**Abstract**

Septic Cavernous Sinus Thrombosis (CST) associated with community acquired Methicillin Resistant Staphylococcus Aureus (MRSA), a rising pathogen in healthy pediatric population, may have atypical presentation and a fulminant course, including significant cerebral arterial involvement.

A 14-year-old healthy girl presented with fever and bilateral eyelids edema. In few hours she developed deterioration in consciousness and bilateral proptosis with conjunctival chemosis. CT excluded sinusitis and revealed filling defects of the cavernous sinus and the superior ophthalmic vein bilaterally, consistent with bilateral CST. MRI demonstrated internal carotid and middle cerebral arteries narrowing with watershed brain infarcts. Her blood cultures grew MRSA. The patient gradually improved, with a combination of antibiotics, anticoagulation and steroids, although some neurologic deficits were noted.

This case emphasizes the need for enhanced awareness, early multimodal neuroimaging and multidisciplinary treatment which may achieve a better outcome. A potential new treatment modality may be considered in future CST cases.

**Introduction**

SepticCavernous Sinus Thrombosis (CST) is a rare, frequently blinding and potentially fatal disease, usually associated with sinusitis and orbital cellulitis or less commonly with various midfacial infections1. Septic CST may have vague initial presentation and rapid deterioration with the potential of inflicting significant cerebrovascular damage. This is a unique and important report of a healthy girl presenting with fulminant community acquired MRSA causing bilateral Cavernous sinus thrombosis and brain infarcts.

**Case Report**

A healthy 14-year-old girl had localized swelling and redness of the right lower eyelid 3 days prior to her admission (presumed to be a sty). She was referred to the emergency room with 39.40C temperature and bilateral eyelids swelling. Leukocytosis (9,000 cells/mcL) and elevated CRP (11.68 mg/L) were measured. Ophthalmologic examination demonstrated visual acuity of 6/9 bilaterally, significant right more than left lid edema, mild conjunctival chemosis, equal round reactive pupils with no afferent pupillary defect, normal eye movements and a normal dilated fundus examination. The Patient was admitted for Intravenous Amoxicillin Clavulonate treatment for presumed periorbital cellulitis.

Several hours later, a rapid deterioration in consciousness had occurred, with the appearance of meningeal signs and bilateral proptosis with significant chemosis. Consequently, the patient was transferred to the pediatric intensive care unit.

Computed tomography venogram (figure 1) demonstrated filling defects of the cavernous sinus and of the superior ophthalmic veins bilaterally consistent with cavernous sinus thrombosis. MRI demonstrated cavernous sinus filling defects (figure 2A), internal carotid artery (in its cavernous part) and middle cerebral artery narrowing (figure 2B) with arterial wall enhancement and brain infarcts (figure 2C). No subperiosteal, periorbital or orbital abscess or sinusitis were evident in different imaging modalities, although preseptal swelling with right more than left orbital fat involvement were evident.

Lumbar puncture revealed a cloudy cerebrospinal fluid, with a cell count of 4,050, elevated protein (196.5mg/dl), decreased glucose (28.8 mg/dl) and gram-positive Cocci.

Following these findings, a diagnosis of septic cavernous sinus thrombosis with cerebral ischemia was made. Intravenous Vancomycin, Ceftriaxone and Metronidazole were initiated, as well as anticoagulation and Methylprednisolone. The patient’s blood cultures grew Methicillin resistant Staphylococcus aureus and Rifampin was added, according to the bacterial sensitivities results.

During her stay in the pediatric intensive care unit, following an improvement in her consciousness, she was noted to have mild right hemiparesis and bilateral restriction in abduction with bilateral esotropia. No cerebral hemorrhage was located on her repeated imaging and her neurologic deficits were attributed to cerebral ischemia. Gradually the patient has improved, MRSA was eradicated, Rifampin was discontinued, and steroids were further tapered. The patient was discharged after a total of 47 days.

The patient was referred to ambulatory daycare rehabilitation and continued neurologic and ophthalmic follow ups. She gradually returned to her normal daily routine including walking. Ophthalmic examination on her latest follow up, 4 months after her discharge, demonstrated bilateral VA of 6/6, normal optic nerves functions, normal optic discs, and mild esotropia with mild bilateral abducens paresis without diplopia. Follow Up MRI demonstrated residual bilateral internal carotid arteries narrowing at the cavernous sinuses, without new neurologic morbidity.

**Discussion**

Septic CST in children without sinusitis is rare1,2. Infection spread occurs through valveless veins draining the midfacial region to the cavernous sinus2. Involvement of MRSA, as a less typical and more aggressive infection, without abscess formation, can further complicate and rapidly deteriorate a case of CST, which is known to be a diagnostic and therapeutic challenge.

Some of the largest series concerning pediatric CST were published in the last few years1,2. These series found that the main cause for CST was sinusitis (mainly Sphenoid) and that the main pathogen involved was Streptococcus Anginosus. The reported frequency of MRSA as the causative agent was up to 10%.

In the last decade studies have shown an increasing incidence of community acquired MRSA infections3 and of community acquired MRSA related orbital cellulitis4,5,6. Nevertheless, New reports are now indicating a reversal of this trend7. Whether the frequency of MRSA infections will be rising, or declining is yet to be determined. Either way, these trends, which maybe population and geography dependent, should be taken into consideration, when pediatricians and ophthalmologists approach pediatric septic CST patients.

The first report of a community acquired MRSA orbital cellulitis in a non-immunocompromised child was reported by Vazan et al8, in 2007 in a 16-month-old male who exhibited ethmoidal and maxillary sinusitis. Further case series described an increasing portion of MRSA as the causative infectious agent in pediatric orbital cellulitis, with frequencies between 36%9 and 44% of cases6.

In 2 large series reporting pediatric CST in the recent years there was a report of, a 5-year-old girl with unilateral MRSA related CST with no sinusitis2 and another report of, a 10-year-old girl with bilateral MRSA related CST with sinusitis3. These MRSA cases represented 9% and 12% of all pediatric CST reported in those series. To note, this portion is significantly lower than the reported MRSA frequency of 36%-44% in the pediatric orbital cellulitis series cited above9,6. Mathias et al, found sinusitis in only 17% of the pediatric orbital cellulitis induced by MRSA4. They demonstrated that MRSA related pediatric orbital cellulitis is an infection with possible atypical presentation, which frequently lacks accompanying sinusitis, but rather is associated with eyelid infections4.

To our best knowledge this is the first pediatric case report of a fulminant community acquired MRSA infection, that began with a presumed sty and rapidly evolved to bilateral cavernous sinus thrombosis, with accompanying meningitis and cerebral infarcts in the absence of sinusitis.

As reported by Frank et al2, CST is often associated with internal carotid artery and middle cerebral artery narrowing with possible neurologic sequel. Our patient suffered from significant bilateral internal carotid artery narrowing (figure 2B) and watershed cerebral infarcts in the anterior cerebral and middle cerebral arteries’ territories (figure 2C). Our case had a rather favorable outcome to date, but cerebral vasculature changes and damage were evident. Residual narrowing of the cavernous part of the internal carotid arteries was noted in our case in a follow up MRI nearly half a year after her initial presentation. This phenomenon was previously described by Press et al, which studied the MRI findings of 10 pediatric CST cases. In their cohort, three of the cases demonstrated residual carotid artery narrowing lasting between one to ten years from presentation10. These findings may represent inflammatory and later fibrotic changes in the previously thrombosed cavernous sinuses.

Diagnosing and treating these patients is a considerable challenge, due to the initially vague clinical presentation and the rapid deterioration that follows it11. Quick recognition of the signs which include fever, periorbital swelling, proptosis, simultaneous dysfunction of cranial nerves 3,4,5 and 6, which may become bilateral, and a toxemic patient, could possibly prevent further patient deterioration12. It is, therefore, critical to perform early neuroimaging to establish rapid and definitive diagnosis, and to orchestrate a multidisciplinary team involvement. Treatment should be based on broad spectrum antibiotics (including those effective against MRSA), anticoagulation and surgical evacuation of abscesses when appropriate1,2.

A recent article13 concerning transfemoral catheterization of thrombosed cavernous sinus and superior ophthalmic veins in a 7-years-old, reported a significant improvement following recanalization achieved by microcatheter mechanical thrombectomy. This report raises the question about the future role of interventional neuroradiology procedures in CST. Especially interesting is whether timely recanalization by mechanical thrombectomy, will be able to prevent the ocular and cerebral complications that occur with septic CST. Additional, case series of thrombectomy in CST are required to further establish the safety and efficacy of this new treatment modality in different CST scenarios. Nevertheless, in view of this report and the rarity and severity of CST, ophthalmologists along with the multidisciplinary management team should consider such interventions, in CST patients when appropriate.

**Declaration of Interest:**

The authors report no conflicts of interest

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**Figure 1**

**תמונה שמכילה אובייקט, מקורה

התיאור נוצר באופן אוטומטי**

**Figure 2A**

**תמונה שמכילה אובייקט, מקורה

התיאור נוצר באופן אוטומטי**

**Figure 2B**

**תמונה שמכילה שעון, אובייקט, מקורה

התיאור נוצר באופן אוטומטי**

**Figure 2C**

**תמונה שמכילה אובייקט, שעון, קיפוד ים

התיאור נוצר באופן אוטומטי**

**Figure Titles:**

**FIGURE 1**

Axial image of CTV demonstrated a filling defect of the cavernous sinus bilaterally (black arrows) as opposed to the sigmoid sinus which is completely filled with contrast (white arrow).

**Figure 2A**

T1 3D MRI with Gadolinium at the venous phase revealed filling defects of the Cavernous sinuses (white arrow), in contrary to complete opacification of other dural sinuses (asterisk). Enhancement of the carotid artery in the cavernous sinus is also noted (black arrow).

**Figure 2B**

MRA demonstrating Bilateral Cavernous ICA (white arrow) and MCA (black arrows) irregularity and narrowing.

**Figure 2C**

Diffusion Weighted MRI revealed Watershed infarcts between MCA and ACA territories (black arrows).