RESEARCH ARTICLE

Experience of trans-sphenoidal excision of pituitary adenomas in a tertiary care hospital in Pakistan

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Abstract

Objective: To determine the presentation, indications, management and clinical outcomes of patients who underwent trans-sphenoidal excision of pituitary adenomas in a tertiary care setting.

Method: The retrospective, descriptive study was conducted at the Shaukat Khanum Memorial Cancer Hospital, Lahore, Pakistan, and comprised records of patients with pituitary adenoma who underwent trans-sphenoidal excision between July 2005 and September 2022. Data was analysed using STATA 15.1.

Results: Of the 50 patients, 25(50%) were males and 25(50%) were females. The overall mean age was 43.16±12 years. In 35(70%) cases, tumours were invading the cavernous sinus and were partially resected, 32(64%) tumours were macroadenoma, and 36(72%) were non-secretory. Of the total, 29(58%) patients were discharged within eight days of surgery. Intraoperative cerebrospinal fluid leak was seen in 4(8%) patients. Postoperative complications included anterior pituitary deficiency 17(34%), posterior pituitary deficiency 13(26%) and panhypopituitarism 3(6%). Postoperatively, vision improved in 23(46%) patients. External radiation therapy was offered to 15(30%) patients, while 5(10%) had gamma knife therapy.

Conclusion: Patients with non-functioning pituitary adenomas mostly presented later in life, with large adenomas causing compressive symptoms.

Key Words: Pituitary adenoma, Endoscopic surgical procedure, Radiotherapy.

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Introduction

The pituitary gland, which is the master gland, is responsible for several vital functions essential to human physiology.[1] Pituitary adenomas are one of the most common brain tumours, accounting for 10-15% of intracranial neoplasms.[2] These tumours vary widely in their presentation due to the diverse functions of the pituitary gland.[3] In recent years, the incidence of pituitary adenomas has appeared to rise, likely due to advances in imaging and diagnostic techniques, as evidenced by data from various registries, including the Surveillance, Epidemiology and End Results (SEER) database in the United States.[4]

Despite these insights, comprehensive data on the incidence of pituitary tumours in South Asian populations, particularly in Pakistan, remains limited. Increased awareness and diagnostic capability are helping reveal the true prevalence of these tumours, including subtypes like prolactinomas that are especially common in females of childbearing age.[5] Using a meta-analysis approach, Ezzat et al. in 2004 published a systematic review of 13 radiological and autopsy studies, concluding that pituitary tumours' incidence was 16.7%.[6]

In most cases, the excision of pituitary adenomas via trans-sphenoidal approach is the mainstay of treatment. This method typically requires a multidisciplinary team, including ear-nose- throat (ENT) specialists and neurosurgeons, as well as specialised equipment, such as neuro-navigation systems and endoscopes. The technical demands and steep learning curve of this endoscopic procedure restrict its availability to specialised centres in Pakistan, limiting access.[7] One notable example is the experience documented by Das et al. at Aga Khan University Hospital (AKUH) in Karachi, where 93% of cases with non-functioning adenomas were managed with this approach over 10 years.[8] However, detailed insights into their outcomes and techniques have not been fully explored or compared with other centres in Pakistan.

The current study was planned to address the gap in local data by determining the presentation, indications, management and clinical outcomes of patients who underwent trans-sphenoidal excision of pituitary adenomas.

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Materials and Methods

The retrospective, descriptive study was conducted at the Shaukat Khanum Memorial Cancer Hospital (SKMCH), Lahore, Pakistan, and comprised records of patients with pituitary adenoma who underwent trans-sphenoidal excision between July 2005 and September 2022. Data was extracted after approval form the institutional ethics review board.

Data was retrieved for patients of either gender aged at least 18 years who underwent trans-sphenoidal surgery for a suprasellar mass based on imaging and clinical indications, had a high likelihood of preoperative diagnosis of pituitary adenoma, based on radiological and endocrinological assessments, and histologically confirmed diagnosis of pituitary adenoma following surgery. Patients who, after surgery, received a histopathological diagnosis other than pituitary adenoma were excluded.

The trans-sphenoidal approach of pituitary tumour resection provided a minimally invasive route to access the sphenoid sinus through the nasal cavity, thereby avoiding brain retraction and minimizing neurological risks. We observed that in addition to the surgical technique, a series of procedural insights played a crucial role to improve patient outcomes. Pre-operative imaging techniques, such as MRI and CT, critically mapped the tumour's location and its relation to adjacent structures. Surgical precision was obtained by specialized endoscopic equipment, allowing for high-resolution visualization and precise excision. This setup minimized trauma to surrounding tissue, particularly vascular structure and hence addressing the intra-operative caveat of maintaining haemostasis. Special post-operative consideration was given to the monitoring of electrolyte balance and visual fields, as these can be affected by pituitary surgery.

Data was analysed using STATA 15.1. Categorical variables were expressed as frequencies and percentages. Continuous variables were reported as mean ± standard deviation.

Results

Of the 50 patients, 25(50%) were males and 25(50%) were females. The overall mean age was 43.16±12 years, with 41(82%) aged 30-60 years, and 5(10%) aged >60 years. In 35(70%) cases, tumours were invading the cavernous sinus and were partially resected, 32(64%) tumours were macroadenoma, and 36(72%) were non-secretory (Table 1).

The most common presenting symptom was visual disturbance 28(56%), followed by headache 14(28%), and hormonal manifestations 8(16%) (Figure 1). Magnetic resonance imaging (MRI) showed macroadenoma in 32(64%) patients and giant adenoma in 17(34%), and 1(2%) patient had a microadenoma (Figure 2).

Table-1: Demographic and diagnostic characteristics of the patients.

Characteristics	Frequency	Percentages
Age (years)		
<30	4	8
30-60	41	82
>60	5	10
Gender		
Male	25	50
Female	25	50
Pre-operative hormonal status of tumour		
Secretory	14	28
Non-secretory	36	72
Invasion of the cavernous sinus		
Yes	35	70
No	15	30

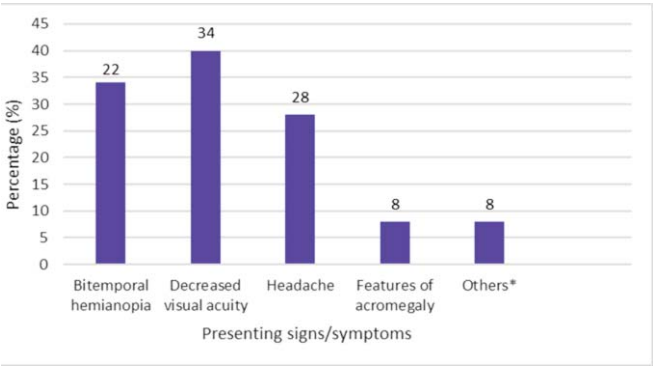

Figure-1: Clinical characteristics of the patients.
*Galactorrhoea, oligomenorrhea, amenorrhoea.

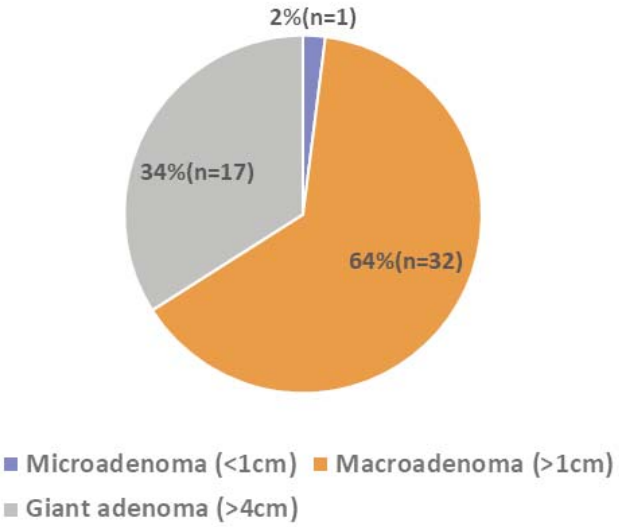

Figure-2: Size of pituitary lesion

Table-2: Surgical resection and radiation therapy.

Variables	Frequency (n=50)	Percentage (%)
Extent of resection (post-op MRI)		
Partial resection	48	96
Near total	2	4
Intraoperative complication		
CSF leak	4	8
No complication	46	92
Re-do surgery		
Yes	3	6
No	47	94
External radiation therapy		
Yes	15	30
No	35	70
Gamma knife therapy		
Yes	5	10
No	45	90

MRI: Magnetic resonance imaging, CSF: Cerebrospinal fluid.

Table-3: Postoperative complications and outcomes.

Variables	Frequency (n=50)	Percentage (%)
Postoperative complications		
None	24	48
Transient diabetes insipidus	7	14
Permanent diabetes insipidus	6	12
CSF rhinorrhoea	3	6
Hormonal deficiency*	20	40
Post-operative ophthalmological outcome		
Improved	23	46
Worsen	7	14
No change	20	40
Hospital stay		
< 2 weeks	46	92
> 2 weeks	4	8

CSF: Cerebrospinal fluid.

*Other than anti-diuretic hormone (ADH).

Partial tumour resection was achieved in 48(96%) cases due to tumour invasiveness, while 2(4%) tumours had near-total resection on postoperative MRI. The mean operating time was 149.88±43 minutes. Intra-operative complication of cerebrospinal fluid (CSF) leak was reported in 4(8%) cases, 3(6%) patients required redo surgery based on follow-up imaging and recurrence of symptoms within six months postoperatively. No perioperative mortality was reported. Out of the 50 participants, 5 were lost to follow up, mostly due to patients living in remote areas with limited access to healthcare facilities. Decisions regarding postoperative radiation were guided by residual tumour size and invasiveness. Postoperatively, 15(30%) patients were subjected to external beam radiation therapy, primarily targetting subjects with large residual tumours or high recurrence risk, typically within 3-6 months post-surgery. Gamma knife therapy was offered to 5(10%) patients with small, inaccessible residual tumours (Table 2).

Postoperative complications were observed in 26(52%) patients. The most common issue encountered was hormonal deficiency 20(40%), followed by transient diabetes insipidus (DI) 7(14%), and permanent DI 6(12%) (Table 3). During follow-up duration of one year, visual improvement was reported in 23(46%) patients, while 20(40%) had no change in vision, and 7(14%) experienced worsened vision postoperatively. The mean time to discharge the patients was 8.08±4 days, with only 4(8%) patients staying in the hospital for >2 weeks.

Discussion

The current study reported an institutional experience with the trans-sphenoidal resection of pituitary adenomas, focussing on patient demographics, presenting symptoms, surgical outcomes and post-operative complications. It was found that 82% patients were aged 30-60 years, aligning with the pattern of age distribution observed globally.[4] Gender is related to the age of presentation, with functional adenomas presenting earlier in females due to apparent manifestations of hormone excess.[9] Two patients in the current study presented with galactorrhoea, indicating the secretory nature of a prolactinoma.

Macroadenomas were present in 64% of the current patients, contrasting with study in the United States in which 71.6% cases had microadenomas.[10] This reflects late presentation and delayed diagnosis of the disease in the current study's population. Visual disturbance was the most prevalent initial symptom in the study, as silent adenomas grow rapidly, exerting pressure on nearby tissues.[11] The proposed aetiology of headache caused by pituitary adenoma is an aggressive tumour-causing invasion of the cavernous sinus.[12] Cavernous sinus invasion was documented in 70% of the current patients, which is known to complicate surgical outcomes, and could explain the high rate of partial resections seen in the current cohort.

Pituitary adenomas, irrespective of their size, require precise detection by high-resolution MRI to guide surgical removal accurately.[13] At the institutional level, MRI is the modality of choice for diagnosis, management and postoperative surveillance of pituitary adenomas at SKMCH. Formal visual fields must be assessed to determine the extent of visual disturbance.[14] Data on formal visual perimetry was lacking in the patient's medical record. Official visual perimetry can also indicate other visual disturbances due to the invasion of third,

fourth, fifth or sixth cranial nerves manifested by parasellar extension of the tumour.

Management strategies to cure pituitary adenoma involve observation, medical management, trans-sphenoidal resection, craniotomy, radiation and stereotactic radiosurgery.[15] The trans-sphenoidal approach still requires further advancement in developing countries due to the unavailability of necessary instruments and the need for more experience among surgeons. The SKMCH applied a collaborative effort between ENT and neurosurgical teams, utilising neuro-navigation to minimise complications. Partial resection was achieved in 96% of the cases, whereas a similar case series by Meleine et al. reported a total resection in 57.14% patients.[16] This finding may indicate limitation in resources and experience with endoscopic techniques in Pakistan. However, radiotherapy was required in 30% of the current patients, and 10% were referred to other hospitals for gamma knife therapy, which is expected in cases with partial resection or aggressive tumour characteristics.

Although it is generally considered a safe and rewarding procedure, complications may still arise, which include--but are not limited to – epistaxis, hyposmia, CSF leak, meningitis, sinusitis, DI (transient and permanent), and inappropriate antidiuretic hormone (ADH) secretion syndrome.[17] In the current study, 26% patients suffered from postoperative DI, with 12% suffering from permanent DI, a rate somewhat lower than in some studies, but in line with the anticipated risk for this approach.[18] Visual improvement was found in 46% subjects, which is encouraging, as visual restoration remains a key benefit of early intervention. Intraoperative complications, such as CSF leaks, were rare, reinforcing the safety of the procedure when performed by experienced teams. Also, 92% patients being discharged within two weeks was a significant factor as it limited the nosocomial factors from affecting the recovery of the patients.

The current study has limitations of a small, single-centre cohort. The findings could only predict significant differences, and were not generalisable. Besides, the absence of visual perimetry findings in the medical records hindered the accurate stratification of visual impairments.

Despite the limitations, the current findings were consistent with previous research on trans-sphenoidal excision in different parts of the world. the study successfully identified the postoperative progress of patients by following up on their clinical visits. Extensive hormonal assessment was done both before surgery and in follow-up endocrinology consultations. This aided in recognising biochemical fluctuations and implementing timely intervention, when required.

Conclusion

Pituitary adenoma mainly presented after 30 years of age, with an upward trend in incidence with increasing age. Most tumours were macroadenoma, producing mass effect features due to compression of the optic chiasma. Trans-sphenoidal excision was found to be a highly effective method of treating pituitary adenoma. This was reflected in minimum intraoperative and postoperative complications and improvement in visual outcome in about half of the patients.

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AUTHOR'S CONTRIBUTION:

MB: Design, data acquisition, analysis, interpretation, drafting, revision, final approval and agreement to be accountable for all aspects of the work.

NUHB: Data analysis, interpretation, revision, final approval and agreement to be accountable for all aspects of the work.

MT: Data analysis, revision, revision, final approval and agreement to be accountable for all aspects of the work.

IBK: Data acquisition, drafting, final approval and agreement to be accountable for all aspects of the work.

SKG: Concept, drafting, final approval and agreement to be accountable for all aspects of the work.

IY: Concept, revision, final approval and agreement to be accountable for all aspects of the work.