

Failure of contrast enhanced computed tomography scans to identify an orbital abscess. The benefit of magnetic resonance imaging

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Abstract

Introduction: Acute sinusitis is a relatively common condition, which usually responds to medical therapy. In most cases, there are no sequelae or complications subsequent to this infection. However, like many acute illnesses, there are well documented complications of acute sinusitis, and in particular these include peri-orbital and intracranial spread.

Objective: The purpose of this paper is to highlight the importance of vigilance in peri-orbital involvement and the limitations of imaging techniques, such as computed tomography scanning. An illustrative case is presented to demonstrate this.

Conclusion: Magnetic resonance imaging scanning is a valuable modality in assessing complex presentations of peri-orbital complications of acute sinusitis.

Key words: Orbital Diseases; Acute Sinusitis; Abscess; Magnetic Resonance Imaging

Introduction

Acute sinusitis is predominantly an infectious disease caused by bacteria such as *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*. Symptoms include common features of an infective illness with facial pain, rhinorrhoea, and nasal obstruction. Management usually consists of nasal decongestion and broad spectrum antibiotics, such as amoxicillin and clavulanic acid (Augmentin).

The combination of both host and disease factors may result in spread of infection beyond the paranasal sinuses. The orbit is particularly prone, and this is more so in children. There are several reasons as to why this is the case. Anatomically, there is only a thin plate of bone that separates the medial orbital wall from the ethmoid sinuses, known as the lamina papyracea. Translated from its Latin description, it literally means 'paper layer'. Apart from being slim, there are also natural dehiscences (of Zuckerkandl) within this bone.¹ Furthermore, there are foramina for neurovascular structures that transverse the orbit and sinuses, providing a pathway for both direct and haematogenous spread. This accounts for medial involvement of the orbit being the most common site of orbital complications.² The superior and inferior orbital walls are also bounded by paranasal sinuses (frontal and maxillary, respectively), and hence spread of disease to these regions is also possible. The creation of *de novo* pathways in any of these regions is also possible.

Orbital complications of sinusitis require a high level of clinical acumen as serious complications such as visual loss is a potential outcome.³ Most patients present with orbital complications as a rapidly evolving swelling of one orbit

after several days of an upper respiratory tract illness. Distinction between pre-septal (in front of the orbit) and post-septal (within the orbit) may be difficult. Orbital involvement is indicated by features such as ophthalmoplegia, proptosis, blurred vision, diplopia, loss of red–blue colour discrimination, decreased visual acuity and afferent papillary defects. Assessment of these features can be quite difficult when there is significant lid oedema, and hence an expert ophthalmological opinion is essential.^{1,3}

In cases where there is uncertainty or concerns regarding the location of infection, the visual status, or failure to respond to conservative measures, contrast enhanced imaging is appropriate. Preference is given to computed tomography (CT) scanning as this will demonstrate the illness and surgical anatomy, should surgery be required. The characteristic findings of contrast enhanced CT imaging includes an enhancing crescentic swelling, usually along the medial wall, which indicates a subperiosteal abscess.³ This may be associated with displacement of the medial rectus muscle, proptosis and traction of the optic nerve. In more advanced cases, a well defined contrast enhancing abscess may be evident. It is important to review the intracranial components of the CT images, and in particular confirm contrast flow through the cavernous sinus.

In clinical cases where there is a strong suspicion of orbital involvement but contrast enhanced CT scanning does not support this, then contrast enhanced magnetic resonance imaging (MRI) scanning is the next appropriate modality. This has a greater sensitivity than CT for soft tissue changes and avoids repeated radiation to the orbits, an important consideration in the paediatric population. The following clinical case highlights the above principles.

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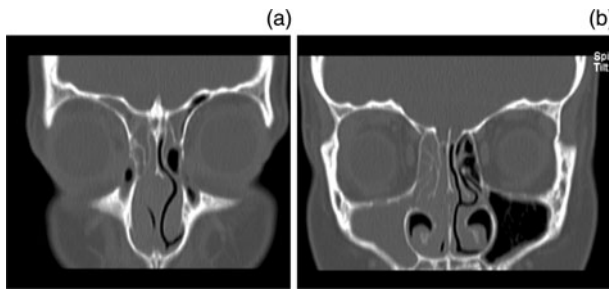


FIG. 1

(a) and (b) Coronal CT scan slices of the paranasal sinuses demonstrating opacification of the right frontal, ethmoid, and maxillary sinuses. No orbital collection evident.

Case presentation

OK is a 14-year-old, otherwise healthy, female who presented with acute sinusitis complicated by right peri-orbital infection. She had no predisposing or prior history of nasal symptoms. She initially presented to her local doctor with a one-week history of an upper respiratory tract illness associated with the onset of right frontal headache a few days beforehand. She was commenced on Augmentin and a decongestant but within 24 hours re-presented worse with an associated right eye swelling. On arrival to the emergency department, she had temperatures up to 38 °C, and obvious peri-orbital involvement with significant lid oedema and proptosis. Visual assessment was not possible. There was slight numbness over her right forehead. She was commenced on intravenous Augmentin and had a contrast enhanced CT scan performed that night which confirmed acute sinusitis but failed to demonstrate an orbital collection (Figures 1 and 2).

- Acute sinusitis is a leading cause of peri-orbital infection
- Peri-orbital infections may be pre-septal or post-septal
- Computed tomography scanning does not identify all peri-orbital abscesses
- Not all orbital abscesses are located in the medial orbital region
- Magnetic resonance imaging is a valuable modality for complex cases

She was reviewed the next day and it was felt that she had worsened. Specifically she complained of a wider area of

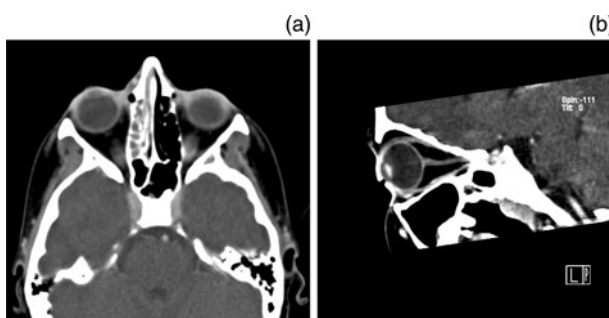


FIG. 2

(a) Axial and (b) parasagittal CT scan slices of the orbit. No orbital collection evident.

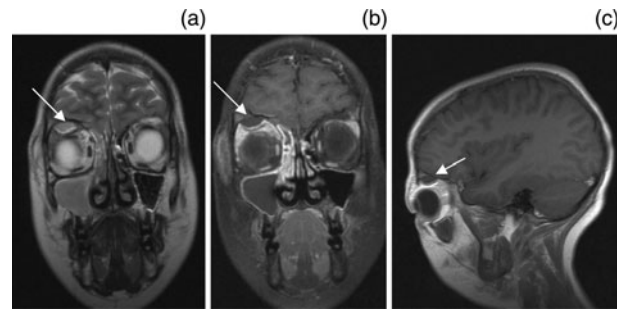


FIG. 3

(a) and (b) Coronal and (c) parasagittal MRI scan slices, demonstrating an abscess in the superior right orbit (arrows).

facial numbness, and upon forced lid opening, there was the suggestion of diplopia with ophthalmoplegia. An urgent contrast enhanced MRI scan was organised to assess both the orbit and cavernous sinus. Selected images are presented in Figure 3. A superiorly placed orbital abscess can be seen in these images. There was no intracranial complication of the illness.

She was taken to theatre with these findings and underwent an incision and drainage of her abscess via an external superior incision, complemented by endoscopic drainage of her maxillary, anterior ethmoid and frontal recess, with frontal sinus mini-trephination. She had an unremarkable recovery, with full neurological and ophthalmological improvements.

Discussion

This case highlights the difficulties associated with clinical assessment of peri-orbital complications of acute sinusitis and the potential for false reassurance from CT scanning. Even with the benefit of hindsight, subsequent review of the CT scans performed less than 24 hours before the MRI was still non-diagnostic. Hence, we strongly recommend MRI as an important modality in cases where there is strong clinical evidence of orbital involvement despite normal contrast enhanced CT findings within the orbit. The variability in the location of abscess collection indicates that empirical drainage targeting the medial orbital wall will be inappropriate and non-therapeutic in alternatively placed disease.

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