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CLINICAL RECORD

Periorbital cellulitis, subgaleal abscess and superior sagittal sinus thrombosis: a rare combination of complications arising from unilateral frontal sinusitis

H JONES, A TRINIDADE, M C JABEROO, M LYONS

Department of Otolaryngology, The Lister Hospital, Stevenage, UK

Abstract

Background: Subclinical infection of the sinuses can result in delayed diagnosis and unusual presenting complications.

Case report: This paper describes the case of a 14-year-old boy with a rare combination of periorbital cellulitis, subgaleal abscess and superior sagittal sinus thrombosis following a late presentation of unilateral frontal sinusitis.

Results: Following multiple surgical procedures, and antimicrobial and anticoagulation therapy, the patient made a full recovery.

Conclusion: Serious sinusitis complications still occur, and can do so in unusual combinations with minimal clinical signs. Systemic anticoagulation therapy is considered safe practice in the management of cerebral venous sinus thrombosis and may reduce morbidity and mortality.

Key words: Sinusitis; Child; Abscess; Sinus Thrombosis, Intracranial

Introduction

Complications arising from rhinosinusitis are becoming increasingly uncommon with the use of modern antimicrobials.[1] Diagnosis may be complicated by atypical presentations, resulting in delayed treatment. We encountered a rare combination of periorbital cellulitis, subgaleal abscess and superior sagittal sinus thrombosis following a late presentation of unilateral frontal sinusitis.

Case report

A 14-year-old boy was admitted with complaints of frontal headache, vomiting and 24 hours of swelling over his right eye and forehead. This followed a 9-day period of coryza, non-productive cough, sore throat and fever.

Examination revealed a tender swelling over the right upper eyelid and frontal region. The patient complained of mild photophobia, but had no other ocular or neurological symptoms. Ophthalmology assessment showed a normal visual acuity and low suspicion for orbital involvement. His C-reactive protein was 280 mg/l, and white cell count was 11.3×10^9. He was diagnosed as having periorbital cellulitis and treated with empirical, intravenous co-amoxiclav.

A computed tomography (CT) scan of the sinuses and orbits revealed opacification of the maxillary, and ethmoidal (both anterior and posterior) and frontal sinuses. Subcutaneous swelling and gas was visible over the right frontal region consistent with a subcutaneous abscess (Figure 1). As there was no suspicion of intracranial pathology at this point, a contrast agent was not used.

The antibiotic treatment was amended in light of a suspected group A streptococcal pansinusitis, and the patient was given a combination of ceftriaxone, metronidazole and flucloxacillin. He underwent an incision and drainage with corrugated drain insertion, and approximately 10 ml of pus was expressed. Bilateral polypectomy, uncinectomy, middle meatal antrostomy and anterior ethmoidectomy were performed to reduce the bulk of the sinus disease and to aid clearance of the frontal recess. Pus was also expressed through both lamina papyraceae on external ocular compression. Post-operative saline nasal douching and betamethasone nasal drops were instituted.

After 24 hours, the patient's right eyelid swelling recurred and a second incision and drainage was required in the right supraorbital region. Swab cultures yielded no growth, but blood cultures confirmed group A streptococcal infection.

Two days later, the patient developed a large, fluctuant swelling over the right parietal region. A repeat CT scan revealed a subgaleal collection, with no underlying bony destruction or intracranial collection, and a suspicion of thrombosis in a 6 cm segment of the superior sagittal sinus (Figure 2). He had no focal neurology and so, on the advice of the regional paediatric neurosurgical unit, was not anticoagulated.

The patient underwent a third incision and drainage, with repeat imaging after 72 hours. This confirmed the presence of thrombosis and excluded cerebral oedema and venous ischaemia. Subcutaneous heparin was started after a normal thrombophilia screen.

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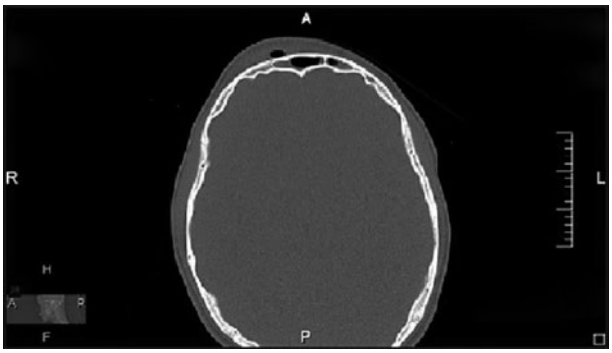

FIG. 1

Axial computed tomography image of the head demonstrating a subcutaneous swelling and gas over the right frontal region consistent with a subcutaneous abscess. A = anterior; R = right; L = left; H = head; F = feet; P = posterior

The patient recovered well; he was discharged and given a four-week course of oral co-amoxiclav and a six-month course of warfarin. At four months, magnetic resonance imaging showed no residual flow void in the cerebral venous sinuses. His anticoagulation was discontinued after review by a paediatric neurologist.

Discussion

Local complications of sinusitis are either intracranial or extracranial. The former carry the greater risk, with an incidence range of 3.7–11 per cent.[2,3] In children, periorbital cellulitis is the most common complication, followed by meningitis, intracranial abscess and dural venous sinus thrombosis.[4] These carry a 10–20 per cent mortality rate.[5]

It is considered rare to have multiple complications presenting in one patient. However, in a study of 74 patients, Herrmann *et al.* found that the frequency of intracranial complications was 24 per cent in children if surgical treatment was required for orbital disease.[6]

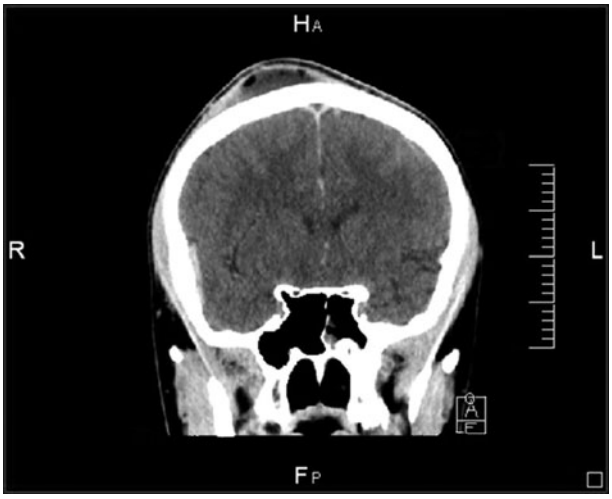

FIG. 2

Coronal computed tomography image of the head demonstrating a subgaleal collection overlying the right superior parietal region, with no underlying bony destruction or intracranial collection. Increased density of the superior sagittal sinus can be seen, suggesting thrombosis. H = head; A = anterior; R = right; L = left; F = feet; P = posterior

Infection of the sinus cavities can spread relatively easily to the neighbouring orbits or intracranial cavity due to their anatomical proximity. The bony lamina separating these structures are extremely thin and direct spread can occur through neurovascular foramina, or haematogenously via the valveless diploic and emissary veins.[7] Haematogenous spread can also cause subperiosteal and subgaleal abscesses of the calvarium at sites distant to the original infection.[8]

This was thought to be the case in our patient. Infection from a right frontal sinusitis spread to cause periorbital cellulitis. This progressed through the diploic and emissary veins resulting in a subperiosteal and subgaleal abscess of the scalp overlying the right parietal bone. It is postulated that infected emboli exacerbated the superior sagittal sinus thrombosis. Such emboli could potentially spread infection to more distant sites and this should always be considered when assessing similar cases.

Diagnosis of intracranial complications is notoriously difficult as children commonly have no focal signs or symptoms.[1,9] Indeed, Germiller *et al.* found that less than half of their series of 25 patients with intracranial pathology had any focal neurological symptoms. However, they did find that orbital infection frequently coexisted with intracranial problems, particularly in the absence of any neurological deficit.[10] Magnetic resonance imaging is considered more sensitive in diagnosing intracranial complications than CT, but it is poor at defining the bony anatomy required to plan endoscopic sinus surgery and can be difficult to obtain out of hours.[11]

The specific mortality of cerebral venous sinus thrombosis is less than 10 per cent, but many suffer long-term morbidity, with chronic neurological symptoms including headache, visual disturbance, seizure, developmental delay and abducent nerve palsy (due to raised intracranial pressure).[12,13]

- **The use of modern antimicrobials has reduced complications arising from rhinosinusitis**
- **However, subclinical infection can result in delayed diagnosis and unusual complications**
- **Haematogenous spread of infection can cause calvarial abscess at sites distant to the original infection**
- **It may also result in cerebral venous sinus thrombosis**
- **Treatment for this thrombosis includes anticoagulation (heparin, warfarin)**
- **A Cochrane review deemed this to be safe management in the paediatric setting**

Treatment with systemic anticoagulation is controversial but is thought to arrest thrombosis and prevent propagation. In a study of 162 children, Moharir *et al.* demonstrated a significant reduction in thrombus propagation on follow-up imaging in those treated with anticoagulation compared with no anticoagulation.[14] The main concern is the development of intracranial haemorrhage. However, the International Study on Cerebral Vein and Dural Sinus Thrombosis demonstrated an incidence of only 6 per cent following anticoagulation.[13] A recent Cochrane review concluded that anticoagulation therapy was a safe treatment for cerebral venous sinus thrombosis in children, and was associated with an apparent reduction in

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mortality (although this failed to reach statistical significance).[15] There is currently no consensus with regards to duration of therapy or review timings, but most recent studies have used oral anticoagulation for three to six months, with consideration of cessation of treatment if subsequent imaging shows recanalisation of the sinus.[16]

Management of these rare cases requires a multidisciplinary team, with early involvement of the otolaryngologist, paediatrician, ophthalmologist, neurosurgeon and radiologist. In the presence of intracranial complications, treatment involves rapid administration of intravenous antibiotics, systemic anticoagulation and surgical drainage of the infected sinus source if the patient's condition allows.[17]

Conclusion

Complications of rhinosinusitis can be extremely difficult to detect both clinically and radiologically. A high level of vigilance is necessary in cases that do not settle with conventional interventions; such complications may be life-threatening if missed.

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Address for correspondence:
Mr A Trinidade,
Department of Otolaryngology,
The Lister Hospital,
Coreys Mill Lane,
Stevenage SG1 4AB, UK

E-mail: aarontrinidade@gmail.com

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