



# A novel minimally invasive endoscopic approach of thyroid surgery—endoscopic thyroidectomy via sternocleidomastoid muscle posteroinferior approach

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**Background:** Since the endoscopic thyroidectomy was firstly reported by Hüscher in 1997, there has been an ongoing debate regarding whether mainstream endoscopic thyroidectomy can be classified as minimally invasive surgery. In this study, we innovatively proposed the endoscopic thyroidectomy via sternocleidomastoid muscle posteroinferior approach (ETSPIA), a novel minimally invasive surgical technique, and compared its efficacy with the well-established transoral endoscopic thyroidectomy vestibular approach (TOETVA).

**Methods:** We retrospectively analyzed 50 patients who underwent ETSPIA and 50 patients who underwent TOETVA at Beijing Tongren Hospital, comparing their clinical characteristics, operative duration, blood loss, postoperative alterations in parathyroid hormone (PTH) and serum calcium, recovery post-surgery, complications, and follow-up data.

**Results:** The ETSPIA group had a shorter operation time compared to the TOETVA group ( $243.40 \pm 58.67$  vs.  $278.08 \pm 78.50$  min;  $P=0.01$ ). The ETSPIA group also had less intraoperative blood loss than the TOETVA group ( $20.60 \pm 10.58$  vs.  $33.00 \pm 11.11$  mL;  $P<0.001$ ). More central lymph nodes were dissected in the ETSPIA group compared to the TOETVA group ( $5.90 \pm 4.72$  vs.  $3.36 \pm 2.80$ ;  $P=0.002$ ). However, the difference in the number of positive central lymph nodes dissected was not statistically significant ( $1.38 \pm 2.33$  for ETSPIA vs.  $0.94 \pm 1.39$  for TOETVA;  $P=0.26$ ). The ETSPIA group had a shorter length of stay (LOS) compared to the TOETVA group ( $6.82 \pm 2.02$  vs.  $8.26 \pm 2.72$  days;  $P=0.003$ ). The alteration in PTH levels 1 day after surgery was less pronounced in the ETSPIA group compared to the TOETVA group ( $-26.38\% \pm 18.43\%$  vs.  $-35.75\% \pm 22.95\%$ ;  $P=0.04$ ). At the 1-month postoperative mark, the ETSPIA group showed a marginal increase in PTH levels, whereas the TOETVA group exhibited a slight decrease ( $10.12\% \pm 35.43\%$  vs.  $-11.53\% \pm 29.51\%$ ;  $P=0.03$ ). Regarding the average percentage change in serum calcium level 1 day after surgery, the ETSPIA group showed a smaller change, though this difference was not statistically significant ( $-4.79\% \pm 5.47\%$  vs.  $-5.66\% \pm 3.90\%$ ;  $P=0.40$ ). Furthermore, the incidence of hoarseness attributable to transient recurrent laryngeal nerve (RLN) injury in postoperative patients was lower in the ETSPIA group compared to the TOETVA group, but this difference did not reach statistical significance ( $0\%$  vs.  $4\%$ ;  $P=0.15$ ).

**Conclusions:** Overall, compared to TOETVA, the ETSPIA is characterized by a shorter operative route, enhanced protection of the parathyroid glands, reduced trauma, and expedited postoperative recovery.

**Keywords:** Thyroid cancer; endoscopic surgery; minimally invasive; sternocleidomastoid muscle

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## Introduction

The prevalence of thyroid cancer occupies the ninth position globally, and it ranks fifth in the incidence of new cancer cases among females (1). Notably, there has been a trend towards younger ages of onset in recent years (2). Traditional open thyroidectomy often results in neck scarring and associated complications, which can adversely impact patients' quality of life postoperatively (3). Consequently, aesthetic considerations have become more prominent in the therapeutic strategy for thyroid cancer, leading to the rapid evolution of endoscopic thyroidectomy via diverse approaches. This surgical technique aims to enhance postoperative aesthetic outcomes by employing small or hidden incisions. Predominant surgical methodologies encompass transoral, transthoracic, transaxillary, and transauricular approaches.

However, in contrast to conventional surgeries, the majority of these endoscopic procedures cannot be classified as strictly minimally invasive, given their longer operative paths and larger incisions. Moreover, for patients with cervical lymph node metastases, the simplistic transoral or

transaxillary methods are insufficient for comprehensive cervical lymph node dissection, necessitating additional incisions, thereby extending operative durations and increasing trauma. Transcervical endoscopic thyroidectomy is relatively uncommon. In 2006, Sebag *et al.* (4) reported 38 cases utilizing a transcervical endoscopic approach with air injection, but subsequent scholarly publications on this method are lacking.

In pursuit of a more efficient endoscopic approach, we have introduced the endoscopic thyroidectomy via sternocleidomastoid muscle posteroinferior approach (ETSPIA). This study is a retrospective case-control analysis aimed at evaluating the surgical outcomes of ETSPIA in comparison to transoral endoscopic thyroidectomy vestibular approach (TOETVA). We present this article in accordance with the TREND reporting checklist (available at <https://gs.amegroups.com/article/view/10.21037/gS-24-48/rc>).

## Methods

### Patients

Utilizing propensity score matching (PSM) based on age, gender, and tumor T stage, a retrospective analysis was conducted on 100 patients diagnosed with papillary thyroid cancer (PTC). This cohort comprised 50 patients who underwent ETSPIA from November 2022 to September 2023 and an equal number who received the TOETVA from January 2019 to February 2022. These patients were treated at the Thyroid Head and Neck Surgery Department of Beijing Tongren Hospital, Capital Medical University. The patient cohort, selected based on general health status and absence of significant comorbidities, primarily presented with thyroid nodules identified during routine physical examinations. Preliminary ultrasonography in these cases indicated a suspicion of malignancy. During the operation, intraoperative neurophysiologic monitoring (IONM) was used in both groups of patients, and the position and function of the recurrent laryngeal nerve (RLN) could be accurately detected during the operation. Each patient underwent unilateral gland lobectomy and selective neck lymph node dissection, with a subsequent diagnosis of PTC. The study meticulously recorded various parameters

### Highlight box

#### Key findings

- We innovatively proposed the endoscopic thyroidectomy via sternocleidomastoid muscle posteroinferior approach (ETSPIA), a novel minimally invasive surgical technique.

#### What is known and what is new?

- In response to evolving demands for improved postoperative aesthetics and function, and advancements in endoscopic surgery, endoscopic thyroidectomy has emerged as a significant development. There has been ongoing debate regarding whether mainstream endoscopic thyroidectomy can be classified as minimally invasive surgery.
- The ETSPIA is characterized by a shorter operative route, enhanced protection of the parathyroid glands and recurrent laryngeal nerve, reduced trauma, and expedited postoperative recovery.

#### What is the implication, and what should change now?

- The ETSPIA maximizes postoperative aesthetic and comfort outcomes and shows promise for broader application in thyroid surgery.

including clinical characteristics, operative duration, blood loss, postoperative alterations in parathyroid hormone (PTH) and serum calcium, recovery post-surgery, complications, and follow-up data.

Inclusion criteria for ETSPIA patients were as follows: (I) preoperative imaging indicating the maximum diameter of thyroid nodules  $\leq 4$  cm; (II) absence of extrathyroidal invasion; (III) enlarged lymph nodes with a maximum diameter of  $\leq 2$  cm, not exhibiting conglomeration or fixation. Conversely, exclusion criteria for ETSPIA encompassed: (I) nodules located in the thyroid isthmus; (II) abnormal preoperative thyroid function or concurrent thyroid endocrine disorders; (III) comorbid conditions precluding the patient's tolerance for general anesthesia surgery.

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This retrospective study was approved by the Beijing Tongren Hospital Ethics Committee (No. TREC2023-xjs07) and individual consent for this retrospective analysis was waived due to retrospective nature.

### *Operative procedure*

(I) Positioning and incision technique: the patient is positioned supine, with the head centrally aligned. An incision, approximately 3.5 to 4.5 cm in length, is made subdermally and parallel to the striae, commencing 1 cm posterior to the sternocleidomastoid muscle's posterior margin. This approach ensures the meticulous dissection and preservation of the transverse cervical nerve, greater auricular nerve, accessory nerve, lesser occipital nerve, and the external jugular vein. A protective sheath is employed to safeguard the incision site. (II) Formation of the operative cavity without gas: dissection is carried out along the posterior margin of the sternocleidomastoid muscle, extending inferiorly to the clavicular head attachment and superiorly to the juncture of the digastric muscle's posterior belly and its middle tendon. Medially, dissection proceeds to the omohyoid muscle's superior belly. The sternocleidomastoid muscle, along with the omohyoid muscle and the lateral boundary of the carotid triangle, is elevated using a surgical retractor. (III) Thyroid gland exposure: complete dissection of the omohyoid muscle is performed, placing a retractor beneath it to reveal the lateral edge of the sternothyroid muscle. The approach to the muscle is contingent upon whether a preoperative biopsy was performed, preserving the hypoglossal nerve

loop and its muscular branches. (IV) Glandular excision: the upper pole vessels of the thyroid are dissected and ligated. This process facilitates the exposure and preservation of the superior parathyroid glands and the RLN. Subsequently, the thyroid's middle vein, inferior artery and vein, and the isthmus are sequentially transected. (V) Central lymph node dissection: the lymph nodes in the VIA area can be concurrently excised with the thyroid glands. This is followed by the systematic dissection of the prelaryngeal, pretracheal, and VIB area lymph nodes. (VI) Cervical lymph node dissection: the necessity and extent of cervical lymph node dissection are determined based on preoperative ultrasonographic findings and intraoperative frozen section analysis. (VII) Closure and drainage of the incision: this step involves precise suturing of the incision and the placement of drainage to ensure postoperative fluid evacuation. The surgical procedures are depicted in *Figure 1*.

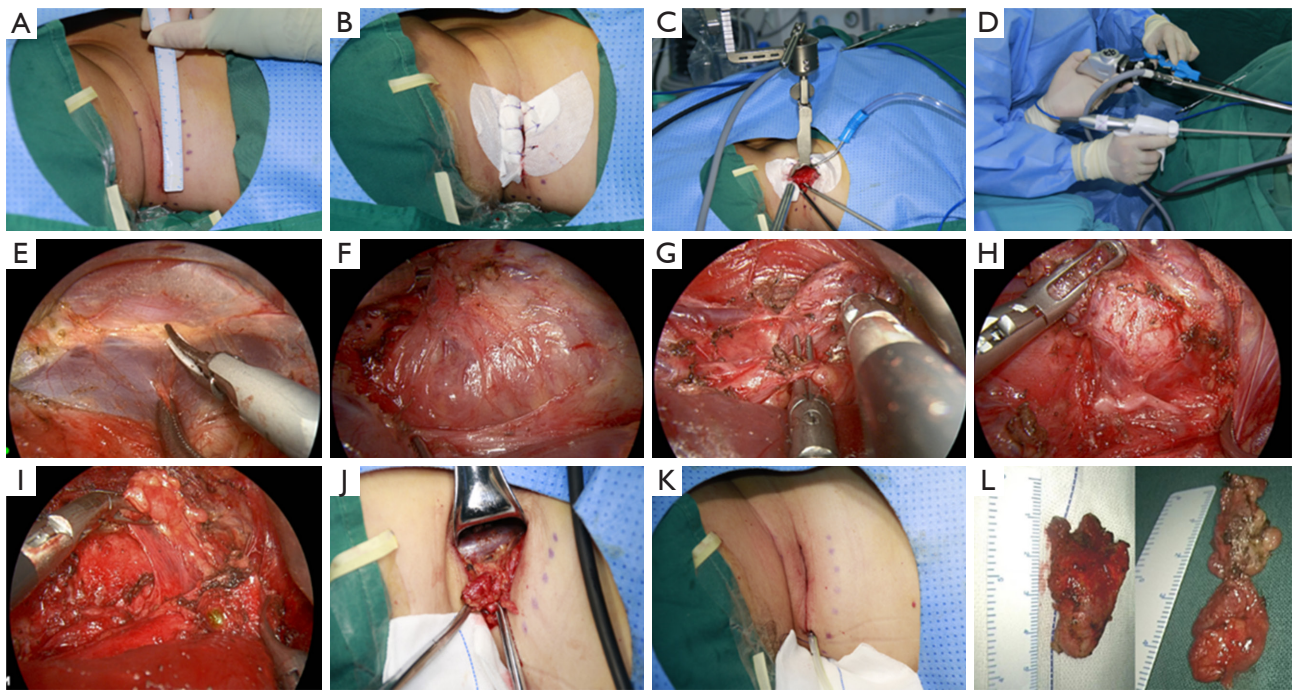
### *Statistical analysis*

Continuous variables were reported as mean  $\pm$  standard deviation, Mann-Whitney *U* test and independent *t*-test were used for comparison of continuous variables between groups. Count data were expressed as composition ratios, and Chi-squared test was used between groups. Statistical analysis was performed by SPSS 26.0 (IBM Corp., Armonk, NY, USA).  $P < 0.05$  was considered to be significant.

## **Results**

The clinical and pathological characteristics of all patients are summarized in *Table 1*. We matched the variables of both groups strictly by gender, age, and tumor T stage. No significant differences were found in preoperative cytological puncture, tumor location, number of tumors, tumor's maximum diameter, and its relationship with the capsule. All patients in the ETSPIA group underwent lateral cervical lymph node dissection. Postoperative pathology revealed a significant difference in N stage pathological diagnosis between the two groups ( $P = 0.001$ ).

Perioperative data are presented in *Table 2*. Statistical differences were observed between the groups in operation time, intraoperative blood loss, number of central lymph nodes dissected, length of stay (LOS), and changes in PTH levels 1 day and 1 month after surgery. The ETSPIA group had a shorter operation time compared to the TOETVA group ( $243.40 \pm 58.67$  vs.  $278.08 \pm 78.50$  min;  $P = 0.01$ ). The ETSPIA group also had less intraoperative blood loss than



**Figure 1** Surgical procedures. (A) Incision design; (B) incision protection; (C) supporting system; (D) assistant cooperation; (E) isolate the posterior edge of the sternocleidomastoid muscle; (F) expose thyroid; (G) preserve parathyroid glands and blood supply; (H) dissecting the RLN; (I) dissection of level VI lymph nodes and protection of parathyroid glands (indocyanine green fluorescence imaging); (J) dissection of lateral cervical lymph nodes under direct vision; (K) place drainage; (L) thyroid lobe and level VI lymph nodes. The images are published with the patient's consent. RLN, recurrent laryngeal nerve.

the TOETVA group ( $20.60 \pm 10.58$  vs.  $33.00 \pm 11.11$  mL;  $P < 0.001$ ). More central lymph nodes were dissected in the ETSPiA group compared to the TOETVA group ( $5.90 \pm 4.72$  vs.  $3.36 \pm 2.80$ ;  $P = 0.002$ ). However, the difference in the number of positive central lymph nodes dissected was not statistically significant ( $1.38 \pm 2.33$  for ETSPiA vs.  $0.94 \pm 1.39$  for TOETVA;  $P = 0.26$ ). The ETSPiA group had a shorter LOS compared to the TOETVA group ( $6.82 \pm 2.02$  vs.  $8.26 \pm 2.72$  days;  $P = 0.003$ ). The alteration in PTH levels 1 day after surgery was less pronounced in the ETSPiA group compared to the TOETVA group ( $-26.38\% \pm 18.43\%$  vs.  $-35.75\% \pm 22.95\%$ ;  $P = 0.04$ ). At the 1-month postoperative mark, the ETSPiA group showed a marginal increase in PTH levels, whereas the TOETVA group exhibited a slight decrease ( $10.12\% \pm 35.43\%$  vs.  $-11.53\% \pm 29.51\%$ ;  $P = 0.03$ ). Regarding the average percentage change in serum calcium 1 day after surgery, the ETSPiA group showed a smaller change, though this difference was not statistically significant ( $-4.79\% \pm 5.47\%$  vs.  $-5.66\% \pm 3.90\%$ ;  $P = 0.40$ ). One patient in the TOETVA group developed numbness in his hands and feet after surgery. This

symptomatology resolved following the administration of an intravenous calcium chloride solution. Conversely, none of the participants in the ETSPiA group reported similar symptoms postoperatively. Additionally, laryngoscopy was conducted on all patients prior to the surgery. There was an absence of abnormal vocal cord function observed in both groups. The incidence of hoarseness attributable to transient RLN injury in postoperative patients was lower in the ETSPiA group compared to the TOETVA group, but this difference did not reach statistical significance ( $0\%$  vs.  $4\%$ ;  $P = 0.15$ ). After the operation, we re-examined the laryngoscope on the patient with hoarseness. The examination showed that the patient's vocal cord activity was normal. It is hypothesized that the transient hoarseness could have been attributed to mechanical traction or compression of the RLN during surgery. Notably, the symptoms resolved within 3 months.

## Discussion

Surgical resection remains the primary therapeutic modality

**Table 1** Clinical characteristics and pathologic features of the patients

Variables	ETSPIA (n=50)	TOETVA (n=50)	P value
Age (years)	37.62±8.60	36.56±7.39	0.51
Sex			>0.99
Male	7 [14]	7 [14]	
Female	43 [86]	43 [86]	
Thyroid cytology			0.059
Yes	37 [74]	28 [56]	
No	13 [26]	22 [44]	
T stage			0.53
T1a	39 [78]	39 [78]	
T1b	10 [20]	8 [16]	
T2	1 [2]	1 [2]	
T3a	0	0	
T3b	0	2 [4]	
N stage			0.001
N0	24 [48]	29 [58]	
N1a	13 [26]	21 [42]	
N1b	13 [26]	0	
Tumor location			>0.99
Left	27 [54]	27 [54]	
Right	23 [46]	23 [46]	
Tumor number			0.06
Single	38 [24]	45 [90]	
Multiple	12 [76]	5 [10]	
Tumor diameter, cm	0.72±0.40	0.79±0.41	0.29
Tumor-capsule relationship			0.08
Not invaded	11 [22]	23 [46]	
Nearby	8 [16]	6 [12]	
Invaded	24 [48]	15 [30]	
Penetration	7 [14]	6 [12]	

Data are presented as mean ± standard deviation or n [%]. ETSPIA, endoscopic thyroidectomy via sternocleidomastoid muscle posteroinferior approach; TOETVA, transoral endoscopic thyroidectomy vestibular approach.

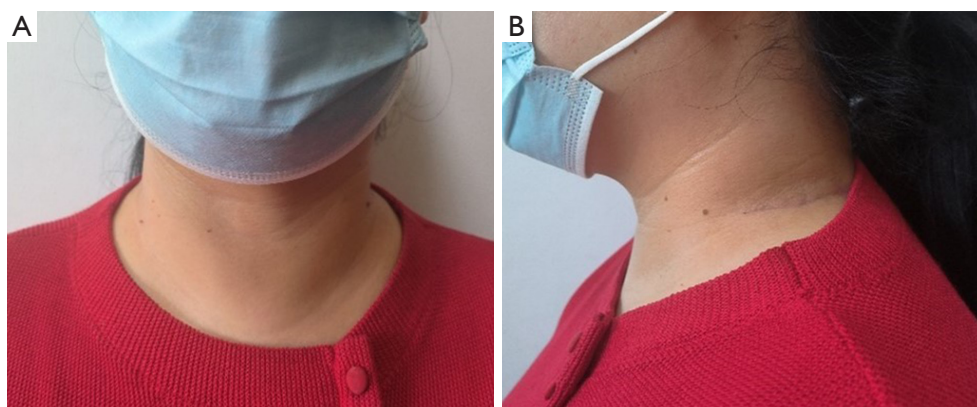
two decades, endoscopic thyroidectomy has evolved to effectively treat tumors while prioritizing postoperative aesthetic and comfort considerations, gaining increasing acceptance among surgeons and patients. Current sophisticated endoscopic thyroid techniques encompass transoral, transaxillary, retroauricular, transthoracic, and subclavian approaches, with ongoing enhancements and explorations in surgical methodologies. These endoscopic thyroidectomy approaches have varying degrees of cosmetic results, such as TOETVA and transaxillary approach offer a scar-free aesthetic outcome (9). However, these methods involve opening the superficial layer of the deep cervical fascia, which may result in nerve damage and postoperative anterior cervical adhesions among tissue layers, causing functional post-thyroidectomy syndrome (10). Symptoms include pressure, numbness, pinprick sensation in the surgical area, discomfort in swallowing, and a pulling sensation (11). In our study of 50 cases underwent TOETVA, 14% (n=7) showed symptoms of mandibular or labial hypoesthesia after surgery. Additionally, the limited space available in TOETVA and transaxillary approach make it challenging to thoroughly dissect cervical lymph nodes (12). These techniques are also characterized by an elongated surgical pathway and the creation of larger wounds, leading to substantial trauma (13). Such trauma does not offer any protective advantage to the parathyroid gland or the RLN. Therefore, we have introduced a novel and authentically minimally invasive endoscopic approach of thyroidectomy—ETSPIA.

ETSPIA leverages a posterior-inferior approach to the thyroid surgical area via the tissue gap deep to the strap muscle, circumventing the need to incise the white line and anterior cervical strap muscles. Embodying the new concept in endoscopic surgery through natural tissue cavities of the human body, this technique significantly reduces tissue layer adhesions in the anterior neck region and avoids damage to the transverse cervical nerve, thereby markedly diminishing postoperative neck discomfort. ETSPIA enables intuitive operation and delivers a comprehensive view of the surgical area. It ensures direct access to the thyroid gland's posterolateral capsule and improves endoscopic visibility of key structures such as the laryngeal recurrent nerves, thyroid suspensory ligament,

**Table 2** Perioperative characteristics of the patients

Variables	ETSPIA (n=50)	TOETVA (n=50)	P value
Operative time (min)	243.40±58.67	278.08±78.50	0.01
Blood loss (mL)	20.60±10.58	33.00±11.11	<0.001
Number of lymph nodes dissected in the central zone	5.90±4.72	3.36±2.80	0.002
Number of positive lymph nodes in the central zone	1.38±2.33	0.94±1.39	0.26
Length of stay (days)	6.82±2.02	8.26±2.72	0.003
Percentage change in PTH 1 day post-surgery (%)	-26.38±18.43	-35.75±22.95	0.04
Percentage change in PTH 1 month post-surgery (%)	10.12±35.43	-11.53±29.51	0.03
Percentage change in serum calcium 1 day post-surgery (%)	-4.79±5.47	-5.66±3.90	0.40
Transient RLN palsy	0	2 [4]	0.15

Data are presented as mean ± standard deviation or n [%]. ETSPIA, endoscopic thyroidectomy via sternocleidomastoid muscle posteroinferior approach; TOETVA, transoral endoscopic thyroidectomy vestibular approach; PTH, parathyroid hormone; RLN, recurrent laryngeal nerve.

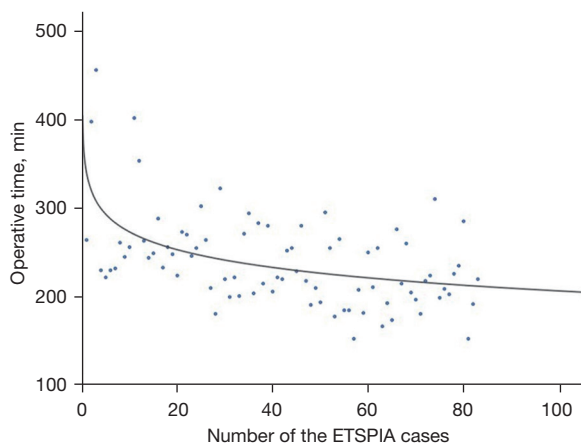


**Figure 2** After 3 months of ETSPIA, the incision cannot be seen from the front, and the lateral incision is concealed. The images are published with the patient's consent. ETSPIA, endoscopic thyroidectomy via sternocleidomastoid muscle posteroinferior approach.

for differentiated thyroid cancer. Classical thyroidectomy techniques, such as the anterior cervical striae incision and the cervical white line approach, are well-established. However, traditional anterior cervical incisions leave visible scars. Even with the adoption of lower-neck arcuate incisions, conspicuous scarring is a common outcome. Postoperative complications, such as tissue bulging above the incision due to the underlying suprasternal fat pad, can exacerbate scar hypertrophy (5). Additionally, the conventional cervical white line approach, involving dissection through layers like the anterior cervical strap muscles, can result in adhesions and scar hypertrophy. This, in turn, may impair swallowing and neck mobility,

with reports indicating incidences of neck discomfort and pressure sensations of 22.6% at 3 months and 7.6% at 6 months (6). Therefore, although the traditional midline cervical incision offers expediency and accessibility, its resultant visible scarring and associated long-term discomfort significantly affect patients' postoperative quality of life.

In response to evolving demands for improved postoperative aesthetics and function, and advancements in endoscopic surgery, endoscopic thyroidectomy has emerged as a significant development. Gagner (7) first introduced endoscopic parathyroid surgery in 1996, and Hüscher *et al.* (8) reported endoscopic thyroidectomy in 1997. Over



**Figure 3** Logarithmic fitting curve of operation sequence time. The surgeon performed a total of 84 operations, and the total operation time showed a downward trend as the number of cases increased ( $P < 0.001$ ). ETSPIA, endoscopic thyroidectomy via sternocleidomastoid muscle posteroinferior approach.

and superior thyroid artery. Consequently, this enhances the precision of surgical interventions and minimizes the risk of damage to these structures. This study demonstrates that, in comparison to the TOETVA group, patients undergoing the ETSPIA did not experience postoperative complications such as hoarseness from transient RLN injury. The ETSPIA incision, located within the skin striae on the neck's lateral aspect, experiences less tension and more uniform fat distribution. This promotes superior wound healing compared to the anterior midline neck approach. Furthermore, hiding the incision under the collar improves its cosmetic appeal after surgery (Figure 2). Compared with transoral, transaxillary, and retroauricular endoscopic thyroidectomy, ETSPIA is characterized by a shorter pathway, reduced tissue trauma, and rapid access to the surgical site without extensive subcutaneous tissue dissection, exemplifying a truly minimally invasive surgical technique. Initially, longer operation times were observed in the early stages of implementing the cervical approach, potentially linked to the learning curve associated with surgical procedures and instrument handling. An analysis of 83 consecutive cases from November 2022 to September 2023 revealed a progressive decrease in operation time, as depicted in Figure 3. With the refinement of surgical techniques and the use of specialized endoscopic equipment, operation durations have been reduced to approximately 2.5 to 3 hours, with a future goal of under 2 hours, aligning with the duration of conventional open thyroid surgery.

Both the ETSPIA and TOETVA groups in this study were treated by senior chief physicians with similar surgical practices within the same department. Compared to TOETVA, ETSPIA offers reduced operative and anesthesia times, thereby decreasing anesthesia-related risks and expediting postoperative recovery.

The protection of parathyroid glands and their blood supply constitutes a critical aspect of thyroidectomy (14). In clinical practice, there is a tendency among some practitioners to prioritize lymph node dissection, ignoring the protection of parathyroid glands, leading to temporary or permanent hypoparathyroidism, and subsequent hypocalcemia. Previous studies have scarcely reported on the postoperative parathyroid function following endoscopic thyroidectomy. The data from this study indicate that, in comparison with the TOETVA cohort, the PTH levels on the first postoperative day in the ETSPIA group exhibited a decrease from preoperative levels ( $-26.38\% \pm 18.43\%$ ), with an increase observed 1 month postoperatively ( $10.12\% \pm 35.43\%$ ). Specifically, 37 patients experienced a transient reduction in PTH 1 day post-surgery, likely due to surgical trauma. Conversely, a marginal increase in PTH was noted on the first postoperative day in a few patients, with no significant change in the remaining cases. At the 1-month postoperative mark, 10 patients presented with a slight decline in PTH, whereas 21 patients showed an increase. Notably, in six of these patients, the PTH variation was nearly double the preoperative values. It is hypothesized that this direct and intuitive operative approach significantly contributes to this outcome. The direct opposite positioning of the parathyroid glands in relation to the operator's field of view and the clarity of anatomical structures enhance precise identification and dissection of the glands. Consequently, ETSPIA facilitates a more meticulous protection of the parathyroid glands, effectively reducing the incidence of inadvertent glandular damage and thus preserving parathyroid function more effectively.

PTC is notably predisposed to lymph node metastasis. Research has demonstrated that in PTC patients with a preoperative clinical evaluation of cN0, the incidence of central cervical lymph node metastasis ranges from 30% to 80% (15), while lateral cervical lymph node metastasis occurs in approximately 18.6% to 64% of case (16-18). In endoscopic thyroidectomy such as transoral or transaxillary approaches, lateral neck lymph node dissection is typically feasible only through auxiliary or extended incisions, contradicting aesthetic surgical principles and augmenting

surgical trauma. The incision in the ETSPiA is strategically located in the lateral neck area, enabling direct dissection of metastatic lymph nodes in the lateral neck under direct vision and obviating the need for extended incisions. This can not only significantly eradicate tumors but also adhere to aesthetic principles. Lateral cervical sentinel lymph nodes were routinely dissected in the ETSPiA. Among the 50 patients in the ETSPiA group, there were nine cases that exhibited no preoperative ultrasound evidence of cervical lymph node metastasis. However, intraoperative frozen biopsies of lateral cervical sentinel lymph nodes yielded positive results. Consequently, a comprehensive dissection of cervical lymph nodes at levels II–IV was conducted to identify hidden metastases, thereby circumventing the need for subsequent surgery due to recurrent PTC. Lymph node metastasis in the lateral neck region of PTC predominantly occurs in areas III and IV on the affected side, followed by areas II and V, with area I being less commonly affected. For lateral neck lymph node dissection in PTC, therapeutic dissection is recommended, entailing preoperative evaluation or intraoperative surgical assessment. For mid-operative confirmed lateral neck lymph node treatment, the recommended dissection scope includes areas II, III, IV, and VB, with the minimum range being areas IIA, III, and IV (2). However, the precise extent of lateral neck lymphadenectomy remains a topic of debate, with ongoing research needed to balance minimizing tumor residue or recurrence against reducing unnecessary surgical trauma. Contrasted with previous reports of the anterior edge of the sternocleidomastoid muscle and intermuscular approach, ETSPiA provides superior exposure of the central lymph nodes without compromising the integrity of the sternocleidomastoid muscle. Our study highlights that the number of lymph nodes dissected in the central zone is significantly higher in the ETSPiA group compared to the TOETVA group ( $5.90 \pm 4.72$  vs.  $3.36 \pm 2.80$ ;  $P=0.002$ ). However, there is no significant difference in positive central zone lymph nodes between the two groups ( $1.38 \pm 2.33$  vs.  $0.94 \pm 1.39$ ;  $P=0.26$ ). This finding corroborates the advantage of the ETSPiA in central lymph node dissection relative to the TOETVA.

The 2018 edition of the guidelines by the Japanese Society of Endocrine Surgery clearly states that treatment should be tailored and risk-stratified for each patient. The guidelines facilitate the exploration of the neck's side due to the ETSPiA. Despite the presence of lymph node metastasis in this area, the average number of positive

cervical lymph nodes per case was only 0.7, with no other high-risk factors noted. Following these guidelines, our research group conducted unilateral gland resection, along with prelaryngeal, pretracheal, and ipsilateral cervical lymph node dissection, and maintained close postoperative follow-up. Among the patients included in this study, no contralateral gland mass or suspicious lymph nodes in the contralateral cervical region were found in preoperative imaging evaluation, and among the patients with cervical lymph node metastasis, the maximum number of lymph node metastases in the cervical region did not exceed five. According to the 2015 American Thyroid Association (ATA) guidelines, patients exhibiting such minimal nodal involvement do not require postoperative  $^{131}\text{I}$  therapy. Therefore, we performed individualized unilateral lobectomy on the patient.

Nonetheless, in comparison to established endoscopic surgical techniques such as the anterior cervical, transaxillary, and transoral approaches, the ETSPiA presents specific technical challenges and limitations: (I) the ETSPiA is predominantly applicable for unilateral thyroid and cervical lymph node pathologies. Bilateral lesions necessitate either dual cervical incisions or alternative surgical methods; (II) in instances of substantial tumor volume or enlarged thyroid gland lobes, the confined operative space can substantially elevate the complexity of the procedure, mandating thorough preoperative evaluation; (III) the surgical route traverses the interval between the deep surface of the sternocleidomastoid muscle and the carotid sheath, posing a potential risk of injury to the carotid sheath and the hypoglossal nerve loop.

This investigation is a single-center retrospective study and is subject to limitations such as a small sample size, its retrospective nature, and a brief duration of follow-up. Future endeavors aim to expand the case cohort and extend the follow-up period. This expansion will facilitate a more comprehensive comparison between open surgery, various endoscopic thyroidectomy, and their efficacy in treating PTC.

## Conclusions

We have pioneered the application of ETSPiA, employing natural tissue planes to achieve radical resection of thyroid cancer while preserving parathyroid gland function and facilitating lateral neck dissection. This approach maximizes postoperative aesthetic and comfort outcomes and shows promise for broader application in thyroid surgery.



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## Footnote

*Reporting Checklist:* The authors have completed the TREND reporting checklist. Available at <https://gs.amegroups.com/article/view/10.21037/gS-24-48/rc>

*Data Sharing Statement:* Available at <https://gs.amegroups.com/article/view/10.21037/gS-24-48/dss>

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*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at <https://gs.amegroups.com/article/view/10.21037/gS-24-48/coif>). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This retrospective study was approved by the Beijing Tongren Hospital Ethics Committee (No. TREC2023-xjs07) and individual consent for this retrospective analysis was waived due to retrospective nature.

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