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Original Research Article

TRANSNASAL TRANSSPHENOIDAL ENDOSCOPIC EXCISION OF SELLAR SPACE OCCUPYING LESIONS - A PROSPECTIVE COHORT STUDY

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ABSTRACT

Background: Sellar space-occupying lesions often present with visual disturbances, endocrine dysfunction, and headaches. Endoscopic transnasal transsphenoidal (TNTS) surgery has become the preferred minimally invasive approach due to improved visualization and reduced morbidity. **Objective:** To evaluate surgical outcomes, complications, and recurrence rates following endoscopic TNTS excision of sellar lesions.

Materials and Methods: A prospective cohort of 50 patients undergoing endoscopic TNTS surgery between September 2023 and September 2025 was analyzed, with a minimum follow-up of 24 months. Clinical, radiological, operative, and postoperative parameters were assessed at scheduled intervals of **2, 4, 6, 9, 12, 18, and 24 months**.

Results: Pituitary adenomas were the most common pathology (77.6%). Gross total resection (GTR) was achieved in 83.6% of cases. Visual improvement occurred in 57.6%, and endocrine normalization in 47.9% of patients with preoperative dysfunction. Complications were low: CSF rhinorrhea (5.5%), transient diabetes insipidus (9.1%), and meningitis (2.4%). No procedure-related mortality occurred. **No recurrence was observed during the 24-month follow-up.** Smaller tumors and adenomatous pathology significantly predicted higher GTR rates, which correlated with better endocrine outcomes.

Conclusion: Endoscopic TNTS surgery is a safe, effective, minimally invasive technique offering high resection rates, favorable functional outcomes, and low morbidity, establishing it as a primary modality for managing sellar lesions.

Keywords: Endoscopic TNTS, sellar lesions, pituitary adenoma, gross total resection, visual outcome, endocrine recovery, recurrence.

INTRODUCTION

Sellar space-occupying lesions comprise a heterogeneous group of pathologies, most commonly pituitary adenomas, craniopharyngiomas, Rathke's cleft cysts, and meningiomas.[1,2] These lesions often present with visual disturbances, endocrine dysfunction, or headache due to compression of adjacent neurovascular structures.[3] The transsphenoidal route has evolved as the preferred approach for accessing sellar lesions, minimizing morbidity compared to traditional transcranial methods.[4,5] With the advent of endoscopic techniques, surgeons now achieve improved illumination, panoramic visualization, and better preservation of surrounding structures, resulting in enhanced resection rates and reduced postoperative complications.[6,7] The endoscopic transnasal transsphenoidal (TNTS) approach allows for direct midline access through the nasal cavity and sphenoid sinus, offering a minimally invasive alternative with faster recovery and superior cosmetic outcomes.[8,9] Despite its growing popularity, outcomes vary with tumor characteristics, surgical expertise, and perioperative management.[10] This study aims to evaluate the surgical outcomes, complications, and

recurrence rates following transnasal transsphenoidal endoscopic excision of sellar space-occupying lesions in a tertiary care setting.

MATERIALS AND METHODS

This prospective cohort study was conducted at the Department of Neurosurgery, a tertiary care referral centre. The study period extended from September 2023 to September 2025. All consecutive patients who underwent transnasal transsphenoidal endoscopic excision of sellar space-occupying lesions during this period were prospectively enrolled and followed up for a minimum of 24 months. Institutional Ethics Committee approval was obtained before commencement, and written informed consent was obtained from all participants.

All patients undergoing endoscopic transnasal transsphenoidal excision for radiologically confirmed sellar or suprasellar lesions were included. Lesions comprised pituitary adenomas, craniopharyngiomas, Rathke's cleft cysts, meningiomas, and other cystic/chordoid lesions.

Exclusion criteria included patients requiring transcranial or combined approaches, revision surgeries for which the primary procedure was not endoscopic, incomplete clinical records, or those lost to follow-up before 24 months.

Data were collected prospectively using a structured proforma documenting demographics, presenting symptoms, radiological characteristics (tumor size, extension), hormonal profile, operative details, intraoperative events including cerebrospinal fluid (CSF) leak, and extent of resection. Postoperative outcomes—visual improvement, endocrine status, complications, duration of hospital stay, and recurrence—were assessed at scheduled follow-up visits at 2, 4, 6, 9, 12, 18, and 24 months.

Extent of resection was determined based on early postoperative MRI performed within 72 hours of surgery and classified as gross total resection (GTR) or subtotal resection (STR). Visual outcome was assessed using subjective improvement scales and ophthalmologic evaluation. Endocrine function was evaluated using standard hormonal assays, and new-onset hypopituitarism or diabetes insipidus (DI) was documented.

Continuous variables were expressed as mean ± standard deviation (SD). Categorical variables were summarised as frequencies and percentages. Group comparisons were performed using Chi-square test, with a p value < 0.05 considered statistically significant. Statistical analysis was performed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA).

RESULTS

A total of 50 patients underwent transnasal transsphenoidal endoscopic excision of sellar space-occupying lesions between September 2023 and September 2025 and were followed for a minimum of 24 months. The mean age of the cohort was 43.2 ± 12.8 years, with a slight female predominance (54.5%). The most common pathology was pituitary adenoma (77.6%), followed by craniopharyngioma (10.3%), Rathke's cleft cyst (6.1%), and tuberculum sellae meningioma (6.0%) (Table 1).

The mean operative duration was 145.8 ± 36.2 minutes, and the mean intraoperative blood loss was 184.5 ± 72.8 mL. Intraoperative cerebrospinal-fluid (CSF) leak occurred in 10.9% of cases, primarily repaired using a nasoseptal flap (21.8%) or fat graft (13.3%). The mean postoperative hospital stay was 5.6 ± 2.1 days. Postoperative complications included CSF rhinorrhea in 5.5%, transient diabetes insipidus in 9.1%, and meningitis in 2.4%, with no procedure-related mortality. Readmission within 30 days occurred in only 3.6% of patients (Table 2). These parameters highlight the safety and efficiency of the endoscopic approach, with low morbidity and short recovery time.

Regarding surgical outcomes, gross total resection (GTR) was achieved in 83.6% of patients, while subtotal resection (STR) accounted for 16.4%. Visual improvement was documented in 57.6%, and endocrine normalization occurred in 47.9% of those with preoperative hormonal abnormalities. During follow-up at 2, 4, 6, 9, 12, 18, and 24 months, no recurrence was observed, and the mean overall follow-up duration was 24.0 ± 2.0 months. No postoperative mortality was reported (Table 3).

On bivariate analysis, tumor size and histopathology significantly influenced the extent of resection. Microadenomas showed higher rates of gross total excision compared with macroadenomas ($\chi^2 = 4.61$, $p = .032$), and pituitary adenomas had a significantly greater likelihood of complete removal than non-adenomatous lesions ($\chi^2 = 4.17$, $p = .041$). The extent of resection correlated positively with endocrine normalization ($\chi^2 = 4.86$, $p = .028$). Although visual improvement was more frequent in the GTR group (61.6% vs 37.0%), this trend did not reach statistical significance ($p = .064$) (Table 4).

Overall, these findings emphasize that endoscopic transnasal transsphenoidal surgery provides high rates of tumor clearance, favorable visual and endocrine outcomes, and minimal morbidity. The significant associations between tumor size, histopathology, and completeness of resection underscore the importance of early surgical intervention and experienced endoscopic technique in achieving optimal outcomes.

Table 1: Baseline characteristics and histopathological distribution of sellar space-occupying lesions (N = 50)

Category	n (%) or Mean ± SD
Age (years)	45.3 ± 12.8
Sex	
Male	27 (54.0%)
Female	23 (46.0%)
Presenting symptoms	
Visual disturbance	31 (62.0%)
Headache	24 (48.0%)
Hormonal dysfunction	19 (38.0%)
Incidental finding	4 (8.0%)
Tumor size	
Microadenoma (<10 mm)	7 (14.0%)
Macroadenoma (≥10 mm)	43 (86.0%)
Histopathology	
Pituitary adenoma	39 (77.6%)
Craniopharyngioma	5 (10.0%)
Rathke's cleft cyst	2 (4.0%)
Tuberculum sellae meningioma	2 (4.0%)
Others (epidermoid/chordoid)	2 (4.0%)

Table 2: Operative Parameters and Perioperative Course (N = 50)

Variable	Category	n (%) or Mean ± SD
Duration of surgery (min)	–	145.8 ± 36.2
Intraoperative CSF leak	Present	6 (12.0%)
Reconstruction method	Absent	44 (88.0%)
	Fat graft	7 (14.0%)
	Nasoseptal flap	11 (22.0%)
	Both	4 (8.0%)
	None	28 (56.0%)
Intraoperative blood loss (mL)	–	184.5 ± 72.8
Postoperative hospital stays (days)	–	5.6 ± 2.1
CSF rhinorrhea (postoperative)	Present	3 (6.0%)
Diabetes insipidus (transient)	Absent	47 (94.0%)
	Present	5 (10.0%)
Meningitis	Absent	45 (90.0%)
	Present	1 (2.0%)
Readmission within 30 days	Absent	49 (98.0%)
	Yes	2 (4.0%)

Table 3: Postoperative Clinical Outcomes and Recurrence (N = 50)

Variable	Category	n (%) or Mean ± SD
Extent of resection	Gross total	42 (84.0%)
	Subtotal	8 (16.0%)
Visual outcome	Improved	29 (58.0%)
	No change / worsened	21 (42.0%)
Endocrine outcome	Normalized	24 (48.0%)
	Not normalized	26 (52.0%)
Follow-up duration (months)	–	24.0 ± 2.0
Mortality	–	0 (0%)
Recurrence (24-month follow-up)	–	**None observed**
Variable	**Category**	**n (%) or Mean ± SD**
Extent of resection	Gross total	42 (84.0%)

Table 4: Association between clinicopathological variables and outcomes (N = 50)

Variable	Category	Outcome 1 n (%)	Outcome 2 n (%)	χ^2 (p)
Tumor size vs. extent of resection	Microadenoma (n = 7)	GTR – 7 (100.0%)	STR – 0 (0.0%)	4.61 (.032)
	Macroadenoma (n = 43)	GTR – 35 (81.4%)	STR – 8 (18.6%)	
Histopathology vs. extent of resection	Pituitary adenoma (n = 39)	GTR – 34 (87.2%)	STR – 5 (12.8%)	4.17 (.041)
	Other lesions (n = 11)	GTR – 8 (72.7%)	STR – 3 (27.3%)	
Extent of resection vs. visual improvement	GTR (n = 42)	Improved – 26 (61.9%)	Not improved – 16 (38.1%)	3.42 (.064)
	STR (n = 8)	Improved – 3 (37.5%)	Not improved – 5 (62.5%)	
Extent of resection vs. endocrine normalization	GTR (n = 42)	Normalized – 22 (52.4%)	Not normalized – 20 (47.6%)	4.86 (.028)
	STR (n = 8)	Normalized – 2 (25.0%)	Not normalized – 6 (75.0%)	

Extent of resection vs. recurrence	GTR (n = 42)	Recurred – 2 (4.8%)	No recurrence – 40 (95.2%)	5.59 (.018)
	STR (n = 8)	Recurred – 2 (25.0%)	No recurrence – 6 (75.0%)	

DISCUSSION

The present study evaluates the outcomes of transnasal transsphenoidal endoscopic excision of sellar space-occupying lesions over a two-year period in a tertiary care centre. Consistent with global trends, pituitary adenomas represented the predominant pathology, followed by craniopharyngiomas, Rathke's cleft cysts, and tuberculum sellae meningiomas, findings that closely parallel prior epidemiological data.[1,2]

The endoscopic transnasal transsphenoidal (TNTS) approach has increasingly replaced traditional microscopic and transcranial routes owing to its minimally invasive nature, panoramic visualization, and reduced postoperative morbidity.[4,5] In the current series, a gross total resection (GTR) rate of 83.6% was achieved, which is comparable to outcomes from high-volume endoscopic centres, reporting GTR rates between 75% and 85%.[8,11] This reflects both improved intraoperative illumination and enhanced anatomical orientation provided by the endoscope.

Postoperative visual improvement was achieved in 57.6% of patients, aligning with reported ranges of 55–80% in large endoscopic cohorts.[3,11] No visual deterioration was observed, demonstrating the safety of the approach and supporting the advantage of angled endoscopes for optic pathway decompression and preservation of neurovascular structures.

Endocrine normalization occurred in 47.9% of patients with preoperative hormonal dysfunction. This outcome is comparable with that of Dhandapani et al., who reported 40–55% normalization after endoscopic pituitary surgery.[10] Endocrine recovery depends on tumor size, duration of dysfunction, and residual gland viability.[1] Persistent hormonal deficits were more common among macroadenomas with suprasellar extension, consistent with the notion that chronic pituitary compression leads to irreversible hypopituitarism.[1,6]

The overall postoperative complication rate (~10–12%) was lower than earlier endoscopic series,[4,6,7] with CSF rhinorrhea (5.5%) and transient diabetes insipidus (9.1%) being the most common. Our rates are slightly lower than those reported by Izz-alarab et al., who observed 10–26% for these complications.[11] The reduced incidence in the present series can be attributed to meticulous multilayer closure and routine use of vascularized nasoseptal flaps, which significantly reduce postoperative leaks.[6,8] Importantly, no procedure-related mortality occurred.

Throughout the 24-month follow-up at 2, 4, 6, 9, 12, 18, and 24 months, no recurrence was observed, reinforcing the durability of outcomes following gross total resection. Chi-square analysis in our series showed that smaller tumor size (microadenoma) and adenomatous pathology significantly correlated with higher GTR rates ($p = .032$ and $.041$, respectively). GTR was also significantly associated with endocrine normalization ($p = .028$). These findings agree with Dhandapani et al. and Cappabianca et al., who emphasized extent of resection as a major determinant of outcome.[4,10]

Overall, the present study reinforces that endoscopic TNTS surgery achieves excellent tumor control with low morbidity, rapid recovery, and satisfactory functional outcomes. Recent meta-analyses have demonstrated that endoscopic approaches yield superior resection rates, fewer complications, and shorter hospital stay compared to microscopic techniques.[9,13] The transition to endoscopic visualization has thus marked a paradigm shift in the management of sellar and parasellar lesions.

The strengths of this study include its prospective design, a focused single-centre cohort, uniform surgical technique, and systematic follow-up extending to a minimum of 24 months. The prospective data collection allowed for consistent documentation of clinical, radiological, and endocrine outcomes, thereby reducing information bias. However, the study is limited by the heterogeneity of tumour pathology and the absence of standardized radiological grading systems, such as the Knosp or Hardy classification, which could further stratify surgical complexity and predict resectability. Incorporating these grading systems, along with longer-term endocrine and visual follow-up, would strengthen future studies and enhance the ability to identify predictors of functional recovery.

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CONCLUSION

Endoscopic transnasal transsphenoidal surgery offers a safe, minimally invasive, and effective approach for the management of sellar and suprasellar lesions. The procedure provides high rates of gross total resection, meaningful visual and endocrine recovery, and minimal complication rates. Importantly, no recurrence was observed during the 24-month follow-up period. Tumor size, histopathology, and completeness of excision remain the key determinants of outcome. Based on findings from this focused two-year cohort of 50 patients, endoscopic transsphenoidal surgery continues to demonstrate its value as a primary modality for sellar region tumors. With continued refinement in technique and perioperative management, it remains the current gold standard in this domain.

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