity falls to 38% versus 61% for CT Angiogram [9].

There is no accepted standard management for infectious aneurysms. The management of MA should be provided by an Endocarditis Team and tailored to the individual patient. Some infectious aneurysms may resolve during antibiotic treatment, while others require surgical or endovascular intervention depending on the occurrence of rupture and the location in the artery bed, as well as the clinical status of the patient [10]. Regarding intracranial infectious aneurysms, ruptured aneurysms should be treated immediately by surgical or endovascular procedures. Unruptured infectious aneurysms must be followed by serial cerebral imaging under antibiotic therapy. If the size of the aneurysm decreases or resolves completely, surgical or endovascular intervention is usually unnecessary [10]. It is likely that the patient will require intervention, if the size of the aneurysm increases or remains unchanged. On the other hand, if the infectious aneurysm is voluminous and symptomatic, neurosurgery or endovascular therapy is recommended [10].

Endovascular therapy has rapidly evolved in its efficacy and ability to access more distal aneurysms. The safety profile of this intervention is difficult to interpret, as it is based only on case-report data. A meta-analysis study of 16 patients in previously published cases who underwent endovascular treatment; 69% had a good outcome, while none had procedural-related complications [11]. However, parent artery sacrifice was much more common in patients who underwent endovascular intervention versus open craniotomy with surgical ligation.

Endovascular therapy is potentially safer and more effective than open craniotomy if performed at a high volume tertiary center and in the absence of mass effect, hypotension, hematoma, or involvement of eloquent territory [12].

Surgical therapy with open craniotomy and aneurysm clipping is reserved for patients with intraparenchymal hemorrhage, or for those who require clot evacuation of increasing intracranial pressure. Another advantage of surgical intervention is the option of vascular bypass to preserve distal blood flow, which is a vital consideration when the aneurysm involves eloquent territory [12].

Finally, if early cardiac surgery is required, preoperative endovascular intervention might be considered before the procedure, depending on associated cerebral lesions, the hemodynamic status of the patient and the risk of the intervention [12].

Conclusion

In the case of our patient, the diagnosis of infective endocarditis was made and treated early in the hospital. If a MA is suspected, it's should be investigated with CT Angiography. Frequent evaluations of neurological status should be performed. A neurosurgical consult should be obtained to determine the appropriate therapeutic intervention once the diagnosis has been made.

Medical management should be reserved for patients with unruptured aneurysms and should be followed closely with serial cerebral angiograms. Endovascular intervention must be based on the stability of the patient and involvement of eloquent territory. Surgical treatment should be performed emergently in the setting of intraparenchymal hemorrhage or increased intracranial pressure.

Finally, this case shows the importance of considering the presence of MA in the differential diagnosis in the setting of suspected endocarditis and focal neurological deficits

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Conflict of interest

The authors declare that there are no conflicts of interest.

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