CASE REPORT
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Seven-Year-Old Girl with Cavernous Sinus Thrombosis Due to Nasal Furunculosis

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ABSTRACT

The purpose of this study is to report and take into account a rare and potentially dangerous disease, often considered as a historical complication of skin infections in the nasal area. This case report describes the story of a 7-year-old girl who was hospitalized with a high fever and furunculosis of the nasal dorsum and tip. On admission, she presented with an increasing swelling of both eyes. Computed tomography and magnetic resonance imaging scans showed periorbital cellulitis with limited post-septal expansion and right-sided cavernous sinus thrombosis. This young, immune-competent girl recovered fully after appropriate antibiotic and anticoagulation therapy. We conclude that cavernous sinus thrombosis of nasal origin is a rare but serious complication of skin infections in the nasal area. Early diagnosis and aggressive treatment are mandatory to prevent the development of a cavernous sinus syndrome and thereby ensure a good outcome.

Keywords: Cavernous sinus thrombosis (CST), furunculosis, nasal, anticoagulation, magnetic resonance imaging

Introduction

Cavernous sinus thrombosis (CST) of nasal origin is a rare and serious complication of infections in the nasal area. Due to modern antibiotic treatment, it is often considered as a historic complication. This case shows that even with unlimited medical access, and in the presence of normal socioeconomic background, this complication still occurs. One should therefore not lose sight of the possibility of CST even in mild and common skin infections, as early diagnosis and aggressive treatment are important to ensure a good outcome. If early symptoms of septic CST are misdiagnosed, the impact on morbidity and mortality could be substantial. The purpose of this article is to report and take into account this rare and potentially dangerous complication, as well as to discuss the treatment options.

Case Presentation

A 7-year-old girl was hospitalized with a high fever and furunculosis of the nasal dorsum and nasal tip (Figure 1). On admission, she had a temperature of 40.6°C, tachypnoea, and an increasing swelling of both eyes. She was however not complaining of headache and was not presenting any other neurological symptoms.

Additional Testing

A thorough ophthalmological examination showed a pronounced swelling of both upper eyelids with signs of periorbital cellulitis (Figure 2). Although the spontaneous opening of the right eye was not possible, normal ocular movement was noted with forced opening of the right eye. In the right eye, subconjunctival bleeding that resorbed spontaneously over the following days was noted. There was no associated diplopia, color desaturation, or signs of compression on the optic nerve. There were no clinical signs of a cavernous sinus syndrome, often defined as a pathology involving 2 or more of the following cranial nerves: III, IV, V (V1, V2), and VI, or involving only 1 in combination with a confirmed lesion in the cavernous sinus on neuroimaging.[1] Signs and symptoms that result from the compromised cranial nerves that pass through the cavernous sinus can be proptosis, ocular or conjunctival congestion, ophthalmoplegia, trigeminal sensory loss, and Horner's syndrome.[2] A thorough neurological exam did not show any abnormalities. A computed tomography (CT) scan with iodinated contrast showed periorbital cellulitis on the right side

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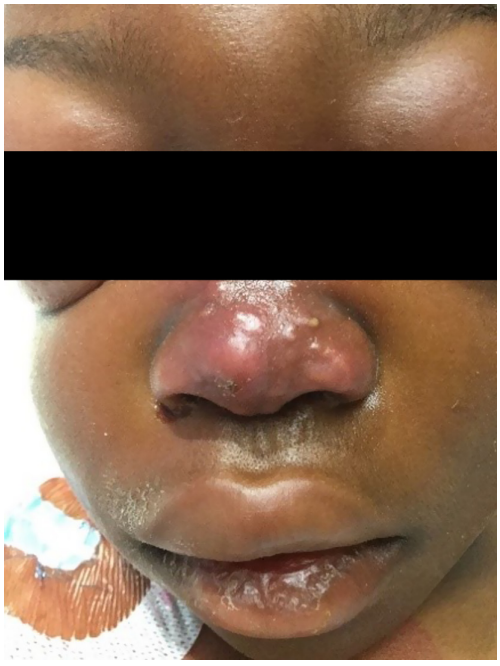

Figure 1. Frontal view of a 7-year-old girl with nasal furunculosis complicated with periorbital cellulitis and cavernous sinus thrombosis.

with limited post-septal expansion along with the right medial rectus muscle. There were no signs of osteomyelitis or abcedation. An additional magnetic resonance imaging (MRI) scan with gadolinium demonstrated a right-sided CST and confirmed the periorbital cellulitis (Figure 3). A swap from the most voluminous pus collection on the nose tip was obtained. Both this swap and blood culture showed *Staphylococcus aureus*. Methicillin resistance was excluded with resistance limited to tetracyclin. Additional blood results demonstrated a C-reactive protein of 283 mg/L and white blood count of 13.9 × 10^3/mm^3 with 84% neutrophils.

Treatment

The patient was transferred to the intensive care unit where intravenous antibiotic and anticoagulation therapy were started immediately. Initially, vancomycin was administered. After 1 day, this therapy was re-evaluated with the microbiologist and switched to flucloxacillin and cefotaxime based on the microbial sensitivity tests and because of the presumed higher blood–brain barrier penetrance of the latter antibiotic. Three days later, cefotaxime was switched to clindamycin. Heparin therapy was started. In the presence of a hypothetical need for surgery, heparin was preferred over low-molecular weight heparin. Should there be a need for invasive treatment, a normalization of the coagulation is possible by using an appropriate antidote. Both the indications for neurosurgical thrombectomy and thrombolysis (local and systemic) were evaluated. Due to the high risks of bleeding and mortality, both interventions were discarded as long as there was no neurological deterioration. As soon as clinical improvement was apparent, and the need for thrombectomy/thrombolysis subsided, heparin therapy was switched to subcutaneous administration of tinzaparin. The treatment also included local skincare with isobetadine gel on a daily basis and single drainage of the most voluminous pus collection of the nasal dorsum. With this treatment and under close observation, the patient was discharged from the intensive care unit after 7 days. After 3 weeks of the above-mentioned treatment, she could leave the hospital in generally good health. The tinzaparin therapy was continued for 3 months. An MRI scan 3 months after anticoagulation started still showed impaired flow and contrast pooling in the right cavernous sinus due to residual cicatricial tissue post-thrombosis. Therefore, the tinzaparin treatment was continued for an additional 3 months.

Main Points

- Early recognition of cavernous sinus thrombosis (CST) of nasal origin is mandatory to reduce morbidity and mortality.
- Imaging using magnetic resonance imaging (or less favorable computed tomography) with contrast is an important diagnostic tool in order to make the correct diagnosis of CST.
- The cornerstone of the treatment in case of a septic origin is antibiotics and also anticoagulants are mostly recommended in the literature.
- Even in modern medicine, we must take into account certain mortality.

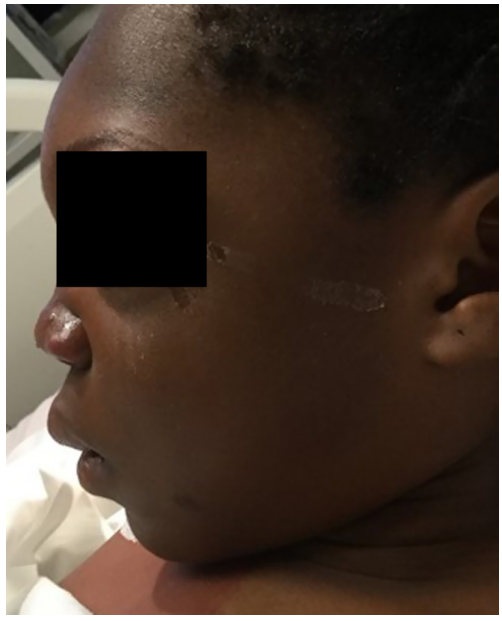

Figure 2. Lateral view of a 7-year-old girl with nasal furunculosis complicated with periorbital cellulitis and cavernous sinus thrombosis.

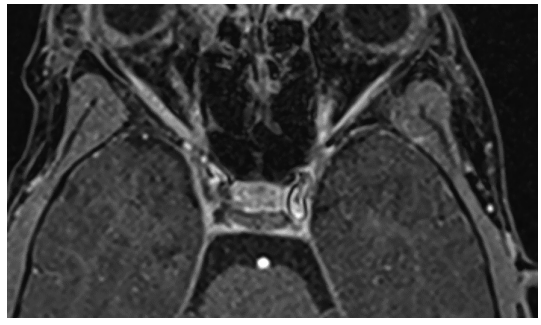

Figure 3. Post-gadolinium T1-weighted axial image showing a right-sided cavernous sinus thrombosis noticeable by the multiple T1 hypointense foci in the cavernous sinus as well as periorbital cellulitis with limited post-septal expansion.

A signed release for publication of medical photographs was obtained from the patient and her legal representative following a detailed explanation.

Discussion

The cause of a CST is either aseptic (surgery or trauma) or infectious. Infectious CST has become a rare complication due to antibiotic therapy. The incidence of this complication decreased drastically since the beginning of the antibiotic era. Therefore, the present generation of medical doctors typically do not encounter this pathology. Misdiagnosis must be prevented as rapid deterioration can follow if this disease stays untreated. A septic CST most frequently finds its origin in one of the following sites of primary infection: a facial skin infection such as furuncles or erysipelas in the danger zone of the medial third of the face, a sphenoid or ethmoidal sinus infection, a dental infection, tonsillitis or pharyngitis, and otitis media or mastoiditis. Due to the lack of population-based data, the incidence of CST is difficult to determine.[3] In pediatric populations, there is a higher incidence in neonates.[4] There are still several cases reported, mostly in India.[5,6] According to these authors, most cases are associated with lower socioeconomic groups with limited access to health care.

Cavernous sinus thrombosis is more frequently seen in patients suffering from immunodeficiency,[7] but is a rare complication, especially in immune-competent and otherwise healthy patients.

The cornerstone of the treatment in case of a septic origin is antibiotics.[8] Surgical intervention is often needed to treat the primary source of infection and should be done as soon as possible. Surgical thrombectomy on the other hand is often avoided due to high mortality and risk of complications.[8] Anticoagulants are mostly recommended in the literature, although not all articles show a reduced mortality rate. Reduction of morbidity on the other hand is clearer.[9] A potential risk of intracranial hemorrhage should not be neglected, especially when CST is associated with meningitis.[10] Steroid therapy in cases of CST is controversial.[11] The potential benefits of lowering edema and inflammation should be well weighed against possible suppression of the immune response.

It has to be noted that recent literature shows that the prognosis of CST has drastically improved compared to older series with mortality rates of 50%.[12] However, even in a recent series of 12 patients, published in 2018, the death of 1 patient was mentioned, while 2 patients suffered from permanent deficits.[13] Although there is less mortality reported, these data still show that in modern medicine, one must take into account certain mortality. However, poor clinical condition upon admission is mostly associated with a higher mortality rate.[14]

Conclusion

Although often considered as a historic complication, the present case emphasizes the importance of early recognition of CST of nasal origin, as prompt treatment is critical to prevent morbidity and mortality in this young population.

Informed Consent: A signed release for publication of pictures and radiographic imaging for scientific purposes was obtained of both the legal representative (father) and the patient herself after a thorough explanation.

Peer-review: Externally peer-reviewed.

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Declaration of Interests: The authors have no conflict of interest to declare.

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