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Subdural empyema secondary to contralateral sinusitis: hematogenous dissemination?

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Sinusitis refers to inflammation in the sinuses. Complications of sinusitis are rare and most often affect the orbit. However, in rare cases, these complications may be intracranial. One of these intracranial complications is subdural empyema, which is a loculated suppuration between the dura mater and the arachnoid. Despite its rarity, it has a high mortality rate and is often underestimated by physicians.

We report here a rare case of a 5-year-old girl with a subdural empyema secondary to contralateral sinusitis. She was admitted to a local hospital complaining of fever, nasal congestion and headache for 6 days. Antibiotic therapy was initiated on admission. After six days, the patient maintained the previous symptoms and developed a decreased level of consciousness, a right hemiparesis and had a witnessed tonic-clonic seizure. This prompt her transfer to a tertiary hospital for brain computed tomography (CT) scan, which revealed a left subdural collection and a right maxillo-sphenoid sinusitis. She was referred to neurosurgical care and underwent surgical drainage of the empyema. There were another two complications of sinusitis: periorbital cellulitis and frontal osteomyelitis (both on the right). The patient was discharged from the tertiary hospital on day 39 without neurological sequelae.

This case shows a rare complication of sinusitis and its clinical, surgical and radiological features and reinforces to physicians the importance of being aware of the possible complications of sinusitis. The peculiarity of the case is attributable to the way in which bacterial spread from sinusitis to a contralateral subdural empyema occurred.

Keywords: Subdural empyema, sinusitis, osteomyelitis, neurosurgical drainage

INTRODUCTION

Sinusitis is defined as inflammation (infectious or noninfectious) on the paranasal sinuses. Infectious sinusitis can be bacterial or viral [1]. Complications of sinusitis are rare and occur most frequently in children and patients with depressed immune system [1,2]. Orbital complications are the most common [2] while Subdural empyema (SE) is a rare complication of sinusitis in children [3].

SE represents a loculated suppuration between the dura mater and the arachnoid [4]. Neurosurgical intervention and high doses of intravenously administered antibiotics are the mainstays of treatment [5]. In the case of sinusitis, SE is an outcome of bacterial infection spread through erosion of bone barriers to the epidural space or, in unusual cases, through hematogenous dissemination [6, 7].

Therefore, even though sinusitis is a common disorder, especially in children, SE is a rare complication of this pathology [8]. Despite its rarity, it has a high mortality rate and is often underestimated by physicians [9].

We report here a rare case of a 5-year-old girl with a subdural empyema secondary to contralateral sinusitis. We highlight in this case the clinical, radiological, and surgical features with a brief review of the literature.

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CASE REPORT

A 5-year-old girl patient without any previous medical history was admitted to a local hospital in Caicó (Brazil) complaining of fever, nasal obstruction and headache for 6 days. Her lab tests revealed a marked leukocytosis (22,600 cells/µL). Initially, she was diagnosed with purulent tonsillitis and periorbital cellulitis and underwent antibiotic therapy (oxacillin + ceftriaxone).

After six days of hospitalization, the patient maintained the previous symptoms and developed a decreased level of consciousness, a right hemiparesis and had a witnessed tonic-clonic seizure. Thus, she was transferred to Monsenhor Walfredo Gurgel Hospital at Natal (270 km away from Caicó) for a brain computed tomography (CT) scan.

The CT scan (figure 1) revealed a left thick fronto-parieto-temporal hypodense subdural collection compressing the underlying brain parenchyma and a contralateral deviation of midline structures. In addition, CT scan showed right maxillo-sphenoid sinusitis.

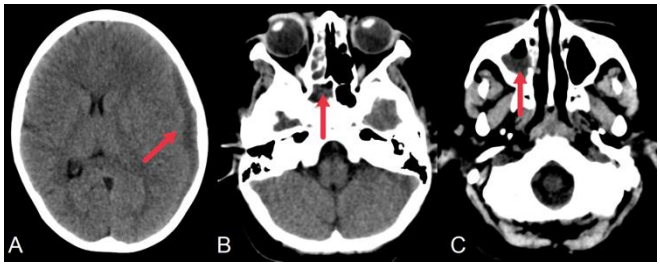

Figure 1 - CT scan in the day before surgery showing: A. Left subdural collection and deviation of midline structures. B. Right sphenoid sinusitis. C. Right maxillary sinusitis

Thereafter, the patient was admitted in Monsenhor Walfredo Gurgel Hospital for neurosurgical care. She underwent a wide left craniotomy, C-shaped dural opening, drainage of massive SE (figure 2), subdural space lavage, dural closure, craniotomy flap replacement and fixation, layered closure, and subcutaneous portovac drain implantation. There were no complications in the procedure and the patient was referred to intensive care unit (ICU), where she continued antibiotic therapy (oxacillin + ceftriaxone + metronidazole). Culture of the drained material had no bacterial growth after 48 hours.

Two days after surgery, a control CT scan (figure 3A) was performed, which revealed a good surgical outcome. Clinically, she improved from her neurological deficits and had no fever, but persisted with periorbital cellulitis (in follow-up with ophthalmology) and leukocytosis. The patient was transferred to the hospital ward.

On the 8th day of hospitalization, a control CT was performed and yielded suggestive findings of persistent periorbital cellulitis and right frontal osteomyelitis (figure 3B).

Figure 2 - Surgical picture showing the empyema drainage

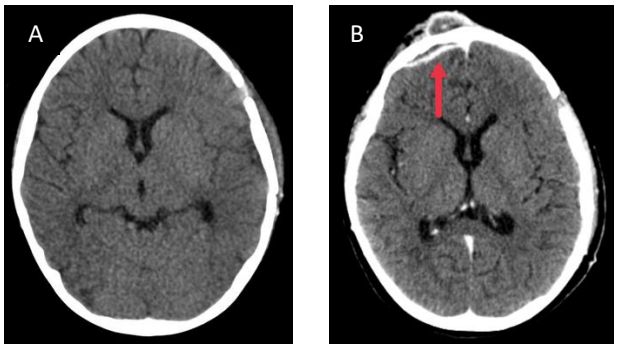

Figure 3 – A- Two days postoperative CT scan showing a good surgical result – B - 8th day of hospitalization control CT scan showing right frontal osteomyelitis.

For a thorough evaluation, a magnetic resonance imaging (MRI) was requested.

On hospital day 19, an MRI was obtained (figure 4), which showed signs suggestive of right frontal osteomyelitis and enlargement of adjacent epidural and subgaleal soft tissues, with a small subgaleal collection that may represent a small abscess, also showing continuity with the right periorbital cellulitis.

Three days after the MRI, a surgery to explore the osteomyelitis was performed. There were no complications in the procedure and the patient was transferred to ICU.

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Thereby, another control CT was obtained, which showed no new neurosurgical pathologies. The patient remained under the care of pediatric team until infection resolution. She was discharged from Monsenhor Walfredo Gurgel Hospital after 39 days with no neurological deficits.

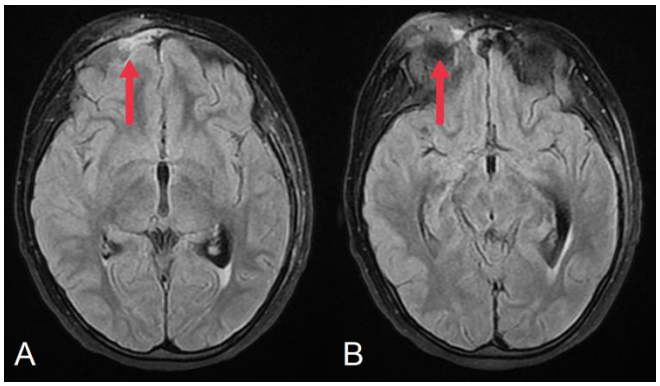

Figure 4 - MRI 19 days after surgery showing: A. Right frontal osteomyelitis. B. Continuity of cranial findings with periorbital cellulitis

DISCUSSION

Initially, the patient was diagnosed with an upper tract respiratory tract infection (URI) and underwent antibiotic therapy, which is the choice treatment for acute bacterial sinusitis [10]. The diagnosis of acute bacterial sinusitis in children is made when an URI presents with persistent illness, worsening course or severe onset [11]. In addition, she already presented with periorbital cellulitis, a well-known complication of sinusitis [12].

Several organisms are commonly seen in SE and the most frequent are: Streptococcus pneumoniae, group B Streptococcus, Haemophilus influenzae type b, Salmoneela, Escherichia coli and Pseudomonas aeruginosa [13]. In the case of our patient, there was no bacterial growth in the culture, which is reported in 7-53% of patients [14]. Absence of bacterial growth in subdural empyema cultures is associated with frequent use of pre-culture/pre-operative antibiotics [14].

Even without microbiological diagnosis, it is recommended to initiate empirical broad-spectrum antibiotic therapy, which should include oxacillin (against Gram-positive organisms) plus third-generation cephalosporin (against Gram-negative organisms and Pseudomonas) plus metronizaole (against anaerobic organisms) [14].

The SE is an uncommon, but also a well-known complication of sinusitis, with a high mortality, ranging from 6 to 15% [9]. Its clinical suspicion was well performed by the first hospital's physician. This pathology usually presents with high fever, headache, lowered level of consciousness, and can cause focal neurological deficits and seizures [6].

A quick response to the SE is of great importance since this disorder is potentially fatal and progresses rapidly [15]. Also, with early treatment, the patient has a good chance of recovering with mild neurological deficits or even without them [5], which is exactly what happened to the patient.

MRI with gadolinium contrast is the gold standard for its high sensitivity [7]. Although less sensitive (especially for subdural empyemas with posterior fossa involvement), CT is more commonly used in emergency situations [4] due to its greater availability and practicality.

Another point to explore is the initial site of sinusitis and the empyema localization. Typically, patients with intracranial complications of sinusitis are previously healthy male adolescents with frontal sinusitis [9, 11]. The empyema is usually located in the cerebral convexity and rarely affects the posterior fossa [4].

Furthermore, the emergence of SE as a complication of sinusitis is commonly secondary to the spread of bacterial sinusitis through erosion of bony barriers to the epidural space at the same side [6]. Conversely, on our patient, sinusitis was contralateral to the empyema, which leads us to question how the bacterial spread occurred, since it probably did not occur by contiguity. The most likely hypothesis is hematogenous dissemination.

CONCLUSION

In summary, conditions indicative of acute bacterial sinusitis should be treated early, as well as physicians should always be aware of possible neurological complications, even if rare, of this very prevalent pathology, due to its fatality potential in a short period of time. This case reinforces the importance of knowledge about this complication and shows many clinical, surgical and radiological features. Finally, the peculiarity of the case is attributable to the way in which bacterial spread from sinusitis to a contralateral subdural empyema occurred.

DISCLOSURES

Ethical approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the local Ethics Committee.

Consent to participate

The patients gave consent to use their information and images for research purposes. *Consent for publication*

The patient gave consent to use his information and images for publication.

Conflict of interest

The authors declare no conflicts of interest with respect to the content, authorship, and/or publication of this article.

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CONTRIBUTIONS

Emerson Kennedy Ribeiro de Andrade Filho: Conceptualization; Methodology; Data curation; Writing – original draft.

José Eduardo Nóbrega Moura: Data curation; Writing – original draft.

Heitor Dutra de Medeiros: Data curation; Writing – original draft.

Francisco de Assis Fernandes Tavares: Data curation; Writing – review & editing.

Rivus Ferreira Arruda: Conceptualization; Methodology; Supervision; Writing – review & editing.

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