CASE REPORT

Transfemoral thrombectomy in the cavernous sinus and superior ophthalmic vein

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SUMMARY

Cavernous sinus thrombosis (CST) is a rare condition that can cause death, neurologic disability, and visual loss. A pre-teen with septic CST leading to ocular hypertension and acute visual loss was treated at our institution with thrombectomy and thrombolysis of the cavernous sinuses and superior ophthalmic veins. Successful recanalization of the bilateral cavernous sinuses and superior ophthalmic veins was achieved in two separate procedures without complication. The patient showed immediate symptomatic relief. He was neurologically intact without visual deficits at the 2 month follow-up. This is the first report in the literature showing the feasibility of cavernous sinus thrombectomy using current devices and techniques. Early endovascular therapy may help preserve vision in patients with acute CST.

BACKGROUND

Cavernous sinus thrombosis (CST) is a rare but life threatening condition, most commonly caused by contiguous or venous spread of infection from a nearby site, resulting in a septic thrombus (83%).^{1,2} The rarity of CST makes it difficult to accurately estimate its incidence but, over a period of 18 years, one literature review found only 166 published cases.² The mortality of CST has been estimated at approximately 30%, and more than 50% of patients experience morbidity due to cranial neuropathies.³ Visual impairment has been reported in 7–22% of cases while blindness has been reported in 8–15% of cases.³ There are no randomized controlled trials regarding the management of CST and most of the existing literature involves case specific discussions.³

Current treatment options for CST invariably involve prompt initiation of antibiotics in cases of

septic CST while surgical treatment of the source of infection and anticoagulation are frequently also utilized as treatments.⁴ In cases of cerebral venous sinus thrombosis (CVST), of which CST is one type, systemic anticoagulation is the current standard treatment and there is a growing body of literature regarding the possible use of endovascular interventions, such as direct thrombolysis and mechanical thrombectomy.^{5,6} Previous authors have suggested extrapolating recommendations and treatments used for CVST to CST, given the common features of these two conditions and the comparative frequency of CVST.³

CASE PRESENTATION

A 7-year-old boy presented to a community hospital with headaches. Head CT revealed mucosal thickening in all paranasal sinuses and an air fluid level in the sphenoid sinus. He was managed conservatively and sent home. Four days later, he came back with rapid left eye swelling, severe headache, high fever, and somnolence. Physical examination showed marked left periorbital swelling, proptosis, ptosis, chemosis, afferent pupillary defect, painful ophthalmoplegia, and finger counting vision. CT angiogram demonstrated severe pansinusitis as well as non-opacification of the bilateral cavernous sinuses and dilated left superior ophthalmic vein with tram tracking enhancement concerning for bilateral CST, with thrombus extending to the left superior ophthalmic vein (figure 1). The patient was treated with heparin, vancomycin, ceftriaxone, metronidazole, dexamethasone, and given dorzolamide and timolol drops for the left eye. His left eye vision continued to deteriorate despite this treatment. He was transferred to our hospital for advanced level of care. He barely had any light perception when he arrived. Dilated fundoscopic examination revealed left optic nerve pallor. Intraocular pressure was found to be elevated to 31 mm Hg in the left eye. In light of the patient's acute symptoms and likely poor prognosis for the recovery of his vision in the left eye, the neurointerventional team decided to attempt urgent recanalization of the cavernous sinus and superior ophthalmic vein.

TREATMENT

After confirming bilateral CST with cerebral angiogram, we inserted a 6 F angled Envoy guiding catheter (Cordis Corp, Miami Lakes, Florida, USA) into the left common femoral vein and advanced it to the left internal jugular vein (figure 2C). An

Figure 1 (A) Axial post contrast CT shows right superior ophthalmic vein thrombus (white arrow) with associated proptosis. (B) Similarly, an axial CT slice demonstrates left superior ophthalmic vein thrombus (white arrowhead) with proptosis.

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Figure 2 (A) Fluoroscopic full exposure shot demonstrates anteroposterior appearance of the wire and catheter within the left cavernous sinus. (B) Fluoroscopic full exposure shot demonstrates lateral appearance of the wire and catheter within the left cavernous sinus. (C) Pre-procedure DSA shows a thrombosed left cavernous sinus and left superior ophthalmic vein. (D) Post-procedure DSA demonstrates a recanalized left cavernous sinus and left superior ophthalmic vein after thrombectomy and thrombolysis.

Echelon 14 microcatheter (eV3, Irvine, California, USA) was advanced over a Synchro-2 microwire (Boston Scientific, Natick, Massachusetts, USA) into the left inferior petrosal sinus. We carefully navigated the microcatheter into the left cavernous sinus, left superior ophthalmic vein, and then left angular vein under biplane fluoroscopy (figure 2A and B). After placing a floppy choICE exchange wire (Boston Scientific) into the angular vein, we exchanged the catheter for a Rapid Transit microcatheter (Cordis Corp) and slowly infused 2mg of diluted tissue plasminogen activator (0.2 mg/mL) into the left superior ophthalmic vein, left cavernous sinus, and the left inferior petrosal sinus over 5 min. We then replaced the Rapid Transit microcatheter with a Penumbra 3 MAX reperfusion catheter (Penumbra, Alameda, California, USA) and moved it back and forth multiple times along the exchange wire in the left inferior petrosal sinus, the left cavernous sinus, and the left superior ophthalmic vein while applying aspiration. The exchange wire was kept in place to avoid losing access.

Follow-up venography demonstrated near complete recanalization of the left superior ophthalmic vein and partial recanalization of the left cavernous sinus, creating a channel of venous outflow to the left internal jugular vein (figure 2D). The patient's left eye symptoms improved immediately after the procedure. His intravenous heparin was switched to Lovenox. However, the next day, the patient began to experience right-sided ocular symptoms, including periorbital edema and ophthalmoplegia. Given that the patient was experiencing worsening symptoms while on anticoagulation, we decided to perform bilateral endoscopic sinus surgery for infection control and subsequent repeat thrombectomy on the right. We successfully recanalized the right inferior petrosal sinus and right superior ophthalmic vein,

Learning points

- ▶ Sinus disease can present with a rare complication of septic cavernous sinus thrombosis.
- ▶ Cavernous sinus thrombosis carries a high morbidity rate (50%) due to cranial neuropathies.
- ▶ In the setting of acute symptomatology, endovascular treatment of cavernous sinus thrombus can be considered.

and achieved partial recanalization of the right cavernous sinus using a similar procedure to that described previously. However, we experienced great difficulties achieving endovascular access of these venous structures due to replacement of thrombus by granulation and scar tissue which necessitated that we perform angioplasty at multiple locations with a Maverick balloon catheter (Boston Scientific) to advance our instruments.

OUTCOME AND FOLLOW-UP

Post-procedurally, the patient's symptoms improved significantly. Sinus cultures demonstrated growth of MRSA and the patient was discharged home to complete a total of 2 weeks of ceftriaxone, 2 months of clindamycin and metronidazole, and 6 months of warfarin. At 2 the month follow-up, he was noted to have no residual symptoms and 20/20 vision bilaterally.

DISCUSSION

To the best of our knowledge, this is the first instance of CST reported in the literature. In this case, our patient experienced symptoms of rapidly progressive visual loss, optic disc pallor, increased intraocular pressure, periorbital edema, and retrograde flow of the ophthalmic artery. Given these findings and his likely poor visual prognosis if not treated urgently, we felt that recanalization with mechanical thrombectomy was the best option to immediately decrease his intraocular pressure and thus to spare his eyesight. A 2015 study of aseptic CSVT noted that it can take months of anticoagulation to observe any radiographically noticeable recanalization.⁷ This suggests that anticoagulation alone may not be adequate in cases of CST where vision is acutely threatened by ocular hypertension. From this experience, we note that it is easy to advance a microcatheter through a thrombus in the inferior petrosal and cavernous sinuses. However, after the thrombus has organized, gaining access to the target sinus can be challenging and necessitate angioplasty, thus leading to greater difficulty and risk than early treatment.

We speculate that in an ideal scenario, endoscopic sinus surgery would be performed prior to recanalization of the cavernous sinus, rather than the other way around, as this would prevent any cessation of anticoagulation after recanalization had been achieved. Even with angioplasty and local delivery of low dose tissue plasminogen activator immediately after sinus surgery, we did not encounter any bleeding complications. Cranial nerve injury is a potential complication of catheter manipulation in the cavernous sinus, but is probably less likely than in embolization of cavernous dural arteriovenous fistula, as no mass effect from implant or ischemia from embolic material is expected. We speculate that it may be advisable to treat CST patients endovascularly at the onset of symptoms rather than waiting for conventional therapy to fail.

Contributors All listed authors contributed to all aspects of the manuscript.

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REFERENCES

- Southwick FS, Richardson EP, Swartz MN. Septic thrombosis of the dural venous sinuses. *Medicine* 1986;65:82–106.
- Lai PF, Cusimano MD. The spectrum of cavernous sinus and orbital venous thrombosis: a case and a review. *Skull Base Surg* 1996;6:53–9.
- Desa V, Green R. Cavernous sinus thrombosis: current therapy. *J Oral Maxillofac Surg* 2012;70:2085–91.
- Weerasinghe D, Lueck CJ. Septic cavernous sinus thrombosis: case report and review of the literature. *Neuroophthalmology* 2016;40:263–76.
- Kernan WN, Ovbiagele B, Kittner SJ. Guidelines for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack. *Stroke* 2015;46:e87–9.
- Siddiqui FM, Dandapat S, Banerjee C, *et al.* Mechanical thrombectomy in cerebral venous thrombosis: systematic review of 185 cases. *Stroke* 2015;46:1263–8.
- Arauz A, Vargas-González JC, Argüelles-Morales N, *et al.* Time to recanalisation in patients with cerebral venous thrombosis under anticoagulation therapy. *J Neurol Neurosurg Psychiatry* 2016;87:247–51.

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