EDITORIAL

Minimally Invasive Surgical Approaches to the Sphenoid Sinus, Sella, Parasellar and Clival Region: Current and Future Perspectives

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Since its original description in 1907, surgery of the pituitary gland has undergone a remarkable evolution. While open transphenoid approaches gained interest, they were mostly abandoned in favour of craniotomy because of concern of inadequate tumour resection. However, with widespread use of antibiotics in the 1950s and introduction of surgical microscope in the 1960s, the transphenoidal approach gained popularity as the procedure of choice in the management of pituitary neoplasms. Widespread application of endoscopic surgery for diseases of the sinuses in the 1980s and 1990s, including the management of skull base tumours and CSF leaks, led to the development of the technique of minimally invasive pituitary surgery. Endoscopic endonasal pituitary surgery has gained in popularity because of the remarkable visualization provided by the endoscope in addition to the reduced morbidity and rapid recovery afforded by this technique. Now it is almost routine at many centres to extend transnasal endoscopic-assisted surgery beyond the sinuses to the orbit and skull base. Providing excellent intranasal visualization, endoscopes are now used to perform frontal sinus drainage procedures, to repair CSF leaks, for orbital and optic nerve decompression and to perform dacryocystorhinostomies.

The transsseptal trans-sphenoidal pituitary surgery (initially via the sublabial and then the transnasal approach) is routinely performed as a joint rhino-surgical procedure between the Otorhinolaryngologist and the Neurosurgeons at the Medical Faculty, UKM, Hospital Kuala Lumpur and subsequently via the endoscopic endonasal approach at Hospital UKM, Cheras since 1986[1] and 1998[2] onwards. Over 250 cases of transeptal pituitary surgery has been performed as a joint rhinosurgical procedure. Lesions in this area, which most commonly include pituitary adenoma, meningiomas, and craniopharyngiomas may have significant suprasellar component thus requiring precision surgery.

The various surgical approaches to the pituitary gland are listed in Table I. The initial intracranial approach used routinely by the neurosurgeon to the pituitary is becoming less popular due to its disadvantages which includes fits due to brain retraction, anosmia, pain due to craniotomy and prolonged hospital stay. Initially the sublabial approach was widely used as the standard technique as a joint rhino-surgical procedure at our referral centre for wide midline exposure through sphenoid regardless of size of nose. The disadvantages were limitation of exposure from the overhanging upper lip, hypoaesthesia of the upper gum, retraction of the columella due to resection of anterior nasal spine causing tip depression and difficulties with dentures and feeding for two to three weeks post-surgery. The sublabial-transseptal, transnasal and direct transphenoid approach were significantly improved with the operating microscope prior to the advent of endoscopes[3]. The transeptal transphenoidal approach was favoured over other approaches because it was midline and safer and provided equal access to both sides of the sphenoid sinus and sella. It avoids access through the oral cavity. The limitations of the transeptal transnasal approach via

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alatomy or external rhinoplasty are alatomy scar[1] and transcolumellar scar[4]. Unfortunately the author has no experience to comment on the external ethmoidectomy, sublabial transantral or the transpalatal approach to the pituitary.

A direct transnasal transsphenoid approach to the pituitary was introduced in 1987[5]. It has increased in popularity because of improved patient comfort and the elimination of the complications of lip numbness, oronasal fistula, septal perforations, chronic nasal crusting and nasal deformity. It provides reasonably good midline exposure and is the least invasive procedure described thus far. Some Neurosurgeons use this endoscopic approach for removal of other intracranial lesions and masses[6,7]. Use of angled nasal endoscopes (0, 30 and 70 degree) and navigational fusion imaging technology allows precise view of suprasellar or clival extension of sella tumour. Thus, endoscope is a helpful tool for the neurosurgeon for tumours with suprasellar and parasellar extension utilizing the transsphenoidal technique. The hospital stay will be significantly shortened, minimal to no nasal packing and patient comfort is enhanced. The advantages of the transnasal non-septal direct transphenoid approach is the least traumatic and less invasive using the four hand technique advocated by Dr. Heinz Stammberger from Graz. The disadvantages is it is off the mid-line technique and its potential complications.

The increased utilization of endoscopes was accompanied by the development of new generations of radiographic imaging modalities (CT, MRI) and specialised surgical instruments such as shaped bipolar forceps, angled extra-long drill handpieces with diamond burrs, powered microdebrider instrumentation and image guidance systems. Anatomically the pituitary gland sits behind a thin layer of bone in the superior posterior sphenoid sinus. A logical application of the endoscopic anterior skull base surgical approaches from the sphenoid extending to the cribriform, sella, parasellar and clival region as shown in Fig 1. The advantages is that the exposure is midline, it does not involve any brain retraction and facial incision is not required.

A pre-operative coronal/axial CT scan, an MRI, as well as an endocrine evaluation and a visual field examination is essential. A preoperative nasal endoscopy is also performed to determine if there are any anatomic obstruction or polyps. Postoperative visual evaluations were performed only in patients who showed preoperative visual impairment. Formal postoperative endocrine evaluations were performed in all our patients.

In contrast to the limited visualization of the anterior wall of the sella offered by the microscope, the endoscope provides an excellent view of optic and carotid protuberances, opticocarotid recesses and clival indentation which minimizes the chances of catastrophic injury to vital structures on the lateral wall of sphenoid sinus. Although, the microscope provides a three dimensional view, the viewable surgical field is restricted by line of sight. The endoscope has been found to be a highly efficient tool for use in narrow surgical fields. In microsurgery of the pituitary gland, it provides excellent fields of vision of the natural ostium of the sphenoid bone and enables opening of the sphenoid sinus using powered instruments in a very simple and accurate manner[8]. In addition, by using angled endoscopes, intrasellar inspection can be performed which allows for more complete tumor removal. Should there be inadvertent CSF leak, the endoscope allows for immediate identification and repair[9,10]. The disadvantages of the endoscope include its lack of binocular vision and the fact that it does not allow the surgeon freedom of both hands.

Since most pituitary tumours are in the midline, an endoscopic trans-septal sphenoidotomy provides direct access to the sella. In this issue the approaches highlighted are the hemitransfixation[1,2] incision with or transcolumellar approach (external rhinoplasty)[4]. It provides wide midline access to the sphenoid with shorter operating distances without manipulations of the upper lip, maxillary crest or anterior nasal spine. It simultaneously allow for the correction of nasal deformities such as the correction of dorsal hump and tipplasty. The disadvantages of the transcolumellar approach is the noticeability of the columellar scar, swelling and stiffness of the nasal tip which is dependent on the individual skin thickness [4,8].

In the small Oriental nostrils, it is almost impossible to introduce the 4mm endoscope and surgical instrumentation through the nostril that makes surgical manipulation very difficult. The transcolumellar approach highlighted in this issue that has been used for rhinoplasty by the author for patients undergoing transsphenoidal pituitary surgery is an alternative option[4]. In Orientals with small nostrils and females in particular, to accommodate the Hardy's speculum frequently used by the neurosurgeons in Malaysia, an alatomy is a disadvantage for it can produce a visible scar 1.

The advantages of the direct endoscopic sphenoidotomy access are multifold [4,11,12]. Since the patient does not require sublabial or nasal mucosal incision and dissection from the nasal septum, potential complications of the orodental, septal and paranasal sinuses areas are eliminated. In majority of the cases, postoperative obstructive nasal packing is not necessary. In terms of surgical trauma, the patients were ready to be discharged the day of surgery, although the surgeon opted to hospitalize them further in order to rule out postoperative diabetes insipidus. Newer instrumentation is now available for minimally invasive pituitary surgery as highlighted by Cappabianca *et al* [13]. The availability of surgeon friendly endoscope irrigating systems is essential in avoiding the 0, 30 or 70 degree scope being frequently being obscured by blood during pituitary surgery.

Thus, it appears that the endonasal endoscopic approach to the sphenoid sinus/sella, extending to the cribrifom, parasellar and clival region poses new frontiers and challenges to the Otorhinolarynngologists and Neuro surgeons in Malaysia. As a joint team effort, this extended applications beyond the sphenoid sinus/sella needs a lot of planning and coordination for proper patient selection and optimal care. The incidence of tumour recurrence will be very much reduced with the endonasal endoscopic approach. The use of powered instruments with navigational fusion imaging is most beneficial especially in revision cases. If need be, the Neurosurgeon can alternate between the microscope and the endoscope to allow for more complete tumor removal. Emphasis on on-going cadaver dissection skills are essential to enhance precision skills in endoscopic anterior skull base surgery.

Table I: The various surgical approaches to the sphenoid sinus, sella and parasellar region

A). Transcranial
B). Extracranial
Transantral
Sublabial
Transeptal
Sublabial
Transnasal
With alotomy
With external rhinoplasty
Transnasal non-septal
Transethmoid
Transpalatal
Direct transsphenoid

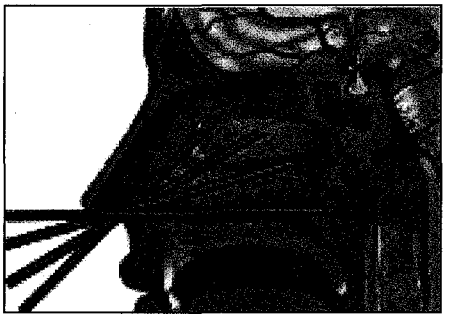

Fig. 1: Sagittal section showing the application of endoscopic anterior skull base surgical approaches from the sphenoid/sella extending to the cribriform, parasellar and clival region.

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