

NATIONAL INSTITUTE FOR CLINICAL EXCELLENCE

INTERVENTIONAL PROCEDURES PROGRAMME

Interventional procedure overview of endoscopic transsphenoidal pituitary adenoma resection

Introduction

This overview has been prepared to assist members of the Interventional Procedures Advisory Committee in making recommendations about the safety and efficacy of an interventional procedure. It is based on a rapid review of the medical literature and opinion of Specialist Advisors. It should not be regarded as a definitive assessment of the procedure.

Date prepared

This overview was prepared in April 2003

Procedure name

Endoscopic transsphenoidal pituitary adenoma resection

Specialty society

*British Association of Otorhinolaryngologists, Head and Neck Surgeons
Society of Neurological Surgeons*

Description

Indications:

The pituitary gland is a small structure attached to the base of the brain (behind the nose), where it is protected by a part of the skull called the sphenoid bone.

Pituitary adenomas are benign slow growing tumours that arise within the pituitary gland.

The manifestations of a pituitary tumour depend on the hormone secreted by the tumour as well as the pattern of growth of the tumour within the space in which the pituitary gland is lodged (sella turcica). For example larger tumours can result in individuals experiencing visual problems and headache as the tumour may press on adjoining structures such as the optic nerves.

Pituitary adenomas can also cause hormonal imbalances by producing either too many or too few hormones. In general adenomas are classified as being "non-functional" (non secreting) or functional (secreting) tumours.

Current Treatments and Alternatives:

The treatment options for pituitary adenomas include surgery, pharmacological therapy or radiotherapy.

The transsphenoidal surgical approach has been the preferred procedure for removal of tumours.

However surgery via the endonasal route has become increasingly popular as a means to reduce morbidity. As the endonasal technique has a narrower surgical field the use of an endoscope has been added to this procedure as a visualisation tool.

What the procedure involves:

The patient is given an anaesthetic. An endoscope inserted into the nose towards the base of the tumour at the skull base. Surgical instruments are then inserted and the tumour is removed.

Patients usually undergo the procedure via the right nostril, however surgery is sometimes done via the left nostril, depending on the location of the tumour.

There are also various endonasal approaches that can be used for endoscopic pituitary surgery such as the parasseptal approach.

The use of the endoscope in transsphenoidal surgery for pituitary adenomas has primarily been popularised by the work by Jho ¹. Articles on endoscopic transsphenoidal pituitary adenoma resection often refer to this body of work or note that the procedure undertaken is an adaptation of the Jho technique.

More recently the use of flexible endoscopes ² and computer aided image guided techniques ^{3 4} have also been included as part of this procedure.

Efficacy:

- From the evidence presented it would appear that endoscopic transsphenoidal pituitary adenoma resection resulted in comparable surgical outcomes to conventional surgery.
- The procedure may also shorten operation time. The length of hospital stay was also shorter with the endonasal procedure: 2–5 days compared with 4–10 days for conventional surgery.
- The majority of Specialist Advisors considered that this procedure was a minor variation of an existing procedure and was unlikely to alter the efficacy of the procedure. Two Advisors however did note that incomplete tumour removal may be a potential concern with this procedure.

Safety:

- From the evidence presented it would appear that the complication rate of endoscopic transsphenoidal pituitary adenoma resection is less than that of conventional surgery. Major morbidity (cerebrospinal fluid leak, meningitis, stroke, intracranial haemorrhage, and visual loss) occurs in a small number of cases. Less serious complications (sinus disease and nasal septal perforations) occur in less than 7% of patients.
- The most serious reported complication of the procedure was meningitis. This occurred in two patients in the largest case series studies which included 310 patients.
- Specialist Advisors did not report any particular safety concerns, though bleeding, optic nerve damage, cerebrospinal fluid leakage and carotid artery injury were noted as potential complications of endoscopic transsphenoidal pituitary adenoma resection.

Literature review

Rapid Review of Literature

The medical literature was searched to identify studies and reviews relevant to endoscopic transsphenoidal pituitary adenoma resection. Searches were conducted via the following databases from commencement to February 2003: MEDLINE, PREMEDLINE, EMBASE, Cochrane Library and Science Citation Index. Trial registries and the Internet were also searched. No language restriction was applied to the searches.

The following selection criteria (Table 1) was applied to the abstracts identified by the literature search. Where these criteria could not be determined from the abstracts the full paper was retrieved.

Table 1 Inclusion/criteria for identification of relevant studies

Characteristic	Criteria
Publication type	Clinical studies included. Emphasis was placed on identifying good quality comparative studies. Abstracts were excluded where no clinical outcomes were reported; the paper was a review, editorial, technical or animal study
Patient	Patients with pituitary adenoma (any cause)
Intervention/test	Endoscopic transsphenoidal resection NB this excludes endonasal resection done by microscope
Outcome	Articles were retrieved if the abstract contained information relevant to the safety and/or efficacy
Language	Non-english language articles will be excluded unless they are thought to add substantively to the English language evidence base.

Table 2 Summary of key efficacy findings

Authors, location, date, number of patients	Key efficacy findings		Safety		Comments
Cho and Liao (2002) ⁵ Chinese Randomised Controlled Trial 1996-2000 44 patients 22 patients endonasal surgery 22 patients transseptal surgery Prolactinomas Mean follow-up 3.5 years	Endonasal endoscopic surgery	Transseptal operation	Endonasal endoscopic surgery	Transseptal operation	Method of randomisation unclear Methodology unclear Hospital stay in the endonasal group was significantly shorter However at the beginning of the study the operative time and the hospital stay were the same for both procedures - learning curve Control approach: sublabial incision
	Normal prolactin level 66% Prolactin levels <100ng/ml 93% Visual field improvement 5/8 63% (macroadenoma)	Normal prolactin level 75% Prolactin levels <100ng/ml 85% Visual field improvement 6/10 60% (macroadenoma)	1 patient sinusitis Complication rate: 4.5%	2 patients sinusitis 1 patient hypopituitarism 1 patient nasal septum perforation 1 wound disruption 1 massive nasal bleeding Complication rate: 27%	
Badie, Nguyen,& Preston (2000) ⁶ Non randomised comparative study (historical controls) University of Wisconsin 1996 – 1999 41 patients 34/41 procedures were done for resection of pituitary adenomas Endonasal 7 microadenomas 9 macroadenomas 4 other sella Transseptal 6 microadenomas 12 macroadenomas 3 other sella Mean follow-up: unclear	Microadenomas Complete Response 7/7 Partial Response 0/7 Macroadenomas Complete Response 5/9 Partial Response 4/9	Microadenomas Complete Response 6/6 Partial Response 0/6 Macroadenomas Complete Response 11/12 Partial Response 1/12	2 patients cerebrospinal (CNS) fluid fistula 1 patient meningitis Complication rate: 15%	4 patients cerebrospinal (CNS) fluid fistula 1 patient cranial nerve injury Complication rate: 24%	Historical cohort follow-up in endonasal group was shorter Hospital stay and operative time in the endoscopic group shorter Surgeon unfamiliar with the use of the endoscope Control approach: sublabial or columellar incision
	Complete resection	Complete resection 15/36	3 patients with	7 patients with cerebrospinal	
Sheehan, Atkinson,	Complete resection	Complete resection 15/36	3 patients with	7 patients with cerebrospinal	Historical cohort follow-up in

Authors, location, date, number of patients	Key efficacy findings		Safety		Comments
Kasperbauer, Erickson, & Nippoldt (1999)⁷ Non randomised comparative study 1995 –1997 70 patients 26 endonasal 44 Sublabial Non-functioning pituitary macroadenomas	7/16 44% Visual field improvement 11/16 92%	46% Visual field improvement 27/36 87%	bleeding >500ml 3 patients with cerebrospinal fluid leakage Complication rate: 24%	fluid leakage 2 patients extensive mucosal/septal injury Complication rate: 21%	endonasal group was shorter Not all patients had comparable preoperative evaluations and post-operative follow-up was incomplete Hospital stay/operative time was shorter in the endonasal group Could be a select group of patients Approach: sublabial
Kawamata, Iseki, Ishizaki & Hori (2002a)⁸ Non randomised comparative study (historical controls) 215 consecutive patients with pituitary tumours Tokyo 1996-2001	Acromegaly Post operative remission rate 28/43 65.1% Prolactinoma Post operative remission rate 15/34 44.1%	Acromegaly Post operative remission rate 40/67 59.7% Prolactinoma Post operative remission rate 25/53 47.1%	3 patients cerebrospinal (CNS) fluid leakage Complication rate 1.4%	3 patients cerebrospinal (CNS) fluid leakage Complication rate 1.5%	Unclear how 197 patients who underwent sublabial surgery were selected Results based on functioning tumours Authors note endoscope used 'intermittently' – also used microscope Control approach: Sublabial

Authors, location, date, number of patients	Key efficacy findings	Safety	Comments
Nasseri, Kasperbauer, Strome, McCaffrey, Atkinson, & Meyer (2001)⁹ Case series 164 patients pituitary adenomas Mean follow-up 10.28	Microadenomas 29/35 (83%) without recurrence Macroadenomas 31/102 no recurrence 32/102 debulked 11/102 treated irradiation 27 revision operation	2 patients epistaxis 7 patients cerebrospinal (CNS) fluid leakage 3 patients nasal obstruction 4 patients alar laceration 3 patients headache 1 patient meningitis Complication rate: 12%	First 2 years the procedure was not used to resect microadenomas Transnasal approach. 1 death due to metastatic lung cancer – not procedure complication

months 35 microadenomas 129 macroadenomas 16 other sella	Length of hospital data was also shorter compared with historical data		
Cappabianca, Cavallo, Colao, & De Divitis (2002) ¹⁰ Case series January 1997 and July 2001 146 consecutive patients with pituitary adenomas 125 individuals has a pituitary macroadenoma, whereas 21 had a microadenoma Follow-up 3 months to 4 years after the procedure	Not reported (not aim of the study)	2 patients epistaxis 3 patients sphenoid sinusitis 3 patients cerebrospinal (CNS) fluid leakage 1 patient residual lesion 1 patient meningitis 1 patient IS haematoma 1 patient internal injury 1 patient cranial nerve palsy Complication rate: 9%	Complications divided into groups according to anatomical structures.

* The rate may not be an accurate reflection as some patients may have had more than one complication

Validity and generalisability of the studies

- Studies included patients with a range of pituitary adenomas, for example secreting and non-secreting tumours. This has potential implications for the generalisability of the results to all patients with pituitary adenomas.
- In the studies identified, no information is reported on the experience of surgeons in performing the endoscopic endonasal procedure. This is despite acknowledgment by many of the groups that a learning curve exists in relation to this procedure, and is evident from reported operation times. It is therefore unclear what impact the learning curve may have on safety and or efficacy outcomes.
- The endoscopic procedure often slightly varied among papers. This is also true for the comparative technique in the studies with a control group. It is hard to know how significant these variations are in relation to the overall generalisability of results.
- Outcome measures also varied between the studies. Not all studies reported that the primary aim was resection of tumours.

Specialist advisor's opinion / advisors' opinions

Specialist advice was sought from the British Association of Otorhinolaryngologists, Head and Neck Surgeons, and the Society of Neurological Surgeons

- Procedure is considered a minor variation on an existing procedure.
- The main issue regarding efficacy is the adequate removal of tumours.
- Potential adverse events were listed as CSF fistula and carotid artery injury.
- Specialist Centre and training were also mentioned.

Issues for consideration by IPAC

- There would appear to be a learning curve associated with this procedure.

References

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- 10 Cappabianca P, Cavallo LM, Colao A, De Divitiis E. Surgical complications associated with the endoscopic endonasal transsphenoidal approach for pituitary adenomas. *J Neurosurg* 2002; 97(2):293-8.