Endoscopic Sinus Surgery Venturing Outside the Nose

Dr. Wai-kuen HO

FHKAM(ORL), FRCS(Ed), DLO(Eng)
ENT Services, Hong Kong West Cluster, Hospital Authority

Introduction

More than 3 decades have elapsed since Messerklinger reported his detailed physiological studies of the mucociliary clearance of the paranasal sinuses. With the understanding of the recovery potential of even the most severely diseased paranasal sinuses, endoscopic sinus surgery (ESS), rather than destructive exenteration surgery, is now generally accepted for the treatment of inflammatory sinus diseases that are resistant to medical treatment. Terms like FESS (Functional Endoscopic Sinus Surgery) are commonly used to describe these operations to emphasise the minimally invasive access nature of the procedure and the functional concept to preserve normal mucosa, in contrast to previous exenteration types of operations, for early recovery of mucociliary clearance. With advance in surgical techniques, development of a new generation of video equipment and advent of computer-assisted surgery, the endoscopic sinus procedure ESS has understandably extended outside the nose and sinuses and might not be minimally invasive and functional anymore in its true context. This article describes the development of these extended endoscopic procedures through the nose.

Oncological Surgery through the Nasal Cavity Assisted or Completely Performed with the Nasoendoscope

It was very logical that ESS techniques were employed to resect nasal/sinus neoplasms by rhinologists when the techniques used for inflammatory nasal diseases became mature. The commonest nasal tumour resected by the nasoendoscopic route reported in the literature is probably the inverted nasal papilloma. These benign tumours have a high propensity for recurrence and a significant potential of association with malignancy. Transnasal endoscopic resection has the benefit of avoiding a major facial scar and also provides close magnified views of the surgical field to facilitate a complete and clear resection. These tumours usually arise from the lateral nasal wall and an endoscopic maxillectomy is required (Figure 1). Good ESS technique is mandatory especially in the maintenance of a bloodless field during surgery to provide a clear view during resection. Experience so far shows that outcomes and recurrence rate are at least comparable to open surgical resection if not better.

The commonest malignant nasal/sinus neoplasm is squamous cell carcinoma. There are other possibilities like haemangiopericytoma, undifferentiated carcinoma, adenoid cystic carcinoma, adenocarcinoma and mucosal melanoma. Selected malignant nasal/sinus tumours might be amendable to a minimally invasive access for tumour resection by the ESS technique alone without a facial scar (Figure 2). This would not be a functional surgery and all oncological principles for tumour resection have to be followed. Whether the tumour is delivered en bloc or in stages, resection must be complete with adequate clear resection margins. And like open surgery, adjuvant treatment, further radiotherapy +/- chemotherapy have to be given if there is a high chance of local or systemic recurrence. It is usually the site of the tumour rather than the histological type that dictates if an exclusive ESS approach would be possible. Tumours arising more near the midline: nasal septum, nasal cavities, lateral nasal wall are more amendable to transnasal ESS approach. Tumours involving the subcutaneous tissue, skin, contents of the orbit, intracranial cavity are not suitable for an exclusive ESS resection.

Figure 1. Inverted papilloma filling the left nasal fossa (A); Coronal CT showing tumour in the left nose (B); Left nasal cavity 3 yrs after exclusive endoscopic ESS resection with no recurrence (C)

Figure 2. Haemangiopericytoma arising from the nasal septum, viewed from the right side of the nasopharynx (A); Axial CT showing the tumour (B); Operative site with nasal septum resected, viewed from the right nasal cavity 4 months after surgery (C) (* normal right and left sphenoid sinus ostium)
Tumours of the anterior skull base often present in the Clinic as nasal masses with bleeding. Common anterior skull base neoplasms include olfactory neuroblastoma, ethmoidal squamous carcinoma and undifferentiated sinonasal carcinoma. To have a complete clearance of the tumour, the anterior skull base including the cribiform plate, the frontal sinuses, the ethmoidal roof and sphenoid roof have to be resected. Classically this can be resected through a combined craniofacial resection with separate incisions on the scalp by a neurosurgeon and rhinotomy incision on the face by an ENT surgeon. With the advance of ESS techniques, the facial incision can now be spared and the nasal part of resection can be exclusively performed through the endoscopic transnasal route (CranioNasal Resection)5. The exact extent of oncological resection as performed with the open technique can now be achieved with ESS with a much decrease in morbidity(Figure 3). Exclusive transnasal endoscopic resection of anterior skull base tumours, e.g. olfactory neuroblastoma, without a scalp incision has also been reported in the literature6. The question at the moment is whether these approaches could have an adequate local control rate over a prolonged period of follow-up when compared with the traditional open craniofacial approach7.

CSF Rhinorrhea and Repair of Anterior Skull Base Defects

Skull base defect and CSF rhinorrhea can be idiopathic, following trauma like skull base fractures after injury or iatrogenic like inadvertent penetration during sinus surgery or a defect after anterior skull base resection. This usually presents as clear rhinorrhea with the amount increases on exertion. This carries the potential risks of meningitis and serious intracranial infections if not detected and repaired. Traditionally, repair can be performed through a craniotomy from above. With the advance in ESS techniques, the site of CSF leakage can now be identified with a nasoendoscope from the nasal cavity(Figure 5) and the defect repaired by free or pedicled mucosal grafts9. The outcome of transnasal ESS repair of the skull base is at least as good as open techniques and without the morbidity accompanying a craniotomy10.

Orbital Surgery with ESS: Endoscopic DCR, Endoscopic Orbital Decompression

Nasolacrimal duct obstruction is a result of trauma, infection or of idiopathic causes. Patients present with chronic epiphora (excessive tearing) and recurrent dacrocystitis (infection of the lacrimal sac). With an external incision near the medial canthus, conventional surgical treatment with external dacrocystorhinostomy (DCR) opens up a new pathway of drainage anterior to the insertion of middle turbinate in the nasal fossa. With the guidance of a light probe through the canaliculi by an ophthalmologist, DCR can now be performed with an intranasal endoscopic ESS approach without a facial incision (endoscopic DCR)11. The success rate is comparable to conventional external DCR(Figure 6).
Thyrotoxic exophthalmos is usually related to Grave’s disease. This may persist even if the primary thyroid problem is under control. Abnormal deposition in the orbit results in exophthalmos with exposure keratitis and risk of permanent blindness. An increase in intraorbital pressure would also lead to pressure symptoms and more importantly, compression on the optic nerve. For patients resistant to medical treatment and requiring prolonged systemic steroid therapy, orbital decompression with surgery is indicated. Approaches to the orbit include those with open external ethmoidectomy with an skin incision near the medial canthus of the eye (medial approach), lateral approach with a skin incision near the lateral canthus, inferior approach through the maxilla(transantral) or superior with a craniotomy. Endoscopic ESS orbital decompression is now the approach of choice. Transnasal ethmoidectomy is first performed with the ESS approach and medial decompression of orbital content into the ethmoidal sinus follows(Figure 7). Besides being a minimally invasive access procedure with no facial incision required, endoscopic orbital decompression has the virtue of achieving extensive decompression by removing 2 orbital walls - the lamina papyracea (medial wall) and the medial floor of the orbital cavity with more reliable results.

Summary

With the experience gained in managing inflammatory diseases, endoscopic sinus surgery ESS techniques have ventured outside the nose and sinuses and have been applied in tumour resection around the nose and anterior cranial fossa, used in repairing skull base defects and worked around the orbits as a technique with minimally invasive access. Depending on the target of therapy, the actual ESS surgery may be extensive and invasive and non-functional. ESS has been developed as one option of surgical approach where selection of patient, selection of the site of diseases and follow-on with oncological principles are all required in order to have an optimal outcome.

References