

Editorial Review

Extended applications of endoscopic sinus surgery—the territorial imperative

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Sinus surgery has always had the potential of allowing us intentionally, or unintentionally, to enter the realms of our colleagues in ophthalmology and neurosurgery. An endoscopic approach has obviated the need in many cases, for the more conventional and often more radical approaches for the treatment of chronic rhinosinusitis. The access and visualization provided by the rigid endoscope allows us literally to break down the barriers between the orbit and the skull base and in so doing extend our application of the technique in a way that is by no means 'functional' but one in which morbidity and hospital stay is reduced whilst achieving comparable results to conventional techniques. However, not all cases are suitable for an endoscopic approach and the surgeon must be experienced in the full range of surgical options and above all with the patho-physiology and natural history of the disease processes themselves if optimum results are to be achieved. This is particularly true in the controversial area of sinonasal neoplasia.

Orbital and optic nerve decompression

Hypertrophy of the extraocular muscles and orbital fat in thyroid eye disease is one of the commonest causes of proptosis. Surgical decompression may be required to relieve compression of the optic nerve at the orbital apex, exposure keratopathy and, occasionally, subluxation of the globe in severe cases. However, even in mild disease, one should not underestimate the cosmetic disability posed by this disease. An endonasal endoscopic approach allows precise removal of the entire medial orbital wall with ease as far posteriorly as the ethmosphenoidal junction together with the medial portion of the floor of the orbit (Kennedy *et al.*, 1990). The sphenoidal bone overlying the optic nerve may also be removed using a purpose-built drill although this is generally unnecessary in most cases of thyroid eye disease, being reserved for much rarer situations where the nerve has been compressed by trauma or oedema of other origin. Adequate removal of the floor of the orbit can only be achieved through a very large middle meatal antrostomy but despite this potential technical disadvantage, the results are comparable to those achieved by conventional external approaches. The same mean decrease in

axial proptosis of 5.5 mm has been achieved in 54 of my own patients undergoing bilateral orbital decompression irrespective of whether a Patterson's external ethmoidectomy (34 cases) or an endoscopic approach (20 cases) was utilized.

The endoscopic approach obviously avoids a facial scar, carries a much smaller risk to the nasolacrimal system and infraorbital nerve and is not excluded by a previous external approach. However, it is important that patients clearly appreciate the potential complications of any orbital decompression, in particular the inevitable (though usually temporary) post-operative diplopia which in selected cases may require muscle surgery. This should not be undertaken until at least three months have elapsed and in the interim a prism can be used on the spectacles. Occasionally defatting of the upper lid by blepharoplasty can also improve appearances further.

The value of optic nerve decompression in cases of trauma or oedema of the nerve is still unclear and the situation may be regarded as entirely analogous with decompression of the facial nerve. It may be some time before the multicentre Boston trial comparing surgery with high dose steroids answers this question.

Repair of orbital blow-out fractures

In contrast to decompression, the orbital walls may require restitution following direct anterior trauma. Compression of the orbital contents leads to fracture along lines of weakness resulting in the classical blow-out of the floor in the region of the infraorbital nerve through which the orbital fat extrudes and becomes trapped. More rarely, and often in association with a blow-out of the floor, the laminae papyracea may fracture increasing enophthalmos. As in orbital decompression there are technical limits to assessing the lateral orbital floor endoscopically, but to improve enophthalmos the medial wall may be readily repositioned via an endoscopic approach through the ethmoid labyrinth (Yamaguchi *et al.*, 1991) (and held in place whilst healing occurs with a small temporary Whitehead's varnish pack). This, as always, can be combined with one of a variety of external approaches where appropriate.

Dacrocystorhinostomy

Traditionally, an external approach has been utilized by our ophthalmic colleagues to overcome obstruction of the nasolacrimal system. However, for some years an endonasal approach has been advocated in certain ENT centres in Germany and France and it is clear that an endoscopic approach can be employed with ease (El-Khoury and Rouvier, 1992; Whittet *et al.*, 1993; Weidenecker *et al.*, 1994). A single optical light fibre can be passed through one of the canaliculi to identify the position of the lacrimal sac and the intervening bone removed with a drill, curette or laser. Stenting of the rhinostomy may be unnecessary when marsupialization of the sac is wide or the mucosal edges held back with liga clips. In experienced hands the success rate is comparable to the conventional external approach and neither precludes the use of the other if revision is required.

Repair of CSF leaks

Once aware of the endonasal endoscopic approach, many neurosurgeons are happy to relinquish their cases of CSF leak from the anterior skull base. The endoscopic approach generally allows precise localization of the source of the leak, enabling direct repair with negligible morbidity, thus avoiding craniotomy with its attendant post-operative anosmia (Stankiewicz, 1991). Fine fracture lines and dehiscences may be beyond the resolution of even the highest quality imaging and in these cases the use of intrathecal fluorescein, whilst observing the usual precautions, can be extremely helpful (Stammberger, 1991). The wide range of material described in the literature for closing the defect suggests that all are probably equally effective, my own preference being for middle turbinate mucosa, held in position with gel foam soaked in Sofradex and a small Whitehead's varnish pack for 10 days. Generally, lumbar and/or lumbar-peritoneal drains are only indicated in profuse leaks of long-standing to decompress the system whilst the arachnoid granulations recover their ability to resorb CSF.

Hypophysectomy

Several ENT centres have reported a trans-sphenoidal endoscopic approach to the pituitary gland in combination with their neurosurgical colleagues (Sethi and Pillay, 1995). This is clearly a variant of other endonasal approaches and does suffer from the major disadvantage of controlling haemorrhage in a confined space using a one-handed technique. Although this has led to some criticism, it may be countered by careful patient selection and the combination and/or conversion to alternative approaches if required.

Choanal atresia

There are in the population a small number of adolescents and young adults who regard their unilateral nasal obstruction as 'normal', the true cause of which only becomes apparent on careful nasal endoscopy and axial computed tomography (CT) scanning. Obligate nasal respiration in the neonate rapidly uncovers bilateral choanal atresia but unilateral cases may not come to light until many years later. The atretic area is usually a combination of fibrous tissue and bone filling an otherwise narrow posterior choana. To obtain a reasonable airway, both the atretic plate and a portion of the posterior nasal septum should be removed which may require an endoscopic drill with cutting burrs and/or strong bone punches (Cumberworth *et al.*, 1995). Stenting should be avoided if possible.

Mucocoeles

As mucocoeles of the paranasal sinuses slowly expand, they more often than not impinge on the orbit, producing displacement of the globe and resulting in an ophthalmology referral. Fronto-ethmoidal, sphenoidal and the rare maxillary sinus mucocoeles are ideal cases for an endoscopic approach provided wide marsupialization can be achieved (Kennedy *et al.*, 1989). The likely success of an endoscopic approach can be determined on coronal CT scan which will show whether the lesion can be accessed via the nasal cavity, whether it is uni- or multilocular and whether there is any contributory pathology. Mucocoeles by definition are associated with expansion and erosion of bone but aetiological factors such as mid-facial trauma, previous surgery and abnormally thick bone as in Paget's disease may preclude an endoscopic approach. In the frontal sinus, a mucocoele in a lateral compartment may simply be impossible to access via the nose. However, even in these circumstances external and endoscopic approaches can be usefully combined, preserving lateral support of the frontal recess where possible and avoiding a stent. In our original series of 118 cases of fronto-ethmoidal mucocoele, a Lynch Howarth approach was exclusively employed (Harrison and Lund, 1993). In the last 44 cases, two-thirds have been amenable to an entirely endoscopic approach though this has been combined with an external approach in the remaining third for technical reasons. Ethmoidal, maxillary and sphenoidal mucocoeles are almost always accessible to an endoscopic approach alone and this is particularly advantageous in children who may present as young as four years old.

Complications of acute sinusitis

The orbital and neurological complications of acute sinusitis again traverse the boundaries of the sinuses and there are reports in the literature advocating endonasal endoscopic approaches to both areas which I feel should be treated with some caution. The drainage of intraorbital but

extraperiosteal pus may certainly be effected via an endoscopic approach combined with drainage of the infected sinuses. However, this should only be attempted by an experienced endoscopic surgeon as there is inevitably significant bleeding and distortion of the anatomy (Younis and Lazar, 1996). Intraperiosteal and in particular intraconal abscesses may be difficult to identify and we should not put our patients' vision at risk in wishing to demonstrate the versatility of a technique. It need hardly be said that the medicolegal consequences of failing to successfully drain an intracranial collection would be grave indeed.

Anterior skull base neoplasia

An equally controversial area and one in which the effects of failure may take longer to manifest but are even more catastrophic, is the increasing enthusiasm for endoscopic excision of sinonasal neoplasia. This can only be endorsed if the surgeon is already an expert in endoscopic sinus surgery, understands the natural history of the individual tumours, is confident from detailed imaging that the lesion can be totally excised and if proved wrong, is able to perform the range of more extensive procedures to effect excision. The lesion which has most frequently been removed endoscopically is the inverted papilloma which classically arises within the middle meatus, extending into the maxillary sinus. However, its ability to stimulate and invade adjacent bone, to infiltrate the nasolacrimal region and to extend to the lateral wall of the maxillary sinus and into the frontal sinus may preclude a complete endoscopic excision. True malignant transformation occurs in under two per cent of cases but the recurrence rates of up to 75 per cent seen in the pre-lateral rhinotomy and mid-facial degloving era may again be observed if an endoscopic approach is employed indiscriminately. However, with careful case selection reasonable long-term results via an endoscopic approach have been reported in a moderately large series (Waitz and Wigand, 1992). The same cannot be said at present for the occasional case reports which are appearing for malignant tumours such as olfactory neuroblastoma and adenocarcinoma.

It is clear that we now have as great an opportunity as ever to collaborate with our ophthalmic and neurosurgical colleagues in ways which offer us some of the most interesting and challenging surgery whilst affording our patients considerable

benefit. Endoscopic surgery cannot replace every conventional external approach and we should never be embarrassed to employ or convert to these conventional approaches. However, it is clear that an endoscopic approach can often offer comparable results with reduced morbidity and length of hospital stay and that in so doing we can demonstrate to our ophthalmic and neurosurgical colleagues that we can enter their territories not just by accident but by invitation and design.

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