



Submandibular suction lipectomy and single-hole inflator-free endoscopic thyroidectomy with a submental approach: a new surgical technique

Zhongliang Lang^{1#^}, Jing Lv^{2#}, Deling Wu³, Chunlei Sun³, Zhiwei Xing⁴, Gaoyuan Yu⁵, Gongshuai Tao³, Liping Zhao¹, Xiaopeng Ma³

¹Department of Plastic Surgery, The First Affiliated Hospital of USTC, Division of Life Sciences and Medicine, University of Science and Technology of China, Hefei, China; ²Department of Stomatology, The First Affiliated Hospital of USTC, Division of Life Sciences and Medicine, University of Science and Technology of China, Hefei, China; ³Department of Thyroid and Breast Surgery, The First Affiliated Hospital of USTC, Division of Life Sciences and Medicine, University of Science and Technology of China, Hefei, China; ⁴Wannan Medical College, Wuhu, China; ⁵Affiliated Provincial Hospital, Anhui Medical University, Hefei, China

Contributions: (I) Conception and design: Z Lang, J Lv, X Ma; (II) Administrative support: None; (III) Provision of study materials or patients: D Wu, C Sun, X Ma; (V) Collection and assembly of data: Z Xing, G Yu; (V) Data analysis and interpretation: Z Lang, G Tao; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

[#]These authors contributed equally to this work.

Correspondence to: Xiaopeng Ma, MD, PhD. Department of Thyroid and Breast Surgery, The First Affiliated Hospital of USTC, Division of Life Sciences and Medicine, University of Science and Technology of China, Hefei 230001, China. Email: docmxp@126.com.

Abstract: We have successfully carried out single-hole inflator-free endoscopic thyroidectomy through a submental approach, which has the advantages of less trauma, fewer complications, and hidden incisions. However, for patients with submandibular fat accumulation, submental incisions are not easy to hide, which directly affects the cosmetic effect. We developed a new surgical strategy “submandibular suction lipectomy and single-hole inflator-free endoscopic thyroidectomy with a submental approach” for these patients. We initially used submandibular suction lipectomy to reduce the accumulation of submandibular fat and obvious fat protrusion and, thus, restore the normal depression, placing the submental incision back where it is hidden in the submental shadow. Subsequently, we began to use single-hole inflator-free endoscopic thyroidectomy with a submental approach. We aimed to explore the feasibility and cosmetic effect of this method for the treatment of thyroid disease patients with submandibular fat accumulation. The average operation time was 4.2 hours; and the average hospitalization time was 4.75 days. There were no postoperative complications, such as hoarseness, low calcium, hand and foot numbness, etc., and no special complications and no recurrence or metastasis seen in the 6-month follow-up examination. The aesthetic satisfaction survey results of patients half a year after surgery were satisfactory and above. For thyroid cancer patients with submandibular fat accumulation, this method not only hides the surgical incision in the neck but also meets the patient’s requirement for “submental aesthetics”; thus it has good application prospects. It should be pointed out that the current findings are preliminary results, based on data from only four patients.

Keywords: Endoscopic thyroidectomy; thyroid cancer; submental approach; liposuction

Submitted Oct 23, 2022. Accepted for publication May 01, 2023. Published online Jun 30, 2023.

doi: 10.21037/gs-22-624

View this article at: <https://dx.doi.org/10.21037/gs-22-624>

[^] ORCID: 0000-0003-2387-6294.

Introduction

Thyroid cancer is a malignant tumor originating from thyroid follicular epithelium or parafollicular epithelial cells, and it is also the most common malignant tumor of the head and neck. In recent years, the incidence of thyroid cancer has increased rapidly worldwide. Thyroid cancer is usually treated with surgery. Traditional open surgery for thyroid tumors often leads to obvious scars on the neck. To avoid the influence of neck surgical incisions on the appearance of patients, a variety of endoscopic thyroid surgery techniques have been developed, e.g., the transthoracic approach, transaxillary approach, transoral vestibular approach, etc. (1). We previously reported a new surgical approach, single-hole inflator-free endoscopic thyroidectomy with a submental approach (2), in which the incision is hidden under the chin, and the incision scar rests in the sub-chin shadow, where it is somewhat hidden when the patient's neck is in a natural upright position. However, for patients with submandibular fat accumulation (commonly known as a double chin), the submental incision is not easy to hide. For these patients, we initially used submandibular suction lipectomy to reduce the accumulation of submandibular fat and obvious fat protrusion and, thus, restore the normal depression, placing the submental incision back where it is hidden in the submental shadow. Subsequently, we began to use single-hole inflator-free endoscopic thyroidectomy

with a submental approach, which can satisfy the patients' requirement for submaxillary aesthetics following radical tumor treatment. We named this operation "submandibular suction lipectomy and single-hole inflator-free endoscopic thyroidectomy with a submental approach", abbreviated to SSS-LS. Our preliminary clinical experience was as follows. We present this article in accordance with the SUPER reporting checklist (available at <https://gs.amegroups.com/article/view/10.21037/gS-22-624/rc>).

Preoperative preparations and requirements

Patients

We reviewed four patients who underwent submandibular suction lipectomy and single-hole inflator-free endoscopic thyroidectomy with a submental approach from December 2021 to April 2022. Inclusion criteria: (I) thyroid cancer diagnosed by puncture, and the largest diameter ≤ 3 cm, no lymph node metastasis in the lateral neck region and distant organ metastasis; (II) patients have cosmetic requirements and submandibular fat accumulation; (III) no history of neck surgery and radiation; (IV) no hyperthyroidism or hypothyroidism. Exclusion criteria: (I) submandibular skin infection and ulceration; (II) mental disorders or patients with high cosmetic requirements; (III) tumor invades adjacent structures such as trachea, esophagus or severe tissue adhesion; (IV) patients who may not be cured under laparoscopy; (V) scar constitution patient.

These four patients were all female; their ages ranged from 34 to 39 years, and the average age was 36.8 years; their body mass index (BMI) ranged from 24.6 to 31.2 kg/m², and the average BMI was 27.4 kg/m²; the largest diameter of the preoperative thyroid nodule was 0.63 cm (range, 0.5–0.8 cm). They did not find lymph nodes in the lateral neck region and distant organ metastasis. This group of patients desired the removal of their localized submandibular fat accumulation for cosmetic reasons. Preoperative thyroid puncture biopsy results indicated thyroid cancer, and the patients were considered suitable for submandibular suction lipectomy and single-hole inflator-free endoscopic thyroidectomy with a submental approach. There was no previous history of jaw or neck surgery, neck infection, psychological disorders, etc., and the patients agreed to us using this new approach after we explained to all patients and their families details of the method of mandibular liposuction and endoscope-assisted thyroidectomy before the operation. A preoperative

Highlight box

Surgical highlights

- For thyroid cancer patients with submandibular fat accumulation, this surgical method can hide the incision of thyroid surgery and meet the patient's requirements for mandibular aesthetics.

What is conventional and what is novel/modified?

- We previously used trans-submental single-foramen suspended thyroid surgery to treat patients with thyroid cancer. Because the incision cannot be hidden, this technique is not suitable for patients with submandibular fat accumulation.
- We innovatively introduced submandibular liposuction, which can retract and hide the submental incision in the shadow of the submandibular depression, to solve the above limitations.

What is the implication, and what should change now?

- We believe that this surgical method can be used as an optional surgical method for patients with thyroid cancer with submandibular fat accumulation, and patients can obtain satisfactory aesthetic results on the basis of radical treatment of thyroid cancer.

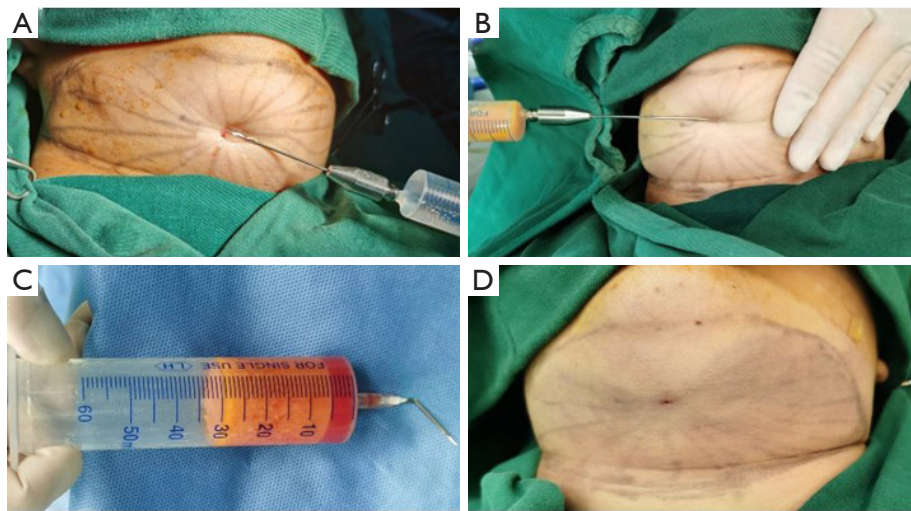


Figure 1 The procedure of submandibular suction lipectomy. (A) Liposuction range and inject the tumescent solution into the subcutaneous fat layer; (B) negative-pressure liposuction with 20 mL syringe; (C) the amount of pure fat suctioned after removing tumescent solution; (D) the status after liposuction and the thickness of subcutaneous fat less than 5 mm.

evaluation of surgical indications for thyroid nodules was carried out by the plastic surgeons of the minimally invasive diagnosis and treatment team in our hospital.

Preoperative marking, anesthesia, and surgical position

The patient's surgery was performed in a sterile operating room. Before surgery, nurses and doctors strictly check patient information, surgical methods, etc. The area of liposuction and position of the incision were marked with the patient in the standing position. An incision was made 2–3 cm below the median chin of about 3.0 cm in length. The surgical incision is Class I. Endotracheal anesthesia combined with intravenous general anesthesia was used, and the patient was placed in the supine head and neck hyperextension position. Routine disinfection and laying of sterile surgical drape were applied.

The surgical team includes plastic surgeons, thyroid surgeons, anesthesiologists, surgical instrument nurses, and itinerant nurses. The team members have undergone rigorous training and simulation exercises. Plastic surgeons are mainly responsible for preoperative photography, incision design, and mandibular liposuction operations; thyroid surgeons are mainly responsible for endoscopic thyroid surgery, requiring two assistants to support the endoscope and expose the surgical field; the surgical instrument nurse is responsible for instrument delivery and sorting; the patrol nurse is responsible for adding items

needed for the operation and keeping records for future reference.

Step-by-step description

For the liposuction, Local tumescent negative-pressure liposuction was used. The tumescent solution (2% lidocaine 20 mL + 0.1% epinephrine 0.5 mL + 5% sodium bicarbonate 10 mL + 0.9% normal saline 500 mL) was opened at the midpoint of the submental surgical incision marked by the skin and injected into the surrounding area through the subcutaneous fat layer with a water-injection needle (*Figure 1A*). The solution was injected evenly around the subcutaneous fat layer in an area exceeding the marked range by 2–3 cm to create local tension of the skin. Attention was given to the symmetry of the bilateral injection. The total amount of tumescent solution injected was 150–300 mL. After waiting for 5–10 min, we observed the whitening of the skin. Liposuction was started by slowly inserting the liposuction needle into the subcutaneous fat layer through the small opening in the skin, connecting the 20 mL syringe and pumping it to generate negative pressure. The liposuction tube was radial, and the suction tunnel fan-shaped and crossed. After a thick needle was used to remove most of the fat, suction was performed with a fine needle (*Figure 1B*). The amount of pure fat suctioned was 15–50 mL, with an average of 25 mL (*Figure 1C*). It is noted that the amount of fat removed with liposuction was

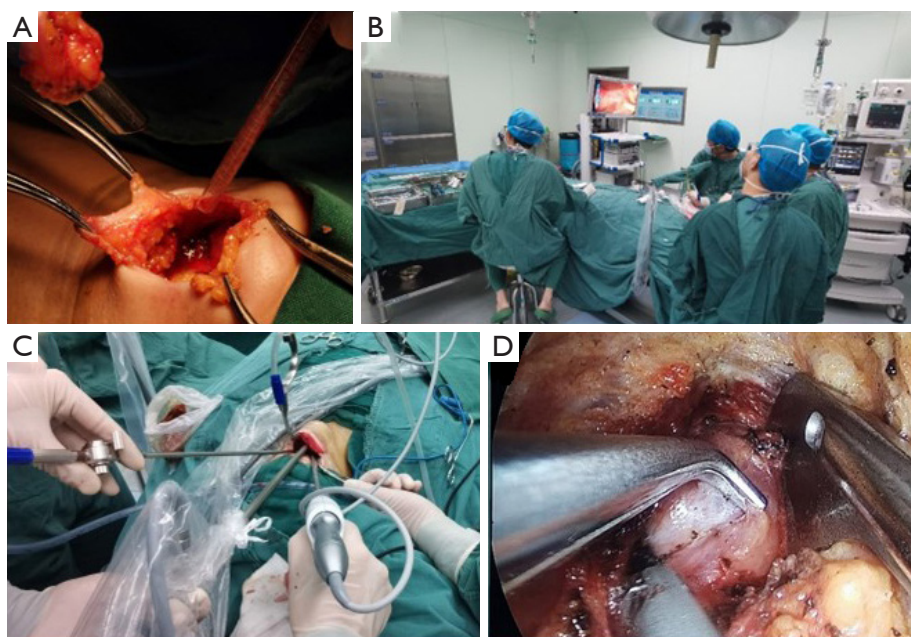


Figure 2 The procedure of submental endoscopic thyroid cancer radical resection. (A) Excision of the incised fat pad; (B) the positions for the operators; (C) the positions for the operators; (D) intraoperative picture.

typically the same on both sides. The contour and curve of the jaw and neck were reshaped, and when the skin was pinched, the subcutaneous fat thickness did not exceed 5 mm (*Figure 1D*). Residual fat and residual fluid were removed from the surgical area.

For submental endoscopic thyroid cancer radical resection, the area was re-sterilized and a sterile towel laid; then the skin, subcutaneous tissue, and superficial cervical fascia to the deep surface of the platysma were cut along the designed incision line, and electrocauter excision of the incised fat pad was made with incomplete liposuction (*Figure 2A*). The inferior skin flap from the sternal side to a transverse finger of the suprasternal fossa and the lateral skin flap from both sides to the inside of the sternocleidomastoid muscle were dissociated. The retractor was suspended, and the endoscope (5 or 10 mm in diameter) and two operating instruments were inserted into the incision (*Figure 2B,2C*). The linea alba cervicalis was cut with an electric hook; the band muscles on both sides were separated with an ultrasonic knife to expose the thyroid; the lateral thyroid was freed; the middle thyroid vein was coagulated; and the common carotid artery and vagus nerve were exposed (*Figure 2D*). The conical lobe of the thyroid was retracted and freed with a downward motion; the pretracheal space was separated; the isthmus of the thyroid was cut off with an ultrasonic knife; the cricothyroid

space was enlarged; Used ultrasonic scalpel to dissociate the superior pole of thyroid and pay attention to protect the superior parathyroid gland during operation. The branched vessels in the upper pole of the thyroid were coagulated. The course of the recurrent laryngeal nerve at the point where the recurrent laryngeal nerve enters the larynx was detected, the R1 signal obtained, and the Berry ligament excised. The blood vessels around the thyroid were coagulated; the recurrent laryngeal nerve was dissected; the thyroid gland was freed at the same time as the central lymph nodes were dissected; and the specimens were taken out. Attention was paid to protect the recurrent laryngeal nerve, superior laryngeal nerve, and superior and inferior parathyroid glands during the operation. After checking the wound for active bleeding, it was rinsed with distilled water, the white line of the neck was sutured, and a negative-pressure drainage tube was inserted. The specimen was checked for the parathyroid gland: if the parathyroid gland is cut by mistake, it should be minced and implanted under the skin.

Postoperative considerations and tasks

Postoperative considerations

A small cotton pad and elastic sleeve were used for a compression bandage under the jaw. A liquid diet was

Table 1 Surgical features of patients with SSS-LS (n=4)

Patient No.	Age (years)/gender	BMI (kg/m ²)	Pathology	Size (cm)	Side	Resection	CND/No. of lymph nodes	Operation duration (min)	Liposuction/thyroid operation time (min)	Hospital duration (days)	Aesthetic satisfaction score	Complications
1	37/F	31.2	PTC	0.7	R	Lobectomy	Yes/0	245	110/135	4	5	None
2	37/F	24.6	PTC	0.5	R	Lobectomy	Yes/2	230	90/140	5	5	None
3	34/F	25.1	PTC	0.5	L	Lobectomy	Yes/5	275	120/155	3	3	None
4	39/F	28.7	PTC	0.6–0.8	L + R	Lobectomy	Yes/5	250	100/150	7	4	None

F, female; BMI, body mass index; PTC, papillary thyroid carcinoma; L, left; R, right; CND, central neck dissection.

given 6 h after the operation, and the drainage tube was removed when postoperative drainage was less than 10 mL. Antibiotics were not used prophylactically. The mandibular elastic sleeve was worn for about 1 month.

Observation indicators

The operation time, postoperative pathology, hospital stay, drainage volume, postoperative complications, and postoperative cosmetic effects were observed and recorded. Patients were followed up half a year after surgery to rate aesthetic satisfaction, with 5 points representing very satisfied, 4 points representing satisfaction, 3 points representing general satisfaction, 2 points representing dissatisfaction, and 1 point representing very dissatisfaction.

All procedures performed in this study were in accordance with the ethical standards of the institutional research committee and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from patients for publication of this article and accompanying images. A copy of the written consent is available for review by the editorial office of this journal. The study was reviewed and approved by the Ethics Committee of The First Affiliated Hospital of University of Science and Technology of China (No. 2021-269).

Results

Surgical conditions: liposuction was performed in four patients by the same plastic surgeon, and the same thyroid surgeon performed the complete submental single-port endoscopic thyroid cancer radical resection. The surgical methods were thyroidectomy plus isthmus resection plus ipsilateral central lymph node dissection. The postoperative pathology was papillary thyroid carcinoma for all patients. In terms of central lymph node metastasis, one patient had no dissected central lymph nodes, which may be that

no obvious lymph node tissue was found on pathological examination; one patient had two dissected lymph nodes; five lymph nodes were dissected in the central regions of the other two patients, and one lymph node was metastasized. A patient underwent bilateral thyroidectomy because of multiple papillary carcinomas in the bilatera thyroid, which were indications for radical thyroidectomy. Observation indicators: the average operation time was 4.2 h; the average hospitalization time was 4.75 d; no postoperative complications were observed, including abnormal voice after operation or hypocalcemic hand or foot numbness. Follow-up results: there were no special complications and no recurrence or metastasis seen in the 6-month follow-up examination.

According to the aesthetic satisfaction survey results of patients half a year after surgery, two patients gave a score of 5 for very satisfaction, one patient gave a score of 4 for satisfaction, and one patient gave a score of 3 for general satisfaction, and there were no dissatisfied patients.

The surgical features of the patients are summarized in *Table 1*. A typical case comparison is shown in *Figure 3*.

Discussion

Endoscopic thyroid surgery using the oral vestibular approach has been widely accepted by surgeons due to the advantages of good incision concealment, short operating distance, simultaneous treatment of bilateral thyroid glands, and facilitation of a thorough dissection of the central lymph nodes (3,4). However, endoscopic thyroid surgery using an oral vestibular approach often leads to mental nerve damage, resulting in numbness of the lower lip and chin, which is an important deficit of this operation (5,6). Ding *et al.* reported that a 2.5- to 3.0-cm long surgical scar was left in the submental area after thyroidectomy with a single small incision under the chin, and the cosmetic effect was satisfactory (7). Further related improved



Figure 3 A typical case comparison. (A,C,E) Before surgery; (B,D,F) 6 months after surgery.

surgical methods are constantly being proposed (8,9). We reported in 2021 the use of trans-submental single-foramen suspended thyroid surgery, referred to as SSS surgery (2), which includes a short operating path; small free area; small degree of trauma; clear surgical field; no oral trauma; no surgical complications, such as mental nerve injury or lower lip numbness; and little risk of gas embolism. Since then, we have performed SSS surgery routinely and proficiently. However, this method still uses an incision under the chin; therefore, to ensure concealment of the submental incision, this technique is not suitable for patients with submandibular fat accumulation, submental protrusion or scar constitution, for which a transoral vestibular approach is a more suitable choice. For patients with submandibular fat accumulation, we innovatively introduced submandibular

liposuction to the method to reduce submandibular fat accumulation and fat prominence to restore a normal depression, and the submental incision is retracted and hidden in the shadow of the submandibular depression. This solves the above limitations, expands the scope of use of completely submental single-hole air-free endoscopic thyroid surgery, and meets the patient's requirements for mandibular aesthetics after radical tumor treatment.

Compared with traditional submandibular liposuction (in which a drainage tube is not required), SSS-LS surgery makes it easier to remove liquefied fat after submandibular liposuction due to the placement of a drainage tube during submental thyroid surgery. In traditional submandibular liposuction (10), the needle is generally inserted through a small incision behind the ear, while in the SSS-LS

procedure, the needle is inserted at the incision position for submental thyroid surgery, further reducing trauma. In addition, when an incision is made under the chin to free the skin flap, the excess adipose tissue, together with a little fibrous tissue, can be removed with incomplete liposuction. Liposuction improves the aesthetics of the chin-cervical angle, and extensive injection of tumescent anesthesia solution into the operation area further reduces bleeding in the operation channel established by separating the skin flap during endoscopic thyroid surgery.

The four patients with thyroid cancer in this study had plastic and cosmetic requirements for the appearance of the wound, but the patients had obvious fat accumulation on the mandibular border and submandibular border, a blunted chin and neck angle, and an obvious double chin. If SSS thyroid surgery is used, the incision on the surface of the double chin may affect the aesthetics. After submandibular liposuction, the incision scar is moved to the shadow of the submental depression; therefore, the technique not only eliminates the double chin but also hides the surgical incision. Six months after the operation, all patients were followed-up and were satisfied with the curative effect of the procedure on the thyroid cancer and the restoration of their jaw and neck contour. The advantages of liposuction and submental incision complement each other, and the above four patients obtained satisfactory cosmetic results after radical thyroid cancer treatment.

Compared with other endoscopic thyroidectomy, SSS-LS has a shorter approach, and completely avoids the risk of infection caused by transoral endoscopic surgery, has the advantages of small free area, less trauma, and can achieve neck cosmetic effect. We did not use an endocatch bag when removing the tumor during the operation, and the possibility of tumor seeding could not be completely avoided only by rinsing the wound with distilled water. We will use an endocatch bag to remove the tumor in future surgery.

SSS-LS is suitable for patients with mild to moderate fat accumulation on the mandibular border and submandibular border, but it may not be suitable for patients with severe fat accumulation and significant skin relaxation, as liposuction surgery may not completely restore a normal depression, resulting in an incision that cannot be concealed. SSS-LS is only suitable for patients with thyroid cancer accompanied by mandibular fat accumulation who have cosmetic requirements. The treatment of thyroid cancer also achieves the purpose of mandibular plastic surgery, and postoperative incision scars are not easily detected. Other patients with thyroid cancer are not suitable for this surgical technique.

The four patients we have completed have been exempted from the cost of liposuction surgery, but after the technical scheme matures, the cost will be charged to patients in the future. The cost of liposuction surgery is not high, and the overall cost is within the scope of medical insurance, which does not pose a significant burden on the patient's economy.

This study is only a retrospective analysis to initially introduce the feasibility and safety of a new technology. In the future, we will use this technology to conduct a randomized controlled study with patients with "traditional surgery" and collect more data for further explanation.

Conclusions

We believe that SSS-LS can be used as an optional surgical method for patients with thyroid cancer with submandibular fat accumulation. Due to the short follow-up time and small number of cases examined, more cases are needed for further study.

Acknowledgments

Funding: This study was supported by grants from the University of Science and Technology of China (USTC) New Medical Foundation in 2020 (No. WK9110000151) and Anhui Provincial Hygiene and Health Research Project Foundation in 2022 (No. AHWJ2022b011).

Footnote

Reporting Checklist: The authors have completed the SUPER reporting checklist. Available at <https://gs.amegroups.com/article/view/10.21037/gS-22-624/rc>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://gs.amegroups.com/article/view/10.21037/gS-22-624/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. All procedures performed in this study were in accordance with the ethical standards of the institutional research committee and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from patients for

publication of this article and accompanying images. A copy of the written consent is available for review by the editorial office of this journal. The study was reviewed and approved by the Ethics Committee of The First Affiliated Hospital of University of Science and Technology of China (No. 2021-269).

Open Access Statement: This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license). See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

References

1. Kudpaje A, Subash A, Subramaniam N, et al. Remote Access Thyroid Surgery: A Review of Literature. *Indian J Surg Oncol* 2022;13:191-8.
2. Xiaopeng M, Cunlei S, Deling W, et al. A new approach to thyroid surgery: submental approach, single-hole, non-inflatable for endoscopic thyroidectomy. *Hans Journal of Surgery* 2021;4:49-53.
3. Tufano RP, Mohamed Ali K. The Year in Surgical Thyroidology: Recent Technological Developments and Future Challenges. *Thyroid* 2022;32:14-8.
4. Anuwong A, Ketwong K, Jitpratoom P, et al. Safety and Outcomes of the Transoral Endoscopic Thyroidectomy Vestibular Approach. *JAMA Surg* 2018;153:21-7.
5. Akritidou E, Douridas G, Spartalis E, et al. Complications of Trans-oral Endoscopic Thyroidectomy Vestibular Approach: A Systematic Review. *In Vivo* 2022;36:1-12.
6. Fu J, Luo Y, Chen Q, et al. Transoral Endoscopic Thyroidectomy: Review of 81 Cases in a Single Institute. *J Laparoendosc Adv Surg Tech A* 2018;28:286-91.
7. Ding Z, Deng X, Fan Y, et al. Single-port endoscopic thyroidectomy via a submental approach: report of an initial experience. *Head Neck* 2014;36:E60-4.
8. Chen Y, Chomsky-Higgins K, Nwaogu I, et al. Hidden in Plain Sight: Transoral and Submental Thyroidectomy as a Compelling Alternative to "Scarless" Thyroidectomy. *J Laparoendosc Adv Surg Tech A* 2018;28:1374-7.
9. Zhang DG, He GF, Gao L, et al. Gasless submental-transoral combined approach endoscopic thyroidectomy for papillary thyroid carcinoma: a series of 41 cases. *Zhonghua Wai Ke Za Zhi* 2022;60:154-8.
10. O'Ryan F, Schendel S, Poor D. Submental-submandibular suction lipectomy: indications and surgical technique. *Oral Surg Oral Med Oral Pathol* 1989;67:117-25.

Cite this article as: Lang Z, Lv J, Wu D, Sun C, Xing Z, Yu G, Tao G, Zhao L, Ma X. Submandibular suction lipectomy and single-hole inflator-free endoscopic thyroidectomy with a submental approach: a new surgical technique. *Gland Surg* 2023;12(7):974-981. doi: 10.21037/gS-22-624