Case Report

Flow-Diverter Stenting of Intracavernous Internal Carotid Artery Mycotic Aneurysm

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This is the first reported case in which a mycotic aneurysm refractory to the first medical treatment was treated with a Pipeline embolization device (PED), and the first case of a mycotic aneurysm from *Brucella* treated by endovascular therapy. A 35-year-old man presented with left eye pain and ptosis, and fever for 2 weeks. Before symptom onset, he visited Vietnam where he developed a flu-like illness; however, antibiotics were ineffective. We suspected *Brucella* as the most likely infectious etiology for the patient's intracavernous aneurysm. Since the aneurysm did not reduce in size following 2 weeks of antibiotic therapy, we placed a PED in the left internal carotid artery. Follow-up angiogram 4 months later showed no residual aneurysm, and cranial nerve palsies had completely resolved. From the results of this case, it appears that flow diverter stenting may be a safe and effective treatment of mycotic aneurysms of the cavernous segment of ICA.

Key words: Mycotic aneurysm—flow diverter—*Brucella*—cavernous segment

Background

Mycotic aneurysms of the cavernous segment have been treated endovascularly with coil embolization.[1,2] We report the second case treated with Pipeline Embolization Device (PED; Medtronic, Irvine, CA) for a giant mycotic cavernous aneurysm, and the first case from *Brucella sp* treated by endovascular intervention.

Case

A 35-year-old man travelled to Vietnam and developed a gastrointestinal flu-like syndrome with low grade fever, and was treated with acetaminophen and oral penicillin a month ago. Two weeks later he developed high fever and left retro-orbital pain, ptosis, headache, and diplopia. CT angiogram demonstrated multiple cerebral aneurysms, and he was started on intravenous vancomycin, which was changed to cefotaxime due to an allergic reaction. His past medical history was unremarkable, except for methamphetamine for 10 years.

He presented with complete third, fourth, and sixth cranial nerve palsies on the left side. While his cerebrospinal fluid demonstrated no bacteria and negative polymerase chain reaction, his IgG serum titer was elevated for *Brucella sp.* at 0.91 mg/dL. His IgM titer was not elevated, and his blood cultures were negative.

MR images revealed increased enhancement of the dura of the cavernous sinus (Fig 1, A). CT angiogram and digital subtraction angiogram demonstrated multiple small aneurysms, including the large left cavernous aneurysm (Fig 1, B). Transesophageal echocardiography showed small vegetation in the mitral valve. These aneurysms were thought to be caused by bacterial meningitis from *Brucella* infection in Vietnam.

Ceftaroline was changed to doxycycline once the *Brucella* titer came back positive. Although soon after doxycycline therapy, the patient became afebrile and the vegetation disappeared, the left cranial nerve palsies persisted. The cavernous

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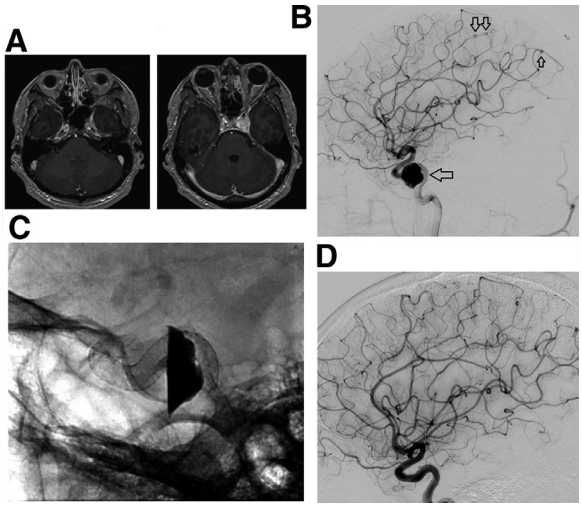

Figure 1. *The enhanced T1-weighted Magnetic resonance images show enhancement of the dura of the cavernous sinus and the left sphenoid wing around the large left cavernous aneurysm (A).*

Digital subtraction angiogram showing multiple small aneurysms (white arrow and double white arrow), including the large left internal carotid artery cavernous aneurysm (large white arrow) (B).

After placement of the Pipeline embolization device, we observed an eclipse sign, representing stasis of the contrast medium at the bottom of the aneurysm (C).

At the 3-month follow-up, digital subtraction angiogram revealed the complete obliteration of the left cavernous aneurysm, and the resolution of a few, but not all, distal mycotic aneurysms (D).

aneurysm had not changed in size, and we decided to use PED (Fig 1, C). Three months after the placement, digital subtraction angiogram showed no residual cavernous aneurysm (Fig 1, D). His cranial nerve palsies had completely resolved.

Discussion

There have been only 2 other reported cases, treated with Silk[3] and PED.[4] In the previous report with PED, the cavernous aneurysm was a de novo atypical aneurysm after the trans-sphenoidal surgery and the antibiotic treatment. In our case, we tried antibiotics as the first treatment, and added the endovascular intervention after the insufficient medical therapy. It is also the first reported case of a mycotic aneurysm due to *Brucella* by endovascular therapy.[5,6]

We chose PED placement because our patient already had symptoms from the cavernous carotid aneurysm, and none of his mycotic aneurysms were ruptured. Coil embolization may provide an additional mass effect by packing the aneurysm with coils, and FD stenting is superior in this respect. PEDs require dual antiplatelet therapy and cannot prevent rupture immediately. If our patient had intracranial aneurysms that were refractory to antibiotic treatment, coil embolization may have been safer than PED placement.

Timing of FD stenting is important. We decided to place the PED because the patient's severe pain and multiple cranial neuropathies were not resolved, even after several weeks of antibiotics. Because he had multiple mycotic aneurysms in addition to the large aneurysm, antibiotics were intravenously provided for 6 weeks. However, intravenous administration of antibiotics was required for this aneurysm because its cause was bacterial meningitis from *Brucella sp*.

FD stenting is advantageous because new aneurysmal formation may occur in the contralateral ICA, and parent arterial flow and small branches can be maintained. It may be alternative treatment for mycotic cavernous aneurysm with cranial nerve palsy.

Conclusion

FD stenting may be safe and effective against mycotic aneurysms of the cavernous segment refractory to the medical treatment.

References

1. Ghali MG, Ghali EZ. Intracavernous internal carotid artery mycotic aneuyrsms: comprehensive review and evaluation of the role of endovascular treatment. Clin Neurol Neurosurg 2013;115:1927-1942.
2. Kim US, Kim JS, Kwon OK, et al. Complete visual recovery after mycotic aneurysm embolization complicated by cavernous sinus thrombophlebitis. Korean J Ophthalmol 2010;24:322-324.
3. Appelboom G, Kadri K, Hassan F, et al. Infectious aneurysm of the cavernous carotid artery in a child treated with a new-generation of flow-diverting stent graft: case report. Neurosurgery 2010;66:623-624.
4. Kobets AJ, Scoco A, Nakhla J, et al. Flow-diverting stents for the obliteration of symptomatic, infectious cavernous carotid artery aneurysms. Oper Neurosurg 2018;14:681-685.
5. Amiri RS, Hanif H, Ahmadi A, et al. Brucella-related multiple cerebral aneurysm: report of a case and review of the literature. Surg Neurol Int 2014;5:152.
6. Erdogan B, Sener L, Ozsahin K, et al. An unusual case of ruptured distal anterior cerebral artery aneurysm associated with brucellosis. J Infect 2005;51:79-82.