

An unusual swelling of the forehead

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A 52-year-old man was referred to the ENT department with a 10-week history of facial pain. He described the worst pain he had ever experienced and had been unable to work during the preceding fortnight.

He had noted increasing swelling around his left eye and forehead and green discharge from his left nostril, with occasional blood-staining. He had received three courses of antibiotics with little effect.

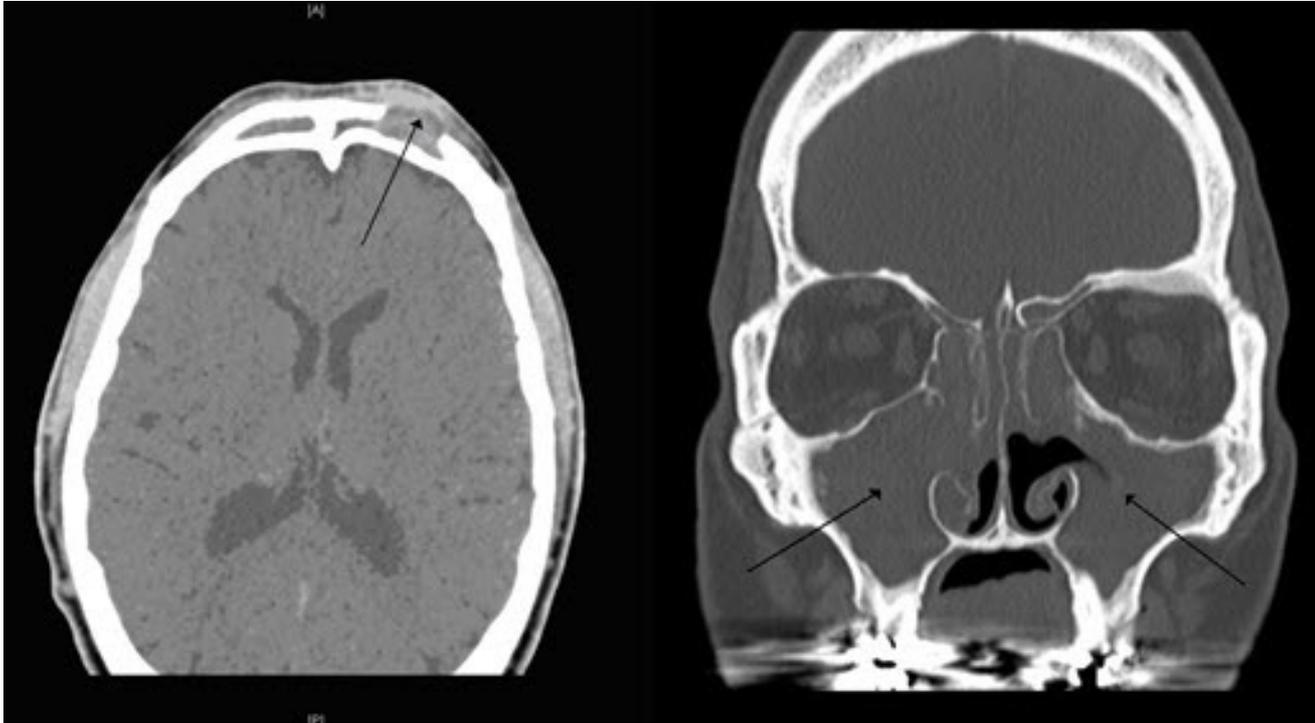
The patient described a long history of sinus problems, previously requiring hospital admission for intravenous antibiotics. He had undergone functional endoscopic sinus surgery (FESS) on three occasions electively for nasal polyposis and had undergone emergency surgery to the maxillary sinuses for an episode of orbital cellulitis. He is an asthmatic and had previously had an attack triggered by aspirin.

On examination, marked tenderness was noted bilaterally over the orbital and maxillary regions and there was a fluctuant swelling in the region of the left forehead. Eye movements and vision were normal. Polyps and pus were visible on anterior rhinoscopy. Full blood count, renal function and electrolytes were normal.

Swabs from both nostrils were sent for culture and sensitivity and an urgent CT scan was requested (Figures 1 and 2) showing soft tissue swelling with abscess formation overlying the left frontal sinus, bony erosion of the anterior wall of the sinus and inflammation of most paranasal sinuses.

Figure 1. Axial CT showing bony defect of the anterior wall of the frontal sinus with overlying soft tissue swelling

Figure 2. Coronal CT showing extensive shadowing of the paranasal sinuses suggestive of mucosal thickening and retained secretions



What do these findings indicate and why would this patient be prone to develop this condition?

Answer—Osteomyelitis of the frontal bone with subperiosteal abscess formation (*Pott's puffy tumour*) secondary to chronic rhinosinusitis.

The patient has *Samter's triad* (asthma, aspirin sensitivity and nasal polyposis) which is associated with a particularly persistent and treatment resistant form of chronic rhinosinusitis.¹

Discussion—This patient has *chronic rhinosinusitis and as a consequence has developed osteomyelitis* of the frontal bone with an associated sub-periosteal abscess, otherwise known as a Pott's puffy tumour—a rare but potentially life-threatening complication of frontal sinusitis.

Pott's puffy tumour is a misnomer as there is no underlying neoplastic process. It was first described by Sir Percival Pott in the 18th Century in relation to sub-periosteal abscess formation secondary to minor trauma at the height of the frontal vault^{2,3} but it has now become synonymous with a clinical diagnosis of a sub-periosteal abscess overlying the anterior table of the frontal bone through any cause. Most commonly this is due to osteomyelitis secondary to frontal sinusitis¹ as is the case in this patient but it can occur over an intact frontal bone due to retrograde thrombophlebitis of the diploic veins.

Organisms commonly implicated are *Staphylococcus aureus*, non-enterococcal streptococci and oral anaerobes.⁴ Pott's puffy tumour occurs more frequently in children and male adolescents than in adults¹ and its incidence has declined with increased use of antibiotics.⁵

Samter's triad or the "aspirin triad" is the co-existence of asthma, aspirin intolerance and nasal polyposis.⁶ This is associated with a particularly persistent and treatment resistant form of chronic rhinosinusitis, characterised by involvement of all sinuses and nasal passages.

It is thought that in affected patients, aspirin and other non-steroidal anti-inflammatory medications (NSAIDs) inhibit the activity of the enzyme cyclooxygenase-1 (COX-1) in the arachidonic acid metabolism pathway resulting in a release of leukotrienes. These potent inflammatory mediators can induce mucous secretion, bronchoconstriction and oedema of the nasal mucosa.⁷ A higher thickness of hypertrophic mucosa has been documented with CT in these patients, and the higher severity of disease is reflected in the recurrence of nasal polyps and the frequent need for endoscopic sinus surgery.⁷⁻⁹

Life-threatening intracranial extension is the feared complication in Pott's puffy tumour and can arise in over half of all cases.^{4,10} Extension can occur either as a result of direct spread from erosion of the posterior table of the frontal sinus or, more commonly, from haematological spread through the valve-less diploic veins that connect the sinus mucosa and dura.

Epidural abscess may result or septic thrombophlebitis of the sagittal sinus leading to meningitis, subdural or intra-cerebral abscess formation.¹ Extension through the floor of the frontal sinus may also occur with subsequent subperiosteal abscess of the orbital wall or intraorbital abscess, which can jeopardize vision.

This should be considered a surgical emergency. Antibiotic therapy should initially be intravenous and should cover *Staphylococcus aureus*, streptococci and anaerobes until microbiological cultures and sensitivities are available based on nasal swabs or drained pus.

Topical therapy with nasal vasoconstrictors and mucolytics is also recommended.¹ Therapy thereafter can then be more targeted and should be continued for several weeks where there is suggestion of an underlying osteomyelitis.¹⁰

Cephalosporins have good bone penetration and are often a good first choice.^{4,10} If the abscess does not respond to antibiotic therapy within 24 hours, it should be drained surgically and sequestrectomy of affected bone should be considered at the same time. Further endoscopic sinus surgery should be considered once the acute episode has settled although with an underlying Samter's triad, curative surgery is unlikely to be achieved.

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