

Complications of the Transsphenoidal Approach to Sellar Lesions

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ABSTRACT: Transsphenoidal surgery is currently performed extensively for lesions of the sella turcica. The mortality and morbidity of this surgical approach are minimal, and the results satisfactory overall. Only a few studies have addressed the complications of this approach. The authors present a retrospective study of 200 transsphenoidal procedures in 196 patients over an eleven year period. There was one death due to meningitis. Major morbidity consisted of intraventricular hemorrhage in three patients, false aneurysm of the internal carotid artery in one patient and thalamic infarction in another patient. Minor morbidity details are presented. The pathogenesis of the most serious of these complications along with possible preventive measures are discussed.

RÉSUMÉ: Complications de l'approche transsphénoïdale dans les lésions de la selle turcique La chirurgie transsphénoïdale est maintenant pratiquée couramment pour les lésions de la selle turcique. La mortalité et la morbidité de cette approche chirurgicale sont minimales et les résultats sont en général satisfaisants. Peu d'études ont traité des complications de cette approche. Les auteurs présentent une étude rétrospective de 200 interventions transsphénoïdales pratiquées chez 196 patients sur une période de onze ans. Il y a eu un décès par méningite. La morbidité principale a été une hémorragie intraventriculaire chez trois patients, un faux anévrisme de la carotide interne chez un patient et un infarctus thalamique chez un autre patient. Nous présentons des détails mineurs de morbidité. Nous discutons de la pathogenèse des plus sérieuses de ces complications ainsi que des mesures préventives possibles.

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Transseptal transsphenoidal approach to lesions of the sella was introduced by Schloffer¹ in 1907. With minor modifications, this approach was used extensively in the early part of this century.²⁻⁴ The recent resurgence in its popularity is attributable primarily to Hardy.⁵ This approach is currently widely used for all surgical lesions of the sella.⁵⁻⁹ Though the mortality and morbidity of this procedure are low,^{5,6,8-10} several serious complications have been described.¹¹⁻²⁰ Only three previous studies have directly addressed the complications of transsphenoidal surgery.^{12,15,20} Two of the studies^{12,15} were from large referral based teaching hospitals and one was a compilation of results of transsphenoidal surgery from an international panel of neurosurgeons with extensive experience with the transsphenoidal approach.²⁰ In view of the relative paucity of information regarding the incidence of complications with the transsphenoidal approach in non-referral based institutions, we reviewed our experience with transsphenoidal surgery in a community based teaching centre over an eleven year period.

CLINICAL MATERIAL

Two hundred transphenoidal procedures were performed in 196 patients. Records of the patients operated upon from January 1978 to January 1989 at the two Manitoba teaching hos-

pitals were reviewed with specific emphasis on perioperative complications. All complications occurring within one month of surgery were considered surgical unless otherwise proven. Seventy-three of these patients were male and 123 were female. The mean age was 47 years for males and 49 years for females. The presenting clinical features in these patients are shown in Table 1, and the diagnoses in Table 2.

SURGICAL MANAGEMENT

Preoperative workup included a thorough endocrinologic evaluation, an ophthalmologic evaluation when necessary, along with computerized tomography (CT) in all patients. Angiography was performed only rarely when a vascular lesion was being considered in the differential diagnosis.

The surgical technique used was as described by Hardy,⁵ using uniplanar fluoroscopy and the operating microscope. Prior to 1984, submucosal septal dissection was carried out on both sides of the nasal septum and the septal cartilage partially excised and used as a stent in the sella. After 1984, the technique of unilateral submucosal dissection without excising the septum²⁹ was used and a free fat graft obtained from the abdomen used to fill the empty space in the sella and the sphenoid sinus.

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RESULTS

The perioperative complications are listed in Table 3. One patient died due to fulminant meningitis. Though the major morbidity rate is comparable to other series, the 1.5% incidence of intraventricular hemorrhage is higher than in other series. The incidence of other complications is not significantly different from other comparable series.^{4,8,10}

DISCUSSION

The mortality and morbidity in this series were comparable to those in other studies.^{10,15-16} All the reported complications of transsphenoidal surgery are listed in Table 4. The single patient who died was an 80-year-old lady who developed meningitis three weeks postoperatively, having not shown any evidence of cerebrospinal fluid (CSF) leak in the interim. The incidence of meningitis in our series was similar to that in other series.^{8,15,22} One series had a higher incidence of meningitis,¹⁴ but the operative technique used was different (combined transethmoidal and transnasal transsphenoidal approach).

One case of carotid false aneurysm²³ resulted from inadvertent straying off the midline. The variations in the anatomy of the sphenoid sinus and intracavernous carotid artery²⁴ place this vessel at risk. The false aneurysm was treated in our case successfully by trapping. Biplanar fluoroscopy and the practice of placing a fine needle into the lesion prior to incising it²⁵ could possibly have prevented this complication.

One case of thalamic infarction was seen in the immediate postoperative period (Figure 1). In this case, the consistency of the tumor was firm to hard, and pituitary rongeurs had to be used for tumor removal. The patient awoke from anaesthesia with dense right sided hemiplegia. Even after several months this patient continues to be severely disabled. The authors speculate that occlusion or disruption of one of the thalamic perforating vessels²⁶ was the likely cause of infarction in this patient. It is suggested that if the tumor is of firm consistency, consideration be given to using Co2 laser²² or other surgical approaches or treatment modalities to complete the removal of the tumor.

The incidence of intraventricular hemorrhage (IVH) is relatively high in our series, possibly related to the significant suprasellar extension of the tumors in all these cases with very close relationship to the floor of the third ventricle. Two of the three patients with this complication have improved but have been unable to return to their previous occupation. One patient remains in a vegetative state. In addition to very careful hemostasis, consideration has to be given to other surgical approaches in large vascular tumors.

The single case of transient blindness remains a perplexing problem. This 31-year-old lady was found (unexpectedly) to have an empty sella syndrome (ESS), and the sella was packed with absorbable gelatin sponge (GELFOAM, manufactured by Upjohn Company, Don Mills, Ont.) to prevent "chiasmal herniation" and methylmethacrylate (HISTOACRYL, distributed in Canada by Trihawk International Inc., Montreal) was used to seal it. The patient developed complete blindness 36 hours postoperatively. In the absence of any CT changes, empirical steroid therapy resulted in rapid improvement of vision to normalcy. The possibilities of nonspecific inflammation of the optic apparatus due to gelfoam or histoacryl have to be considered. The potential

Table 1. Presenting Clinical Features

ENDOCRINE:	
Amenorrhoea/Galactorrhoea/Infertility (F)	76
Acromegaly	20
Decreased Libido/Impotence (M)	14
Cushing's Disease	14
Panhypopituitarism	4
Nelson's Syndrome	2
Diabetes Insipidus	1
SIADH	1
NEUROLOGIC:	
Decreased Vision	58
Diplopia	11
Decreased Memory/Dementia	10
Somnolence	3
Seizures	2
Anosmia/Parosmia	2
Gait Apraxia	2
Incontinence	1
Loss of Consciousness	1
OTHER:	
Headache	34
Lethargy/General Malaise	12
Asymptomatic	3
Intractable Pain	1

Table 2. Diagnoses

Microadenoma	63
Macroadenoma	
Confined to Sella	31
Extrasellar Extension	71
Pituitary Apoplexy	8
Empty Sella Syndrome	4
Craniopharyngioma	3
Meningioma (Biopsy)	3
Sellar Cysts	1
Diffuse Glandular Hyperplasia	1
Normal Adenohypophysis	
Hemi/Total Hypophysectomy	6
Radiologic Microadenoma	3
Carcinoma of Lung	1

Table 3. Complications of the Transsphenoidal Approach

MORTALITY	1
MAJOR MORBIDITY	
Meningitis	1
Carotid False Aneurysm	1
Intraventricular Hemorrhage	2
Thalamic Infarction	1
MINOR MORBIDITY	
DIABETES INSPIDUS	
lasting less than 1 week	41
lasting less than 3 months	1
permanent	1
Transient CSF Leak	9
Septal Perforation	8
SIADH (Transient)	5
Paranasal Sinusitis	5
Urinary Tract Infection	4
Numbness Upper Lip/Tip of Nose	2
Deep Vein Thrombosis	1
Transient Blindness	1
Hydrocephalus	1

Table 4. Reported Complications of the Transsphenoidal Approach**VASCULAR**

Vascular occlusion^{16,17,20}
 False aneurysm^{13,19,23}
 Mycotic aneurysm¹⁸
 Vasospasm^{16,17}
 Thalamic infarction
 Subarachnoid hemorrhage¹⁷
 Hematoma
 Intrasellar¹⁰
 Intratumoral
 Intracerebral⁸
 Intraventricular
 Cerebral Thrombophlebitis³²

NASAL

Septal perforation^{9,15,16}
 Saddle nose deformity⁹
 Epistaxis²⁰
 Palatal diastasis^{9,15,16}
 Lip numbness⁹

DENTAL³²

Numbness
 Discoloration

VISUAL (PERMANENT/TRANSIENT)^{11,15-17,20,28}

Decreased acuity
 Visual field defects^{9,16}
 Diplopia
 Oculomotor palsy^{8,17,20}
 Abducens palsy^{8,17}

NEUROLOGIC

Seizures⁹
 Hydrocephalus⁸
 Hypothalamic injury^{3,15,16,20}
 Encephalopathy²⁰
 Anosmia⁹

INFECTIOUS

Meningitis^{9,14-16,20}
 Sellar abscess²⁰
 Sinusitis^{9,15,16}
 Abdominal wound infection²⁸

ENDOCRINE

Diabetes Insipidus^{8,12,15,16,20}
 Permanent
 Temporary
 SIADH
 Hypopituitarism

MISCELLANEOUS

CSF leak^{8-9,15,16}
 Pneumocephalus²⁰
 Tension pneumocephalus²¹
 Orbital floor fracture³³

SYSTEMIC

Pulmonary embolism²⁰
 Myocardial infarction
 Deep vein thrombosis
 GI bleed²⁰
 Anesthetic Complications
 Air embolism³⁴

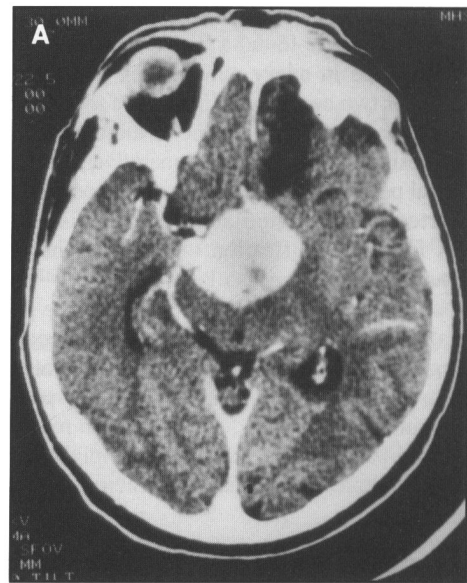


Figure 1a — The preoperative CT scan of a male with a non-secretory pituitary tumor (please note the left frontal hypodensity related to the previous subfrontal resection).

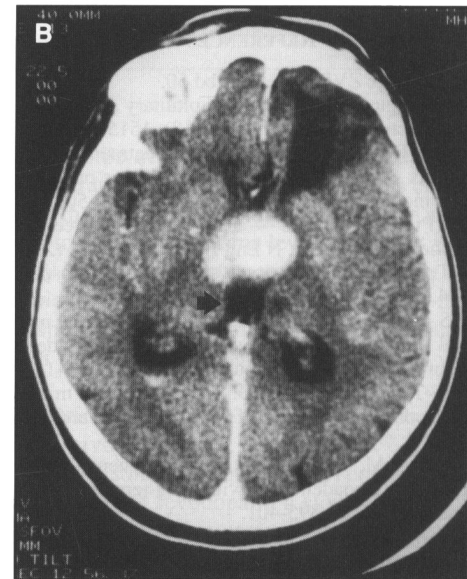


Figure 1b — Post-operative CT scan showing a left thalamic infarction.

causes of visual deterioration following transsphenoidal surgery have been reviewed recently.¹¹

The incidence of CSF leak in our series was comparable to that in other series.^{8,10,12,15} Various sellar reconstructive techniques have been described to prevent this complication.²⁷

Detailed evaluation of endocrinologic outcome was considered to be outside the scope of this study. The incidence of permanent diabetes insipidus (DI) in our series compares favourably with others,^{12,15,16} though our incidence of transient DI is quite high. Most series have not considered transient early DI.^{12,15,16}

The incidence of early transient DI was considered in one series of prolactinomas and was found to be 60%.²⁸ In our series, this diagnosis was made in every patient who passed more than 200cc of urine for two consecutive hours and required treatment with a possible diagnosis of DI. Some of these cases could well have been diuresis in response to intraoperative overhydration.

Of the septal perforations seen in this series, only one occurred after we started using the unilateral septal dissection technique.^{29,30} A further modification to preserve the entire cartilaginous and bony septum has been described,³¹ though we have no experience with this technique. In all these patients the nasal perforations were treated with conservative local measures with ensuing complete recovery. Most of the patients complained of upper lip numbness in the immediate postoperative period but the incidence of this complication on routine follow-up was found to be extremely low. The complication rate was felt to be greater in macroadenomas than microadenomas.

CONCLUSIONS

The authors conclude that the incidence of complications related to transsphenoidal surgery in this series was comparable to others, though the incidence of intraventricular hemorrhage was found to be higher. The incidence of complications appeared to increase with an increase in the size of the tumors, especially if they had significant extrasellar extension. Various precautionary measures are suggested in an effort to prevent serious complications.

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