



ORIGINAL ARTICLE

Transoral endoscopic thyroidectomy by vestibular approach (TOETVA): initial experience in an academic hospital

Antonio Augusto Tupinamba Bertelli^{1*}, Leonardo Guimarães Rangel², Giancarlo Artese Araujo³, Rolando Costa Monteiro⁴, Luiz Claudio Bosco Massarollo⁴, Jonathon Owen Russell³, Ralph Patrick Tufano³, Antonio José Gonçalves¹

Abstract

Introduction: Transoral endoscopic thyroidectomy vestibular approach (TOETVA) is being adopted in many centers around the world for many reasons especially because it depends only on laparoscopic instruments. **Objective:** To describe the initial results of TOETVA after its adoption in a large academic hospital. **Methods:** Fifteen patients underwent TOETVA and were evaluated regarding its indication, operative time and complications. **Results:** Nine lobectomies and six total thyroidectomies were performed, with mean operative time of 107 minutes (64-150min). Ten patients did not have any surgical complications and five patients experienced some sort of complication (1 mental nerve temporary numbness, 1 vocal fold temporary paralysis, 1 temporary hypoparathyroidism and 2 small skin burns). We observed a progressive decrease of operative time. **Conclusion:** The initial results of TOETVA show that it could be instituted safely and effectively in a Brazilian academic center with a short learning curve.

Keywords: thyroid cancer; papillary; thyroid gland; thyroid nodule; thyroidectomy; endoscopic; remote access thyroidectomy.

¹Faculdade de Ciências Médicas da Santa Casa de São Paulo, Departamento de Cirurgia, Disciplina de Cirurgia de Cabeça e Pescoço, São Paulo, SP, Brasil

²Universidade Estadual do Rio de Janeiro (UERJ), Rio de Janeiro, RJ, Brasil

³Division of Head and Neck Endocrine Surgery, Otolaryngology-Head and Neck Surgery Department, Baltimore, Estados Unidos da América

⁴Hospital Samaritano de São Paulo, São Paulo, SP, Brasil

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Introduction

Theodor Kocher standardized the open surgery of the thyroid gland in 1898, which has since been used worldwide for partial and total thyroid removal in cases of goiter and thyroid nodules. Classical thyroidectomy involves a collar incision in the anterior part of the neck, and its main complications are laryngeal nerve injury and hypoparathyroidism. The recent interest in minimally invasive surgical techniques, endoscopic surgery through natural orifices, and surgery without apparent scarring have led to the development of approximately 20 different thyroidectomy techniques, such as the so-called remote approach thyroidectomy, in which the most commonly used has been trans-axillary and transthoracic. Although both techniques involve minimal scarring, they still require considerable dissection between portal entry and the thyroid gland. Thus, most authors do not consider these techniques as minimally invasive¹.



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The current concept of natural orifice transluminal endoscopic surgery (NOTES™) has gained ground as it promotes less surgical trauma, less tissue damage, lower morbidity, and faster recovery than conventional techniques. Transoral endoscopic thyroidectomy by vestibular approach (TOETVA) can be performed with standard laparoscopic instruments. In recent years, TOETVA has been developing as a promising and alternative technique to conventional open thyroidectomy, since it involves less dissection between portal entry and the gland, with similar morbidity to the conventional technique and is scar-free². In 2016, Anuwong, in a pioneering work, published the first series of 60 cases operated by this technique using endoscopic instruments and video surgery material, performing lobectomy in 42 patients and total thyroidectomy in 22 patients². In 2008, Witzel et al. demonstrated the safety of this technique in an experimental study in live pigs³; and in 2009, Benhidjeb et al. confirmed the feasibility of this procedure in human cadavers⁴. Since then, several authors have published their TOETVA case series with encouraging results. The procedure is now routinely performed in various parts of the world, including some countries in the East, the United States, Italy, and Latin America¹. Most published series have shown complication rates similar to the open technique⁴⁻¹¹. Richmon et al. were the first to describe the step by step transvestibular approach for thyroidectomy with central neck dissection included^{10,11}. The fear that communication of the oral cavity with the neck would lead to higher infection rates than conventional surgery has not been realized⁵.

The largest series published in the literature belongs to the pioneer of the technique and describes its 425 cases⁵.

This study aimed to evaluate the complications related to the implementation of TOETVA in a Brazilian academic medical center, and the evolution of the surgical time of these procedures in an academic hospital.

Methods

Patients with surgical thyroid disease who met criteria for TOETVA chose the technique after explanation by the surgeon. Even after signing the consent form until the moment of surgery, the patient could request conventional surgery instead of the transoral technique. The institutional review board approved this study. The classic indications for the technique included benign disease with a nodule up to 6.0cm, malignant disease with nodule up to 2.0cm, absence of substernal goiter, absence of acute thyroiditis, and absence of suspicious lymph nodes preoperatively¹. All patients underwent preoperative laryngoscopy and presented with mobility of both vocal folds. The first cases performed were lobectomies. The surgeries were performed by the main author (AATB), with the help of the other authors and fellows/residents of the Head and Neck Surgery Division.

TOETVA

We used the technique described by Anuwong et al.², using one central portal for 10mm optics input and two lateral 5mm portals for the entry of the working tweezers. The patient undergoes general anesthesia with orotracheal

intubation. After the central incision of approximately 12mm in the central part of the buccal vestibule above the gingivo-labial frenulum, and two 5mm lateral stab incisions in the buccal mucosa near the labial commissure, we proceeded to hydro dissection with saline with 1:5000 epinephrine injected in the upper neck with a Klein needle. Then we performed a dilatation through the central incision with Hegar dilators or Anuwong dilator to create the initial workspace. The portals are inserted into their respective incisions, the 0° optic confirms the absence of any bleeding after dilation, and then CO₂ insufflation under low pressure (6mm Hg) and high flow are initiated. The working instruments are then inserted through the lateral portals and identified in the small initial workspace, which can then be enlarged with subplatysmal dissection inferiorly until the suprasternal notch and laterally until the anterior edges of the sternocleidomastoid muscles. At this time, the optic of 0° is replaced by that of 30°. Thus, we promoted the opening of the median raphe, and it was possible to identify the thyroid isthmus which is then divided with the aid of advanced bipolar or ultrasonic shears. The gland can then be retracted medially to expose the upper pole and pedicle, which is also divided with sealing forceps after topographic mapping of the external branch of the superior laryngeal nerve through intraoperative neurophysiological monitoring. At this moment, we identify and preserve the upper parathyroid gland. After ligation of the upper pole, dissection proceeds inferiorly, where it is possible to identify and preserve the inferior parathyroid and inferior laryngeal nerve. Intraoperative monitoring with stimulation of the ipsilateral vagus nerve and the inferior laryngeal nerves used to confirm neurophysiologic function. If there is difficulty in exposing the tracheoesophageal groove for nerve identification, hanging sutures may be used to suspend the strap muscles. After dissection of the inferior laryngeal nerve until its entry into the larynx, the Berry's ligament is then divided with the help of the sealing forceps, respecting the safe distance to the nerve according to each manufacturer's specification. The specimen is then completely released from the trachea and is then free for removal. In the case of total thyroidectomy, the first lobe is left inside the workspace until all steps are repeated on the second side, so that both specimens are removed at the end of the procedure. Therefore, insufflation is not impaired during performing the second side. The specimens are always removed inside plastic or latex specimen bags so there is no risk of seeding of thyroid tissue. In the end, hemostasis is promoted with a Valsalva maneuver, with the precaution of decreasing the CO₂ insufflation so that any venous bleeding may appear. The final stimuli of neurophysiological monitoring are then performed on the vagus, superior and inferior laryngeal nerves, and their responses compared with those of the initial stimuli. Drainage is not routinely used. The midline is not sutured, and the mucosal incisions are closed with 3 or 4-0 absorbable stitches after careful removal of the portals under direct vision.

Postoperative

The patient remains with an intermittent ice pack on the neck from the immediate postoperative period until hospital discharge. In cases of a total thyroidectomy, a rapid PTH dosage is collected 1 hour after the specimen is removed (PTH1h) and those patients with PTH1h less than 15ng/mL receive

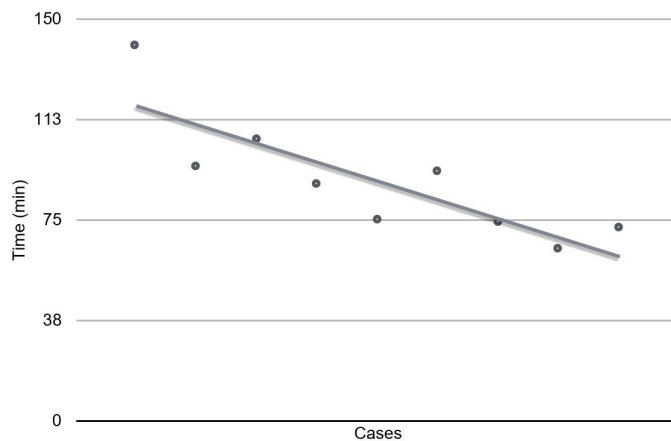
calcium supplementation (2g/day) and calcitriol (0.5-1, 0ug/day) to avoid symptoms of hypocalcemia. After surgery, the patient receives a cold liquid diet, followed by a light diet on the next day. The analgesic medication used is the same as in open surgery (dipyrene and ketoprofen), and all patients receive intravenous antibiotic therapy initiated before anesthetic induction and maintained during hospitalization, and orally for seven days after discharge (cloxulanate amoxicillin). All patients were discharged on the first postoperative day, and all underwent laryngoscopy to assess vocal fold mobility within one month after surgery.

Data analysis

We collected demographic data of each patient as well as the dominant nodule size, fine-needle aspiration biopsy, type of surgery, surgical time, need for conversion, histopathological examination results, and postoperative complications (up to 30 days after surgery).

Results

Fifteen patients underwent TOETVA, nine were lobectomies, and six were total thyroidectomies, from April 2018 to April 2019, 13 were female patients, and two were male patients, ranging from 17 to 59 years old (median: 36 years old). The average size of the dominant nodule ranged from 0.5 to 3.4 cm (mean of 1.3 cm). In six cases the cytology obtained by preoperative aspiration showed Bethesda class III or IV and in nine, class V or VI. Surgical time ranged from 64 to 150 minutes (average 107 min). Graph 1 shows the trend of surgical time of patients undergoing lobectomy.



Graph 1. Operative time of patients undergoing lobectomy showing a progressive decrease.

One patient underwent level VI selective neck dissection for an intraoperative finding of frozen-section confirmed papillary carcinoma lymph node metastasis. There was no need for conversion to open surgery in any case. Histopathological examination revealed benign lesions in six cases (follicular adenoma or adenomatous goiter) and papillary carcinoma in nine cases.

Ten patients (67%) had no postoperative complication, and five (33%) had a postoperative complication (1 transient paraesthesia in the mental nerve territory; 1 transient vocal fold paralysis; 1 transient hypoparathyroidism; 2 skin burns). There were no definite complications related to the technique - Table 1. Mental nerve deficit occurred in the first patient in the series and progressively decreased until complete resolution after four months. Recurrent nerve injury (vocal fold paralysis) was detected intraoperatively due to loss of signal during intraoperative monitoring on the second side of total thyroidectomy and lasted for two months with spontaneous resolution without the need for speech therapy. Transient hypoparathyroidism was identified by measuring PTH1h with a value of 6 mg/dL, and oral administration of calcium and calcitriol was initiated. The patient presented mild symptoms of hypocalcemia in the first postoperative week, and this was managed with increased calcium supplementation. After 40 days, the patient no longer needed medication, presenting normal values of serum PTH and calcium. The remaining patients submitted to total thyroidectomy presented PTH1h levels above 15 mg/dL and did not show symptoms of hypocalcemia. The two skin burns occurred at the time of flap elevation and were focal, without skin perforation. These healed well with local care, and without any aesthetic sequelae.

Table 1. Data from patients undergoing TOETVA (n = 15), complications: 0: none; 1: transient hypoparathyroidism; 2: temporary paralysis of the recurrent laryngeal nerve; 3: temporary paralysis of the mental nerve; 4: skin burn.

Case	Age	Gender	Size	paaf	Surgery	Time	Conversion	Anatomy	Complication
1	45	Female	1.2	IV	Lobectomy	140	No	Benign	3
2	27	Male	0.7	VI	Lobectomy	95	No	Malignant	0
3	42	Female	0.5	V	Lobectomy	105	No	Benign	0
4	36	Male	2	III	TT	150	No	Benign	0
5	40	Female	1.4	VI	TT	132	No	Malignant	2
6	56	Female	1	V	Lobectomy	88	No	Malignant	0
7	59	Female	1.4	IV	Lobectomy	75	No	Benign	0
8	53	Female	1	IV	Lobectomy	93	No	Malignant	4
9	36	Female	1.1	VI	Lobectomy	74	No	Malignant	0
10	28	Female	1.8	VI	TT	141	No	Malignant	0
11	55	Male	0.5	IV	TT	128	No	Malignant	0
12	17	Female	1.2	VI	TT + EC	136	No	Malignant	1
13	31	Female	1.2	VI	Lobectomy	64	No	Benign	0
14	34	Female	1.0	VI	Lobectomy	72	No	Malignant	4
15	32	Female	3.4	IV	TT	118	No	Benign	0

Discussion

Innovative surgical techniques must be tested for safety and reproducibility in other centers other than those of origin. Also, the advantages of these techniques and their feasibility in academic hospitals especially in different

regions of the world deserve careful consideration. TOETVA has been adopted in different centers¹, including hospitals in Latin America and Brazil. Although it involves conventional laparoscopy tools not always available in our country, it is feasible without the need for more expensive technologies such as robotic surgery¹⁻³. Most of the remote approach thyroidectomy techniques involve other expensive tools, such as the robot, which is not available in most academic hospitals in our country.

In addition, unlike other remote approach thyroidectomy techniques, TOETVA allows the approach equally to both sides of the neck, which undoubtedly represents a significant advantage in terms of surgical time. As shown by Razavi et al.⁸, the learning curve for TOETVA is approximately 11 cases, and the progressive decrease in surgical time demonstrated was very similar to our study. Similarly, they evaluated the 30 initial cases performed by a single surgeon, and did not find definitive complications related to the inferior laryngeal nerve or the mental nerve⁸.

Studies before Anuwong et al. performed a transoral thyroidectomy technique with one or more portals entering through the floor of the mouth, internally to the mandible¹. It is important to differentiate this approach from the vestibular access performed in this study since the former was abandoned due to the high number of complications.

Other authors also observed skin burns related to flap elevation and working-space creation. These typically occurred especially at the beginning of most series, without any reported aesthetic sequelae, similar to our study.

Complications related to the mental nerve are often a concern with TOETVA but not with conventional thyroidectomy technique. They have been shown to occur less frequently after the central portal site was modified from the buccal vestibule fundus to a higher location above the gingiva-labial frenulum⁹, and most of the time it is temporary, as in the case reported in this study.

We believe that TOETVA is a promising technique to avoid a cervical incision and similar early outcomes for our series are similar to what others have reported in other regions of the world.

Conclusion

Complications related to the adoption of TOETVA in a Brazilian academic hospital are minimal and similar to what others have reported in their initial series. A rather quick and progressive decrease in operative times may make it attractive for other surgeons to adopt.

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***Correspondence**

Antonio Augusto Tupinamba Bertelli
Faculdade de Ciências Médicas
da Santa Casa de São Paulo,
Departamento de Cirurgia, Disciplina
de Cirurgia de Cabeça e Pescoço
Rua Cons. Brotero 1539 cj 101,
Higienópolis,
CEP 01232-011, São Paulo (SP), Brasil
Tel.: +55 (11) 2309-0509
E-mail: dr.bertelli@me.com

Authors information

AATB - MD, MS, Professor Instrutor,
Faculdade de Ciências Médicas
da Santa Casa de São Paulo,
Disciplina de Cirurgia de Cabeça e
Pescoço, Departamento de Cirurgia
da Irmandade, Santa Casa de
Misericórdia de São Paulo. LGR -
MD, Universidade Estadual do Rio
de Janeiro. GAA - MD, Faculdade
de Ciências Médicas da Santa Casa
de São Paulo. RCM and LCBM -
MD, Hospital Samaritano de São
Paulo. JOR - MD, Head and Neck
Endocrine Surgery, Otolaryngology-
Head and Neck Surgery, Johns
Hopkins Medicine. RPT - MD, MBA,
Head and Neck Endocrine Surgery,
Otolaryngology-Head and Neck
Surgery, Johns Hopkins Medicine.
AJG - MD, PhD, Professor Titular,
Livro Docente, Faculdade de Ciências
Médicas da Santa Casa de São Paulo,
Chefe, Disciplina de Cirurgia de
Cabeça e Pescoço, Departamento de
Cirurgia da Irmandade, Santa Casa de
Misericórdia de São Paulo.

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