ORIGINAL ARTICLE

Analyzing the Rate of Complications after Endoscopic Transsphenoidal Surgery for Removal of Pituitary Adenomas

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ABSTRACT

Objective: *Analyzing the rate of complications after endoscopic transsphenoidal surgery for removal of pituitary adenomas in neurosurgery department lady reading hospital Peshawar.*

Materials and Methods: *Retrospective study of 58 patients who underwent endoscopic transsphenoidal surgery for pituitary adenomas between July 2013 and June 2016. The Criteria for diagnosis of complications were clinical and radiological.*

Results: *11 (18.96%) of the 58 patients who underwent endoscopic transsphenoidal surgery developed per-operative or postoperative complications most of which were managed successfully resulting in good outcome.*

Conclusion: *The rate of complications observed in our hospital are comparable to those in the international literature. There is a drop in the rate of complications with increasing experience of the neurosurgeon.*

Abbreviations: *Pts: Pituitary Tumors. TSS: Transsphenoidal Surgery. DI: Diabetes Insipidus. CSF: Cerebro-spinal Fluid. ICA: Internal Carotid Artery.*

INTRODUCTION

Pituitary tumors (PTs) are a group of tumors, with an approximate prevalence of 15% of brain tumors. Majority of PTs originate from adenohypophyseal cells of the pituitary, and are mostly benign adenomas.[1] Majority of these are asymptomatic, they may become symptomatic due to mass effect on surrounding structures or secrete pituitary hormones causing various endocrinologic symptoms. Main treatment modalities available are medical, surgical and radiation therapy.[2] Surgical resection is the primary treatment of choice for most patients with symptomatic tumors. Transsphenoidal surgery (TSS) is the first choice of treatment for pituitary tumors, it is less invasive, successful and having less complications. Decompression of visual apparatus and other surrounding anatomical structures is also done adequately.[3-5]

With the introduction of the endoscope to endonasal pituitary surgery in the last 20 years has been a key milestone in the field of neuroendoscopy and have helped neurosurgeon in resection of these tumors with small portals and have also resulted in less morbidity and mortality ranging from 0% to 20%.[4,6,8,10] The main type of complications are dural tears, meningitis, perioperative bleeding, vascular injuries, orbital injuries, cerebrospinal fluid (CSF) leak, permanent diabetes insipidus (DI), and permanent endocrinologic sequale.[14-17,19] The goal of this study is to determine the rate of complications following primary transsphenoidal surgery for pituitary tumors in our own setup.

MATERIALS AND METHODS

This study is a descriptive retrospective analysis of 58 patients who underwent a primary transsphenoidal resection of a pituitary tumors (PT) in the department of neurosurgery unit B lady reading hospital from 01 July 2013 to 30 June 2016 (3 year). All clinical and surgical data were collected from patients, hospital charts and in follow up in outpatient department regarding tumor size, symptoms, and residual tumor after surgery, functional hormonal remission, symptom relief, and complications. All patients underwent neurological, ophthalmological, and endocrinological exa-

minations before and after resection. But primary outcome of interest was the rate of major and minor surgical complications. The institutional review board of Medical teaching institution lady reading hospital approved this study.

All cases of recurrent tumors were excluded from surgery due to the fact that complication rate are higher in these recurrent cases because of altered anatomy due to previous surgery and surgically induced fibrosis. Data analysis was done on SPSS version 20 and data presented in charts and tables.

RESULTS

A total of 58 consecutive patients underwent endoscopic transsphenoidal procedures for pituitary adenomas. The age of this patient cohort ranged from 34 to 68 years (mean: 54 years). The mean follow-up was of 15 months (range: 2 – 24 Months). 31 had functioning adenomas, of functioning tumors 11 had GH producing tumors, 9 had Cushing's disease, and 11 had prolactinomas (Figure 1, 2). Of these functioning adenomas, 24 were macroadenomas and 7 were micro adenomas; 27 cases were non-functioning macroadenomas. Among macroadenomas, 16 had suprasellar and five had suprasellar and parasellar extension. 18 patients had hormone levels at the upper limit of normal range. The mean follow-up of functioning adenomas was eight months (range = 4 – 17 months). Of the 58 pituitary adenomas, total tumor removal was achieved in 86% of patients. Among patients who presented with non-functioning pituitary adenomas, total tumor removal was achieved in 91%. 87% of the functioning adenomas improved. Compressive symptoms related to optic apparatus compression due to macroadenomas were relieved in 85% of these patients.

Hormonal remission was achieved in 78% of patients during last follow-up for growth and cortisol. Four cases presented failure of hormonal remission; two GH tumors with suprasellar, parasellar extension and cavernous sinus extension, and the other two with Cushing's disease with micro adenoma not visible during surgery, despite surgical exploration of the pituitary gland with approximately 3 mm of size at MRI.

Surgery-related complications were observed in 11 cases (18.96%); most were easily managed during surgery or post operatively, not withstanding one carotid artery injury resulting in fatal immediate post op bleeding and death of patient. CSF leakage and infection was among the most common complication (3.44% each). During surgery some CSF leak was

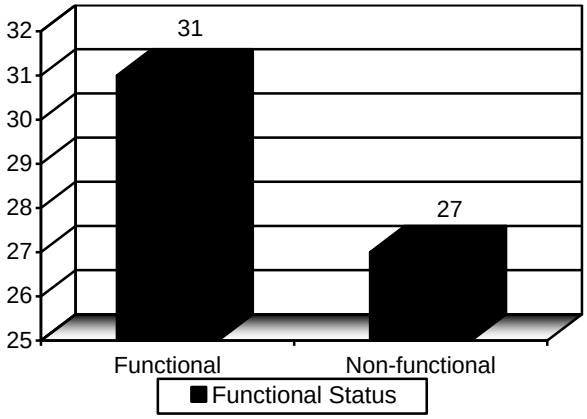

Fig. 1: *Functional Status of Tumors (n = 58).*

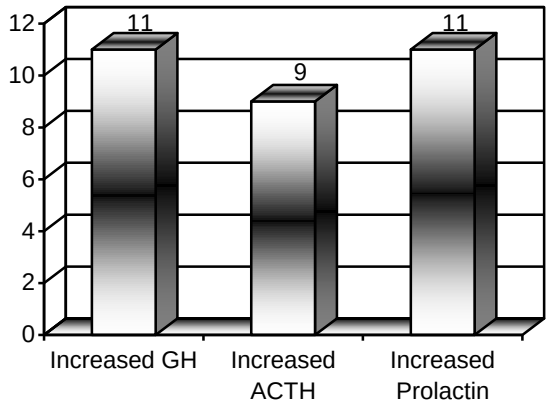

Fig. 2: *Classification of Functional Tumors (n = 31).*

observed in 6 patient. In all of them, the arachnoid opening was repaired by a routine multilayer closure using fat tissue graft, fascia lata graft, bone or cartilage and a pedicle mucosal flap. In cases of high volume CSF leaks, a vascularized nasal septal flap was raised for seller roof repair[22]. Post-operative CSF leak occurred in 2 patients (3.44%) and were treated with lumbar drains; two of these cases required further surgical exploration of the sphenoid sinus. Diabetes Insipidus, septal perforation, DVT and pulmonary embolism, anterior pituitary insufficiency, carotid artery injury and opthalmoplegia occurred in one patient each (1.72%).

One patient (1.72%) suffered major bleeding and death after the opening of the seller floor due to injury to the internal carotid artery (ICA).

DISCUSSION

Among the 63 cases of transsphenoidal surgery for PT

identified, 58 primary cases met inclusion criteria. The mean age of the included population was 51. The most common primary endoscopic transsphenoidal procedure performed in this cohort was a partial/ complete excision of the pituitary tumor. Complication occurred in 11 patients, complications identified peroperatively or postoperatively were successfully managed in 10 patient. One fatal complication in form of internal carotid artery injury proved fatal resulting in mortality of 1.72%. Patient age, type of neoplasm (benign, uncertain, or malignant), size of tumor and invasion of surrounding structures were predictors of complications following surgery. Surgical complications were more common in cases with a diagnosis of a malignant neoplasm as compared to benign tumor. Structural complications rate was also higher in patient with acromegaly. Endocrinologic complication rate was high in patient having preoperatively hormonal imbalances.

Study by Berkeret al.[20] noted same percentage of complications and our result is comparable to other studies done on same topic. Higher rates of complications were shown in a meta-analysis[21] published in 2012 containing 38 studies with 2,125 endoscopic and 3,518 microscopic approaches. In this study complication rates were similar when comparing endoscopic to microscopic approaches, with only the rate of vascular complications being statistically significantly higher in the endoscopic group. In the endoscopic group, this study noted a death rate of 0.49% with complications including CSF leak in 7.0%, meningitis in 1.1%, vascular complication in 1.6%, visual loss in 0.7%, transient DI in9.1%, and permanent DI in 2.31% of patients. As compared to these and earlier studies,[7-9,12,23] the rate of complications following transsphenoidal pituitary surgery in this cohort was comparatively low, with 8.39% of primary cases resulting in complications.

CONCLUSIONS

Transphenoidal surgery is the first choice of treatment after failed appropriate medical treatment because of less invasiveness, less complication, high success rate and its easy availability in most tertiary neurosurgical centers.

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Table 1: *Post-operative complications of EETSS (n = 58).*

Complications	No. of Patients	Percentage
CSF Rhinorrhea	2	3.44
Diabetes Insipidus	1	1.72
Septal perforation	1	1.72
DVT and pulmonary embolism	1	1.72
Anterior pituitary insufficiency	1	1.72
Carotid artery injury	1	1.72
Meningitis	2	3.44
Opthalmoplegia	1	1.72
Death	1	1.72

REFERENCES

1. Colao A, Pivonello R, Di SC, Savastano S, Grasso LF, Lombardi G. Medical Therapy of pituitary adenomas: effects on tumor shrinkage. Rev Endocr Metab Disord. 2009; 10: 111–123.
2. Sheplan Olsen LJ, Robles IL, Chao ST, et al. Radiotherapy for prolactin secreting pituitary tumors. Pituitary, 2012; 15: 135–145.
3. Fatemi N, Dusick JR, de Paiva Neto MA, Kelly DF. The endonasal microscopic approach for pituitary adenomas and other parasellar tumors: a 10 – year experience. Neurosurgery, 2008; 63 (4 suppl. 2): 244–256.
4. Cappabianca P, Cavallo LM, Colao A, et al. Endoscopic endonasal transsphenoidal approach: outcome analysis of 100 consecutive procedures. Minim Invasive Neurosurg. 2002; 45: 193–200.
5. Casler JD, Doolittle AM, Mair EA. Endoscopic surgery of the anterior skull base. Laryngoscope, 2005; 115: 16–24.
6. Charalampaki P, Ayyad A, Kockro RA, Perneczky A. Surgical complications after endoscopic transsphenoidal pituitary surgery. J Clin Neurosci. 2009; 16: 786–9.
7. D'Haens J, Van RK, Stadnik T, Haentjens P, Poppe K, Velkeniers B. Fully endoscopic transsphenoidal surgery for functioning pituitary adenomas: a retrospective comparison with traditional transsphenoidal microsurgery in the same institution. Surg Neurol. 2009; 72: 336–340.
8. Dehdashti AR, Ganna A, Karabatsou K, Gentili F. Pure endoscopic endonasal approach for pituitary adenomas: early surgical results in 200 patients and comparison with previous microsurgical series. Neurosurgery 2008; 62: 1006–1015.
9. Cavallo LM, Cappabianca P, Galzio R, Iaconetta G, de Divitiis E, Tschabitscher M. Endoscopic transnasal app-

roach to the cavernous sinus versus transcranial route: anatomic study. Neurosurgery, 2005; 56 (2 Suppl.): 379-89.
10. de Divitiis E, Cavallo LM, Esposito F, Stella L, Messina A. Extended endoscopic transsphenoidal approach for tuberculum sellae meningiomas. Neurosurgery, 2007; 61 (5 Suppl.): 229-38.
11. Dehdashti AR, Gentili F. Current state of the art in the diagnosis and surgical treatment of Cushing disease: early experience with a purely endoscopic endonasal technique. Neurosurg Focus, 2007; 23: E9.
12. Frank G, Pasquini E, Farneti G, Mazzatenta D, Sciarretta V,- Grasso V, et al. The endoscopic versus the traditional approach in pituitary surgery. Neuroendocrinology, 2006; 83: 240-8.
13. de Divitiis E, Cappabianca P, Cavallo LM, Endoscopic transsphenoidal approach: adaptability of the procedure to different sellar lesions. Neurosurgery, 2002; 51 (3): p. 699-707.
14. Conceição Aparecida Dornelas; Tereza N. A. G. Nogueira; Evandro T. Alves; River A. B. Coêlho. Fatal complication after transsphenoidal surgery of pituitary adenoma: case report. J Bras Patol Med Lab. June, 2015; V. 51, N. 3: p. 178-182.
15. Krzentowska-Korek A, Gołkowski F, Bałdys-Waligórska A, Hubalewska-Dydejczyk A. Ef"cacy and complications of neurosurgical treatment of acromegaly. Pituitary, 2011; 14 (2): 157-62.
16. Santos AR, Fonseca Neto RM, Veiga JC, Viana Jr J, Scaliassi NM, Lancellotti CL, et al. Endoscopic endonasal transsphenoidal approach for pituitary adenomas: technical aspects and report of casuistic. Arq Neuropsiquiatr. 2010; 68 (4): 608-12.
17. Armengot M, Gallego JM, Gómez MJ, Barcia JA, Basterra J, Barcia C. Transphenoidal endoscopic approaches for pituitary adenomas: a critical review of our experience. Acta Otorrinolaringol Esp. 2011; 62 (1): 25-30.
18. Katznelson L, Atkinson JL, Cook DM, Ezzat SZ, Hamrahian AH, Miller KK. American Association of Clinical Endocrinologists Medical Guidelines for Clinical Practice for the Diagnosis and Treatment of Acromegaly – 2011 update: executive summary. Endocr Pract. 2011; 17 (4): 636-46.
19. Cappabianca P, C.L., De Divitiis E, Endoscopic endonasal transsphenoidal surgery. Neurosurgery, 2004; 55 (4): p. 933-941.
20. Berker M, Hazer DB, Yucel T, et al. Complications of endoscopic surgery of the pituitary adenomas: analysis of 570 patients and review of the literature. Pituitary, 2012; 15: 288–300.
21. DeKlotz TR, Chia SH, Lu W, Makambi KH, Aulisi E, Deeb Z. Meta-analysis of endoscopic versus sublabial pituitary surgery. Laryngoscope, 2012; 122: 511–518.
22. Hadad G, Bassagasteguy L, Carrau RL, et al. A novel reconstructive technique after endoscopic expanded endonasal approaches: vascular pedicle nasoseptal flap. Laryngoscope, 2006; 116: 1882–1886.
23. Kumar S, Darr A, Hobbs CG, Carlin WV. Endoscopic, endonasal, transsphenoidal hypophysectomy: retrospective analysis of 171 procedures. J Laryngol Otol 2012; 126: 1033–1040.

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