The Clinical Application of Novel Mini Transoral Endoscopic Thyroidectomy to Avoid Numbness and Pain in Patients with Thyroidectomy

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Abstract

Background: Transoral endoscopic thyroidectomy has been gaining popularity as it allows patients to avoid a visible scar in the neck. However, there are still existing disadvantages of traditional transoral endoscopic thyroidectomy—including numbness in the lower jaw or excessive edema. Therefore, we designed and applied a novel Mini transoral endoscopic thyroidectomy on patients requiring for thyroidectomy.

Patients and Methods: A total of 55 patients requiring for unilateral thyroidectomy who underwent novel Mini transoral endoscopic thyroidectomy (Mini group) were identified from August 2019 to December 2019. As a comparison, a matched cohort of 55 patients requiring for conventional transoral endoscopic thyroidectomy was also identified. The two groups were analyzed in terms of clinical characteristics, perioperative/operative clinical data and post-operative complications.

Results: The hospitalization time of patients in the Mini group was obviously less than that in traditional group. Furthermore, the numbness of the lower jaw, nylon wire examination score, pressure needle puncture examination score, or numbness VAS score indicated that the degree of numbness of the jaw in Mini group is significantly better than the traditional group. Moreover, the pain of the axillary incision using the pain VAS score method also showed that Mini group is significantly better than the traditional group. The results of pain of the axillary incision using the VAS score method also showed that novel Mini group was significantly better than that in the traditional group. Furthermore, dysfunction of mandibular muscles was observed in six of fifty-five patients in the traditional group, whereas no dysfunction of mandibular muscles observed in Mini group. At last, the degree of postoperative mandibular edema in Mini group was markedly slighter than that in traditional group. The post-operation infection rate was markedly lower in Mini group.

Conclusion: The new novel Mini transoral endoscopic thyroidectomy is safe and feasible, and reduces the damage to the functional muscles such as the mandibular diaphragm and lower lip muscles, which significantly reduces the numbness and edema of the mandible after surgery. Our novel Mini transoral endoscopic thyroidectomy is a feasible and safe advancement, which can be a viable alternative protecting patients from insufferable numbness and pain.

Background

Over the past two decades, transoral endoscopic thyroidectomy has gained popularity worldwide—likely born from a desire to avoid cosmetically displeasing scarring in such an exposed area^[1]. The development of minimally invasive approaches to the thyroid gland went through many trials and tribulations. This process entailed a paradigm shift, away from the traditional transcervical thyroidectomy, toward a more refined technique in an attempt to hide scarring and improve cosmetics in the neck region^[2,3]. Of the currently available endoscopic techniques, the transoral endoscopic

thyroidectomy vestibular approach provides a truly scarless approach with relatively direct access to the thyroid and reduced tissue dissection^[2,4].

More recently, there has been development of a technique known as the transoral endoscopic thyroidectomy vestibular approach^[5]. This novel remote-access endoscopic technique for the excision of the thyroid gland has the benefits and avoids the drawbacks of the other remote access procedures^[6]. However, there are still some shortcomings in the commonly used surgical methods. For instance, the median incision is relatively large (2-3cm), part of the mental muscle and descending labial muscle need to be cut off, leading to larger injury surface. When the median incision is cut to both sides, it is very possible to damage the branches of the mental nerve of both sides. Postoperative numbness or complete loss of consciousness of the lower jaw will inevitably occur, which will generally take 2–3 months to completely recover^[7]. After operation, it will affect the voluntary expression of subtle facial, the fine movement of the mouth and the pronunciation of some sounds. The swelling of postoperative mandible was obvious. When the specimen is larger, given that the specimen has to cross the chin, it is not easy to take out. During the operation, the needle hook is routinely used to puncture from the neck to help distract the banded muscle, and the drainage tube is routinely drawn from the neck, leaving fine scars or marks on the neck after operation. Intraoperative 10 mm endoscopy is easy to conflict with 5 mm Trocar on both sides. The prolonged compression of thin mental skin by 10 mm Trocar often leads to redness and swelling or subcutaneous ecchymosis. Moreover, there are still a program of disadvantages of traditional transoral endoscopic thyroid surgery, including numbness in the lower jaw or excessive edema^[8].

In present study, we aim to examine and describe our experience with a novel Mini transoral endoscopic thyroidectomy, outline the patient characteristics that make the transoral endoscopic approach feasible, detail the surgical technique, and will provide an overview to establish its efficacy and safety.

Methods

From August 2019 to December 2019, all patients who underwent thyroidectomy by the Department of Thyroid Surgery of the First Hospital of Wuhan were entered into a prospectively collected database. Our selection criteria for patients during this time period was as follows: 15–50 years of age, and thyroid mass size < 4 cm. Patients were excluded from this approach if they had a history of mandible or neck operation, lateral cervical lymph node or distant metastasis or a tumor located in the upper pole. A matched cohort of patients who underwent conventional transoral endoscopic thyroidectomy over this same time period was obtained from this prospective database by applying the same inclusion and exclusion criteria with 1:1 matching performed based on age and gender.

Data collection

Data were collected on patient demographics, operative details, post-operative outcomes and final pathologic results. Time for central lymph node dissection was calculated from time of thyroid specimen removal to time of central lymph node specimen removal. Follow-up was standardized among both

groups and was consistent with our practice at the time. The two groups were analyzed in terms of patient characteristics, operative clinical results and post-operative outcomes.

Statistical analysis

Statistical analysis was performed using SPSS 22.0 (SPSS, Chicago, IL, USA). The Chi-square test was employed for categorical variables and the Wilcoxon rank-sum test was used for continuous variables. A P value of <0.05 was considered statistically significant. The study was approved by The Ethical Committee of First Hospital of Wuhan.

Operative procedure of novel mini transoral endoscopic thyroid surgery

The patient was placed in a supine position, and general anesthesia was induced with orotracheal intubation using a nerve monitoring tube(Fig1.). The neck was extended with a shoulder pillow. The oral cavity was disinfected with povidone in water, and skin preparation and draping were carried out in the usual manner. All papillary thyroid carcinoma has been confirmed via fine needle aspiration before surgery. Total endoscopic thyroid surgery procedure via oral vestibular approach: The oral cavity was sterilized 3 times with 0.5% iodophor and then rinsed with normal saline 3 times. After 0.5mm vertical incision taken from the inferior square of the orbicularis oris muscle of the lower lip, the oral mucosa was opened with a sharp knife, and then the 5mm Trocar was pierced directly from the incision to the middle of the chin and pressed close to the mandible as it passed through the chin. Through the subcutaneous puncture direction of the chin, firstly vertically downward, then forward below the platysma muscle, the 5mm Trocar was used to puncture several times in the thyroid cartilage region, with the subcutaneous space initially established. About 2.5-3cm distance from the median line, and about 2cm from the labial buccal and gingival sulcus, making oblique incision of 0.5cm small incision with sharp knife, then 5mmTrocar was directly pressed against the mandible on both sides of the incision and punctured in the direction of ipsilateral sternoclavicular joint. Ensure the Trocar confluent with the middle puncture tunnel at the lower level of the platysma muscle. The 5mm Trocar was filled with CO₂ with the gas pressure at 3mm Hg and the inlet flow rate at 15L/min. The electrocoagulation hook is entering from the right 5mmTrocar to cut open the loose fascia tissue below the thyroid cartilage, making the subcutaneous space gradually enlarged. The ultrasonic knife was used to further expand the space downward and bilaterally, and the sternocleidomastoid muscle was dissociated from the sternocleidomastoid muscle on both sides of the sternocleidomastoid muscle. After the construction of the cavity, the inflation pressure of CO₂ is adjusted to 6mm Hg, and the inlet flow rate of CO₂ is adjusted to 35L/min. The white line of the neck was cut with ultrasonic knife to expose the thyroid gland and cut the false capsule of the thyroid gland(Fig2.).

The 10mm incision was taken from the ipsilateral axillary fossa along the dermatoglyphic direction, and a blunt subcutaneous puncture device was used to puncture from the armpit along the superficial layer of the subcutaneous deep fascia to the cervical platysma muscle, close to one side of the

sternocleidomastoid muscle to open the tunnel into the neck space, and then place 10mm Trocars in the armpit. Entering the endoscopic "bendable L-shaped" retractor to help retract the ribbon muscle(Fig3.).

Initially, the amount of 0.1ml carbon nanoparticles was injected into each side of the gland. After excision of anterior laryngeal lymph nodes and tapered lobes, with ultrasonic knife downward cutting of the isthmus was done to cut open berry ligament and adjust "bendable L-shaped" retractor to open the ribbon muscle above the cricothyroid joint, so as to expose the upper pole of the thyroid gland.

Electrocoagulation hook was used to cut open a small part of sternal thyroid muscle, soon after, endoscopic multi-functional separation forceps with nerve monitoring function was used to avoid the injury of external branch of superior laryngeal nerve with cricothyroid muscle tremor evaluation method. Then the branches of the upper polar vessels were cut off with ultrasonic knife. The V1 signal was measured in the area of carotid sheath, then the superior parathyroid gland was bluntly separated by endoscopy, with blood supply preserved in situ. The carotid sheath was cut open and the lymphoadipose tissue in the central region was dissociated medially. The recurrent laryngeal nerve was dissected below the inferior pole of the thyroid and the R1 signal was detected. Dissect with endoscopic fine separation forceps to bluntly separate the inferior parathyroid gland, and try to retain the blood supply of the inferior parathyroid gland in situ. If the inferior parathyroid gland cannot be preserved in situ, it can be actively removed and transplanted into the sternocleidomastoid muscle or deltoid muscle. Then go back to the laryngeal point and dissect the recurrent laryngeal nerve, continue to cut off part of the suspension ligament, bluntly separate the recurrent laryngeal nerve from the gland, and then completely remove the thyroid tissue near the cricothyroid joint attached to the trachea with an ultrasonic knife. Note that the head of the ultrasonic knife should maintain a distance above 3mm from the recurrent laryngeal nerve.

Next, the recurrent laryngeal nerve was dissected retrograde along the shape of the nerve with endoscopic separation forceps, and the nerve tunnel was opened to block remove from the first and second layers of lymphoid adipose tissue in the ipsilateral central area, reaching the innominate artery and thymus below. Then preserve the specimen with a specimen bag. The specimen bag was removed from the axillary incision. Right thyroid cancer also requires a dissection of the third layer of central lymphoid adipose tissue, the lymph node behind the recurrent laryngeal nerve. With blunt separation close to the recurrent laryngeal nerve, cut and push with ultrasonic knife to remove the lymphoid adipose tissue in front of the esophagus, take out the free lymphoid adipose tissue from the back of the nerve and remove the whole piece as far as possible. At this time, we can use the "bendable L-shaped" retractor to push the common carotid artery outward to facilitate our next lower dissection (Fig4.).

The specimen was put into a specimen bag and removed from the axillary incision. Following up cleaning, the R2 signal and V2 signal were monitored and compared with R1 and V1 to see whether the signal was decreased. If the signal is not significantly reduced, the function of the recurrent laryngeal nerve is well protected. Rinse the operation field with a large amount of distilled water, carefully check the hemostasis, suture the white line, place a high negative pressure drainage tube in the operation cavity, draw out from the axillary incision, and fix the drainage tube in the skin layer. The 5mm Trocar on both sides of the oral vestibule and the 5mm Trocar in the middle were withdrawn in turn. The three 0.5cm oral

mucosal incisions were intermittently sutured with absorbable lines, and each incision was sutured with two stitches. Finally, the oral cavity was sterilized 3 times with 0.5% iodophor and then rinsed with normal saline 3 times.

Results

Patient demographics and clinical characteristics are summarized in Table 1. The distribution of age, gender, and thyroid mass size did not differ significantly between the two groups. Furthermore, there was no significant difference in the postoperative pathological results, and the percent of malignant tumors between the two groups had no significant difference. In sum, the above clinical and pathological data confirm that it is feasible to compare the results of the two groups.

Upon the above, evaluation of surgical data was adopted between the two groups. As shown in Table1, in the novel Mini group, operative time was not significantly longer than that in the conventional group. Moreover, the specimen removal time did not differ between the two groups, suggesting that Mini surgery does not increase the complexity of the operation. Notably, the hospitalization time of patients in the novel Mini group was obviously less than that in conventional group. In conclusion, compared with traditional surgery, Mini surgery reduces the length of hospital stay without increasing the complexity of the operation.

Table 1
Clinicopathological characteristics of the patients who underwent Mini transoral thyroidectomy versus conventional transcervical thyroidectomy

	Mini group (n = 55)	Conventional group (n = 55)	P value
Gender(male/female)	5/50	4/51	0.857
Age	36.5 ± 10.8	35.8 ± 11.2	0.621
thyroid mass size (cm)	2.4 ± 1.8	2.5 ± 1.6	0.352
Bleeding amount	26.5 ± 8.8	26.8 ± 7.6	0.489
Operative time	120.78 ± 25.45	122.80 ± 38.45	0.589
Specimen removal time	15.64 ± 4.38	13.64 ± 4.55	0.129
hospitalization	3.66 ± 0.68	4.64 ± 0.68	0.045
Pathologic results			0.686
Nodular goiter	8	9	
Thyroid adenoma	9	24	
Papillary carcinoma	38	36	

Numbness of the lower jaw, pain, mandibular muscles dysfunction and mandibular edema are the most common side effect after thyroidectomy. Firstly, in order to evaluate and compare the numbness of the lower jaw of the patients between the two groups, in the first day post-operation, appearance of numbness of the jaw, the nylon filament check score, pressure needle puncture examination score, or numbness VAS score were administrated and results indicated that the degree of numbness of the jaw in novel Mini group is significantly better than the conventional group($P < 0.01$). Moreover, the pain of the axillary incision was evaluated using the pain VAS score method, and the results also showed that novel Mini group was significantly better than that in the conventional group($P < 0.001$). Furthermore, in terms of mandibular muscles dysfunction, dysfunction of mandibular muscles was observed in six of fifty-five patients in the conventional group, whereas no dysfunction of mandibular muscles observed in Mini group($P < 0.001$). At last, the results of post-operation mandibular edema between two groups indicated that degree of mandibular edema postoperative in Mini group was markedly slighter than that in the conventional group, whereas there was no difference between the two groups pre-surgery. In sum, patients in novel Mini group generally showed no significant numbness in the lower jaw, no significant pain in the axillary incision, and the degree of edema in the lower jaw was slighter in Mini group.

In terms of surgical results and severe complication, as shown in Table 2, there were no significant differences in RLN palsy, transient hypocalcemia, and subcutaneous emphysema between the novel Mini group and the conventional group. Intriguingly, post-operation infection was observed in two of fifty-five patients in the conventional group, whereas no post-operation infection observed in Mini group ($P < 0.001$), which is attributed to the minor incisions and wounds in Mini transoral endoscopic thyroidectomy (Fig. 5.).

Additionally, this approach has been improved to make the incision in the mouth smaller, reduce the damage to the surrounding tissues, edema and numbness in the lower jaw post-surgery. In order to make up for the loss of surgical operation space, another small incision was made in the armpit as an auxiliary. However, the small incision was clinically verified to have little effect on aesthetics, and did not add additional surgical pain and postoperative complications.

Of note, the novel Mini method reduces the incision in the oral cavity and has a high degree of matching with trocar, which reduces the risk of infection caused by second-class incisions. Furthermore, the improved surgical method did not increase the risk of infection and reduced the postoperative infection and effects on taste and smell when the disinfection time was reduced and the concentration and dosage of iodophor disinfection were reduced.

Table 2
Comparison of surgical outcomes in novel Mini transoral endoscopic thyroidectomy and the conventional transoral endoscopic thyroidectomy

	Mini group (n = 55)	Conventional group (n = 55)	P value
Numbness of the lower jaw	0	5	< 0.001
Nylon filament check score	25.8 ± 3.2	16.5 ± 2.3	< 0.001
Pressure needle puncture test score	3.6 ± 2.3	2.5 ± 1.4	0.003
Numbness VAS score	3.2 ± 1.1	4.6 ± 2.3	0.001
VAS pain score			
Day 1	0.878 ± 0.48	2.65 ± 1.34	< 0.001
Day 2	0.77 ± 0.52	2.20 ± 1.10	< 0.001
Day 3	0.52 ± 0.29	0.87 ± 0.69	0.008
Dysfunction of mandibular muscles	0	6	< 0.001
Degree of mandibular edema Preoperative	2.2 ± 1.3	2.1 ± 1.6	0.563
Degree of mandibular edema postoperative	2.6 ± 0.8	4.2 ± 2.3	< 0.001
Complication			
Infection	0	2	< 0.001
RLN palsy	0	0	0.952
Transient hypocalcemia	2	1	0.986
Subcutaneous emphysema	1	1	0.855

Discussion

There is an increasing number of transoral endoscopic thyroidectomy being performed worldwide^[9,10]. With its ability to be completely scarless and with the most short and direct path to the thyroid, transoral endoscopic thyroidectomy vestibular approach is a logical next step in the evolution of endoscopic thyroid surgery^[11]. In present study, we designed and adopted a novel Mini transoral endoscopic thyroidectomy in patients with thyroidectomy. The most important priority in evaluating and adopting a new surgical procedure is its safety. The conventional transoral endoscopic thyroidectomy has been reported to be safe^[12]. However, there is still a lot of room for improvement in the traditional methods and techniques being used now^[13,14]. Hence, in this study we evaluated the safety and efficacy of novel Mini transoral endoscopic thyroidectomy in the first 45 patients, focusing on safety and complications.

First, our series of study compares the safety and efficacy of novel Mini transoral endoscopic thyroidectomy with conventional transoral endoscopic thyroidectomy specifically for patients with thyroidectomy. Similar to previously published trials comparing endoscopic and open thyroidectomy^[15], Mini transoral endoscopic thyroidectomy did not have a significantly longer overall operative time compared with conventional transoral endoscopic thyroidectomy. This is in large part due to time spent inserting ports and establishing the working space with fine laparoscopic instruments. Outside of operative time, it is critical that any new technique be at least equivalent to the standard of care in terms of outcome. In our cohort, the Mini transoral endoscopic thyroidectomy group had less post-operation hospitalization compared to the conventional transoral endoscopic thyroidectomy.

New techniques also bring with them approach specific complications^[15,16]. For instance, the increased risk of infection from transforming a clean procedure to a clean contaminated operation were key concerns following the introduction of conventional transoral endoscopic thyroid surgery^[17]. In the present study, there was no significant difference in the pathological results, and the occurrence of malignant tumors between the two groups was not significantly different. In the novel Mini transoral endoscopic thyroidectomy group, operative time was not significantly longer than that in the conventional transoral endoscopic thyroidectomy group. Moreover, the specimen removal time did not differ between the novel Mini transoral endoscopic thyroidectomy group and the conventional transoral endoscopic thyroidectomy group.

Axillary pain and numbness of the chin after conventional transoral endoscopic thyroidectomy are important reasons affecting the effect of surgery outcome^[18,19]. More importantly, the nylon wire examination score, pressure needle puncture examination score, or numbness VAS score indicated that the degree of numbness of the jaw in novel Mini transoral endoscopic thyroidectomy group is significantly better than the conventional transoral endoscopic thyroidectomy group. Moreover, the pain of the axillary incision using the pain VAS score method also showed that novel Mini transoral endoscopic thyroidectomy group is significantly better than the conventional transoral endoscopic thyroidectomy group. Patients in novel Mini transoral endoscopic thyroidectomy group generally showed no significant numbness in the lower jaw, no significant pain in the axillary incision, and the degree of edema in the lower jaw was slight. Many advantages of novel Mini transoral endoscopic thyroidectomy have led to this result. For instance, without cutting off any muscles in the mandible, the cavity was constructed by direct puncture with three 0.5cm Trocar, which caused slight injury to the oral cavity and mandible. The middle 0.5cm trocar was punctured from the midline and the bilateral 0.5 cm trocar was punctured from the 2.5-3cm away the midline to avoid the anatomical area of the mental nerve and prevent the injury of the mental nerve. After operation, there was almost no sensation of numbness and loss of consciousness in the lower jaw. After operation, it will not affect the voluntary expression of facial micro expression, the fine movement of mouth and pronunciation. The swelling of mandible was alleviated obviously after operation. One cm incision was made along the dermatoglyphics from the ipsilateral axilla of the lesion. The subcutaneous tunnel from the armpit to the neck was established with the endoscopic visual separation rod made by Schneider. After the specimen was put into the specimen

bag during the operation, the specimen was dragged out from the subcutaneous tunnel to the armpit to be easier to take out. During the operation, 10 mm trocar can be placed from the axillary incision, and then from the armpit into the endoscopic retractor (extensible "L" type) to help retract the banded muscle. The drainage tube can be drawn from the axillary incision, so the neck does not leave any puncture holes or micro-incisions, which can achieve "really no marks". During the operation, 5 mm endoscopy is not easy to conflict with 5 mm Trocar on both sides. 5 mm Trocar is more likely to pass through the chin subcutaneous with mild mental skin compression, producing mild skin redness, swelling or subcutaneous ecchymosis. Intraoperative trocar from the axillary into the separation forceps or grasping forceps to help separate or pull tissues or organs, such as anatomy of parathyroid glands, can help to pull parathyroid glands, conducive to our fine in situ preservation of parathyroid glands and blood supply^[20]. During the operation, the trocar from the axilla can enter the suction tube, so that the smoke produced during the operation can be sucked out from the side, and the fog of the endoscopic lens can be improved obviously. During the operation, trocar can be performed from the axilla, by which we can more clearly observe the situation of the superior thyroid pole and the anatomy of the superior laryngeal nerve. As such, our results indicated that novel mini transoral thyroid surgery is a safe technique when performed by experienced surgeons.

In conclusion, the new novel Mini transoral endoscopic thyroidectomy is safe and feasible, and reduces the damage to the functional muscles such as the mandibular diaphragm and lower lip muscles, significantly reduces the numbness and edema of the mandible after surgery, and reduces the impact on the expression muscle activity. Our novel Mini transoral endoscopic thyroidectomy is a feasible and safe option for select patients who require thyroidectomy, when compared with conventional transoral endoscopic thyroidectomy, and can be a viable alternative for patients wishing to avoid numbness and pain.

Abbreviations

VAS: Visual Analogue Score; RLN: recurrent laryngeal nerve

Declarations

Ethics approval and consent to participate

All the patients were over the age of 16 with the informed consent of the patients.

Consent for publication

The proof of consent to publish from study participants can be requested at any time.

Availability of data and material

Not applicable

Competing interests

None declared.

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Authors' contributions

RJ and NXJ contributed to data analysis and complete the first draft; HF, YY and LB contributed to data collection; ZJG contributed to drafting of the manuscript and its critical revision for important intellectual content. All authors read and approved the final manuscript.

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References

1. Dionigi G, Lavazza M, Bacuzzi A, et al. Transoral Endoscopic Thyroidectomy Vestibular Approach (TOETVA): From A to Z[J]. Surg Technol Int, 2017, 30: 103-112.
2. Peng X W, Li H, Li Z, et al. Modified transoral endoscopic thyroid surgery for treatment of thyroid cancer: operative steps and video[J]. Gland Surg, 2017, 6(6): 742-744.
3. Bakkar S, Al Hyari M, Naghawi M, et al. Transoral thyroidectomy: a viable surgical option with unprecedented complications-a case series[J]. J Endocrinol Invest, 2018, 41(7): 809-813.
4. Karakas E, Steinfeldt T, Gockel A, et al. Transoral parathyroid surgery—a new alternative or nonsense? [J]. Langenbecks Arch Surg, 2014, 399(6): 741-5.
5. Anuwong A, Kim H Y, Dionigi G. Transoral endoscopic thyroidectomy using vestibular approach: updates and evidences[J]. Gland Surg, 2017, 6(3): 277-284.
6. Pinto G, Mazzeo C, Caruso E, et al. Future directions for transoral endoscopic thyroid surgery[J]. Rev Col Bras Cir, 2019, 46(3): e20192209.
7. Anuwong A, Ketwong K, Jitpratoom P, et al. Safety and Outcomes of the Transoral Endoscopic Thyroidectomy Vestibular Approach[J]. JAMA Surg, 2018, 153(1): 21-27.
8. Zhang D, Caruso E, Sun H, et al. Classifying pain in transoral endoscopic thyroidectomy[J]. J Endocrinol Invest, 2019, 42(11): 1345-1351.
9. Razavi C R, Tufano R P, Russell J O. Starting a Transoral Thyroid and Parathyroid Surgery Program[J]. Curr Otorhinolaryngol Rep, 2019, 7(3): 204-208.
10. Gu J H, Zhao Y N, Xie R L, et al. Analysis of risk factors for cervical lymph node metastasis of papillary thyroid microcarcinoma: a study of 268 patients[J]. BMC Endocr Disord, 2019, 19(1): 124.

11. Fama F, Zhang D, Pontin A, et al. Patient and Surgeon Candidacy for Transoral Endoscopic Thyroid Surgery[J]. Turk Arch Otorhinolaryngol, 2019, 57(2): 105-108.
12. Kadem S G, Habash S M, Jasim A H. Transoral Endoscopic Thyroidectomy via Vestibular Approach: A series of the first ten cases in Iraq[J]. Sultan Qaboos Univ Med J, 2019, 19(1): e68-e72.
13. Zhang D, Park D, Sun H, et al. Indications, benefits and risks of transoral thyroidectomy[J]. Best Pract Res Clin Endocrinol Metab, 2019, 33(4): 101280.
14. Lin P, Yao Z, Sun Y, et al. Deciphering novel biomarkers of lymph node metastasis of thyroid papillary microcarcinoma using proteomic analysis of ultrasound-guided fine-needle aspiration biopsy samples[J]. J Proteomics, 2019, 204: 103414.
15. Hurtado-Lopez L M, Gutierrez-Roman S H, Basurto-Kuba E, et al. Endoscopic transoral parathyroidectomy: Initial experience[J]. Head Neck, 2019, 41(9): 3334-3337.
16. Besler E, Citgez B, Aygun N, et al. The Relationship of Clinicopathological Factors of the Tumor with Preoperative TSH Level in Papillary Thyroid Cancers[J]. Eurasian J Med, 2019, 51(1): 8-11.
17. Tartaglia F, Maturo A, Di Matteo F M, et al. Transoral video assisted thyroidectomy: a systematic review[J]. G Chir, 2018, 39(5): 276-283.
18. Anuwong A, Sasanakietkul T, Jitpratoom P, et al. Transoral endoscopic thyroidectomy vestibular approach (TOETVA): indications, techniques and results[J]. Surg Endosc, 2018, 32(1): 456-465.
19. Ze Y, Zhang X, Shao F, et al. Active surveillance of low-risk papillary thyroid carcinoma: a promising strategy requiring additional evidence[J]. J Cancer Res Clin Oncol, 2019, 145(11): 2751-2759.
20. Miyauchi A, Ito Y. Conservative Surveillance Management of Low-Risk Papillary Thyroid Microcarcinoma[J]. Endocrinol Metab Clin North Am, 2019, 48(1): 215-226.

Figures

Figure 1

Demonstration of the position of the patient during the operation. Patients placed in the supine position with neck being extended.

Figure 2

Demonstration of the location of the incision during the operation. Dotted line shows detachment area.

Figure 3

Demonstration of micro-incision during operation. We make a more slender incision at the vestibule.

Figure 4

Demonstration of important anatomical structures. Craniocaudal view with transoral approach.

Figure 5

Demonstration of the recovery of surgical incision after operation. The mucosal incision has healed well.