Delayed Diagnosis

Serious unexpected sinus infection discovered by CT scanning for presumed neurological disease

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Summary: Serious infection in the paranasal sinuses may present with symptoms suggestive of neurological disease and thus lead to delay in the diagnosis and subsequent treatment. We present three such cases in whom the initial diagnoses had been acute optic neuritis, a posterior communicating aneurysm and an intracranial space occupying lesion. The fourth patient had meningitis but the paranasal sinuses had not initially been considered as a possible source of infection. The current methods of diagnosing sinusitis are discussed.

Introduction

Infection of the paranasal sinuses is common and may, on occasions, be severe. Acute sinusitis is usually preceded by a viral infection of the upper respiratory tract with subsequent bacterial secondary infection.¹ The most common bacterial pathogens are *Streptococcus pneumoniae*, *Haemophilus influenza* and, in children, *Moraxella catarrhalis*. Anaerobic bacteria are common if the sinusitis is due to dental infection and they are not infrequent in chronically infected sinuses. Sinusitis is likely to arise from anything that disturbs the mucociliary clearance mechanism in the nose. Mucus stasis allows bacteria to proliferate which inhibits ciliary beat and induces local inflammation, thus worsening the degree of stasis. It has recently been shown that the normal coordinated ciliary beat can be totally disrupted by compounds released by *Streptococcus pneumoniae*,² *Haemophilus influenzae*³ and *Pseudomonas aeruginosa*.⁴

Though symptoms and signs of sinusitis are usually straightforward, in some cases they may be misleading and other diagnoses may be made, particularly if the possibility of sinusitis is not considered.

We present four cases in which serious sinus infection was not considered, until it was found by chance during computerized tomography (CT) of the brain. In three patients, primary neurological diagnoses were made clinically but were not substantiated. In the fourth patient, a neurological

disorder was present (meningitis) but sinus infection had not been considered as a possible focus of infection.

Case histories

Case 1: Unilateral headache/retro-orbital pain

A 31 year old lady was admitted urgently with a left parietal headache of sudden onset and severe retro-orbital pain. She was also vomiting and had paraesthesia of the left side of her face. On examination she was distressed and photophobic, but there were no other neurological signs. She was thought to have acute optic neuritis but a subsequent CT scan showed a completely opaque left maxillary antrum. She underwent irrigation of the maxillary antrum and *Staphylococcus aureus* was isolated from the pus. She was treated with appropriate antibiotics and made a rapid and complete recovery.

Case 2: Orbital pain/abnormal pupil

A 34 year old man was referred with a 4 day history of pain around the right eye. On examination the right pupil did not react to light and he had painful internal ophthalmoplegia and ptosis. A presumptive diagnosis of a posterior communicating aneurysm was made. However, a CT scan showed an opaque right ethmoid, frontal and maxillary sinus (see Figure 1), and on further examination he had a severe right-sided rhinitis and a purulent discharge. The right frontal sinus was trephined and the maxillary sinus drained by an inferior

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Figure 1 Coronal CT sinus scan from case 2. The images show an opaque right ethmoid and maxillary sinus due to infected polyposis (a) and a fluid level in the right frontal sinus (b).

meatal antrostomy. Foul-smelling pus was released from both sinuses and culture subsequently grew β -haemolytic streptococci (Lancefield C). The frontal sinus was irrigated daily via an indwelling tube which was removed 4 days later. He received intravenous cefuroxime and metronidazole, and made a rapid recovery. His right pupil remained unreactive to light but did respond to accommodation and this was later diagnosed as an Adie's pupil.

He remained well for a further 2 months, but his pain recurred and a coronal CT scan of sinuses showed an opaque ethmoid, fluid in the right frontal sinus, and gross mucosal thickening in the right maxillary antrum. He underwent functional endoscopic sinus surgery to the right ethmoid and has since remained well.

Case 3: Headache and nausea

A 21 year old girl presented with a 3 week history of headache associated with nausea. The pains were suggestive of raised intra-cranial pressure and were worst in the early morning, and increased on coughing and bending forward. A space-occupying lesion was considered likely but a CT scan of the head displayed extensive sinus infection but no intra-cranial abnormality. The maxillary sinuses were irrigated and culture of the purulent contents

grew *Streptococcus pneumoniae*. She was treated with co-amoxiclav and made a complete and rapid recovery.

Case 4: Meningitis

A 28 year old man was admitted with bacterial meningitis and treated with intravenous penicillin and chloramphenicol. Pneumococci were isolated from the cerebrospinal fluid and he was subsequently treated with high-dose penicillin alone. He improved a little but after 5 days he still had a persistent headache and pyrexia. Although his neck stiffness had improved a CT scan was performed to exclude an intracranial abscess. The scan revealed bilateral frontal sinusitis and subsequent trephination drained pus which grew *Streptococcus pneumoniae*. Following this he went on to make a good recovery.

Discussion

Sinusitis usually causes pain or discomfort in the face, around or behind the eyes and across the forehead. Sinus sensation is derived from the trigeminal nerve: the ophthalmic division supplies the frontal sinus; the ethmoids and sphenoid sinus

have a dual supply from the ophthalmic and maxillary divisions; the maxillary sinus is supplied by the maxillary branch. The afferent fibres from the nasal and sinus mucosa terminate in the sensory nucleus of the fifth cranial nerve alongside the afferent sensory fibres from the skin and may explain why pain is often referred.⁵ Sometimes, pain is very poorly localized and this is typically seen in acute sphenoiditis in which pain may be experienced over the vertex, occiput or mastoid. In contrast to chronic sinusitis, acute sinusitis is usually accompanied by severe facial pain and/or headache. Most cases of acute sinusitis do not pose a diagnostic problem, the nature and site of the pain is characteristic, and there is usually a history of an acute respiratory tract infection, nasal discharge and obstruction. However, if the presenting symptoms are unusual or masked by antibiotics, ophthalmological or neurological disease may seem more likely and acute sinusitis is not initially considered. A classical problem is seen in patients who develop recurrent pyrexia whilst being treated in an intensive care unit: an underlying sinusitis is often responsible and is predisposed to by indwelling nasogastric and/or nasotracheal tubes.⁶

Neurological signs or symptoms can be particularly misleading. Paraesthesia or numbness of the cheek may be the result of an exposed infraorbital nerve in the roof of the maxillary antrum in the presence of purulent infection. Persistent headache which is worse on straining or coughing may be more suggestive of raised intracranial pressure rather than sinusitis. The pupillary abnormality described above (Case 2) was an Adie's pupil secondary to ciliary ganglion dysfunction and unrelated to sinusitis.

Purulent sinusitis may extend beyond the confines of the sinuses to affect either the orbit or intracranial structures. Orbital cellulitis is most likely with acute ethmoiditis and is seen mainly in children, although all age groups can be affected.⁷ Infection usually spreads through a dehiscence in the thin lamina papyracea. Initial cellulitis may progress rapidly to swelling and inflammation, ptosis, ophthalmoplegia and visual impairment. Rarely, infection may spread posteriorly to lead to cavernous sinus thrombosis, in which case there would be bilateral orbital swelling in a desperately ill patient. Other unusual causes of visual impairment in sinusitis include optic neuritis and compressive optic neuropathy.^{8,9} A patient with optic neuritis due to purulent maxillary sinusitis was described by Awerbuch *et al.*⁸ The CT scan did not include views of the sinuses and maxillary sinusitis was subsequently identified by a coronal magnetic resonance imaging scan of the head.

Intracranial infection usually follows purulent fronto-ethmoiditis. This may lead to meningitis, an epidural or subdural empyema or an intra-cerebral

abscess. Although very unusual, acute sphenoiditis may lead to intracranial complications such as cavernous sinus thrombosis.^{10,11} The most common organisms of sinus-related intracranial infection are anaerobes. Early diagnosis is essential since the mortality is high, particularly with a subdural abscess, even with modern treatment.¹² Sometimes an intracranial abscess may be silent or have few signs. One of us (ACS) has treated a 60 year old man with a huge subdural empyema which grossly displaced the frontal lobes but caused only mild headaches and lack of affect. The patient had purulent pan-sinusitis, advanced dental caries and had been treated for recurrent chest infection.

The diagnosis of sinusitis and its complications has recently been greatly enhanced by computerized tomography. Patients presenting with atypical symptoms or complications may have an axial CT scan before a sinus infection is considered, the latter being detected retrospectively. However, there is a danger that sinusitis may be missed or misinterpreted because the slice thickness beyond the skull base is often large and the main emphasis is likely to be on intracranial structures. Excellent views of the anatomy and disease within the sinuses can be displayed by a series of fine slices, 4–5 mm wide, taken in the coronal plane.¹³ The scans can be set to detect primarily bone or soft tissue by adjusting the window width: the latter being more useful in determining the extent of sinus disease. Magnetic resonance imaging is now becoming more generally available and this also gives valuable information. It is particularly good at distinguishing nasal tumours and fungal infections, and has the distinct advantage of being unaffected by dental artefacts which can seriously interfere with the quality of CT scans.¹⁴

The detection of sinus disease has also been greatly enhanced by the development of rigid Hopkins rod telescopes.¹⁵ The combination of endoscopy and coronal CT scanning will detect and localize most disease within the paranasal sinuses.¹⁶ This is particularly true for disease in the ostiomeatal complex region of the anterior ethmoids which may be quite localized, but may cause obstruction of the maxillary and frontal sinus ostia.

Once severe purulent sinusitis has been diagnosed, treatment should commence with the appropriate antibiotics and pus should be drained. The antibiotic of choice should be broad-spectrum until the bacteriology is known and, ideally, should be resistant to beta-lactamase, particularly if there is a history of chronic sinus disease with previous antibiotic administration.¹ Drainage of pus is most easily attained by irrigation of the maxillary antrum, with or without an antrostomy, and trephination and irrigation of the frontal sinus where necessary. Although the natural ostia of the maxillary and frontal sinuses may be opened with

functional endoscopic sinus surgery (FESS), this will be technically difficult due to acute inflammation, and bleeding will be easily induced. The endoscopic approach is also unsuitable in the presence of orbital or intracranial complications, and open drainage is recommended.¹⁵

In conclusion, a high index of suspicion must be maintained for the possibility of an underlying sinusitis in all patients presenting with acute symp-

toms related to the face, orbit and head. Neurological or orbital features may represent spread of infection beyond the adjacent sinuses and lead to diagnostic delay. Plain X-rays of the sinuses have limitations and underestimate sinus disease. Rigid endoscopy and coronal CT scanning of the sinuses will enable a rapid and precise diagnosis of any underlying pathology.

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