



PROSPECTIVE OBSERVATIONAL STUDY ON TRANSORAL ENDOSCOPIC NECK SURGERY (TOENS) AS A TREATMENT MODALITY FOR NECK SWELLING IN A TERTIARY CARE CENTRE IN CENTRAL INDIA

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ABSTRACT

Background: Transoral Endoscopic Neck Surgery (TOENS), particularly the transoral endoscopic vestibular approach, has emerged as an innovative scarless minimally invasive technique for the management of selected neck swellings. By eliminating the need for a visible cervical incision, TOENS offers improved cosmetic outcomes while maintaining surgical safety and efficacy comparable to conventional open surgery. However, evidence regarding its feasibility and clinical outcomes from Indian tertiary care centers remains limited. The present study was undertaken to evaluate the feasibility, safety, and clinical outcomes of TOENS in the management of selected neck swellings at a tertiary care center in Central India.

Methodology: This prospective observational study included 40 consecutive patients with selected neck swellings who underwent TOENS after obtaining Institutional Ethics Committee approval and written informed consent. Preoperative evaluation included detailed clinical examination, ultrasonography, thyroid function tests (where indicated), contrast-enhanced computed tomography in selected patients, and fine-needle aspiration cytology. Intraoperative parameters such as operative time, blood loss, technical difficulty, conversion to open surgery, and intraoperative complications were recorded. Postoperative outcomes including pain (Visual Analog Scale), complications, hospital stay, cosmetic satisfaction, patient-reported outcomes, histopathological findings, and follow-up results were prospectively assessed. Data were analyzed using IBM SPSS software, with a *p*-value of <0.05 considered statistically significant.

Results: The median age of the study population was 38 years, with females comprising 77.5% of patients. Successful completion of TOENS without conversion was achieved in 95.0% of cases. The median operative time was 118 minutes, and median estimated blood loss was 37.5 mL. Transient hypocalcaemia (15.0%), transient mental nerve neuropraxia (7.5%), and transient recurrent laryngeal nerve palsy (5.0%) were the most common postoperative complications, while no permanent nerve injury, permanent hypocalcaemia, surgical site infection, hematoma, or mortality was observed. The median hospital stay was 2 days, and patients resumed routine activities after a median of 7 days. Cosmetic outcomes were excellent or good in 95.0% of patients, with 100% remaining free of a visible cervical scar. Histopathological examination revealed predominantly benign thyroid lesions, and concordance between preoperative FNAC and final histopathology was observed in 87.5% of cases.

Conclusion: TOENS is a feasible, safe, and effective scarless surgical option for carefully selected patients with neck swellings. The procedure demonstrated favorable perioperative outcomes, low complication rates, rapid postoperative recovery, excellent cosmetic satisfaction, and high patient acceptance. With appropriate patient selection, standardized surgical technique, and adequate training, TOENS represents a promising minimally invasive alternative to conventional open neck surgery in tertiary care settings.

Keywords: Transoral Endoscopic Neck Surgery, TOENS, Transoral Endoscopic Thyroidectomy Vestibular Approach, Neck Swellings, Minimally Invasive Endocrine Surgery.

INTRODUCTION

Neck swellings comprise a heterogeneous group of lesions arising from the thyroid gland, parathyroid glands, salivary glands, lymph nodes, and congenital remnants.

Thyroid swellings constitute the most common indication for elective endocrine neck surgery, with etiologies ranging from benign nodular goitre and follicular adenoma to differentiated thyroid carcinoma. Conventional open cervical surgery remains the gold standard because it provides excellent exposure, facilitates safe identification of the recurrent laryngeal nerve and parathyroid glands, and yields consistently favorable oncological outcomes. However, despite its safety and effectiveness, the permanent anterior cervical scar may adversely affect body image, cosmetic satisfaction, and quality of life, particularly in young



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patients and women. These concerns have driven the development of remote-access and minimally invasive approaches that seek to achieve equivalent surgical outcomes while eliminating visible cervical scars.¹⁻⁴

The advent of Natural Orifice Transluminal Endoscopic Surgery (NOTES) has expanded the scope of scarless endocrine surgery, culminating in the development of the Transoral Endoscopic Thyroidectomy Vestibular Approach (TOETVA), now considered the most standardized transoral approach for selected thyroid and parathyroid lesions. Through three vestibular incisions in the oral cavity, a subplatysmal working space is created using carbon dioxide insufflation, providing a direct midline approach to the central neck with excellent bilateral visualization. Preservation of the recurrent laryngeal nerve and parathyroid glands follows principles similar to conventional surgery while avoiding a visible skin incision. Appropriate patient selection remains fundamental, with current indications primarily including benign thyroid nodules, selected differentiated thyroid carcinomas, and parathyroid adenomas without extensive local invasion or bulky nodal disease. Contemporary evidence demonstrates that TOETVA is feasible and safe in experienced hands, with complication rates comparable to open thyroidectomy, while providing superior cosmetic satisfaction and high patient acceptance. Nevertheless, the technique requires specialized training and is associated with a distinct learning curve, emphasizing the importance of standardized operative protocols and institutional experience.²⁻⁶

Although TOETVA has gained widespread acceptance in several high-volume endocrine surgery centers worldwide, published evidence from India remains limited, and reports from Central India are particularly scarce. Differences in disease spectrum, patient demographics, healthcare infrastructure, surgeon experience, and resource availability may influence perioperative outcomes and limit the generalizability of international data to the Indian setting. Furthermore, prospective observational studies evaluating feasibility, operative outcomes, postoperative complications, histopathological findings, cosmetic satisfaction, and patient-reported outcomes are limited in the regional literature. Therefore, the present study was undertaken to prospectively evaluate the feasibility, safety, and clinical outcomes of Transoral Endoscopic Neck Surgery (TOENS) for selected neck swellings at a tertiary care teaching center in Central India. The findings are expected to provide institution-specific evidence regarding the applicability of this scarless minimally invasive technique and contribute to the growing body of

literature supporting its adoption in appropriately selected patients.^{2-4,6}

METHODOLOGY

This prospective observational study was conducted in the Department of General Surgery at a tertiary care teaching hospital in Central India after obtaining approval from the Institutional Ethics Committee. Consecutive patients presenting with selected neck swellings and fulfilling the predefined eligibility criteria for Transoral Endoscopic Neck Surgery (TOENS) were enrolled during the study period after obtaining written informed consent. Patients with benign thyroid nodules, selected differentiated thyroid malignancies, parathyroid lesions, and other suitable cervical pathologies amenable to transoral endoscopic surgery were considered for inclusion based on clinical evaluation, imaging findings, and institutional surgical protocol. Patients with locally advanced malignancy, extensive cervical lymph node metastasis, previous major neck surgery, uncontrolled coagulopathy, active oral cavity infection, or other contraindications to endoscopic surgery were excluded. A detailed clinical history, comprehensive physical examination, routine hematological and biochemical investigations, thyroid function tests (where indicated), ultrasonography of the neck, and contrast-enhanced computed tomography in selected cases were performed as part of the preoperative evaluation. Fine-needle aspiration cytology (FNAC) was carried out for thyroid and other appropriate lesions, and findings were classified according to the Bethesda System wherever applicable. Demographic characteristics, clinical presentation, radiological findings, and preoperative diagnosis were documented using a structured case record form.

All procedures were performed under general anesthesia by surgeons trained in endoscopic neck surgery using the standardized transoral vestibular approach. A subplatysmal working space was created through three vestibular incisions with carbon dioxide insufflation, followed by meticulous endoscopic dissection using conventional laparoscopic instruments. Surgical principles included identification and preservation of vital structures, particularly the recurrent laryngeal nerve and parathyroid glands during thyroid procedures, while ensuring complete excision of the target lesion. Intraoperative parameters including operative time, estimated blood loss, technical difficulty, carbon dioxide insufflation pressure, intraoperative complications, and the need for conversion to conventional open surgery were prospectively recorded. Excised specimens were submitted for histopathological examination to establish the final diagnosis.

Postoperative assessment included evaluation of pain using the Visual Analog Scale (VAS), time to oral intake, duration of hospital stay, postoperative complications, and time required to resume routine daily activities. Procedure-specific complications, including recurrent laryngeal nerve palsy, hypocalcaemia, mental nerve injury, hematoma, seroma, surgical site infection, and wound-related complications, were carefully documented. Cosmetic outcome and overall patient satisfaction were assessed during follow-up using a validated cosmetic satisfaction scale. Patients were reviewed at scheduled postoperative visits to evaluate wound healing, functional recovery, late complications, recurrence (where applicable), and overall surgical outcomes. The primary outcome measures were feasibility and safety of TOENS, assessed by successful completion of the procedure without conversion and the incidence of perioperative complications. Secondary outcome measures included operative time, blood loss, postoperative

pain, duration of hospital stay, cosmetic satisfaction, completeness of surgical excision, histopathological findings, return to normal daily activities, and the learning curve of the procedure.

All data were entered into Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and analyzed using IBM Statistical Package for the Social Sciences (SPSS) software, Version XX.X (IBM Corp., Armonk, NY, USA). Continuous variables were tested for normality and expressed as mean $\pm$ standard deviation or median with interquartile range, as appropriate. Categorical variables were summarized as frequencies and percentages. Comparisons between continuous variables were performed using the Student's *t*-test or Mann-Whitney *U* test, whereas categorical variables were analyzed using the Chi-square test or Fisher's exact test, as appropriate. A two-tailed *p*-value of <0.05 was considered statistically significant.

RESULTS

Table 1. Baseline Demographic and Clinical Characteristics of the Study Population (N = 40)

Characteristic	Category	n (%) / Summary
Age group (years)	≤ 20	4 (10.0)
	21–30	8 (20.0)
	31–40	12 (30.0)
	41–50	8 (20.0)
	51–60	5 (12.5)
	>60	3 (7.5)
Age	Median (IQR)	38 (29–49) years
	Range	18–66 years
Sex	Female	31 (77.5)
	Male	9 (22.5)
Residence	Urban	24 (60.0)
	Rural	16 (40.0)
Body Mass Index (BMI)	Normal	22 (55.0)
	Overweight	14 (35.0)
	Obese	4 (10.0)
Comorbidity status	None	28 (70.0)
	≥ 1 comorbidity	12 (30.0)
Specific comorbidities	Hypertension	5 (12.5)
	Diabetes mellitus	4 (10.0)
	Hypothyroidism on treatment	3 (7.5)
ASA physical status	ASA I	28 (70.0)
	ASA II	12 (30.0)

A total of 40 patients with selected neck swellings underwent Transoral Endoscopic Neck Surgery (TOENS) during the study period. The median age of the study population was 38 years (IQR: 29–49 years; range: 18–66 years). Patients aged 31–40 years constituted the largest proportion (30.0%), followed by those aged 21–30 years and 41–50 years (20.0% each). Females predominated, accounting

for 77.5% of the study population, while males represented 22.5%. Most participants were from urban areas (60.0%). The majority had a normal body mass index (55.0%), whereas 35.0% were overweight and 10.0% were obese. Comorbid illnesses were present in 30.0% of patients, with hypertension and diabetes mellitus being the most common. According to the American Society of

Anesthesiologists (ASA) classification, 70.0% of patients belonged to ASA Grade I, while the remaining 30.0% were classified as ASA Grade II.

Table 2. Clinical Presentation and Preoperative Evaluation of Patients Undergoing TOENS (N = 40)

Variable	Category	n (%) / Summary
Presenting symptoms	Visible neck swelling	40 (100.0)
	Cosmetic concern	28 (70.0)
	Pain/discomfort	10 (25.0)
	Dysphagia	6 (15.0)
	Pressure symptoms	5 (12.5)
	Incidental detection	4 (10.0)
	Voice change	3 (7.5)
Duration of symptoms (months)	Median (IQR)	7.5 (4.0–18.0)
	Range	2–30
Site of lesion	Right lobe	18 (45.0)
	Left lobe	16 (40.0)
	Bilateral	6 (15.0)
Number of lesions	Solitary	27 (67.5)
	Multiple	13 (32.5)
Clinical lesion size	≤2 cm	9 (22.5)
	2.1–4.0 cm	23 (57.5)
	>4 cm	8 (20.0)
Cervical lymphadenopathy	Absent	37 (92.5)
	Present	3 (7.5)

All enrolled patients presented with a clinically evident neck swelling. Cosmetic concern was reported by 70.0% of patients, whereas pain or discomfort was present in 25.0%. Dysphagia and pressure symptoms were observed in 15.0% and 12.5% of patients, respectively, while voice changes were uncommon (7.5%). The median duration of symptoms before surgery was 7.5 months (IQR: 4.0–18.0 months). Right-sided lesions constituted

45.0% of cases, followed by left-sided lesions (40.0%) and bilateral lesions (15.0%). Solitary lesions were more common than multiple lesions (67.5% vs. 32.5%). Most lesions measured 2.1–4.0 cm clinically (57.5%), whereas only 20.0% exceeded 4 cm in maximum diameter. Cervical lymphadenopathy was infrequently observed, being present in only 7.5% of patients.

Table 3. Operative Characteristics and Intraoperative Outcomes of TOENS/TOETVA (N = 40)

Variable	Result
Type of surgery performed	
Right hemithyroidectomy	21 (52.5%)
Left hemithyroidectomy	16 (40.0%)
Right parathyroidectomy	3 (7.5%)
Operative time, minutes	Median 118; IQR 105.0–132.75; range 80–160
Estimated blood loss, mL	Median 37.5; IQR 23.75–50.0; range 10–80
Successful completion of TOENS/TOETVA	38 (95.0%)
Conversion to open surgery	2 (5.0%)
Significant bleeding >100 mL	2 (5.0%)
Mental nerve injury	2 (5.0%)
No significant intraoperative event	36 (90.0%)
Technical difficulty	
None/mild	29 (72.5%)
Moderate	9 (22.5%)
Severe	2 (5.0%)
IONM used	18 (45.0%)
Technical modification required	6 (15.0%)
CO₂ pressure	

6 mmHg	12 (30.0%)
7 mmHg	17 (42.5%)
8 mmHg	11 (27.5%)

Right hemithyroidectomy was the most frequently performed procedure (52.5%), followed by left hemithyroidectomy (40.0%) and right parathyroidectomy (7.5%). The median operative time was 118 minutes (IQR: 105.0–132.8 minutes), and the median estimated intraoperative blood loss was 37.5 mL (IQR: 23.8–50.0 mL). Successful completion of the transoral procedure without conversion to open surgery was achieved in 95.0% of patients, while conversion was required in only

5.0%. Significant intraoperative bleeding and mental nerve injury each occurred in 5.0% of cases. Overall, 90.0% of procedures were completed without any major intraoperative event. Most operations were associated with either no or only mild technical difficulty (72.5%), whereas severe technical difficulty was encountered in only 5.0% of cases. Intraoperative nerve monitoring was utilized in 45.0% of procedures, and technical modifications were required in 15.0% of patients.

Table 4. Postoperative Complications and Recovery Outcomes (N = 40)

Variable	Result
Overall postoperative outcome	
No postoperative complication	28 (70.0%)
At least one postoperative complication	12 (30.0%)
Minor complication managed conservatively	12 (30.0%)
Major complication requiring intervention	0 (0.0%)
Mortality	0 (0.0%)
Individual postoperative complications	
Transient hypocalcaemia	6 (15.0%)
Transient RLN palsy	2 (5.0%)
Mental nerve neuropraxia	3 (7.5%)
Surgical site infection	0 (0.0%)
Hematoma	0 (0.0%)
Seroma	0 (0.0%)
Permanent RLN palsy	0 (0.0%)
Permanent hypocalcaemia	0 (0.0%)
VAS pain score at 6 hours	Median 4.5; IQR 4.0–5.0; range 3–8
VAS pain score at discharge	Median 1; IQR 0.0–2.0; range 0–3
Reduction in VAS pain score	$p < 0.0001$
Time to oral intake, hours	Median 6; IQR 6.0–8.0; range 4–12
Time to ambulation, hours	Median 8; IQR 6.0–12.0; range 4–24
Length of hospital stay, days	Median 2; IQR 2.0–3.0; range 2–5
Return to routine activity, days	Median 7; IQR 5.0–10.0; range 3–21

The postoperative course was uneventful in the majority of patients, with 70.0% experiencing no postoperative complications. Minor complications managed conservatively occurred in 30.0%, while no patient developed a major complication requiring surgical intervention or experienced mortality. Transient hypocalcaemia was the most common postoperative complication (15.0%), followed by transient mental nerve neuropraxia (7.5%) and transient recurrent laryngeal nerve palsy (5.0%). No cases of permanent recurrent laryngeal nerve injury,

permanent hypocalcaemia, surgical site infection, hematoma, or seroma were observed. Postoperative pain improved substantially, with the median Visual Analog Scale (VAS) score decreasing from 4.5 at 6 hours to 1 at discharge ($p < 0.0001$). The median time to oral intake was 6 hours, ambulation was achieved after a median of 8 hours, the median duration of hospital stay was 2 days, and patients resumed routine daily activities after a median of 7 days.

Table 5. Cosmetic, Functional, and Patient Satisfaction Outcomes (N = 40)

Variable	Result
Visible external neck scar absent	40 (100.0%)
Cosmetic satisfaction	

Excellent	30 (75.0%)
Good	8 (20.0%)
Fair	2 (5.0%)
Poor	0 (0.0%)
Excellent/good cosmetic satisfaction	38 (95.0%)
Voice status at follow-up	
Normal voice	38 (95.0%)
Hoarseness of voice	2 (5.0%)
Swallowing status at follow-up	
Normal swallowing	39 (97.5%)
Mild dysphagia	1 (2.5%)
Overall patient satisfaction	
Highly satisfied	29 (72.5%)
Satisfied	9 (22.5%)
Neutral	2 (5.0%)
Dissatisfied	0 (0.0%)
Overall satisfied/highly satisfied	38 (95.0%)

An external cervical scar was absent in all patients undergoing TOENS. Cosmetic outcomes were highly favorable, with 75.0% of patients rating the cosmetic result as excellent and an additional 20.0% reporting good cosmetic satisfaction. Overall, 95.0% of patients expressed excellent or good cosmetic outcomes. Normal voice was preserved in 95.0% of patients, while only 5.0% experienced

transient postoperative hoarseness. Swallowing function remained normal in 97.5% of patients, with only one patient reporting mild dysphagia during follow-up. Overall patient satisfaction was high, with 72.5% reporting they were highly satisfied and 22.5% satisfied with the procedure, resulting in an overall satisfaction rate of 95.0%.

Table 6. Histopathological Diagnosis and Follow-up Outcomes (N = 40)

Variable	Result
Final histopathological diagnosis	
Colloid nodular goitre	18 (45.0%)
Follicular adenoma	9 (22.5%)
Multinodular goitre	7 (17.5%)
Follicular neoplasm	2 (5.0%)
Papillary thyroid carcinoma	1 (2.5%)
Parathyroid adenoma	2 (5.0%)
Atypical parathyroid tumour	1 (2.5%)
Histopathological category	
Benign thyroid lesions	36 (90.0%)
Malignant thyroid lesion	1 (2.5%)
Parathyroid lesions	3 (7.5%)
Complete recovery	38 (95.0%)
Minor residual symptoms	2 (5.0%)
Major morbidity	0 (0.0%)
Mortality	0 (0.0%)
No late complication	38 (95.0%)
Persistent hoarseness	1 (2.5%)
Mild residual dysphagia	1 (2.5%)
FNAC–histopathology concordance	35 (87.5%)
FNAC–histopathology discordance	5 (12.5%)

Histopathological examination demonstrated that benign thyroid lesions constituted the majority of cases. Colloid nodular goitre was the most common diagnosis (45.0%), followed by follicular adenoma (22.5%) and multinodular goitre (17.5%).

Parathyroid lesions accounted for 7.5% of cases, while papillary thyroid carcinoma was identified in one patient (2.5%). Overall, 90.0% of lesions were benign thyroid pathologies. Complete postoperative recovery was achieved in 95.0% of patients, whereas

minor residual symptoms persisted in 5.0%. No major morbidity or mortality occurred during follow-up. Late complications were uncommon, with only one patient each experiencing persistent hoarseness and mild dysphagia. Concordance between preoperative FNAC and final histopathological diagnosis was observed in 87.5% of cases, while discordance was noted in 12.5%.

DISCUSSION

The present prospective observational study evaluated the feasibility, safety, and clinical outcomes of Transoral Endoscopic Neck Surgery (TOENS) in selected patients with neck swellings at a tertiary care center in Central India. With increasing emphasis on minimally invasive and scarless surgery, transoral endoscopic approaches have emerged as an important alternative to conventional cervical thyroidectomy. The principal advantages include the absence of a visible cervical scar, excellent midline access to the central compartment, and high patient satisfaction without compromising surgical safety in appropriately selected patients. Contemporary reviews and systematic analyses have established TOETVA/TOENS as a feasible technique with outcomes comparable to conventional open surgery when performed by adequately trained surgeons.⁷⁻¹⁰ The present study demonstrated a high procedural success rate, with successful completion of the transoral procedure in 95% of patients and conversion to open surgery in only 5%. Similar findings have been reported in international literature. The comprehensive review by Russell et al. described conversion rates generally below 5%, primarily attributable to uncontrolled bleeding, extensive adhesions, or unexpectedly advanced disease.⁹ Likewise, the recent systematic review by Crawshaw et al. concluded that TOETVA is successfully completed in the vast majority of carefully selected patients, with conversion rates consistently ranging from 0–6% across published series.⁷ These observations indicate that the feasibility demonstrated in the present study is comparable to that reported by high-volume international endocrine surgery centers. The median operative time in our series was 118 minutes, which is comparable with previously published reports. Early experiences with TOETVA frequently reported operative durations of 120–180 minutes, whereas increasing surgical experience has substantially reduced operative times. The recent meta-analysis including 2,889 patients reported that TOETVA requires a significantly longer operative duration than conventional open thyroidectomy, with a weighted mean difference of approximately 55 minutes, reflecting the additional time required for flap creation and endoscopic dissection.⁸

Similarly, Russell et al. emphasized that operative duration progressively decreases after completion of the learning curve and approaches that of conventional surgery in experienced units.⁹ Therefore, the operative time observed in our study appears acceptable and reflects the evolving institutional experience with this relatively new technique.

Intraoperative blood loss in the present study remained minimal, with a median estimated blood loss of 37.5 mL, and significant bleeding occurred in only 5% of patients. Comparable findings have been consistently reported in published literature, where estimated blood loss generally ranges between 20 and 50 mL owing to enhanced endoscopic magnification and meticulous hemostasis. The systematic review by Camenzuli et al. concluded that TOETVA is associated with minimal blood loss and acceptable intraoperative safety comparable with conventional thyroidectomy.¹⁰ Furthermore, the meta-analysis by Oh et al. demonstrated no significant difference in intraoperative blood loss between TOETVA and open thyroidectomy despite the longer operative duration.⁸

Safety remains the principal determinant of acceptance of any novel surgical technique. In the present study, no permanent recurrent laryngeal nerve injury, permanent hypocalcaemia, hematoma, seroma, surgical site infection, or mortality was observed. Transient hypocalcaemia occurred in 15%, transient recurrent laryngeal nerve palsy in 5%, and transient mental nerve neuropraxia in 7.5% of patients. Similar complication profiles have been reported in several systematic reviews. The meta-analysis by Oh et al. found no statistically significant difference between TOETVA and open thyroidectomy regarding transient or permanent recurrent laryngeal nerve injury, transient or permanent hypocalcaemia, hematoma, or postoperative infection.⁸ Russell et al. also reported that transient mental nerve symptoms represent a unique complication of the vestibular approach but generally resolve spontaneously during follow-up.⁹ These findings indicate that the complication profile observed in our series is consistent with contemporary international evidence.

An important finding of the present study was the rapid postoperative recovery. The median duration of hospital stay was 2 days, patients resumed oral intake after a median of 6 hours, ambulation occurred within 8 hours, and routine daily activities were resumed after a median of 7 days. The postoperative pain score also decreased significantly from a median Visual Analog Scale (VAS) score of 4.5 at 6 hours to 1 at discharge. Similar observations have been documented in recent comparative studies. The systematic review and meta-analysis by

Oh et al. demonstrated significantly lower postoperative pain scores following TOETVA compared with conventional open thyroidectomy despite a marginally longer hospital stay in some institutions.⁸ Russell et al. further highlighted that early mobilization and rapid functional recovery contribute substantially to patient acceptance of the transoral approach.⁹

Cosmetic outcome represents one of the greatest advantages of TOENS. In the present study, 100% of patients had no visible cervical scar, 95% reported excellent or good cosmetic satisfaction, and 95% were either satisfied or highly satisfied with the overall procedure. These findings closely mirror those reported in international literature. Multiple reviews have consistently shown cosmetic satisfaction rates exceeding 90%, making TOETVA one of the most cosmetically acceptable approaches for thyroid and parathyroid surgery.⁷⁻¹⁰ The comprehensive review by Crawshaw et al. emphasized that superior cosmetic outcomes remain the primary reason for increasing global adoption of TOETVA, particularly among younger patients and women who are concerned about visible cervical scarring.⁷

Histopathological examination in our study revealed that 90% of lesions were benign thyroid pathologies, with colloid nodular goitre representing the most frequent diagnosis (45%), followed by follicular adenoma (22.5%). Only one patient (2.5%) had papillary thyroid carcinoma. This distribution is consistent with current recommendations, which advocate careful patient selection during the learning phase of TOETVA, primarily including benign thyroid nodules and selected low-risk differentiated thyroid carcinomas. Russell et al. and Camenzuli et al. similarly emphasized that benign thyroid disease continues to represent the commonest indication worldwide, although the indications for TOETVA are gradually expanding with increasing surgical expertise.^{9,10}

The present study also demonstrated a high concordance (87.5%) between preoperative FNAC and final histopathological diagnosis, supporting the reliability of preoperative cytological evaluation in patient selection. Furthermore, 95% of patients achieved complete postoperative recovery without major morbidity or mortality. These observations reinforce the growing body of evidence suggesting that TOENS can provide satisfactory oncological and functional outcomes when appropriate patient selection and meticulous surgical technique are employed.⁷⁻¹⁰

Overall, the findings of the present study support the growing international evidence that Transoral Endoscopic Neck Surgery is a feasible, safe, and cosmetically superior minimally invasive technique for selected neck swellings. Although the procedure

requires specialized instrumentation, structured training, and familiarity with endoscopic neck anatomy, its perioperative outcomes and complication profile are comparable to those of conventional open surgery while offering the distinct advantage of a scarless cervical outcome. With increasing institutional experience and adherence to standardized patient selection criteria, TOENS has the potential to become an important component of endocrine and minimally invasive neck surgery in tertiary care centers across India.

CONCLUSION

The present prospective observational study demonstrates that Transoral Endoscopic Neck Surgery (TOENS) is a feasible, safe, and effective minimally invasive scarless surgical approach for appropriately selected patients with neck swellings. The procedure was associated with a high completion rate, minimal intraoperative blood loss, acceptable operative time, low complication rates, rapid postoperative recovery, and excellent cosmetic outcomes with high patient satisfaction. Histopathological findings confirmed the adequacy of surgical excision, while the absence of major morbidity or mortality further supports the safety profile of the technique. These findings suggest that TOENS is a promising alternative to conventional open neck surgery in experienced hands, offering comparable surgical outcomes with the added advantage of an excellent cosmetic result.

Limitations

The present study has certain limitations. It was conducted at a single tertiary care center with a relatively small sample size, which may limit the generalizability of the findings. The absence of a comparative open surgery group precluded direct comparison of perioperative and functional outcomes between TOENS and conventional surgery. In addition, the duration of follow-up was relatively short, restricting assessment of long-term recurrence, functional outcomes, and oncological efficacy.

Recommendations

Further multicenter prospective studies with larger sample sizes and longer follow-up are warranted to validate these findings and evaluate long-term safety, recurrence rates, functional outcomes, and oncological adequacy. Randomized or well-designed comparative studies between TOENS and conventional open surgery are recommended to establish stronger evidence regarding clinical effectiveness, cost-effectiveness, quality of life, and patient-reported outcomes. Structured training programs and standardized patient selection criteria should also be encouraged to facilitate the safe and wider adoption of TOENS in endocrine and minimally invasive neck surgery.

Conflict of Interest

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