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Original Research Article

A Hospital Based Comparative Assessment of the Efficacy of Endoscopic Versus Microscopic Excision of Pituitary Adenoma

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Abstract:

Aim: The aim of the present study was to compare the efficacy of endoscopic versus microscopic excision of pituitary adenoma.

Methods: The present study was conducted in the Department of Neurosurgery and our study included 100 cases of pituitary adenoma. 60 cases underwent endonasal endoscopic transsphenoidal surgery whereas remaining 40 cases were operated using the microscopic transsphenoidal surgery.

Results: The mean duration of symptoms in endoscopic group was 28.22±19.31 months (ranged from 15 days to 8 years), and in microscopic group, it was 22.6±18.02 months (ranged from 1 month to 5 years). Complete tumor excision was achieved in 40 (66.66%) patients in endoscopic group and in 22 (55%) patients in microscopic group. In endoscopic group, mean operative time was 1.88±0.32 hours (ranged 80–135 min). In microscopic group mean operative time was 2.28±0.12 hours (ranged 120–145 min). In endoscopic group, mean blood loss was 125.45±38.62 ml (ranged 60–190 ml), and in microscopic group, it was 178.22±40.024 ml (ranged 100–220 ml). Postoperative complication was present in both endoscopic and microscopic groups. Slightly higher percentage of complication such as diabetes insipidus, cerebrospinal fluid (CSF) leak and reoperation and sinusitis was observed in microscopic group as compared to endoscopic group. Reoperation was performed one for postoperative hematoma and one for CSF leak in both groups. All the patients after surgery had improvement in a headache and vision in both groups. There was no deterioration of endocrinal function in both groups. In endoscopic group, mean hospital stay was 9.12=8±2.621 (ranged 5–12 days), and in microscopic group, it was 10.05±2.154 (ranged 6–14 days).

Conclusion: In pituitary surgery, endoscopic surgery had started new fields not only by direct endonasal approach but also by providing a panoramic view inside the sphenoid cavity and sella turcica. Endonasal endoscopic transsphenoidal pituitary adenoma surgery is a safe and effective procedure.

Keywords: Endoscopic, Microscopic, Pituitary Adenoma, Transsphenoidal Surgery.

Introduction

Cushing's disease is caused by an adrenocorticotropic hormone (ACTH)-secreting pituitary adenoma, resulting in endogenous glucocorticoid excess. The incidence is estimated to be 1.2–1.7 per million each year. [1] Glucocorticoid excess causes osteoporosis, central obesity, insulin resistance, dyslipidemia, hypertension, hypercoagulability, and neuropsychiatric disorders. [2,3] First-choice treatment remains transsphenoidal pituitary surgery, selectively removing the corticotroph adenoma. [4,5] Despite biochemical cure, mortality risk remains increased in Cushing's disease patients. [6]

Schloffer et al [7] were the first to report the transsphenoidal approach in a sella tumor in 1907. It was Cushing et al [8] who abandoned external incisions and popularized the sublabial transseptal transsphenoidal technique. In the 1960s, Hardy [9] perfected Cushing's approach with the introduction of the operative microscope. The traditional transseptal/ translabial approach has long been considered as the standard approach because it is associated with minimal morbidity and mortality. In recent years, with the development of endoscopic instruments and techniques, Jankowski [10] proposed a fully endoscopic approach to pituitary surgery in 1992. Currently, endoscopic transsphenoidal pituitary surgery has become a

preferred alternative option because of its advantages of improved visualization and minimal invasiveness, which allows surgeons to gain access to central skull base lesions. However, the endoscope has the disadvantage of lacking the stereoscopic view obtainable with a microscope, which makes the benefits of the two techniques equivocal when comparing them in the treatment of pituitary adenomas.

While studies have compared the microscopic and endoscopic approaches, the results are inconclusive as to which technique is better. Previous studies have investigated the introduction of the endoscopic procedure into clinical practice and the associated learning curve for surgeons using it as a new technique for transsphenoidal pituitary surgery. These studies all revealed the endoscopic technique to show promising results on gross tumour resection [11,12], postoperative pituitary function [11,13], visual field changes13 and duration of surgery [15] except in two studies, where no difference between endoscopic and microscopic pituitary surgery could be detected. [16,17]

The aim of the present study was to compare the efficacy of endoscopic versus microscopic excision of pituitary adenoma.

Materials and Methods

The present study was conducted in the Department of Neurosurgery, Institute of Medical Sciences, Banaras Hindu University [IMS-BHU], Varanasi, India for two years and our study included 100 cases of pituitary adenoma. 60 cases underwent endonasal endoscopic transsphenoidal surgery whereas remaining 40 cases were operated using the microscopic transsphenoidal surgery.

Inclusion Criteria Are:

- Sellar and suprasellar pituitary adenoma
- Functioning and nonfunctioning pituitary adenoma
- Solid and cystic pituitary adenoma.

Exclusion Criteria Are:

- Sellar tumor with large parasellar or retrosellar extension.

Full neurological examination including motor, sensory, and cranial nerve examination was performed. Routine blood examination and basic hormonal profile were performed. Magnetic resonance imaging (MRI) brain and computed tomography (CT) of sella and paranasal sinus were performed for all cases. All patients were provided a uniform postoperative care.

Both surgeries were performed under general anesthesia with orotracheal intubation. We used 4 mm diameter sinonasal rigid endoscope, 0° and 30°. The nostrils were decongested. We approach through middle meatus and identified the sphenoid rostrum. Sphenoidectomy was done by using Kerrison Rongeurs. The anterior wall of the sella was identified and opened. The dura was opened with a cruciate incision. Under direct visualization, the tumor was removed first from posterior part and then from anterior part using curette. Sella was inspected for residual tumor with a 30° endoscope. After complete removal of tumor, there is fall of arachnoid in the sellar cavity. Hemostasis done. Sphenoid sinus is packed with fat and sealed with fibrin glue. The nasal packing was done with merocel at the level of middle meatus. The packing was removed after 48 h. Lumber drain was inserted in patients having arachnoid rupture intraoperatively and removed in 48–72 h after surgery. Microscopic surgery was similar to endoscopic surgery, except that it requires Hardy's speculum and was done under visualization with a microscope instead of endoscope. The hormonal profile, visual function evaluation, MRI, and CT scanning were repeated immediately and after 1 month of surgery and were compared with preoperative findings.

Statistical analysis

Statistical analysis was performed with the SPSS, trial version 20 for Windows statistical software package (SPSS Inc., Chicago, IL, USA). The categorical data were presented as numbers (percentage) and were compared among groups using Chi‑square test. Groups were compared for demographic data were presented as mean and standard deviation and were compared using by Student's t‑test applying to find out the most significant groups among all the groups. $P < 0.05$ was considered statistically significant.

Results

Table 1: Pre-operative and intra operative Characteristics of the study Population

Preoperative	**Endoscopic (*N*=60)**	**Microscopic (*N*=40)**	***P* Value**
Age (mean±SD)	42.09±11.69 (24-60yrs)	41.88±12.48 (16-60)	0.80
Duration in months (mean±SD)	28.22±19.31 (15 days-8yrs)	22.6±18.02 (1m-5 yrs)	0.52
Intra operative Complete Excision (no %)	40 (66.66)	22 (55)	0.855
Operative time in Hrs.(mean±SD)	1.88±0.32 (1.3-2.25hrs)	2.28±0.12 (2-2.4hrs)	0.007
Blood loss ml (mean±SD)	125.45±38.62 (60-190ml)	178.22±40.024 (60-220ml)	0.007

The mean duration of symptoms in endoscopic group was 28.22±19.31 months (ranged from 15 days to 8 years), and in microscopic group, it was 22.6±18.02 months (ranged from 1 month to 5 years). Complete tumor excision was achieved in 40 (66.66%) patients in endoscopic group and in 22 (55%) patients in microscopic group. In endoscopic group, mean operative time was 1.88±0.32 hours (ranged 80–135 min). In microscopic group mean operative time was 2.28±0.12 hours (ranged 120–145 min). In endoscopic group, mean blood loss was 125.45±38.62 ml (ranged 60–190 ml), and in microscopic group, it was 178.22±40.024 ml (ranged 100–220 ml).

Table 2: Postoperative complication among the groups

	Endoscopic (*N*=60)	**Microscopic (*N*=40)**	***P* V**
CSF leak (no %)	8 (13.34)	8 (20)	0.913
Diabetes insipidious (no %)	8 (13.34)	12 (30)	0.64
Reoperation (no %)	8 (13.34)	8 (20)	0.955
Sinusitis (no %)	4 (6.66)	8 (20)	0.78
Vision deterioration (no %)	0	0	
Endocrinal deterioration (no %)	0	0	
Hospital stay (days) mean±SD	9.12=8±2.621 (5-12 days)	10.05±2.154 (6-14 Days)	0.36

Postoperative complication was present in both endoscopic and microscopic groups. Slightly higher percentage of complication such as diabetes insipidus, cerebrospinal fluid (CSF) leak and reoperation and sinusitis was observed in microscopic group as compared to endoscopic group. Reoperation was performed one for postoperative hematoma and one for CSF leak in both groups. All the patients after surgery had improvement in a headache and vision in both groups. There was no deterioration of endocrinal function in both groups. In endoscopic group, mean hospital stay was 9.12=8±2.621 (ranged 5–12 days), and in microscopic group, it was 10.05±2.154 (ranged 6–14 days).

Discussion

Pituitary adenoma is the third most common intracranial tumor in surgical practice, accounting for approximately 10%–25% of all intracranial tumors. [18] Recent epidemiological data suggest that clinically apparent pituitary adenomas have a prevalence of 1/1000 in the general population. [19] Although only very rarely malignant, pituitary tumors may cause significant morbidity in affected patients. Sir Victor Horsley was the first surgeon to operate pituitary tumor [20], followed by Schloffer's [21] transnasal transsphenoidal route and Cushing's22 sublabial transseptal route. Hirsch [22] first introduced the operative microscope. Subsequently, Jankowski et al [8] performed the first endoscopic pituitary surgery to start a new era.

The mean duration of symptoms in endoscopic group was 28.22±19.31 months (ranged from 15 days to 8 years), and in microscopic group, it was 22.6±18.02 months (ranged from 1 month to 5 years). Complete tumor excision was achieved in 40 (66.66%) patients in endoscopic group and in 22 (55%) patients in microscopic group. In endoscopic group, mean operative time was 1.88±0.32 hours (ranged 80–135 min). In microscopic group mean operative time was 2.28±0.12 hours (ranged 120–145 min). In endoscopic group, mean blood loss was 125.45±38.62 ml (ranged 60–190 ml), and in microscopic group, it was 178.22±40.024 ml (ranged 100–220 ml). De Divitiis et al [24] reported a prospective series of 170 patients with endoscopic approach, but did not include microsurgical group. Kim et al [25] in a prospective study of 12 patients, compared endoscopic transsphenoidal surgery with the endoscope‐assisted microsurgical approach. Koren et al [26] retrospectively compared sublabial transseptal microscopic with endoscopic transseptal approach.

Postoperative complication was present in both endoscopic and microscopic groups. Slightly higher percentage of complication such as diabetes insipidus, cerebrospinal fluid (CSF) leak and reoperation and sinusitis was observed in microscopic group as compared to endoscopic group. Reoperation was performed one for postoperative hematoma and one for CSF leak in both groups. All the patients after surgery had improvement in a headache and vision in both groups. There was no deterioration of endocrinal function in both groups. In endoscopic group, mean hospital stay was 9.12=8±2.621 (ranged 5–12 days), and in microscopic group, it was 10.05±2.154 (ranged 6–14 days). Jain et al [27] done a prospective study of twenty patients done a comparison between endonasal endoscopic transsphenoidal surgery and endonasal transsphenoidal microscopic surgery and concluded that in endoscopic surgery there were less postoperative complication less operative time as

compared to endonasal transsphenoidal microscopic surgery but complete tumor excision was achieved in the same percentage of patients in both groups. Endoscopic surgery had minimal damage to nasal cavity and reduced postoperative morbidity and with angled endoscope all area of nose and paranasal sinus can be completely visualized. Optical properties of endoscope are superior to the operating microscope. Endoscope provides an exquisite view of optic bulge, carotid bulge, and opticocarotid recess which minimize the chances of catastrophic injury to the internal carotid artery. [28] There are several limitations of endoscopic approach as it require a bloodless surgical field and had a steep learning curve. Endonasal endoscopic surgery does not require sublabial or nasal incision and elevation of mucoperichondrial flap from septum. Hence, potential complication of septal and para nasal sinus areas are eliminated.

Conclusion

In pituitary surgery, endoscopic surgery had started new fields not only by direct endonasal approach but also by providing a panoramic view inside the sphenoid cavity and sella turcica. Endonasal endoscopic transsphenoidal pituitary adenoma surgery is a safe and effective procedure. It had minimal invasiveness, and it's wider and direct anatomical control of the operative fields allows a faster, greater, and safer potential of tumor excision with respect to the sphenoid, sellar, and parasellar structures. In endoscopic surgery elimination of intraoral and trans‑septal dissection, along with reductions in operative time, intraoperative blood loss, and postoperative complications, have ushered in the completely endonasal endoscopic approach to the pituitary gland as the most recent phase in the evolution of pituitary surgery.

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