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A Le Fort I osteotomy approach to lateral sphenoid sinus encephalocoeles

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Abstract
Meningo-encephalocoeles of the skull base may present as spontaneous cerebrospinal fluid rhinorrhoea or acute meningitis. Previous approaches to midline skull base lesions have been either intracranial, via a craniotomy, or by transfacial or endoscopic extracranial approaches. This paper presents an alternative approach to lateral sphenoid sinus encephalocoeles through a Le Fort I osteotomy approach.

Key words: Meningocoele; Sphenoid sinus; Osteotomy, Le Fort I

Introduction

Meningo-encephalocoeles, herniations of the meninges and brain substances through a defect in the skull (Horky *et al.*, 1997), may be congenital, or arise secondary to trauma, surgery, infection or neoplasms (Clyde and Stechison, 1995). Patients may present with obvious deformity or compromise of function, however spontaneous cerebrospinal fluid (CSF) rhinorrhoea or acute meningitis are often the presenting features of an occult encephalocoele arising from the skull base (Schick *et al.*, 1997).

Symptomatic encephalocoeles may arise from the temporal lobe and are often associated with extensive pneumatization of the sphenoid. Encephalocoeles herniating laterally into a pneumatized sphenoid wing are difficult to approach extracranially, and although an intracranial neurosurgical closure of the defect is not technically demanding, the risk of significant post-operative neurological sequelae may be unacceptably high from prolonged upward retraction of the middle cranial fossa contents.

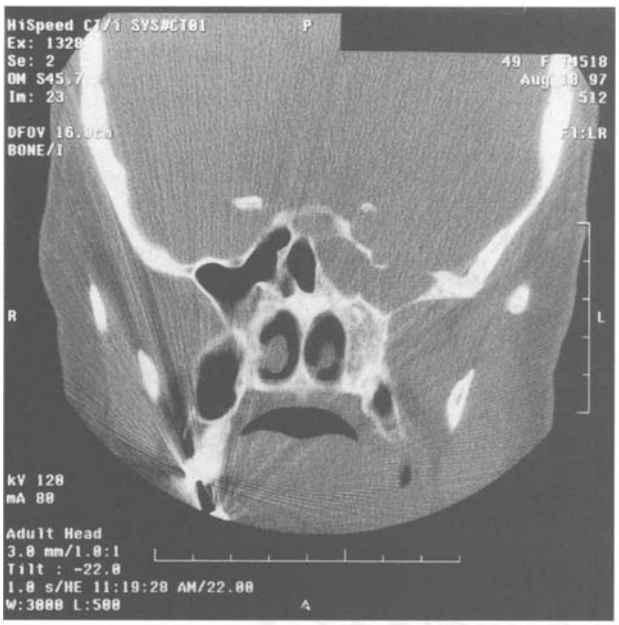
We describe a case of a far lateral sphenoid sinus encephalocoele, successfully treated via an extracranial approach using a Le Fort I osteotomy.

Case report

A 49-year-old woman presented with a six-month history of spontaneous, left-sided, clear rhinorrhoea. Neurological examination and nasendoscopy were otherwise unremarkable. The presence of CSF in the nasal discharge was confirmed on a positive beta 2 transferrin assay. The CSF was sterile and contained no malignant cells.

A computed tomography (CT) scan of the skull base revealed an extensively pneumatized sphenoid bone with complete opacification of the left side, and a bone defect in the roof of that sinus, 3 cm from the midline behind the pterygoid plates and 1.5 cm in diameter (Figure 1). Magnetic resonance imaging (MRI) identified a soft tissue mass passing from the left middle cranial fossa into the sphenoid, continuous with the adjacent temporal lobe (Figure 2). CT cisternography confirmed the tracking of contrast through a defect in the floor of the left middle cranial fossa into the sphenoid sinus. A diagnosis of a left sphenoid meningo-encephalocoele was made.

It was thought by our neurosurgical colleagues that an intracranial approach to this lesion would carry an unacceptably high risk of resultant paresis, and therefore, the Otolaryngology department was asked to provide access via an inferior approach if possible. Surgical



CT scan of the skull base showing complete opacification of the left sphenoid sinus.

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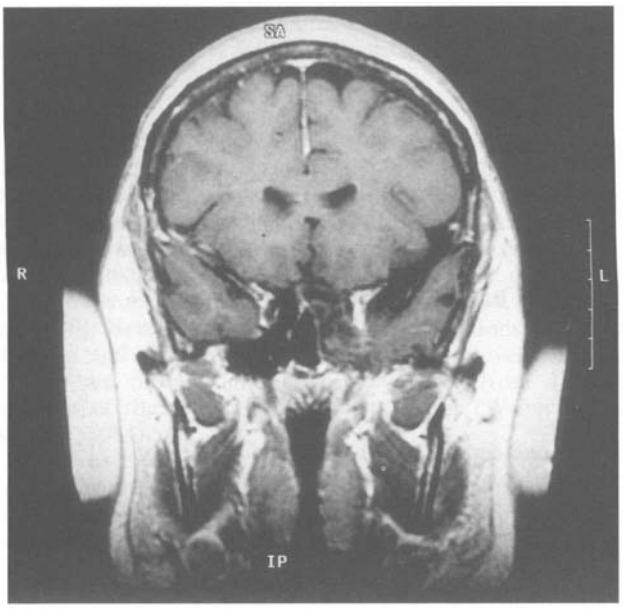


FIG. 2
Coronal MRI scan showing the encephalocoele continuous with the temporal lobe.

exposure of the sphenoid sinus was achieved via a Le Fort I osteotomy. An upper gingival incision was made, and the front of the maxilla exposed. Bilateral, stepped Le Fort I osteotomies were made below the level of the infraorbital nerve trunks (Figure 3), after initial placement of facial mini-plate screw holes to maintain dental alignment. The nasal septum was detached from the maxillary crest and the lateral pterygoid plates were separated from the maxillae. The lower maxillary segment was then depressed by up to 5 cm, giving access to the nasopharynx, both maxillary antra and the sphenoid sinus (Figures 4a and b). The lateral extent of the sphenoid sinus was exposed by removing bone from the floor and front face of the greater wing of the sphenoid and carefully displacing the maxillary artery laterally. The encephalocoele was identified, con-

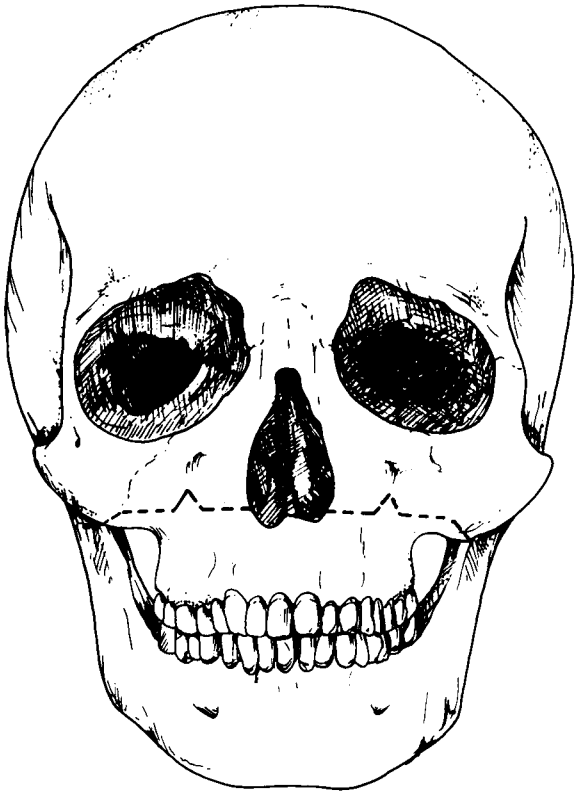
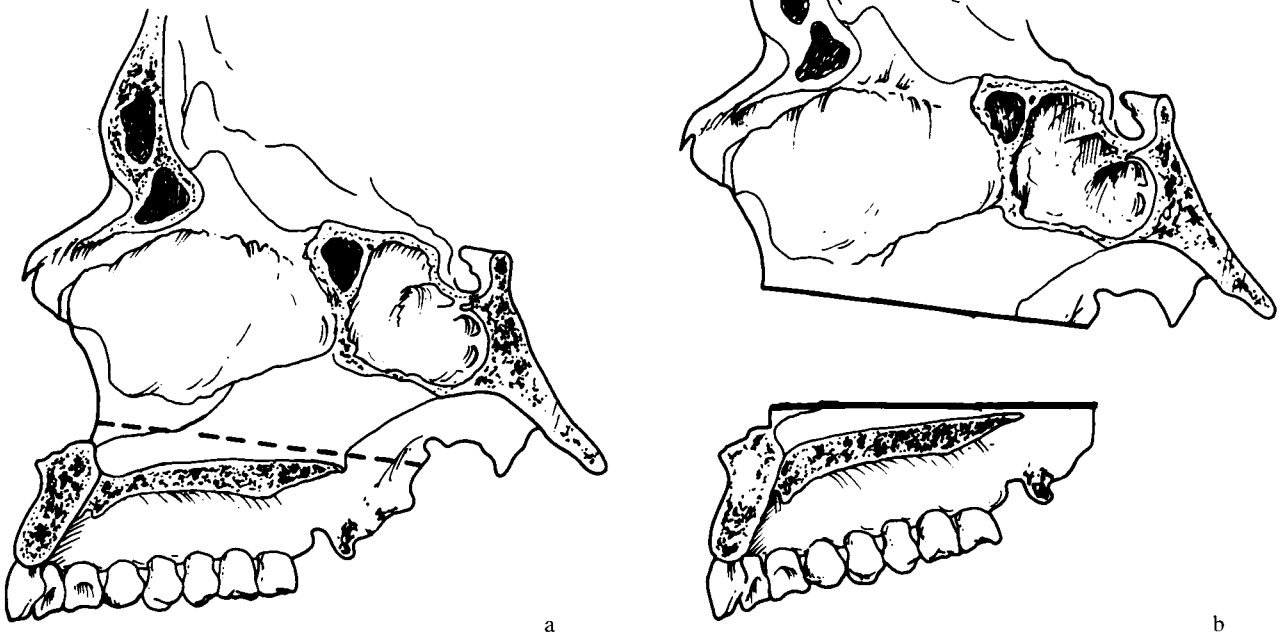


FIG. 3
Skull illustration showing the site of the osteotomy incision.

firmed on frozen section, and then removed piecemeal. The bone defect was isolated and closed with six layers – a double sandwich of fat, fascia lata and fibrin glue – and the



a b

FIG. 4
Sagittal views demonstrating depression of the maxillary segment

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maxillae were repositioned with facial plates and a posterior bridle wire. A nasogastric feeding tube was passed, and a pack soaked in bismuth iodoform paraffin paste was inserted into the nasal cavity and post-nasal space. A lumbar drain had been inserted pre-operatively, and the patient managed post-operatively with the head up at 15 degrees and the CSF drainage bag kept at head height. Prophylactic antibiotics were also used post-operatively.

The patient had an uneventful recovery. The pack was removed after one week, and the patient was discharged on the twelfth post-operative day on a soft diet for six weeks. Histology confirmed the diagnosis of an encephalocoele, with no evidence of malignancy. At subsequent out-patient follow-up at five months, the patient was well, with no further episodes of rhinorrhoea. She still had resolving numbness of the upper teeth, but was back eating a normal diet and had no neurological sequelae.

Discussion

The treatment of sphenoid sinus encephalocoeles remains controversial. In the presence of a continuous CSF leak, the defect should be closed. The ideal approach however, remains debatable. Both intracranial and extracranial approaches have their proponents, however the technique ultimately chosen will depend as much on the expertise of the attending surgeon as on the exact location of the defect.

Intracranial access to the defect can be achieved via a frontotemporal or a subtemporal craniotomy (Clyde and Stechison, 1995), but significant brain retraction may be required. Alternatively, a transfacial or endoscopic extracranial approach may be used, and although an intracranial procedure is avoided, these techniques offer only limited or inadequate access, especially laterally. Despite their respective limitations, high success rates are reported with both intracranial and extracranial approaches, although a lower morbidity is seen with an extracranial approach (Lanza *et al.*, 1996). Unfortunately, neither is ideal when the encephalocoele is away from the midline, however, if the lesion is lateral to the line of the lamina papyracea and the optic nerve, the Le Fort I osteotomy approach may be indicated.

The Le Fort I osteotomy approach has been previously described for the management of midline skull base tumours and vertebrobasilar aneurysms (Utley *et al.*, 1989), but not to our knowledge for the treatment of encephalocoeles into a pneumatized greater wing of sphenoid. It provides superior access to the nasopharynx and sphenoid sinus, and a vastly improved field of vision when compared with alternative external procedures. The cosmetic results are excellent, with limited patient discomfort (Utley *et al.*, 1989), however, there is some risk of associated complications.

The Le Fort I approach may interfere with the nerve or blood supply of the teeth, result in dental misalignment, leave a cleft in the base of the nasal septum, or cause a traction neuropraxia of the infraorbital nerves. The most serious complication is injury to both maxillary arteries with secondary loss of the whole hard palate and upper alveolus. This rare but major complication limits the usefulness of this approach for angiofibromata, where one maxillary artery must be sacrificed for tumour control.

The Le Fort I osteotomy approach is ideal for access to lateral meningo-encephalocoeles into the greater wing of the sphenoid. The technique is not without potential problems, but when compared with the high risk of serious neurological complications which may result from an intracranial approach, the Le Fort I osteotomy appears to offer significant advantages over the alternative methods described to date.

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