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Case Series

Trans-oral endoscopic endocrine surgery vestibular approach: Pioneering the technique in the Gulf Cooperation Council Countries – A case series

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ABSTRACT

Background: We present our experience with the first five thyroidectomies and parathyroidectomy in Kuwait performed via the transoral endoscopic vestibular approach.

Methods: Retrospective data collection for all trans-oral endoscopic vestibular approach endocrine surgeries performed at a single institution in Kuwait between November 2019 and February 2021. Information on patient demographics, perioperative management and complications were collected and reviewed.

Outcomes: All 5 cases were completed successfully; the intended specimen was extracted successfully via the trans-oral endoscopic vestibular approach and conversion to traditional trans-cervical approach (TCA) was not required. Operative time for the parathyroidectomy case was 225 min and the average operative time for the remaining 4 cases, thyroidectomies, was 151 min. Blood loss was minimal, and length of hospital stay was between 24 and 48 h. One patient had a transient mental nerve injury, and one patient experienced a postoperative seroma which required aspiration. One case required completion thyroidectomy as histopathology revealed papillary thyroid carcinoma.

Conclusion: Transoral vestibular approach is a scar free and safe approach to thyroidectomies and parathyroidectomies. Careful patient selection and counselling with regards to risk versus benefit is required. It is an excellent alternative to the traditional transcervical approach and offers great cosmetic results.

1. Introduction

The conventional trans-cervical approach (TCA) was first described by Sir Theodore Kocher in the late nineteenth century [1]. Since then, TCA has been the standard approach for thyroidectomies and parathyroidectomies for the majority of surgeons [2]. The TCA results in a central visible neck scar which is cosmetically unsatisfactory to some patients [2]. In order to improve patient satisfaction and quality of life, numerous alternative minimally invasive approaches have been described in the literature aiming for a smaller scar on the neck or a scarless surgery. Those approaches included minimally invasive video-assisted thyroidectomy (MIVAT) and a trans-axillary approach [3,4]. At a later date, the natural orifice transluminal endoscopic surgery (NOTES) was introduced in thyroid surgery in 2008 [5–7]. Initially the access was via a sublingual or trans-tracheal approach [8]. These techniques resulted in severe tissue damage and were associated with high complication rates [5,6].

In order to improve the cosmetic results of thyroid surgery while maintaining safety, in 2016, Anuwong described an approach which allowed for scarless surgery, minimal tissue damage and better access to both lobes of the thyroid gland. This approach is known as trans-oral endoscopic thyroidectomy vestibular approach (TOETVA) [9]. TOETVA is a totally scarless surgery and involves incisions placed in the vestibular aspect of the lip [10,11]. A similar approach has been developed for parathyroidectomies. Initially it was called transoral partial parathyroidectomy (TOPP) by Karakas in 2009 as part of the NOTES technique. In 2016, Sasanakietkul described the trans-oral endoscopic parathyroidectomy vestibular approach (TOEPVA) [12]. It resulted in similar desired outcomes as experienced by TOETVA [12]. We describe our experience with the trans-oral vestibular approach for thyroidectomy and parathyroidectomy from a single institution in Kuwait.

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2. Material and methods

2.1. Study population and design

Retrospective case-series examining all TOEPVA and TOETVA performed at a single governmental institution between November 2019 and February 2021 by a high-volume Endocrine/General Surgery team. All the surgeries were performed by the same surgeon with a fellowship in endocrine surgery. The work has been submitted with a research registry; unique identifying number is researchregistry7073 [13].

The following case series is in compliance with the PROCESS guideline [14].

Patients were offered TOETVA if they fit the inclusion criteria; history of hypertrophic scarring or desire to avoid an anterior neck incision, a thyroid diameter ≤10 cm or thyroid volume ≤45 ml, benign/intermediate nodule ≤ 6 cm or dominant nodule ≤ 2 cm if Bethesda V/suspicious or confirmed differentiated thyroid cancer, substernal goiter grade 1 and graves' disease that is controlled with medical management [15]. Exclusion criteria included poorly differentiated malignancy, involvement of central/lateral neck, evidence of extrathyroidal disease/extension, unfit for general anesthesia, pre-operative recurrent laryngeal nerve paresis, history of prior neck surgery and oral abscess [15].

For TOEPVA, patients must have a localized primary hyperparathyroidism with no evidence of recurrent or persistent hyperparathyroidism, multi-gland disease, secondary or tertiary hyperparathyroidism, family history of Multiple endocrine neoplasms (MEN), suspected carcinoma and previous neck surgery or irradiation [15]. Morbid obesity and smoking are relative contraindications [15, 17].

2.2. Peri-operative course

Patients underwent preoperative vocal cord assessment as part of their preoperative work-up. Ultrasound was performed to assess the thyroid gland. Preoperative localization of the parathyroid adenoma was achieved using an ultrasound and a sestamibi parathyroid scan. The ultrasound was performed by a radiologist and findings were confirmed by the operating surgeon. The patients were kept nil by mouth prior to surgery. The surgical approach that was adopted is based on the technique described by Anuwong for TOETVA [11] and Sasanakietkul for TOEPVA [12].

2.3. Intra-operative course

Three incisions were made in the vestibular and in the gingival buccal fold (image A). The first incision was made at the center of the lower lip oral vestibule. Two lateral incisions were made between the incisor and canine. Three trocars were used for the procedure, space was created passing the mandibular area and submental space to the anterior neck and lateral. The lateral 2 ports were inserted under direct supervision. In all cases with the exception of case number three, two 5 mm ports and one 10 mm port was used. In case number three, three 5 mm ports were used. The subplatysmal space was insufflated with CO2 at a pressure of 7 mmHg. A workspace was created by blunt dissection (superior border-larynx, inferior border-suprasternal notch, lateral borders-sternocleidomastoid). Space was created by CO2 insufflation and mechanical lifting (external hanging central neck suture for retraction) [18].

In terms of dissection, strap muscles were divided and retracted laterally (image B|). The isthmus was identified, dissected and separated. The thyroid vessels were then identified, coagulated and transected close to the gland. Cranio-caudal dissection of the gland then occurred. The Recurrent laryngeal nerve (RLN) was identified, monitored using electromyography (EMG signal) and preserved. The Vagus nerve and the Superior Laryngeal Nerve (SLN) was not stimulated. The parathyroid glands were identified and preserved. In the parathyroidectomy case, the thyroid lobe was mobilized, the pathological gland was identified and resected, intraoperative parathyroid hormone (PTH) sampling was utilized. The specimen was retrieved via an endobag through the central vestibular incision. Hegar dilator was used to ease removal of the specimen (image C). No drains were required in all 5 cases. Incisions were closed using absorbable sutures [18].

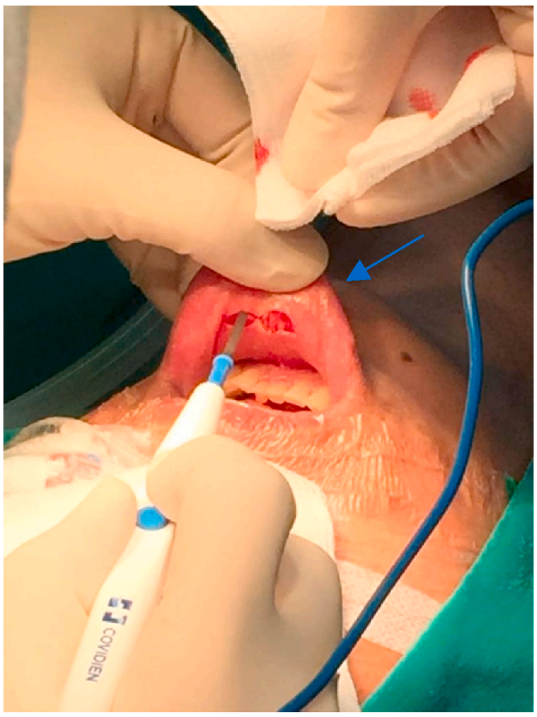

Image A. The first incision was made at the center of the lower lip oral vestibule as shown in figure 1.

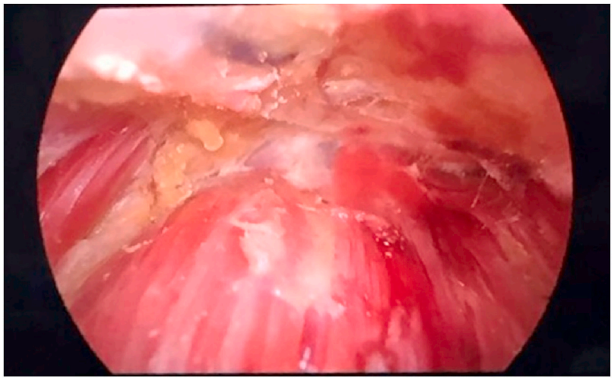

Image B. Subplatysmal flap demonstrated in figure 2.

2.4. Postoperative care

Post-operative laryngoscopic exam was performed in the operating room to confirm the absence of functional deficits.

On postoperative day zero, patients can resume oral intake, brush their teeth, were instructed to avoid pulling their lower lip down and were also instructed to wear a pressure dressing (jaw bra) for 7 days. All patients were compliant to postoperative orders. Criteria for discharge included adequate pain control, patient tolerating oral intake, and no evidence of immediate postoperative complications.

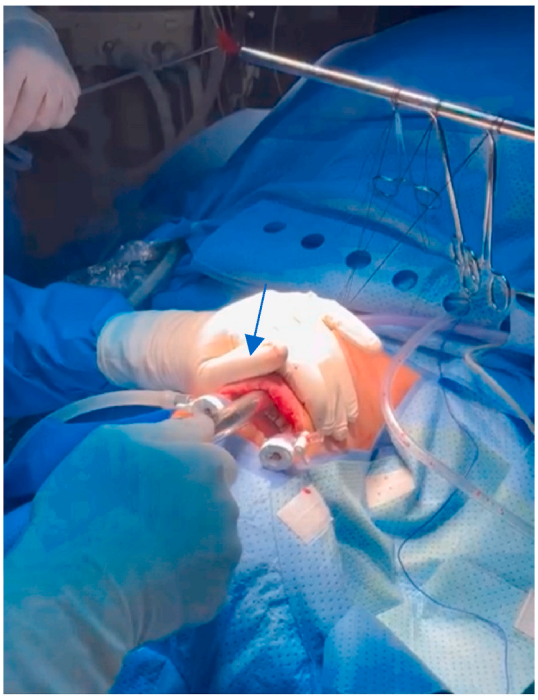

Image C. Hegar dilator was used to ease removal of the specimen as demonstrated in figure 3.

3. Results

A total of five transoral-vestibular-approaches to endocrine surgeries were performed between November 2019 and February 2021. Four cases were thyroid lobectomies, following the TOETVA and one case was a parathyroidectomy and followed TOEPVA.

3.1. Patient characteristics

Patient information including age, gender and comorbidities, as well as preoperative clinical diagnosis, fine needle aspiration cytology (FNAC) results and size of nodule on ultrasound are summarized in Table 1.

Four out of the five cases were female. Age ranging from 28 to 61 years-old (mean age- 43 years-old) and maximum nodule diameter was 4.1 cm. In case number 3, the patient had hyperparathyroidism and FNAC was not done. The remaining 4 cases did not show malignant pathology on FNAC (Table 1).

3.2. Operative details

One left parathyroidectomy, 2 left hemithyroidectomies and 2 right hemithyroidectomies were performed. Three 5 mm ports were used for the parathyroidectomy procedure, and one 10 mm plus two lateral 5 mm ports were used for the thyroidectomy procedures. Operative time for case number three, the parathyroidectomy, was 225 min. For the other four cases, the hemithyroidectomies, it ranged between 105 and 180 min with a mean of 151 min. The estimated Intraoperative blood loss ranged between 5 and 20 ml, and length of hospital stay was 24–48 h. Post-operative histopathology revealed benign findings in case number one and two. In case number three it revealed a left superior parathyroid adenoma. In cases number four and five it revealed papillary micro-carcinoma and papillary carcinoma, respectively. Case number five required completion thyroidectomy at a later date after further evaluation and discussion at a multi-disciplinary team meeting (Table 2).

No postoperative labs were ordered, with the exception for case number 3. In case number 3, the patient underwent a parathyroidectomy, post-operative calcium and parathyroid hormone (PTH) levels were required both in recovery and post-operative day 1 which revealed normal PTH and calcium readings, indicating a biochemical cure.

All cases required postoperative antibiotics which were continued on discharge for 5 days. Stitch removal was not required in all cases as absorbable sutures were used. All patients had postoperative outpatient follow up at 10–14 days, 6 weeks, and 6 months after discharge.

3.3. Complications

In case number one, the patient developed a postoperative seroma which required aspiration twice. In case number two the patient experienced temporary mental nerve injury, which resolved within six weeks. In all five cases there was no evidence of postoperative infection, recurrent laryngeal nerve injury, hypoparathyroidism, hematoma formation or bleeding. In case number 5, post-operative histopathology revealed papillary carcinoma, requiring completion thyroidectomy via the trans-cervical approach (Table 3).

4. Discussion

Since the nineteenth century, the TCA for thyroid and parathyroid surgeries have been the standard of care. It resulted in an anterior neck scar which was cosmetically unappealing for some patients, impacting their quality of life [16]. In the last two decades, advancements in the field of surgery lead to the introduction of minimally invasive surgical techniques. These innovations were adapted in the field of endocrine surgery. Initially, thyroidectomies and parathyroidectomies via remote access, i.e., the trans-axillary approach were adopted, however these approaches were associated with an increase in complication rate [3,4,15]. Further developments in the surgical field, led to the introduction of NOTES and subsequently the transoral approach, TOETVA and TOEPVA by Anuwong and Sasanakietkul respectively in 2016 [9,19].

The transoral endoscopic vestibular approach for neck surgeries is a minimally invasive and safe procedure that provides good cosmetic

Table 1
Patient characteristic.

Case No.	Age (years)	Gender	Pre- operative clinical diagnosis	Comorbidities	ASA	Preoperative FNAC[a]	Laterality	Preoperative size of nodule on imaging (cm)
1	28	Female	Thyroid Nodule	None	II	Benign colloid nodule	Left lobe	2.7 × 2.1 × 4.1
2	42	Female	Thyroid Nodule	Diabetes Mellitus	II	Benign colloid nodule	Left lobe	4 × 3 × 3.7
3	61	Female	Parathyroid adenoma	Osteoporosis	II	Not performed	Left superior parathyroid	1.9 × 1.4
4	51	Male	Toxic thyroid nodule + suspicious	None	II	Atypia of undetermined significant	Right lobe	1 × 1 × 0.7
5	36	Female	Thyroid Nodule	None	II	Benign colloid nodule	Right lobe	3.1 × 1.8

Pre-operative patients' demographics and investigation findings.
[a] FNAC- Fine needle aspiration cytology.

Table 2
Operative Details of the Study patients.

Case No.	Extent of Surgery	Diameter of Ports (mm)	Operative time (mins)	Blood Loss	Length of hospital stay (hours)	Post-operative histopathology	Post-operative treatment/ recommendation
1	Left hemithyroidectomy	5 and 10	150	20 ml	24	Hyperplastic nodule	None
2	Left hemithyroidectomy	5 and 10	170	20 ml	48	Benign simple cyst on a background of mild chronic thyroiditis	None
3	Left parathyroidectomy	5	225	5 ml	48	Left superior parathyroid adenoma	None
4	Right hemithyroidectomy	5 and 10	105	5 ml	48	Papillary microcarcinoma (0.5 × 0.5 × 0.7 cm)	None
5	Right hemithyroidectomy	5 and 10	180	5 ml	24	Papillary carcinoma (pT3aNx)	Completion thyroidectomy

Operative steps and findings.

Table 3
Complications.

Case No.	RLN palsy[a]	Mental nerve injury	Hypoparathyroidism	Hematoma	Infection	Bleeding	Seroma	Others
1	No	No	No	No	No	No	Yes	Aspiration of seroma x 2
2	No	Temporary	No	No	No	No	No	None
3	No	No	No	No	No	No	No	None
4	No	No	No	No	No	No	No	None
5	No	No	No	No	No	No	No	Completion thyroidectomy

Post-operative complications.
[a] RLN- Recurrent laryngeal nerve.

outcomes resulting in greater patient satisfaction and thus improving quality of life [20]. These outcomes have been replicated in different centers globally. There are numerous benefits to the transoral approach. Firstly, this approach is regarded as a scarless surgery which provides the patient with a cosmetic result they desire and thus improving their quality of life. Kasemsiri et al. [20] studied the quality of life in patients who underwent a thyroidectomy via a trans-oral endoscopic approach versus the trans-cervical incisional approach. The study demonstrated better outcomes in terms of quality of life, cosmetic outcome and overall satisfaction in those who underwent a thyroidectomy via the transoral endoscopic approach, the results of the study were statistically significant. Furthermore, the transoral endoscopic approach contributed to rapid recovery and early return to work as evident by Kasemsiri et al. [20]. Patients who underwent TOETVA reported less post-operative pain. This result has been replicated multiple times across different nations [9,19]. Moreover, it is a minimally invasive procedure that has been shown to be safe and feasible by allowing adequate recurrent laryngeal nerve visualization, parathyroid and thyroid gland exploration, complete resection of a gland and similar complication risks to the conventional approach [21,22].

The transoral endoscopic approach to endocrine surgery has a few limitations. It provides a 2-dimensional field especially with the use of instruments such as a rigid endoscope. Another limitation of the procedure is the possible difficulties a surgeon may encounter during the extraction of the specimen, especially if they are greater than 3 cm in size [21]. Appropriate patient selection criteria are crucial to the success of the procedure [15]. A study published in 2019 by Gorgan et al. showed that more than half (55.8%) who underwent a thyroid or parathyroid surgery via the TCA were eligible for a transoral vestibular approach to the surgery [23]. The most common causes for ineligibility to the transoral approach were previous neck surgery, the need for neck dissection and non-localized hyperparathyroidism [23].

Transoral endoscopic approach to head and neck endocrine surgeries have a greater operative time compared to the traditional TCA. Shan et al. published a systematic review of transoral thyroidectomies which demonstrated the mean operative time to range from 60.4 to 265.4 min [24]. In our series, operative time for case number three, the parathyroidectomy, was 225 min. For the other four cases, the hemithyroidectomies, the operative time ranged between 105 and 180 min with an average of 151 min. This is similar to other series in the literature. The greater operative time in the parathyroidectomy is due to intraoperative PTH sampling, to confirm drop in hormone levels prior to concluding the surgery.

Informed consent should be obtained prior to undergoing the procedure, the benefits and complications of the surgery should be fully explained. Patients should be aware of the risk for conversion to the more traditional TCA. Literature has shown an acceptable conversion rate of up to 1.3% [25]. A recent review by Russell et al. [15] demonstrated a lower rate for conversion of up to 1%. It is also recommended that the surgeon performing the procedure is a high-volume surgeon (performing more than 25 thyroidectomies in total annually), has adequate skills in the TCA if conversion is needed, and able to adequately perform a central and modified neck dissection, if required [18]. In our case series, all procedures were completed via the trans-oral endoscopic vestibular approach, conversion to open was not required.

This approach is classified as a clean contaminated wound due to access via the oral cavity. Russell et al. published a 2020 update to transoral thyroid and parathyroid surgeries via vestibular approach [15]. They reviewed 686 cases and only one case of neck infection has been reported with a percentage of 0.1%. The results of our case series did not illustrate wound infection. However, all our patients received prophylactic antibiotics prior to surgery to protect against oral cavity microflora. In addition, all our patients received a 5-day course of post-operative antibiotics.

When comparing the complications reported from the two techniques i.e., the transoral endoscopic vestibular approach and the transcervical approach, the vestibular approach introduced new novel complications. Injury to the mental nerve which is a branch of the inferior alveolar nerve and provides sensory innervation to the chin, gingivae, mucosa and lower lip may occur [26]. It has been reported that the prevalence of mental nerve injury during the transoral vestibular approach ranges between 1 and 5% [21]. Anuwong et al. [27] reported a series of 200 patients who underwent TOETVA and 1.5% had mental nerve injury. Most of these cases reported a transient nerve injury that was completely resolved in less than six months [27]. In our case series, one patient had transient mental nerve palsy which resolved within 6 weeks. Rates of mental nerve injury may be reduced by moving the lateral vestibular incisions higher up on the lip [18].

Furthermore, the use of carbon dioxide (CO2) for insufflation has led to the introduction of new scope of complications. Subcutaneous surgical emphysema, hypercarbia and CO2 embolism has been reported in the literature [8,22]. The first two complications are due to high intra-cavity pressure. Therefore, the risk is minimized by using a low pressure of 6–7 mmHg. CO2 embolism even though it is a rare complication, it still may occur. It has been reported in a case report during robotic transoral thyroidectomy, which occurred due to laceration of the anterior jugular vein [28].

Another complication of both endoscopic and conventional thyroidectomy is RLN injury. The prevalence of transient and permanent RLN injury in the trans-cervical approach ranges between 2.11% to 11.8% and 0.2%–5.9%, respectively [29]. Shan et al. published a systematic review of transoral thyroidectomies in 2018 which showed that the prevalence of temporary RLN injury is 4.3% and permanent RLN injury is <0.5%. Zhang et al. replicated similar results in a published article in 2020 that investigated the mechanism of RLN injury during TOETVA [30]. These results are similar to the conventional approach making the transoral endoscopic approach a safe one.

Moreover, the incidence of transient and permanent hypoparathyroidism was similar between the trans-cervical and transoral vestibular approaches. The former approach reports an incidence of up to 11% [11]. In the transoral approach it was reported to be 7.1% [24].

There were other complications that have been reported in the literature. Flap perforation and burn due to transmitted heat from the diathermy device may occur and has been reported on in a case series for Bakkar et al. and Russell et al. [15,22]. Hematoma is another complication that can occur in both the conventional and the transoral vestibular approaches. The incidence of hematoma formation in the transoral approach is 1.67%. Post-operative seroma is a common complication, the incidence in the transoral approach is up to 5%. Our study reported one case that developed a postoperative seroma that required outpatient department-based aspiration two times.

5. Limitations

It is a retrospective study with a small sample size compared to other centers. It has been performed in a single center. The series lacked certain information such as the BMI, cosmetic scoring and VAS pain score. Further research on a larger scale should be done next, considering information that was lacking in this case series.

6. Conclusion

Transoral endoscopic vestibular approaches to thyroidectomies and parathyroidectomies are considered to be safe procedures with excellent cosmetic outcomes and comparable complication rates to the traditional trans-cervical approach. All patients should be screened for candidacy to undergo TOETVA/TOEPVA. This approach is becoming more widely accepted and is being adopted worldwide.

Ethical approval

The ethical approval for this study was obtained from the Ministry of Health's Standing Committee for Coordination of Health and Medical Research in Kuwait for the protection of human subjects.

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None.

Author contribution

Salman Alsafran- Study concept and design, data interpretation, editing and final approval.
Danah Quttaineh- Data collection and interpretation, writing.
Dalia Albloushi- Data collection and interpretation, writing.
Sarah Al Safi- Data interpretation and writing.
Abdullah Alfawaz- Editing and final approval.
Khalifah Alyatama- Editing.
Ali Ismail- Supervisor.

Trial registry number

1. Name of the registry: Research registry
2. Unique Identifying number or registration ID: researchregistry7073
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): https://www.researchregistry.com/register-now#home/registrationdetails/611d3d4f28bb4a001ea09619/

Guarantor

Salman Alsafran.

Consent

Verbal consent was obtained from the patients.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2021.103114.

References

[1] E.T. Kocher, Ueber Kropfexstirpation und ihre Folgen, Arch Klin Chir 29 (1883) 254–337.
[2] J.O. Russell, C.R. Razavi, M. Shaear, R.H. Liu, L.W. Chen, P. Pace-Asciak, V. Tanavde, K.Y. Tai, K. Ali, A. Fondong, H.Y. Kim, R.P. Tufano, Transoral thyroidectomy: safety and outcomes of 200 consecutive north American cases, World J. Surg. 45 (3) (2021 Mar) 774–781.
[3] J.O. Russell, J. Clark, S.I. Noureldine, A. Anuwong, M.G. Al Khadem, H. Yub Kim, V.K. Dhillon, G. Dionigi, R.P. Tufano, J.D. Richmon, Transoral thyroidectomy and parathyroidectomy - a North American series of robotic and endoscopic transoral approaches to the central neck, Oral Oncol. 71 (2017 Aug) 75–80.
[4] J.D. Richmon, F.C. Holsinger, E. Kandil, M.W. Moore, J.A. Garcia, R.P. Tufano, Transoral robotic-assisted thyroidectomy with central neck dissection: preclinical cadaver feasibility study and proposed surgical technique, J. Robot Surg. 5 (2011) 279–282.
[5] K. Witzel, B.H.A. Von Rahden, C. Kaminski, H.J. Stein, Transoral access for endoscopic thyroid resection, Surg. Endosc. Other Interv. Tech. 22 (2008) 1871–1875.
[6] T. Benhidjeb, T. Wilhelm, J. Harlaar, G.J. Kleinrensink, T.A.J. Schneider, M. Stark, Natural orifice surgery on thyroid gland: totally transoral video-assisted thyroidectomy (TOVAT): report of first experimental results of a new surgical method, Surg. Endosc. 23 (2009) 1119–1120.
[7] E. Karakas, T. Steinfeldt, A. Gockel, T. Schlosshauer, C. Dietz, J. Jäger, R. Westermann, F. Sommer, H.R. Richard, C. Exner, A.M. Sesterhenn, D.K. Bartsch, Transoral thyroid and parathyroid surgery–development of a new transoral technique, Surgery 150 (1) (2011 Jul) 108–115.
[8] B. Dinç1, M. Turan, U. Gündüzl, N. Belen, Transoral endoscopic thyroidectomy vestibular approach (TOETVA): our outcomes from Turkey, Turk. J. Surg. 36 (4) (2020) 340–346.
[9] A. Anuwong, K. Ketwong, P. Jitpratoom, T. Sasanakietkul, Q.Y. Duh, Safety and outcomes of the transoral endoscopic thyroidectomy vestibular approach, JAMA Surg. 153 (2018) 21–27.
[10] H. Al Bisher, A. Khidr, B. Alkhudair, F. Alammadi, A. Ibrahim, Transoral endoscopic thyroidectomy via vestibular approach: first case in Saudi Arabia, Int. J. Surg. Case Rep. 70 (2020) 75–77.
[11] A. Anuwong, Transoral endoscopic thyroidectomy vestibular approach: a series of the first 60 human cases, World J. Surg. 40 (3) (2016) 491–497.

[12] T. Sasanakietkul, P. Jitpratoom, A. Anuwong, Transoral endoscopic parathyroidectomy vestibular approach: a novel scarless parathyroid surgery, Surg. Endosc. 31 (9) (2017 Sep) 3755–3763.
[13] https://www.researchregistry.com/register-now#home/registrationdetails/611d3d4f28bb4a001ea09619/.
[14] R.A. Agha, C. Sohrabi, G. Mathew, T. Franchi, A. Kerwan, O'Neill N for the PROCESS Group, The PROCESS 2020 guideline: updating consensus preferred reporting of CasE series in surgery (PROCESS) guidelines, Int. J. Surg. 84 (2020) 231–235.
[15] J.O. Russell, Z.T. Sahli, M. Shaear, C. Razavi, K. Ali, R.P. Tufano, Transoral thyroid and parathyroid surgery via the vestibular approach-a 2020 update, Gland Surg. 9 (2) (2020 Apr) 409–416.
[16] C. Camenzuli, P. Schembri Wismayer, J. Calleja Agius, Transoral endoscopic thyroidectomy: a systematic review of the practice so far, J. Soc. Laparoendosc. Surg. 22 (3) (2018) e2018.00026.
[17] C.R. Razavi, J.O. Russell, Indications and contraindications to transoral thyroidectomy, Ann. Thyroid 2 (5) (2017) 12.
[18] G. Dionigi, M. Lavazza, A. Bacuzzi, D. Inversini, V. Pappalardo, R.P. Tufano, H. Y. Kim, A. Anuwong, Transoral endoscopic thyroidectomy vestibular approach (TOETVA): from A to Z, Surg. Technol. Int. 30 (2017 Feb 7) 103, 2.
[19] T. Sasanakietkul, P. Jitpratoom, A. Anuwong, Transoral endoscopic parathyroidectomy vestibular approach: a novel scarless parathyroid surgery, Surg. Endosc. 31 (9) (2017 Sep) 3755–3763.
[20] P. Kasemsiri, S. Trakulkajornsak, P. Bamroong, K. Mahawerawat, P. Pirmochai, T. Ratanaanekchai, Comparison of quality of life between patients undergoing trans-oral endoscopic thyroid surgery and conventional open surgery, BMC Surg. 20 (2020) 18.
[21] D. Zhang, D. Park, H. Sun, A. Anuwong, R. Tufano, H.Y. Kim, G. Dionigi, Indications, benefits and risks of transoral thyroidectomy, Best Pract. Res. Clin. Endocrinol. Metabol. 33 (4) (2019 Aug) 101280.
[22] S. Bakkar, M. Al Hyari, M. Naghawi, C. Corsini, P. Miccoli, Transoral thyroidectomy: a viable surgical option with unprecedented complications-a case series, J. Endocrinol. Invest. 41 (7) (2018 Jul) 809–813.
[23] R.H. Grogan, I. Suh, K. Chomsky-Higgins, S. Alsafran, E. Vasiliou, C.R. Razavi, L. W. Chen, R.P. Tufano, Q.Y. Duh, P. Angelos, J.O. Russell, Patient eligibility for transoral endocrine surgery procedures in the United States, JAMA Netw. Open 2 (5) (2019 May 3), e194829.
[24] L. Shan, J. Liu, A systemic review of transoral thyroidectomy, Surg. Laparosc. Endosc. Percutaneous Tech. 28 (3) (2018 Jun) 135–138.
[25] I. Suh, C. Viscardi, Y. Chen, I. Nwaogu, R. Sukpanich, J.E. Gosnell, W.T. Shen, C. D. Seib, Q.Y. Duh, Technical innovation in transoral endoscopic endocrine surgery: a modified "scarless" technique, J. Surg. Res. 243 (2019 Nov) 123–129.
[26] J. Nguyen, H. Duong, Anatomy, Head and Neck, Mental Nerve, StatPearls Publishing, 2021 [Updated 2020 Aug 10]. In: StatPearls [Internet]. Treasure Island (FL), https://www.ncbi.nlm.nih.gov/books/NBK546630/.
[27] A. Anuwong, T. Sasanakietkul, P. Jitpratoom, K. Ketwong, H.Y. Kim, G. Dionigi, J. D. Richmon, Transoral endoscopic thyroidectomy vestibular approach (TOETVA): indications, techniques and results, Surg. Endosc. 32 (1) (2018 Jan) 456–465.
[28] K.N. Kim, D.W. Lee, J.Y. Kim, K.H. Han, K. Tae, Carbon dioxide embolism during transoral robotic thyroidectomy: a case report, Head Neck 40 (3) (2018 Mar) E25–E28.
[29] P.G. Calò, G. Pisano, F. Medas, et al., Identification alone versus intraoperative neuromonitoring of the recurrent laryngeal nerve during thyroid surgery: experience of 2034 consecutive patients, J. Otolaryngol. Head Neck Surg. 43 (2014) 16.
[30] D. Zhang, H. Sun, R. Tufano, E. Caruso, G. Dionigi, H.Y. Kim, Recurrent laryngeal nerve management in transoral endoscopic thyroidectomy, Oral Oncol. 108 (2020 Sep) 104755.