

The Novel Transvestibule Approach for Endoscopic Thyroidectomy: A Case Series

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Object: To evaluate the feasibility of NOTES for thyroid by the transvestibule approach.

Methods: Six patients diagnosed with benign thyroid diseases were enrolled and underwent transvestibule endoscopic thyroidectomy in our hospital from October 2013 to September 2014.

Results: All 6 patients completed transvestibule endoscopic thyroidectomy successfully with no conversion to open surgery. The mean operation time was 122 minutes (100 to 150 min). The average blood loss during surgery was 30 mL (10 to 40 mL). The pathologic diagnosis coincided with the preoperative diagnosis, which was 1 case of thyroid adenoma and 5 cases of thyroid goiters. The mean length of hospital stay was 8.2 days (8 to 10 d). No severe complications were reported during the 3 to 13 months' follow-up.

Conclusions: Transvestibule endoscopic thyroidectomy is feasible, with a satisfactory cosmetic effect; yet, further improvement of surgical techniques are required on account of the complexity of the surgical procedure and the prolonged operation time.

Key Words: thyroid surgery, transvestibule, endoscopy

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NOTES is a minimally invasive endoscopic surgical technique using a natural orifice (eg, stomach, colon, vagina, urethra, etc.) as the access.¹ From October 2013, we have conducted 6 cases of transvestibule thyroidectomy successfully for patients diagnosed with benign thyroid tumors, as reported here.

CASE REPORT

General Information of Patients

We included 6 patients, 1 male and 5 female, in our group. The range of age was from 19 to 45 years, with a mean age of 34.3 ± 5.6 years. Preoperative thyroid function tests were normal in all patients. All lesions were solitary nodules under B-ultrasonography, with 3 cases in the right

lobe and 3 cases in the left lobe. Among the 6 cases, 1 was a cystic nodule, 5 were solid nodules, and 1 contained a mixed mass; the nodule diameter ranged from 1 to 4 cm. The preoperative diagnosis showed 1 case of thyroid adenoma and 5 cases of nodular goiters. There was no clinical diagnosis of thyroid malignancy. All cases were in line with the indications of endoscopic thyroid surgery,² and no surgical contradictions were violated.

Surgery Procedures

All patients underwent general anesthesia with nasotracheal intubation. The patient was placed in the supine position, with the affected shoulder elevated by 15 degrees and the head tilted back; after the routine disinfection and draping, the mouth was disinfected twice with chlorhexidine. The expansion solution was injected (1 mg adrenaline diluted with 300 mL 0.9% saline) from the midline of the vestibule and both sides of the buccal cavity to the neck to inflate the local tissue (Fig. 1). A 10-mm transverse incision in the mucosa of the vestibule was made parallel to the front teeth. Using a glass rod, the submental space was dissected bluntly up to the lower layer of the platysma; a 10-mm trocar was placed and an endoscope was inserted at 30 degrees for observation. Two lateral incisions were then made in the vestibule near the premolars, and a 5-mm trocar each was inserted (Fig. 2) after dissection with a blunt instrument. A forcep and a harmonic scalpel were placed, respectively, through 2 lateral trocars. The CO₂ pressure was maintained below 6 mm Hg during surgery. The subplatysmal plane was expanded with a harmonic scalpel and proceeded to the sternal notch inferiorly and to both sternocleidomastoid muscles laterally under endoscopy. The linea alba was carved and the strap muscles were bluntly retracted laterally to expose the thyroid. The thyroid was separated before the trachea, and the isthmus of the thyroid was intersected with a harmonic scalpel. After the trachea was revealed, the thyroid was dissected laterally to expose the middle thyroid vessels and severed afterwards with a harmonic scalpel. Next, the thyroid was dissected downwards from the lateral side, and the inferior thyroid veins were severed. The thyroid was retroflected medially with an atraumatic grasping forcep to expose the superior thyroid veins and then coagulated with a harmonic scalpel. To preserve the dorsal part of thyroid tissue and prevent damage of the parathyroid and recurrent laryngeal nerves, the superior and the inferior thyroid vessels were dissected as close as possible to the thyroid capsule. The lesion and the surrounding gland were removed and put into a pouch; then, the specimen and the trocar were retrieved together from the middle incision. When the tumor size was large, the specimen was cut within the pouch under direct visualization. The resected tissue was sent for frozen-section examination routinely for pathologic diagnosis. The

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FIGURE 1. Injection of the “expansion solution.”

surgical field was rinsed and the bleeding was stanchied carefully. Finally, the incision was closed with a 3-0 absorbable suture; drainage was not necessary. The surgical region was compressed with a bandage. Antibiotics were administered for 3 to 5 days, and mouthwashes were prescribed to keep the oral cavity sanitary.

RESULTS

All 6 patients completed transvestibule endoscopic thyroidectomy successfully, with no conversion to open surgery; among them, 5 patients underwent partial thyroidectomy and 1 patient underwent unilateral subtotal thyroidectomy. The mean operation time was 122 minutes (100 to 150 min). The average blood loss during surgery was 30 mL (10 to 40 mL). The pathologic diagnosis coincided with the preoperative diagnosis, which was 1 case of thyroid adenoma and 5 cases of thyroid goiters. The mean length of hospital stay was 8.2 days (8 to 10 d). No severe complications such as nerve damage or parathyroid injury were reported. One patient had a postoperative wound infection, but recovered thoroughly after symptomatic treatment. No local recurrence was reported during the follow-up of 3 to 13 months, and patients were satisfied with the cosmetic outcome (Fig. 3).

DISCUSSION

The Surgical Approach

Previous surgical manners of endoscopic thyroid surgeries included the supraclavicular approach, minimally



FIGURE 2. Positions of the 3 trocars in the vestibule: the middle one for observation, and the lateral 2 for operation.



FIGURE 3. Postoperative outcomes: no scar on the surface of the neck.

invasive video-assisted thyroidectomy by anterior cervical incision, the subclavicular approach, the transaxillary approach, the areola and cleavage approach, the axillo-breast approach, and the fully areola approach.³ However, each of the above surgical approaches result in considerable scars on the skin surface that may bring about consequent psychological burden on patients. It is for the first time in 2009 that Wilhelm and Metzger⁴ conducted the first transoral thyroidectomy successfully and realized an absolute scarless effect. The transoral approach follows the anatomic characteristics of embryonic thyroid and achieved authentic minimal invasiveness and is also in line with NOTES principles.⁵ Nevertheless, the transoral approach of endoscopic thyroidectomy allows only a small incision of about 5 mm. Besides, this approach poses potential threats for damage of the sublingual gland, the submaxillary gland, the deep lingual vessels, etc. Moreover, small incisions also constrain the tumor size. Three of the 8 cases reported by Wilhelm were converted to open surgery due to difficult retrieval of specimens from the incision. On the basis of this approach, Wang et al⁶ ameliorated it and designed a thoroughly transvestibule approach for Chinese people, who are generally characterized by a flat mandible and mental region and a strong repair ability of the oral mucosa. Unlike the transoral approach, the transvestibule approach moves the observation port to vestibule and consequently lowers the risk of damaging important structures surrounding the transoral channel and increases the safety of the surgery. In conclusion, this operational manner widened indications of NOTES for thyroid diseases owing to its convenience in handling bilateral lesions and feasibility with relatively large lesions (Fig. 4).

Characteristics of Transvestibule Endoscopic Thyroidectomy

We have performed 6 transvestibule endoscopic thyroidectomies on patients with benign tumors of thyroid since September 2013, and summarized several features of NOTES for thyroid by the transvestibule approach. (1) Absolute scarless results are realized with incisions located in the buccal cavity. (2) Clear vision of anatomic structures is obtained with magnification of lens and angled tip of endoscopy.⁷ (3) Easy recognition of recurrent laryngeal nerves under endoscopy resulted in less injury of recurrent



FIGURE 4. Wounds in the buccal cavity healed.

laryngeal nerves compared with open surgery. (4) Correct distinction of loose membranous structures in the deep surface of the superficial fascia under endoscopy helps surgeons loosen and separate at this anatomic level to establish operating space under the platysma, which can effectively ensure the postoperative anterior “flat” look.⁸ (5) Effective hemostasis: the harmonic scalpel can not only stanch bleeding during thyroid vascular dissection, but can also cut the thyroid gland directly. This instrument can facilitate surgeons to control bleeding effectively and allow the surgery to be performed without interruption, thereby reducing blood loss significantly.⁹ (6) The perspective is the same as with open surgery from the cephalic to the foot side. (7) Proper pressure for postoperative bandage can be achieved easily for surgical areas located outside the mandibular. (8) Good outcomes: this surgery method is safe and feasible with better recovery and fewer complications.

Choice of Patients

To lower the conversion rate, patients should be selected strictly according to surgeons' technique and availability of devices to avoid unnecessary conversion due to improper patient selection, for example, a large tumor size, malignant lesions, intraoperative bleeding, etc. Because this is our first attempt to use the NOTES technique on thyroid surgery, we selected patients with unilateral solitary benign thyroid nodules in this group. In 2005, the Chinese Medical Association of Surgery, Laparoscopic and Endoscopic Surgery drafted surgical indications for endoscopic thyroid surgery as follows: (1) thyroid adenoma, (2) thyroid cyst, (3) nodular goiter (single or multiple, tumor diameter < 5 cm), (4) solitary toxic nodules, and (5) low-grade malignant thyroid carcinoma. Surgical indications suggested by Wilhelm and Metzger¹⁰ for NOTES of thyroid: thyroid volume < 30 mL; diameter of solitary nodule < 2 cm. In our study, the eligibility criteria were as follows: (1) patients who comply with conventional endoscopic thyroid surgical indications; (2) patients without hyperthyroidism or parathyroid diseases; (3) tumor with the maximum diameter < 5 cm (for cystic lesions > 5 cm, apply suction first¹¹); (4) I or II degree thyroid enlargement due to primary or secondary hyperthyroidism; (5) good mobility under palpation, clear boundary without significant adhesion with the surrounding benign tissue; (6) no history of neck surgery.



FIGURE 5. Exposure of the mental nerve.

Precautions

To enable the smooth implementation of the operation, and to minimize the occurrence of postoperative complications, attention should be paid perioperatively. (1) Prevent infection: this approach has altered the incision of thyroid surgery from type I to type II with the absence of drainage; therefore, the chance of effusion and postoperative wound infection could be increased, to prevent infection; perioperative antibiotics should be administered. In our group, 1 patient had postoperative wound infection, but was cured after timely treatment with antibiotics and supportive treatments. (2) Protect the mental nerve: the chin hole, where mental nerves and blood vessels pass through (Fig. 5), is located beneath the gingival sulcus between the first and the second premolar on each side of the buccal cavity, and so the incision should be made between the 2 first premolars. It is beneficial for the preservation of the mental nerve function. (3) Identify the anatomic level: place the first trocar adjacent to the anterior muscle fascia and dissect as close to the muscle as possible.

Identify the gap under the deep fascia, and dissect bluntly with a good grasp of the anatomic plane to make sure that it is not too shallow to avoid flap necrosis in the neck or too deep to cause muscular damage. (4) Proper use of the ultrasonic scalpel: good manipulation of the harmonic scalpel is vital: the longer the heating, the greater the thermal damage. Therefore, when dealing with tissues adjacent to the recurrent laryngeal nerve, use it intermittently with the distance > 5 mm.¹² Continuous usage of the harmonic scalpel should be avoided; the head temperature should be lowered by cleaning the ultrasonic head frequently to avoid damage to nerves, glands, and other tissues¹³; when performing in the area of the recurrent laryngeal nerve, blunt dissection is wiser.

Problems and Prospects

Transvestibule endoscopic thyroidectomy as a new minimally invasive surgical approach brings vitality to the industry of minimally invasive surgery on thyroid¹⁴; however, we still face many problems awaiting urgent solutions such as the operational difficulty,¹⁵ the long operative time due to the narrow operative space, large areas of soft tissue tear, leakage of small thyroid lesions, potential metal nerve damage, and consequent malfunction of expression muscles. Besides, whether this endoscopic surgical manner could apply to thyroid malignancies without violating tumor principles still requires careful considerations. However, we believe that with the development and the improvement of endoscopic surgical techniques and instruments, surgical indications for NOTES on thyroid will increase gradually; postoperative complications will be further reduced, and its development will lead to a new era of minimally invasive thyroid surgery.

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