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Outcome of Pituitary Adenoma Surgery Through Transphenoidal Endoscopic Endonasal Approach - A Study Of 48 Cases

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Abstract:

Background: *Transphenoidal endoscopic approach is the minimal invasive surgery in case of pituitary adenoma.* ***Objective :*** *To see the outcome of transphenoidal endoscopic approach in case of pituitary tumour.* ***Results :*** *This study was carried among the 48 patients and out of them 32 (66.7%) patients were male and 16(3.33%) were female. It was documented that in 48 patients, 44(91.66.3%) were macroadenoma and 4(8.33%) were microadenoma. Among 48 patients, 44 (91.66%) had preoperative visual disturbance and 4(8.33%) had normal vision. Tumor was totally removed in 44(91.66%) patients in endoscopic approach. Clinically 46(95.8%) patients were improved in endoscopically. One (2.1%) patient developed pneumocephalus and meningitis. In 1 (2.1%) patient, carotid artery was partially torn, which was managed by nasal pack.* ***Conclusion:*** *It was concluded that endoscopic endonasal approach is safe and effective procedure.*

Key word: *Pituitary adenoma, transphenoidal approach, endoscopic endonasal approach, acromegally, cushing's syndrome.*

Introduction:

The role of the pituitary gland has intrigued scientists and doctors for many centuries. It was only in 1887 that its clinical role *was* discovered by Minkowski, one year after acromegally was described by Pierre Marie[1]. The first pituitary tumor operations were performed at the end of the 19th century. Transsphenoidal surgical techniques have been improving since 1907 when Schioffer performed the first successful transnasal operation in Vienna. In the USA[2], Hirsch (1910) and cushing (1912)[3] contributed to the evo-lution of transsphenoidal surgery and had surgical mortality rates as low as 9.5 and 4.8% without the use of cortisone or antibiotics. Cushing initially used a head light and otologic mirrors but eventually discontinued trans-sphenoidal surgery because of insufficient vision on the surgical field. Later, Guiot and Derome (1967), in Paris, and Hardy (1969), in Montreal, again popularized the transsphenoidal approach by introducing the surgical mi-croscope, intraoperative radiographs and image intensification. With further technical improvements in neurosurgery and the introduction of antibiotics and cortisone, surgical mortality dropped under 1%. The recent introduction of endoscopy has reduced nasal complications and improved patient comfort. The endoscope had already been used by G. Guiot during transsphenoidal surgery more than 40 years ago but the pure endoscopic approach to pituitary

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lesions was introduced by Jankowski and Jho in the mid 1990s.[1]

Tumors are classified according to *size* and invasiveness, which is predictive of surgical results. There is no consensus on the use of a universal classilica-tion but one which has stood the test of time was proposed by Hardy in 1976 . This classification is based on modifications of the sella turcica on plain x-ray studies and is now adapted to MRI findings. The tumors are divided in four groups as follows.[5]

Grade I tumors, or microadenomas, are lesions up to 10mm in time in diameter.

Grade II tumors arc more than 1 cm in diameter and cause diffuse enlargement of the sella turcica with or without suprasellar extension. These non—invasive macroadenomas remain enclosed in the anatomical structures containing the pituitary gland (diaphragma sellar, medial wall of the cavernous sinus, dura of sellar floor and dorsum sellar) that can be displaced but not invaded.

Grade III tumors are adenomas which show signs of local invasion. Some of them can be smaller than 10mm (invasive microadenomas). Grade IV tumors show extensive and diffuse invasion oi the skull base and/or the intracranial space.[1]

Radiologic assessment of parasellar invasion presents the problem of distinguishing whether the inner wall of the cavernous sinus has been infiltrated or simply displaced.[6]

Methods:

It was a prospective cross sectional study. Sampling technique was purposive consecutive. Total 48 cases of pituitary adenoma by transphenoidal endoscopic approach from January 2010 to December 2018 at the Department of Neurosurgery, Bangababdhu Sheikh Mujib Medical University, Dhaka. Patients with neuro-images suggesting pituitary adenoma. Patient with pituitary adenoma who had visual impairment,hormonal disturbance and requiring surgery for it. Patient who had post-operative histological confirmation of pituitary adenoma were included in this study. Exclusion criteria are patients who were done reexporation, patients who had concomitant intra-ocular disease making visual assessment difficult, systemic disorders other than pituitary adenoma that affected visual function, presence of any other intracranial pathology. Data were collected pre-designed data collection sheet. Data were analysis using computer based programme statistical package for social science (SPSS) for windows version 16.

Operation procedure

Under general anaesthesia with supine position head is raised slightly from body. Nose was parallel to the floor, head was 20^0 flexed and rotated to left shoulder, surgeon will stand towards the right shoulder. Disinfectant was used providone iodine soaked gauze. Killian type nasal speculum and Hardy nasal speculum were used. The middle turbinate was identified and passage was make between the narrow space of middle turbinate and nasal septum. Ostium of sphenoidal air sinus and choana were identified.

Coagulation was done at bony part of nasal septum. Bilaterally nasal mucosa was dissected. Keel of the vomer was identified and was removed. Anterior wall of sphenoidal air sinus, sinus cavity, sinus mucosa and posterior wall of sphenoidal air sinus was removed. Dura was opened after coagulation and tumour was excised by suction ring currete, and micro ronger. Seller floor was reconstructed and nasal pack was given with ribbon gauze and merocele.

Results:

We did transphenoidal microscopic operation of 48 cases from January 2010 to December 2018.

Table-I

Distribution of the patients by sex (n=48)

Sex	Number	Percentage
Male	32	66.66
Female	16	33.33
Total	48	100.00

It was evident that male 32(66.66%) predominate the female 16(33.33%).

Table-II

Distribution of the patients by age (n= 48)

Age	Number	Percentage
1-20	1	2.08
21-40	25	52.08
41-60	15	31.25
>60	7	14.58

It was documented that 21-40 years belonged to the highest age group 25(52.08%)

Table-III

Distribution of the patients by size of the tumor (n=48)

Pituitary adenomoa	Number	Percentage
Microadenoma	4	8.33
Macrodenoma	44	91.66

It was evident that the majority of the tumour were macroadenoma 44(91.66%).

Table-IV

Distribution of the patients by visual field defect, pituitary apoplexy and seller size (n=48)

Visual disturbance	Number	Percentage
Present	44	91.66
Absent	4	8.33
Seller size		
Normal	10	20.83
Enlarged	38	79.16
Pituiary apoplexy		
Present	12	25
Absent	36	75

It was evident that majority of the patients had visual disturbance 44(91.66%) and 38(79.16%)enlarged sella.

Table-V

Distribution of the patients by functional types of tumor (n=48)

Functional Type	Number	Percentage
Prolactinoma	2	4.16
Acromegally	10	20.83
Cortisol secreting tumor	1	2.08
Non functional tumor	35	72.91

It was documented that majority of the tumor were non functional 8(55.55%).

Table-VI

Distribution of the patient by extent of removal of tumor (n=48)

Extent of removal	Number	Percentage
Total removal	44	91.16
Subtotal removal	4	8.33

It was evident that majority of the tumour 44(91.16%) were totally removed.

Table-VII

Distribution of the patients by postoperative complication (n=48)

Complication	Number	Percentage
Diabetes insipidus	15	31.25
Cerebrospinal fluid leakage (CSF)	3	6.25
Meningitis	1	2.08
Pneumocephalus	1	2.08
ICA partially torn	1	2.08

It was documented that majority 15(31.25%)of the patients developed DI after surgery

Table-VIII

Distribution of the patients by postoperative visual outcome and hormonal status (n=48)

Visual outcome	Number	Percentage
Improved	44	91.83
Same as before	4	8.33
Hormonal status (n=13)		
Improved	7	53.84
Same as before	5	38.46
Detoriated (Permanent DI)	1	7.69

It was documented that majority 46 (95.83%) the patients improve after surgery

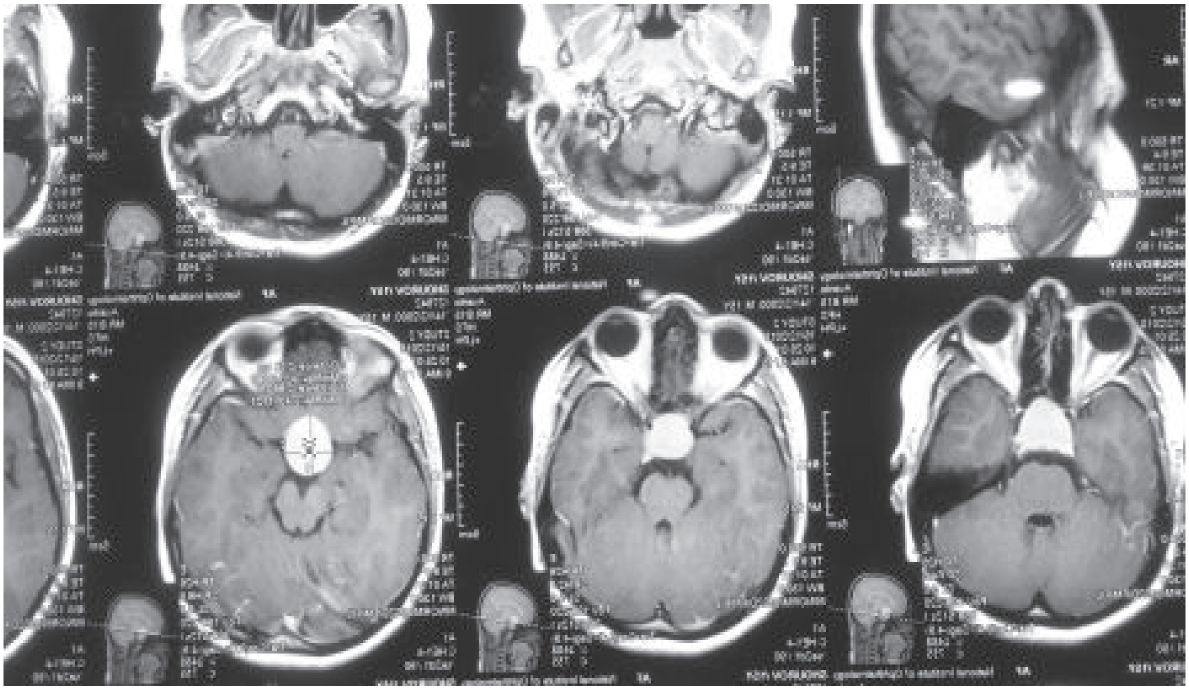

Fig.-1: *Preoperative MRI show macroadenoma (Axial)*

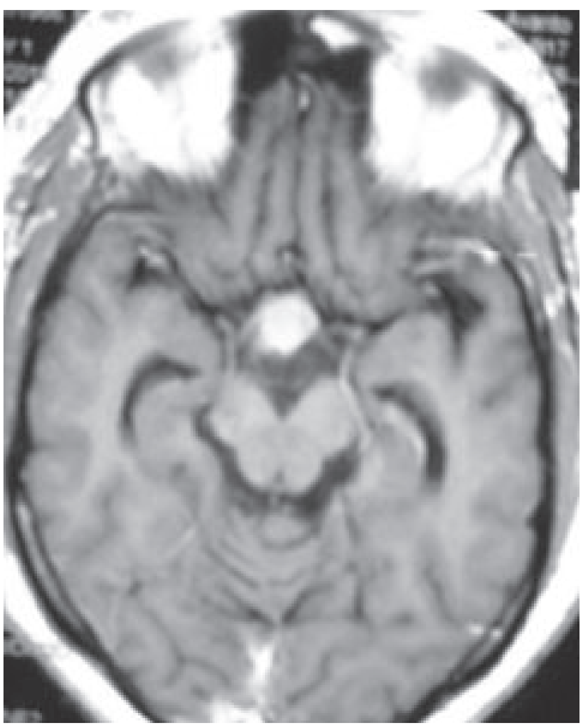

Fig.-2: *Preopeative MRI of brain with pituitary tumour with contrast (axial view)*

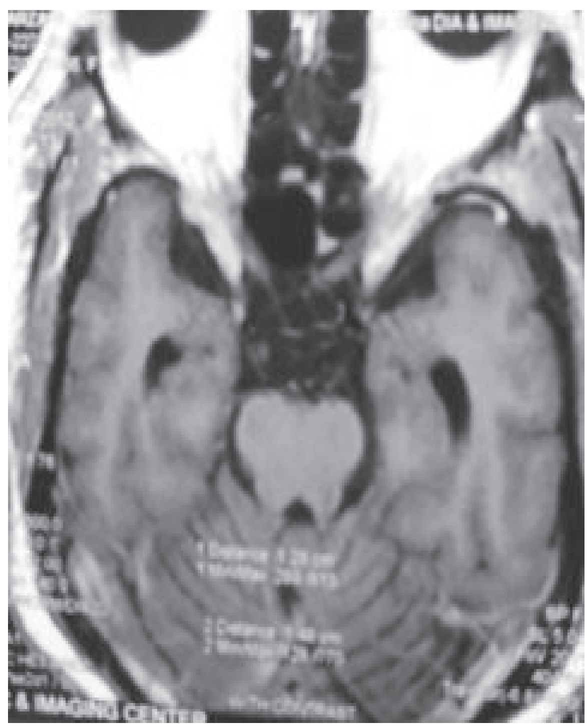

Fig.-3: *Postoperative MRI of brain (axial view)*

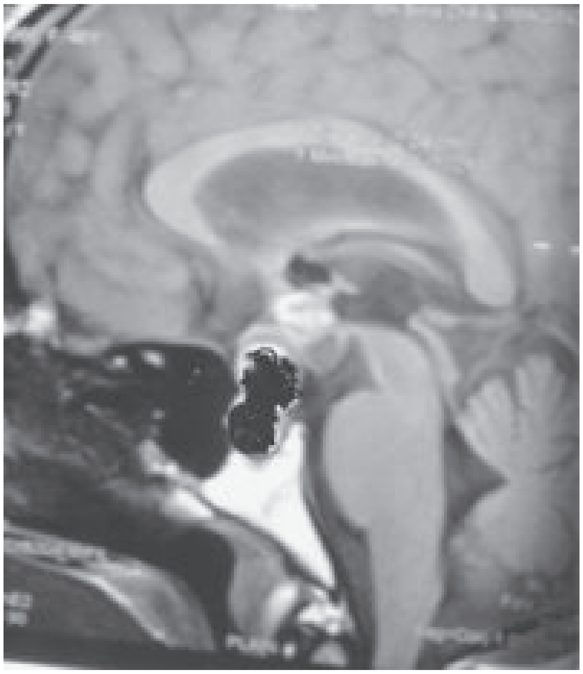

Fig.-4: *Postopeative MRI of brain with contrast (saggital view)*

Discussion:

A endoscopic transsphenoidal approach can be used for about 95% of all pituitary adenomas. Tumors with significant anterior extension into the anterior cranial fossa or lateral extension into the middle fossa, either a transcranial approach consisting of a pteroinal or a subfrontal craniotomy or a combination of both these approaches is required. In dumbbell-shaped tumors with both a significant intrasellar component and a suprasellar-intracranial extension separated by a narrow neck, endoscopic transsphenoidal surgery can first be tried to decompress the visual pathways. Postoperative imaging will indicate if a sub-sequent transcranial approach will be required[7].

Since the mortality rate is very low when the endoscopic transphenoidal approach is used by experienced surgeons (less than 1%), priority must be given to this technique in difficult cases.[8] In our study 15(31.33%) had diabetes insipidus. The situation must be re-evaluated after this first surgical step. Repeated transsphenoidal resections can be proposed to decom-press any residual mass. This is because intracranial pressure will cause the residual suprasellar tumor to progressively descend into the seller in the weeks following surgery.

Combined approaches and staged procedures have to be considered in difficult cases as do alternative treatment modalities such as tumor-suppres-sive drugs and radiation therapy. In the case of very fibrous adenomas that cannot be removed by the transsphenoidal approach, care should be taken to avoid worsening of visual function by manipulation of the optic nerves and optic chiasm during subsequent cranial surgery[5]. In our study one (6.66%) case was ICA injury and abandoned due to excessive bleeding later operations was done by transcranial approach.

Mortality and morbidity related to hypothalamic ischcmia, chiasmatic manipulations and uncontrolled bleeding during cranial surgery for large pituitary adenomas is mentioned in the literature[4].

As a corridor can be safely drilled into the sphenoid bone under naviga-tion or fluoroscopic control during the endoscopic procedure, transsphenoi-dal surgery can be performed on young children (> 5 years) or when the sphenoid sinus is poorly pneumatised[4].

A small-normal sized sella turcica in the presence of a macrotumor with suprasellar extension is not suited for transsphenoidal surgery and implies reconsidering the diagnosis of pituitary adenoma. Using fully endoscopic transnasal approach, endocrinological remission rates in non-invasive functioning adenomas are about 75 to more than 80%. Results achieved in non-invasive grade 2 macroadenomas are similar to those obtained in microadenomas[5].

The invasive character of the tumor is a factor influencing the results neg-atively: correction of hormonal hypersecretion in parasellar invasive mac-roadenomas is only exceptionally observed[6].

Visual improvement is nearly always obtained after good decompression of the visual pathways from below, using a transsphenoidal approach, unless a long preoperative evolution has resulted in optic atrophy[8]. In our study among 44(91.33%) with visual disturbance improved in 44(91.33%) patients after surgery.

Careful tumor resection should avoid postoperative hypopituitarism; however, literature mentions new anterior pituitary insufficiency in up to 14% of the cases. Postoperative transient diabetes insipidus is the most frequent complica-tion and generally recovers in 48 hours. Using endoscope, postoperative CSF leakage rates vary from 1.2 to 6%.[10] In our study 15(31.66%) patients had postoperative diabetes inspidus and improved.

Complications can be due to a wrong track causing damage to the optic nerve perforating the cribriform plate or penetrating the cavernous sinus and damaging the VIth nerve or the carotid artery.In previous study among the 15 cases 1(6.66%) patients had left optic nerve injury and blindness of left eye. Frequent fluoro-scopic or navigation controls to check the anatomical landmarks during the surgical approach are recommended[8].

Hypothalamic damage, CSF leak and diaphragmatic breach or hypopitu-itarisim can result from too aggressive tumor resection. Gentle handling of smooth ring curettes and avoiding any traction on the tumor or the surround-ing structures should prevent these complications[6].

Nasal and sinuses infectious complications will be avoided by repositioning the nasal septum and the middle turbinate at the end of surgery to ensure good ventilation. The use of prophylactic antibiotics for 48 hours is recommended[5].

Pituitary adenomas represent more than 10% of intracranial tumors and are a frequent cause for neurosurgical consultation. Pituitary diseases show multiple and different pathological and clinical aspects, requiring multidisciplinary diagnostic approaches and multimodality treatment options including endocrinology, surgery and radiotherapy. Despite recent improvements in medical therapy, surgery still has an im-portant place in the treatment of these lesions and requires well-trained pituitary surgeons. In experienced hands, pituitary surgery and especially endoscopic transsphenoidal surgery is safe with very low morbidity[7,10].

Vieira have treated 270 pituitary tumors, all macroadeomas and locally invasive; there were malignant tumors. All had been previously treated one or more times by some other modalities. Microsurgery alone was used in 90.3%, radiation therapy and micro-surgery in 8.2%, and radio therapy alone in 1.5%. Tumor volume ranged from 0.9 to 32 mL, with an average volume of Ii mL. In our study 44 (91.16%) case tumor was completely removed and 4(8.33%) patients had subtotal tumour removal[11].

Tumors were treated with a maximum dose of to 60 Gy (average, 37.5 Gy). Periphery dose ranged from 3 to 28 Gy (average, 15 Gy). This discrepancy is caused by variations in patient profile. Patients that had received previous radiation therapy or that had a tumor close to the optic apparatus in general received lower doses. Currently, Gamma Plan, the planning software for the gamma knife, allows for very specific shielding of the optic nerves and chiasm, and this has allowed for higher dose administered when these structures are nearby[11].

Previous authors have treated 92 nonsecretory pituitary tumors, 82 of which have radiographic and endocrinologic follow-up of a minimum of 6 months and an average of 34 months. Of these, 55(67%) had a decrease in the volume of their tumors; 21 (26%) had no change in the size; and 6 (7%) increased in size. New hypopituitarism occurred in 12 patients (15%). The only indication we have to date for treating these tumors is for postoperative residual tumors, in order to lower the incidence of tumor progression or pro-gression in spite of previous radiation therapy[11].

Conclusion:

Transphenoidal endoscopic removal of tumour is one of the save procedure.

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