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Gasless Trans-Subclavian Endoscopic Thyroidectomy versus Conventional Open Thyroidectomy for Unilateral Papillary Thyroid Carcinoma: A Narrative Review

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Abstract

Unilateral papillary thyroid carcinoma (PTC) is often treated by lobectomy, sometimes together with central compartment lymph-node dissection when clinically indicated. Conventional open thyroidectomy (COT) remains the standard operation because it offers direct exposure and can be applied across a wide range of clinical situations. Its visible neck scar and postoperative cervical discomfort, however, matter to some patients. Endoscopic thyroidectomy (ET) moves the incision away from the anterior neck, but the term covers several distinct access routes whose results are not necessarily interchangeable. This narrative review examines ET in comparison with COT for unilateral PTC and focuses on gasless endoscopic thyroidectomy through the trans-subclavian approach (GETTSA). PubMed and official publisher websites were searched on June 22, 2026. Evidence specific to GETTSA remains limited, although recent retrospective comparisons and one randomized trial against the transaxillary route have added useful data. In carefully selected patients with unilateral cN0 disease or limited central-compartment involvement, short-term complication and nodal outcomes appear broadly similar to those reported after COT. The clearest advantage is concealment of the neck scar and the associated improvement in cosmetic satisfaction. GETTSA generally requires more operating time than open surgery, while differences in blood loss, drainage, length of stay, and transient hypoparathyroidism are inconsistent across studies. Direct comparisons with COT also suggest better scar-related and swallowing-related patient-reported outcomes, but they do not demon-

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strate oncologic superiority or long-term non-inferiority. On current evidence, GETTSA is best regarded as an option for selected patients in experienced centers, not as a replacement for open thyroidectomy.

Keywords

Papillary Thyroid Carcinoma, Endoscopic Thyroidectomy, Open Thyroidectomy, Trans-Subclavian Approach, Gasless Thyroidectomy, Quality of Life

1. Introduction

Papillary thyroid carcinoma is the predominant form of differentiated thyroid cancer. In patients with unilateral disease who are suitable for lobectomy, the surgeon must remove the tumor while protecting the recurrent laryngeal nerve (RLN), preserving parathyroid function, and achieving appropriate control of regional lymph nodes. Decisions about the extent of thyroid resection and central compartment dissection should follow the biological risk of the tumor, the nodal findings, preoperative imaging, and the likely need for postoperative therapy. The location of the incision should not determine the oncologic plan [1] [2].

COT is familiar to most thyroid surgeons and provides straightforward access to the thyroid gland, central neck, and surrounding structures. Its main disadvantages are not usually related to tumor clearance, but to the patient's postoperative experience. A cervical scar remains visible, and some patients report tightness, numbness, or dissatisfaction with the appearance of the neck. ET was developed partly in response to these concerns. It includes transaxillary, breast or areolar, transoral vestibular, and trans-subclavian techniques. Because these routes differ in working distance, flap dissection, use of carbon dioxide, and central-neck exposure, their outcomes should be interpreted separately rather than combined under a single label [3]-[8].

The trans-subclavian technique uses an incision below the clavicle and a mechanical lifting device to maintain a gasless working space. The route is shorter than several other remote-access approaches and gives a relatively direct path to one thyroid lobe and the ipsilateral central compartment. It also avoids an anterior cervical incision. Even so, the published experience is much smaller than that for transaxillary, areolar, or transoral surgery. This review therefore separates evidence that directly compares GETTSA with COT from broader findings on ET and aims to define where GETTSA can reasonably fit in the treatment of unilateral PTC.

2. Scope and Literature Identification

This article is a structured narrative review, not a systematic review or meta-analysis. We searched PubMed and official journal websites on June 22, 2026.

Search terms included combinations of "papillary thyroid carcinoma," "unilateral," "endoscopic thyroidectomy," "open thyroidectomy," "trans-subclavian," "subclavian," "gasless," "transaxillary," "areola," "transoral," "quality of life," and "central neck dissection." We first considered guidelines, followed by direct GETTSA-versus-COT studies, comparisons between GETTSA and other endoscopic routes, and systematic reviews or representative comparative studies that could place the route-specific evidence in context. Studies restricted to benign thyroid disease, robotic procedures alone, or extensive lateral-neck disease were not used as the main basis for conclusions about unilateral PTC. The aim was a focused clinical synthesis rather than an exhaustive search of every publication.

After duplicate records were removed, 150 titles and abstracts were reviewed. Twenty-one publications were retained for the final synthesis: three guidelines or consensus documents, two direct GETTSA-versus-COT cohorts, three studies comparing GETTSA with other access routes, and thirteen reports that provided broader context on ET or quality of life.

Eligible evidence included peer-reviewed guidelines, systematic reviews, randomized trials, and comparative cohorts involving adults with unilateral PTC broadly corresponding to cT1-cT2 disease. The principal comparison was limited to patients without gross extrathyroidal extension or clinically evident lateral-neck metastasis and for whom lobectomy with isthmusectomy, with or without an equivalent central compartment dissection, was an appropriate operation [1] [2]. Studies centered on benign disease, robotic surgery only, total thyroidectomy, extensive lateral dissection, gross invasion, or a previously operated or irradiated neck were excluded from this comparison. Recovery and functional outcomes were considered only when follow-up reached at least 3 months. Claims concerning recurrence or oncologic durability were drawn only from reports with at least 12 months of follow-up.

3. Clinical Prerequisites for a Meaningful Comparison

3.1. Disease Selection and Operative Extent

In this review, cN0 refers to the absence of suspicious regional lymph nodes on clinical and radiologic assessment, with no cytologic or imaging confirmation of nodal metastasis. "Limited central-compartment disease" refers to small-volume, non-bulky disease confined to level VI and, when a study explicitly included it, the upper part of level VII. Such disease had to be resectable through the same planned unilateral or ipsilateral central dissection in both treatment groups. Fixed or bulky nodes, extranodal extension, and cN1b lateral-neck disease were not included in this definition [1] [2].

A fair comparison between ET and COT requires both groups to be candidates for the same oncologic procedure. In practice, this generally means unilateral PTC that can be treated by lobectomy and isthmusectomy, with ipsilateral central compartment dissection added only when indicated. Open surgery is usually more ap-

propriate when there is gross extrathyroidal extension, clinically apparent lateral-neck metastasis, invasion of the trachea, esophagus, major vessels, or RLN, or marked scarring from previous surgery or radiotherapy. It is also preferable when the surgeon expects that rapid exposure or a change in operative strategy may be necessary [1] [2].

Management of the cN0 central compartment is not identical for every patient. Therapeutic dissection is required when central nodal disease is clinically involved, whereas prophylactic dissection depends on tumor features, the surgeon's judgment, and local practice. Comparative studies should therefore state clearly whether the dissection was therapeutic or prophylactic, unilateral or bilateral, and whether the same indication was applied to both groups. A higher lymph-node count, by itself, does not prove more complete cancer surgery when these details are missing.

3.2. Sources of Selection Bias

Patients who choose ET are often younger, female, leaner, and more concerned about scar appearance. They may also have smaller tumors and more favorable neck anatomy than patients undergoing COT. Each of these differences can influence technical difficulty, recovery, and willingness to accept a longer operation. Propensity score matching can reduce measured imbalance, but it cannot correct for preferences, anatomy, or other unrecorded factors. The strongest observational comparisons are therefore those conducted after the surgical team has passed its learning phase, with similar disease extent and prospectively defined outcomes in both groups [3]-[8].

4. Technical Characteristics of the Approaches

COT is performed through a low transverse neck incision and provides direct visualization of the thyroid, parathyroid glands, RLN, and central compartment. The working distance is short, and the exposure can be extended quickly when bleeding, anatomical variation, or unexpected invasion is encountered. The trade-off is a visible cervical scar and the possibility of local symptoms related to skin-flap elevation and strap-muscle dissection.

Remote-access ET places the incision outside the anterior neck. Transaxillary and breast or areolar approaches hide the scar but usually require a longer working tunnel and, in some techniques, a wide subcutaneous flap. The transoral vestibular route leaves no visible skin scar, yet it enters through the oral vestibule and has different limitations regarding working space, infection risk, and specimen extraction. These route-specific features make it misleading to discuss all forms of ET as though they were the same operation [8]-[14].

GETTSA creates a gasless operative cavity through an infraclavicular incision supported by a suspension system. Several recent reports suggest that the path to the central compartment is shorter and more direct than with the transaxillary route, with less dissection across the anterior chest. In a randomized

trial of 160 patients with cN0 PTC, GETTSA was associated with a shorter operation and a higher rate of complete central-compartment exposure than gasless transaxillary ET [6]. This trial compared two endoscopic methods, however, and cannot be used alone to claim equivalence between GETTSA and open surgery. Table 1 summarizes the practical differences among the approaches.

Table 1. Practical comparison of conventional open surgery and representative endoscopic access routes for unilateral PTC.

Approach	Potential strengths	Important limitations	Most defensible role
Conventional open thyroidectomy	Direct exposure; versatile; short working distance; rapid conversion of plan if invasion or bleeding is encountered.	Visible anterior neck scar; potential neck tightness, altered sensation, and scar-related distress.	Reference approach for broad disease spectrum, suspected invasion, extensive nodal disease, or limited endoscopic expertise.
Transaxillary/ areolar ET	Concealed scar; established comparative literature; favorable cosmetic satisfaction in selected patients.	Longer corridor; broader flap dissection; operative time often longer; route-specific chest/shoulder symptoms may occur.	Selected low-risk unilateral disease in experienced centers.
Transoral vestibular ET	No cutaneous neck scar; midline access.	Oral vestibular entry; limited space; different infection, extraction, and mental-nerve considerations.	Highly selected patients in specialized teams.
Gasless trans-subclavian ET	Concealed infraclavicular scar; gasless field; relatively direct unilateral/ central-compartment corridor; may reduce chest-wall dissection compared with axillary access.	Evidence base remains small; learning curve; infra-clavicular scar is not truly scarless; no established long-term oncologic non-inferiority data.	Selective alternative for low-risk unilateral PTC when a trained team can provide the same planned oncologic operation as COT.

Surgeon Experience and Learning Curve

Outcomes after GETTSA depend heavily on the experience of the surgeon and the operating team. Compared with COT, the technique introduces several unfamiliar steps, including creation of the flap, placement of the suspension device, endoscopic instrument handling, and a lateral-to-medial view of the central neck. Early in adoption, longer procedures, variable lymph-node yields, or complications may reflect the learning process as much as the access route. Reports should therefore describe previous open and endoscopic case volume, case sequence, supervision, conversion, team stability, and whether patients were treated after the learning curve had stabilized. Because most published series come from high-volume single centers, their results should not be assumed to transfer directly to a new program [3]-[7].

5. Comparative Outcomes

The following outcome sections distinguish three levels of evidence. The first consists of direct comparisons between GETTSA and COT [3] [4]. The second includes studies comparing GETTSA with another endoscopic route [5]-[7]; these clarify technical differences but do not establish equivalence with open surgery. The third is the broader ET literature [8]-[20], which is useful for context but only

indirectly informs the trans-subclavian approach. Conclusions about GETTSA versus COT are based mainly on the direct evidence.

5.1. Operative Time, Blood Loss, and Drainage

Matched comparisons consistently show that GETTSA takes longer than COT. The operation may nevertheless be quicker than transaxillary ET because the subclavian route is shorter and provides a more favorable angle toward the central compartment. That observation comes from comparisons between endoscopic routes and should not be interpreted as evidence that GETTSA is as fast as open surgery [3] [5] [6].

Some ET series report less blood loss, although the clinical meaning of this difference is uncertain. Magnified vision and ultrasonic instruments may improve hemostasis, but blood loss is difficult to measure accurately when volumes are small, and the devices used in the two groups may differ. Meta-analyses of areolar and other total endoscopic procedures generally found longer operating times and modestly lower measured blood loss, while findings for drainage and hospital stay varied considerably [9]-[12]. These variables are better regarded as perioperative process measures than as proof that one route causes less tissue injury in every patient.

5.2. Central-Compartment Lymph-Node Assessment

In the 2026 propensity-matched study, GETTSA yielded more central lymph nodes than COT, but the number of metastatic nodes was similar [3]. This finding suggests that central-neck access can be adequate in experienced hands; it does not show superior cancer clearance. Broader ET studies also report comparable numbers of retrieved and positive nodes in selected patients, although those data come from different routes and are only indirectly applicable to GETTSA [8]-[13] [17]. Node counts vary with the extent of dissection, pathological processing, the definition of lymphatic tissue, and whether level VII is included.

5.3. RLN and Parathyroid Safety

Direct safety evidence for the RLN and parathyroid glands is still based mainly on short-term retrospective cohorts. After matching or adjustment, these studies did not identify a clear difference in transient vocal-cord paralysis or major permanent complications between GETTSA and COT [3] [4]. Similar short-term complication rates have also been described for other endoscopic routes, but those results cannot be transferred automatically to GETTSA [8]-[18]. A non-significant comparison is not proof of identical risk, especially because permanent nerve injury and permanent hypoparathyroidism are uncommon and most studies are too small to evaluate them reliably. Meaningful reporting requires postoperative laryngoscopy, explicit biochemical definitions of hypocalcemia, and documentation of inadvertent parathyroid removal and auto-

transplantation.

Endoscopic magnification may make small structures easier to see, but it does not eliminate injury from traction, thermal spread, or restricted instrument angles. In one matched comparison, transient vocal-cord paralysis was similar in the two groups, whereas the frequency of parathyroid autotransplantation differed; the investigators therefore highlighted parathyroid preservation as an important technical issue [3]. The available evidence supports the feasibility of GETTSA, but not the claim that it is inherently safer than COT for either neural or parathyroid outcomes.

5.4. Postoperative Recovery, Neck Function, and Cosmetic Outcomes

Across transaxillary, areolar, and transoral studies, ET generally produces greater satisfaction with scar location than COT [8] [12]-[19]. These findings provide useful background but are not all specific to GETTSA. The direct GETTSA-versus-COT cohorts also favored the infraclavicular approach for scar-related outcomes [3] [4]. GETTSA is not scarless: it replaces a central neck scar with an infraclavicular scar that can usually be hidden by clothing. Patients should be counseled using this more accurate description.

Patient-reported outcomes should be assessed with validated instruments rather than assumed from the position of the incision. Broader ET studies have described improvements in cosmetic satisfaction and in selected psychological or neck-related quality-of-life domains [16] [19]. The THYCA-QoL questionnaire was designed for thyroid cancer survivors and includes concerns related to scars, swallowing, voice, and other symptoms [20]. In the 2026 matched GETTSA-versus-COT cohort, the trans-subclavian group reported better thyroid cancer-specific quality of life, scar scores, and swallowing-related outcomes, while length of stay was similar [3]. These results are relevant to patient choice, but they remain susceptible to expectation bias because patients selected their operation and blinding was not possible.

After unilateral thyroid surgery, postoperative thyroid function is determined mainly by the volume and functional reserve of the remaining lobe, the presence of thyroiditis, and subsequent treatment. Current evidence does not show that the access route itself creates a sustained difference in thyroid function after an equivalent lobectomy. Studies should therefore use fixed follow-up points and explicit definitions of hypothyroidism or levothyroxine treatment. **Table 2** summarizes the studies most relevant to GETTSA and the broader evidence used for context.

Interpretive note for **Table 2**: the first two rows provide direct GETTSA-versus-COT evidence. Rows 3 - 5 mainly compare GETTSA with another endoscopic route, although row 3 also includes an open group. Rows 6 - 7 give broader ET context. Claims of oncologic equivalence between GETTSA and COT should not be based on rows 3 - 7 alone.

Table 2. Selected evidence informing the role of gasless trans-subclavian ET and contextualizing endoscopic thyroidectomy in unilateral PTC.

Study	Design/population	Comparison	Main message for this review
Yang *et al.*, 2026 [3] **DIRECT GETTSA-COT EVIDENCE**	Retrospective single-center cohort; 488 unilateral PTC cases; 164 matched pairs.	GETTSA vs COT.	GETTSA had longer operation time and better scar-, swallowing-, and THYCA-QoL-related outcomes; no difference in nodal metastases, hospital stay, or transient vocal-cord paralysis after matching.
Yin *et al.*, 2025 [4] **DIRECT GETTSA-COT EVIDENCE**	Retrospective comparative cohort; 140 unilateral PTC cases.	GETTSA vs COT.	Supports feasibility, favorable cosmetic outcomes, and less neck discomfort in selected unilateral disease; short-term design limits oncologic inference.
Li *et al.*, 2025 [5] **MIXED ROUTE COMPARISON (INCLUDES COT)**	Retrospective cohort; 151 unilateral thyroid cancer cases.	Gasless subclavian vs gasless axillary vs COT.	Subclavian access was faster than axillary ET and had favorable central exposure and cervical-function outcomes; open surgery remained fastest.
Zou *et al.*, 2026 [6] **ROUTE-COMPARISON EVIDENCE**	Prospective randomized study; 160 cN0 PTC cases.	GETTSA vs gasless transaxillary ET.	GETTSA showed shorter operating time and more complete central-compartment exposure than transaxillary ET; this is route-comparison evidence, not COT equivalence.
Wu *et al.*, 2025 [7] **ROUTE-COMPARISON EVIDENCE**	Retrospective propensity-matched study; 196 matched PTC cases.	Gasless transaxillary ET vs GETTSA.	Highlights route-specific differences and supports more direct central-compartment access with GETTSA.
Ding *et al.*, 2024 [8] **BROADER ET CONTEXT**	Retrospective cohort; 571 unilateral PTC cases.	Gasless transaxillary ET zvs areolar ET vs COT.	ET had longer operation time and higher cosmetic satisfaction; complication rates were similar across groups.
Jiang *et al.*, 2020 [9]; Yuan *et al.*, 2022 [12] **BROADER ET CONTEXT**	Systematic reviews/meta-analyses.	Total ET or areolar ET vs COT.	Across heterogeneous routes, ET usually takes longer; short-term complication and nodal outcomes are broadly comparable in selected patients, but heterogeneity is high.

6. Oncologic Safety and Interpretation of Evidence

The literature supports short-term technical feasibility and acceptable oncologic surrogate outcomes, but it does not establish long-term equivalence. In selected unilateral PTC, similar central-node yields, positive-node counts, low early recurrence rates, and no obvious excess of short-term complications are reassuring. PTC commonly follows an indolent course, however, so follow-up measured in months or only a few years cannot determine non-inferiority for structural recurrence, reoperation, or disease-specific survival. This uncertainty is especially important for GETTSA because direct comparisons with COT have appeared only recently [3]-[5].

Another difficulty is that the endoscopic and open groups may receive more than a different incision. Policies for prophylactic central dissection, carbon nanoparticle use, intraoperative nerve monitoring, parathyroid autofluorescence, energy devices, and postoperative surveillance can all affect the measured outcomes. In the cohort reported by Yang *et al.*, several adjuncts differed between groups, so the comparison represented two broader surgical strategies rather than access route alone [3]. The evidence should therefore not be summarized as show-

ing superior oncologic clearance or lower permanent complication rates with ET.

7. Clinical Position of the Gasless Trans-Subclavian Approach

On present evidence, GETTSA is a reasonable elective option for selected patients with unilateral low-risk PTC and for carefully chosen patients with intermediate-risk disease, provided that the same oncologic operation can be completed without compromise. Typical candidates have a tumor confined to one lobe, no gross invasion, and no clinically apparent lateral-neck metastasis requiring a formal lateral dissection. Favorable neck anatomy and body habitus are also helpful. Patients need to understand that the cervical scar is avoided at the cost of an infraclavicular incision and, in most series, a longer operation. The procedure should be undertaken by surgeons experienced in open thyroid surgery who are prepared to convert when exposure or completeness becomes uncertain.

GETTSA may appeal particularly to patients who strongly wish to avoid an anterior neck scar but do not want a transoral procedure. Early comparisons with the transaxillary route suggest a shorter working corridor, better access to the central compartment, and fewer early chest-wall symptoms [5]-[7]. These potential advantages do not justify extending the indication to grossly invasive tumors or extensive nodal disease. COT remains the more dependable choice for bulky, high-risk, reoperative, irradiated, or anatomically complex cases.

8. Limitations and Future Research Priorities

The evidence has several recurring weaknesses. Most studies are observational reports from a single center, and patients often selected their preferred operation. Eligibility criteria, policies for central-neck dissection, energy devices, and definitions of complications were not consistent. Cosmetic and quality-of-life results are also vulnerable to expectation and performance bias. Finally, follow-up is generally too short to support reliable conclusions about long-term oncologic outcomes. Matching and multivariable adjustment reduce some of these problems but cannot remove them.

ATA and AAES guidance is consistent with a selection-and-capability approach: remote access should not alter the required oncologic operation, the choice should follow informed shared decision-making, and the technique should be offered only by teams able to manage complications and convert safely to a standard operation [1] [21]. To make results comparable across institutions, studies should describe patient selection, the exact extent of surgery, the experience of the team, and the reason for every conversion.

Future research should document the exact thyroid and nodal procedures, preoperative and postoperative laryngoscopy, standardized RLN and calcium outcomes, accidental parathyroid excision, autotransplantation, validated patient-reported measures such as THYCA-QoL, direct costs, the stage of the learning curve, conversion criteria, and medium- or long-term structural follow-up. Mul-

ticenter prospective registries and direct comparisons with COT would add more value than further small retrospective series from a single route. For GETTSA, the next question is no longer whether the scar can be hidden, but whether safety and oncologic completeness can be reproduced across surgeons and centers.

9. Conclusion

For appropriately selected unilateral PTC, ET can provide acceptable short-term surgical and nodal outcomes while moving the scar away from the anterior neck. COT nevertheless remains the reference procedure because it offers direct exposure, versatility, and the widest oncologic applicability. GETTSA provides a relatively short gasless route to the unilateral thyroid and central compartment, and recent comparisons suggest advantages in scar-related satisfaction and some functional outcomes. These benefits support its use as an experience-dependent alternative for selected patients. They do not yet justify replacing open thyroidectomy or claiming oncologic equivalence beyond the short to medium term.

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Author Contributions

Lei Tang and Chuanchang Yin developed the review concept. Lei Tang designed the literature approach and prepared the first draft. Chuanchang Yin critically revised the manuscript and supervised the work. Both authors approved the final version.

Ethics Approval and Consent to Participate

This narrative review used only previously published, publicly available studies and included no new participants, identifiable information, or original patient-level data. Ethics committee approval and informed consent were therefore not required.

Data Availability

No original dataset was created or analyzed. The evidence discussed in this review is available in the cited publications.

Conflicts of Interest

The authors report no financial or non-financial conflicts of interest related to this review.

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