

## Acute orbital complications of sinusitis: the benefits 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 regarding both peri-orbital involvement of sinusitis and the limitations of imaging techniques such as computed tomography. An illustrative case is presented to demonstrate this.

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

**Key words:** Acute Sinusitis; Orbit; Complications; Magnetic Resonance Imaging; Computed Tomography

### 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.<sup>1</sup> 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 the medial wall of the orbit being the most common site of peri-orbital complications of acute sinusitis.<sup>2</sup> 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 sequelae such as visual loss are possible.<sup>3</sup> Most patients with orbital complications present with a rapidly evolving swelling of one orbit after several days of an upper respiratory tract infection (URTI).

The distinction between pre-septal (i.e. in front of the orbit) and post-septal (i.e. within the orbit) infection 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.<sup>1,3</sup>

In cases in which 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. Computed tomography (CT) scanning is preferred as this will demonstrate both the illness and the surgical anatomy, should surgery be required. The characteristic findings of contrast-enhanced CT imaging include an enhancing, crescentic swelling, usually along the medial wall, which indicates a subperiosteal abscess.<sup>3</sup> 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 to confirm contrast flow through the cavernous sinus.

In clinical cases in which there is a strong suspicion of orbital involvement but lack of support from contrast-enhanced CT scanning, contrast-enhanced magnetic resonance imaging (MRI) is the next appropriate modality. This has a greater sensitivity than CT for soft tissue changes and avoids repeated irradiation to the orbits, an important consideration in the paediatric population. The following clinical case highlights the above principles.

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**Case presentation**

A 14-year-old, otherwise healthy girl presented with acute sinusitis complicated by right peri-orbital infection. She had no predisposing or prior history of nasal symptoms. She had initially presented to her local doctor with a one-week history of an URTI, associated with the onset of right frontal headache a few days beforehand. She had been commenced on Augmentin and a decongestant. However, within 24 hours her condition had worsened, with an associated right eye swelling.

On arrival at the emergency department, the patient's temperature was up to 38°C, and she showed obvious peri-orbital involvement with significant lid oedema and proptosis. Visual assessment was not possible. There was slight numbness over her right forehead.

The patient was commenced on intravenous Augmentin. A contrast-enhanced CT scan was performed that evening, which confirmed acute sinusitis but failed to demonstrate an orbital collection (Figures 1 and 2).

The patient was reviewed the next day and it was felt that her condition had worsened. Specifically, she now complained of a wider area of facial numbness, and, upon

forced lid opening, there was a suggestion of diplopia with ophthalmoplegia.

- **Acute sinusitis is a leading cause of peri-orbital infection**
- **Peri-orbital infections may be pre- 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**

An urgent contrast-enhanced MRI scan was organised to assess both the orbit and the cavernous sinus. Selected images are presented in Figure 3. A superiorly placed orbital abscess could be seen in these images. There were no intracranial complications of the illness.

On the basis of these findings, the patient was taken to theatre and underwent an incision and drainage of her abscess via an external superior incision, complemented by endoscopic drainage of her maxillary and anterior

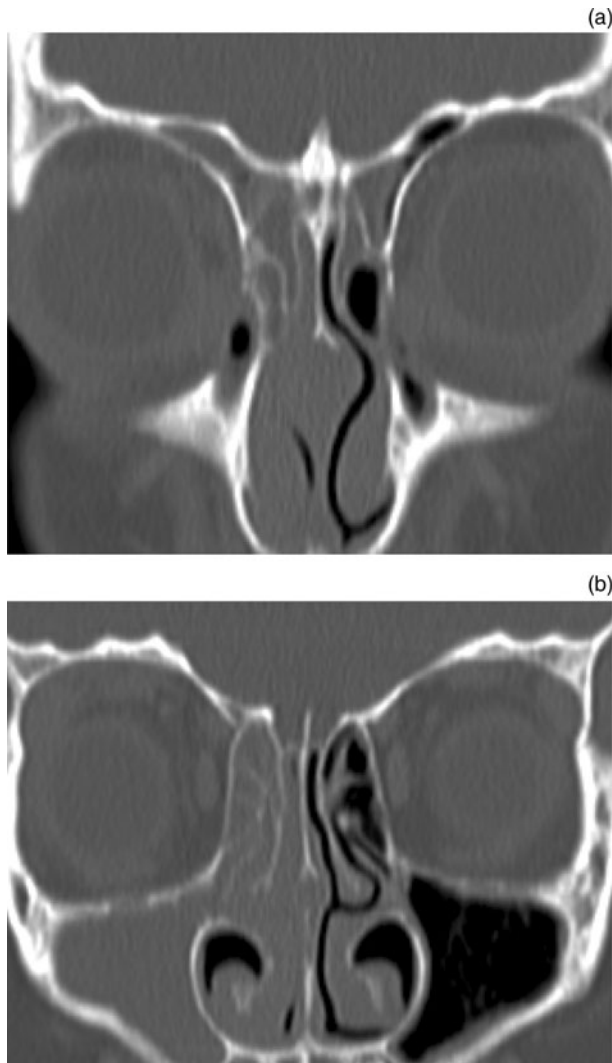


FIG. 1

Coronal computed tomography scan slices of the paranasal sinuses, demonstrating opacification of the right frontal, ethmoid and maxillary sinuses. No orbital collection is evident.



FIG. 2

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

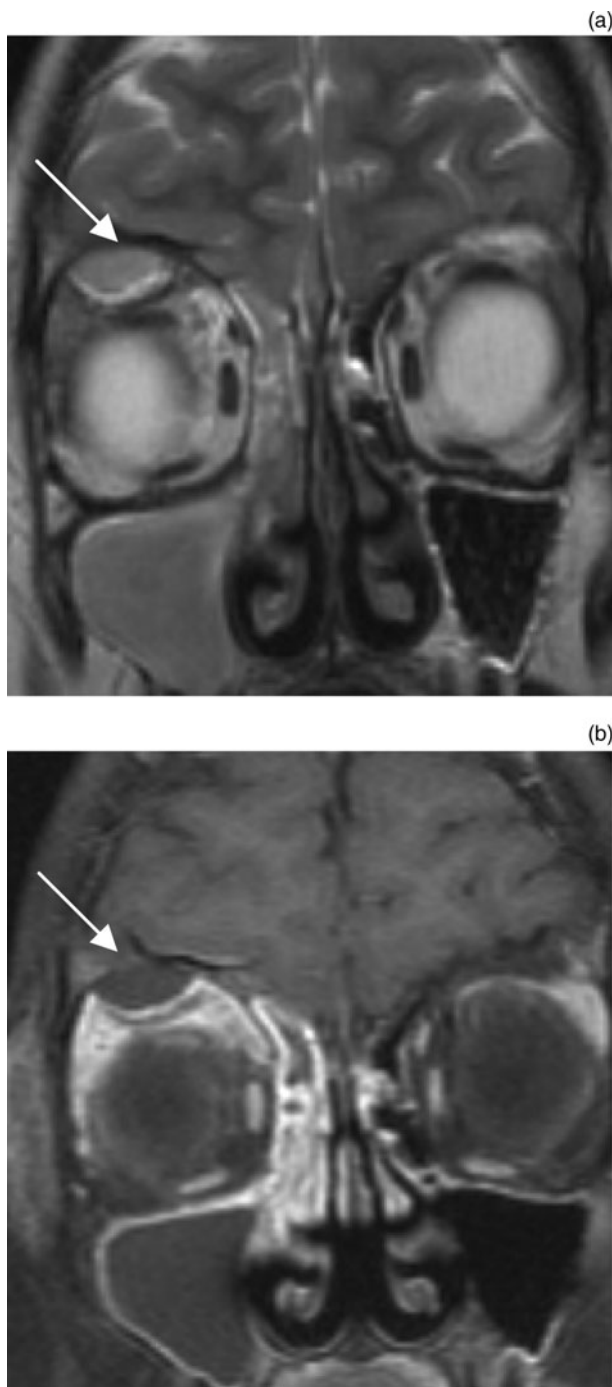


FIG. 3

(a) & (b) Coronal and (c) parasagittal magnetic resonance imaging slices, demonstrating an abscess in the superior right orbit (arrows).

ethmoid sinuses and frontal recess, with frontal sinus mini-trephination.

The patient made an unremarkable recovery, with full return of neurological and ophthalmological function.

### 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.

FIG. 3  
Continued.

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 in which 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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