ABC of ENT

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PARANASAL SINUS DISEASES

Sinusitis

Bacterial infection of the paranasal sinuses usually occurs when the "self-cleansing mechanism" becomes impaired. Mucus accumulates and stagnates within the sinus cavities and becomes infected by relatively harmless, opportunist, pyogenic bacteria normally found in the nose.

The "self-cleansing mechanism" is the means whereby mucus secreted within the sinuses is swept as a continuous blanket by ciliary activity through the sinus ostia into the nose. The mucus is passed back into the nasopharynx. The process requires secretion of mucus with the correct physical characteristics; normal function of the mucosal cilia; and patency of the sinus ostia. Certain anatomical features place individual sinuses at risk: the ostium of the maxillary antrum is high on its medial wall, so mucus has to be swept upwards against gravity; the frontal sinus has a long tortuous duct, which is easily damaged and obstructed; and the ethmoid cells open into the nose in regions where they may be bathed by infected material from the maxillary sinuses.

The commonest predisposing cause of derangement of self-cleansing is viral infection of the nasal and sinus mucosa (viral rhinosinusitis). This depresses the activity of the cilia and provokes oedematous obstruction of the sinus ostia. Other obstructions inside the nose, including gross deflections of the nasal septum or mucosal swelling and polyps due to vasomotor rhinitis make this more likely. During a viral infection mucus accumulates in the paranasal sinuses of one or both sides. If the self-cleansing mechanism does not recover the stagnating mucus becomes secondarily infected and is converted to mucopus. The mucopus impairs ciliary function, and increases the swelling around the ostia where it discharges into the nose—so creating a vicious circle.

Acute sinusitis developing in this way always affects all the sinus cavities on one or both sides of the nose (pansinusitis). An individual maxillary sinus may become infected without preceding viral rhinosinusitis by direct spread of pathogenic, usually anaerobic, organisms from the tooth roots. An individual frontal sinus may become infected by traumatic inflammation of its duct caused by jumping into polluted water with the nose open.

Clinical features of sinusitis

After a typical cold the symptoms do not resolve. The clear nasal discharge becomes yellow or green; fever may persist; and there is often pain in the cheek, which may be referred to the forehead. The pain in the forehead becomes worse on bending or straining. If the ostium of the maxillary sinus is tightly blocked the pain may be severe and may be felt in the teeth. Tenderness is elicited by firm pressure over the maxillary antrum.

Swelling of the cheek is *never* caused by maxillary sinusitis. This symptom indicates an infection of the root of a tooth if it is associated with an acute onset and pain, or cancer of the antrum if it is painless and develops less rapidly.

If the self-cleansing mechanism fails to recover and evacuate the mucopus after the acute illness the sinusitis enters subacute and chronic phases. Persisting chronic infection of the upper sinuses is invariably associated with infection in the lower air cells. Chronic maxillary sinusitis may exist alone, but chronic ethmoid cell infection and chronic frontal sinusitis are always associated with antral infection. This pattern underlies the principles of treatment.

Chronic infection is suggested by persisting nasal obstruction and purulent discharge from the nose. Pain is exceptional, but the patient may complain of dull pressure. Frontal headache is often referred from antral disease, and is caused only rarely by infection of the frontal sinus. Chronic pharyngitis and chronic laryngitis may develop.

The diagnosis is usually obvious from the history and clinical features. Examination of the interior of the nose and the nasopharynx with a mirror may show oedematous mucosa bathed in mucopus, and features such as ethmoid polyps. Transillumination of the sinuses with a bright light in the mouth, in a dark room, often provides confirmatory evidence by lack of translucency. Whenever possible, however, radiographs are needed to confirm the diagnosis and, in chronic infection, to identify the affected sinuses.

Radiographic signs of infection are those that suggest accumulated mucopus. These are either total opacity of the affected sinus or a recognisable fluid level. The common finding of mucosal oedema within a sinus cavity must not be interpreted as evidence of infection, since this appearance, which is often ephemeral, may be seen in any patient with oedema of the nasal mucosa from any cause—of which vasomotor rhinitis is the commonest.

Treatment of acute sinusitis

During the acute illness palliative treatment includes bedrest and analgesics. At times drugs stronger than soluble aspirin or paracetamol may be needed. Warmth from a hot water bottle may be soothing. The nasal mucosa can be decongested by using nasal drops such as ephedrine 1% in normal saline or Otrivine (xylometazoline) as drops or a spray. They should be warmed and then instilled with the patient lying with his head over the side of the bed, breathing through his mouth. After a few drops have been instilled into each nostril, while the other is occluded, the patient should turn his head slowly from side to side for a few minutes before sitting up. Steam inhalations with benzoin tincture often help.

Treatment of chronic sinusitis

Systemic antibiotics are usually advisable. The choice may depend on bacteriological examination of a swab from the nasal discharge, but Vibramycin (doxycycline hydrochloride) in a daily dose of 100 mg after a loading dose of 200 mg is suitable for adults, while penicillin or co-trimoxazole are recommended for children (though childhood sinusitis is rare).

If the patient does not recover with these measures the condition is passing through a subacute phase to become chronic, and pus must be removed from the maxillary antrum to break the vicious circle which prevents the self-cleansing mechanism from recovering.

Pus is removed by antral washout. In adults this procedure is carried out under local anaesthesia by inserting a hollow cannula through the nasal wall of the maxillary antrum under the inferior turbinate. Normal saline, raised above body temperature, is instilled through the cannula by a Higginson's syringe. The contained pus and the retained fluid escape into the nose through the maxillary ostium and pour into a bowl held under the patient's chin. The patient breathes through the mouth.

Antral lavage may be needed more than once and is usually the first step in treating chronic maxillary sinusitis. Repeated antral washouts at weekly intervals are often effective in restoring normal mucosal activity (helped by the administration of a systemic antibiotic and nasal decongestants). If self-cleansing recovers, the washout return will gradually change from mucopus to mucus and then to clear fluid. If the mucosa does not recover pus will be returned week after week. Very rarely, it may be necessary to drain pus from the frontal sinus during acute infection, by trephining its floor through an incision above the eye.

If maxillary sinusitis fails to respond to repeated antral lavage, *intranasal antrostomy* should be considered. In this operation, performed under general anaesthetic, an additional ventilation hole is made from the maxillary sinus into the nose, as low as possible below the inferior turbinate, to encourage excretion of retained pus and to allow the mucosa to recover. Persisting infection after intranasal antrostomy implies that the mucosal lining is irreversibly diseased and that normal self-cleansing is impossible. There may be pockets of pus inaccessible to drainage by gravity. The whole diseased lining then needs to be removed from the sinus by a *Caldwell-Luc operation* (radical antrostomy). An incision is made through the gingival mucosa within the mouth, and the maxillary antrum is opened through its anterolateral wall. The antral mucosa is carefully removed and an antrostomy into the nose fashioned. This approach to the maxillary antrum may also be used to remove material, for histological examination, or a foreign body such as a displaced tooth root. At the end of the procedure the mucosal incision is stitched. A Caldwell-Luc operation may rarely be followed by complications such as anaesthesia or neuralgia of the infraorbital nerve.

Chronic infection in the ethmoid or frontal sinuses is treated first by eliminating infection of the maxillary antrum on that side. Treatment of persisting infection in the ethmoid labyrinth may then require an *ethmoidectomy*, as described in the article on vasomotor rhinitis; particularly if polyps in the nose obstruct the ostia and prevent pus from escaping. The procedure may be carried out through the nose as an intranasal ethmoidectomy, or by external incision around the inner canthus of the eye.

Persisting frontal sinusitis can sometimes be treated by submucous resection or other minor intranasal operations to remove obstruction from the frontonasal duct. Often some form of external frontal sinus operation is needed. Many varieties are available and they rely on one of two principles. Either a new wide frontonasal duct through which infected material can escape into the nose is made, or the sinus and its duct are obliterated completely so that there is no remaining air space.

Complications of sinusitis

All complications of sinusitis are rare. They usually develop from infection of the ethmoid or frontal sinuses, particularly during acute exacerbations of chronic infection. Maxillary sinusitis hardly ever causes complications.

Orbital cellulitis may follow acute ethmoiditis in children or frontal sinusitis in adults. The upper eyelid becomes swollen, red, and tender, and there is associated fever. The cause can usually be recognised from the presence of pus in the nose on the affected side. If the disorder does not respond rapidly to treatment with large doses of antibiotics a subperiosteal abscess may develop within the orbit and there is a risk of damage to the eye.

Mucocoele of the frontal sinus—This complication produces swelling of the frontal sinus with erosion of the floor and displacement of the eye downwards and laterally. Swelling develops slowly and usually without pain. The patient often presents with diplopia. The condition may be identified by feeling the floor of the frontal sinus with a finger and recognising the thinning or loss of bone. The diagnosis can be confirmed by radiography. Much more rarely a mucocoele may develop in the sphenoid sinus causing impairment of vision.

Osteomyelitis of the frontal bone is another rare but serious complication of frontal sinus disease.

Intracranial suppuration develops usually from the frontal sinus and may take the form of meningitis, extradural or subdural abscesses, or frontal lobe cerebral abscess.

Malignant tumours of the paranasal sinuses

Malignant tumours of the paranasal sinuses are almost always squamous cell carcinomas and usually develop in middle-aged or elderly men. Neoplasia should be suspected in any patient who develops chronic sinusitis for the first time in later life without an obvious cause. Extension beyond the bony walls of the ethmoid or maxillary sinuses causes swelling of the face; displacement of the eye with proptosis and diplopia; nasal obstruction and blood-stained discharge; and swelling of the palate or loosening of teeth. Any of these symptoms is highly suggestive. Apart from the swelling, there may be friable vascular material in the nasal cavity, from which a biopsy specimen must be taken. Radiography with tomography will almost always show erosion of bone. A Caldwell-Luc operation may be needed to provide material for histological examination. These tumours hardly ever spread to regional lymph nodes. Treatment includes radiotherapy, radical surgical removal, and cytotoxic chemotherapy.

The radiographs were reproduced by kind permission of Dr J M Dawson. Mr Harold Ludman, MA, FRCS, is consultant otolaryngologist, King's College Hospital, and neuro-otological surgeon, National Hospital, Queen Square, London.