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Endoscopic thyroid surgery

The next level: TOVARA

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Thyroid operations are some of the safest procedures in general and visceral surgery. While to date, open surgery has been the technique of choice, it leaves a visible scar and

may result in potential postoperative sequelae (e.g. scar tissue pain, infection, impaired wound healing). A new and patient-friendly endoscopic technique allows the surgeon to avoid visible scars and offers both cosmetic and medical benefits. Over the last two decades, many access options have been developed for endoscopic surgery, with some extensive case series published. One such truly promising technique is the so-called transoral endoscopic thyroidectomy vestibular approach or TOETVA. When combined with a retroauricular specimen retrieval trocar, even large thyroid lobes may be resected endoscopically and without a visible scar. This combined approach is known as TOVARA.

Surgical techniques and approach

The TOVARA technique comprises two steps: The TOETVA access and the retroauricular retrieval incision. The transoral thyroid access TOETVA permits endoscopic management of both thyroid lobes (Transoral Endoscopic Thyroidectomy Vestibular Approach) without a scar in the tradition of the NOTES technique, with a short endoscopic path to the target organ and the option of central and selective lateral lymphadenectomy during the same procedure (TOVARA – TransOral Vestibular And Retroauricular Approach). Even large thyroid lobes may be retrieved via the retroauricular incision, which complements the operation as needed.

For the TOETVA part, three trocars are inserted posterior to the lower lip and advanced into the subplatysmal space. Splitting the strap muscles of the neck in the longitudinal direction will expose the trachea and isthmus. After transecting the isthmus, the affected thyroid lobe is resected cephalocaudad under intraoperative neuromonitoring just as in open surgery. Standard neuromonitoring covers the EBSLN, recurrent laryngeal nerve and vagus nerve. Continuous neuromonitoring is optional. Visualizing the parathyroid glands by fluorescence is easier in endoscopic than in open surgery, since the fluorescence will not be negatively affected by scattered light. Thyroid lobes with a volume of up to 10 mL may be retrieved without breaching the capsule. This limit is due to the narrowing of the mandible. For larger specimens, a 12 mm disposable trocar is

easily advanced under endoscopic view along the sternocleidomastoid muscle to the subplatysmal space via a 1.5 cm incision in the retroauricular hairline. Pulling out the retrieval bag in a straight line will remove the thyroid lobe without any narrowing getting in the way. Since the loose subplatysmal fatty tissue along the sternocleidomastoid muscle will allow even large thyroid lobes to pass, their retrieval may simply require lengthening of the incision in the hairline. Regrowing hair will then cover this incision. The mucosal incisions in TOETVA may be closed with resorbable Vicryl Rapid 4-0 sutures and will heal without scarring.

Risks and complications in TOVARA

In general, the same risks apply to endoscopic procedures as in open surgery. In the TOETVA case series published to date the complication rate appears surprisingly low. In some publications radical endoscopic resection in cancer appears to be superior to open surgery, and in the few case series published so far the 5-year outcome of endoscopic surgery in thyroid cancer is amazingly good. Nevertheless, the longer path to the thyroid gland poses additional risks, such as labial paresthesia, injury to the mental nerve or burns in the chin area. Infections do not seem to play a significant role. The retrieval incision is reminiscent of the EndoCATS, facelift and retroauricular approach. Unlike procedures via a single retroauricular incision, TOVARA does not require dissection along the sternocleidomastoid muscle. Since the blunt



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trocars are advanced solely in the subcutaneous/subplatysmal plane, nerve lesions are unlikely. When advancing the trocars, the subplatysmal space created by the TOETVA can be clearly viewed endoscopically, so that insertion of the trocars resembles trocar placement in the abdomen under visual guidance.

However, the most significant risk in all endoscopic procedures is potential postoperative bleeding. Since postoperative hemorrhage results in cervical compartment syndrome, cerebral perfusion is quickly impaired. Postoperative bleeding must be recognized more quickly in endoscopic procedures than in open surgery, since bedside suture removal will not provide reliable pressure relief. For this reason, a postoperative bleeding detector has been developed which, according to the manufacturer, will be launched in 2020.

Indication for endoscopic surgery

In both open and endoscopic thyroid procedures, the indication for surgery must be strict. There should be no new indication simply because surgery without a visible scar is possible. Vague indications expose the patients to an avoidable risk and fuel growing skepticism about the frequency of the, in principle, invaluable surgical management of thyroid disorders.

Indeed, there are good reasons for surgery:

In Germany the number of thyroid cancer cases has steadily increased for the last 30 years. Especially in women under 40 years of age, thyroid cancer is the second most common tumor entity after breast cancer. Thyroid cancer is the most common endocrine malignancy. In 2012, 298,000 people worldwide were diagnosed with thyroid cancer, and there were 40,000 deaths. The majority of patients with thyroid cancer have a remarkably good prognosis and thyroid resection offers them the chance to be cured.

In German-speaking countries, planned endoscopic cancer management is currently under intense discussion. However, based on the data from Asia the author believes that low-grade incidental intrathyroid cancer without metastasis or lymph node involvement may be completed endoscopically, allowing endoscopic management without visible scars even in primarily suspect lesions of uncertain behavior (follicular neoplasia). However, in Germany cancer accounts for less than 10% of all indications for thyroid surgery.

In addition to malignancy or lesions suspected of being malignant, benign findings such as autonomous adenomas, diffuse autonomies not controlled by medication, autoimmune thyroid disorders with sequelae in other organs (endocrine



Day 1 and 2 after transoral thyroid surgery.

orbitopathy in Graves disease), and symptomatic enlargement are good indications for endoscopic management.

Constraints for endoscopic surgery

Once the principle indication for thyroid surgery has been established, endoscopic management may be an option if the patient does not want any visible scars in the neck and the surgeon has the necessary expertise. Internships and continued training offered by instrument manufacturers help to develop the necessary experience. Endoscopic management is not recommended in surgery of known cancer, especially with concurrent lymph node involvement, or in intrathoracic dystopia of the thyroid adjacent to large vessels, as well as in recurrences following open surgery. In particular, the American Society of Anesthesiologists does not consider older patients and those on anticoagulants suitable for endoscopic surgery.

Thus, endoscopic surgery is limited to younger, otherwise healthy patients without coagulation disorders who explicitly request a procedure without visible scars.

Joint registry of outcomes in German-speaking countries

In order to approach the topic systematically, an international working group¹ comprising experts in

1 Stefan Schopf (1), Günther Klein (2), Linda Michlmayr



Hypertrophic or keloid scar after standard and MIVAT surgery.



Generator GEN11 with easy touch screen operation.



Harmonic HD1000i: The surgical instrument was developed for complex open and laparoscopic procedures. Modern ultrasound technology allows fast and reliable hemostasis during surgery with minimal thermal injury to adjacent tissue.

transoral thyroid surgery was established. The group evaluates the surgical outcomes of TOVARA procedures in German-speaking countries, devotes itself to training colleagues and develops the fundamental rules of transoral surgery. At present, the data of the participating centers are compiled prospectively and evaluated systematically aiming to establish objective so-called PROMs (Patient Reported Outcome Measures). Preliminary findings suggest that the present maximum lobe volume of 105 ml for TOVARA access may not yet be the limit of this technique, and it is expected that at least 1/3 of all thyroid patients will be eligible for endoscopic surgery.

Benefits of endoscopic surgery

Patients with thyroid pathologies are predominantly female, rather young and mostly free of severe general disorders. In more than 90% of cases, the thyroid pathology is benign. 5-15% of patients undergoing conventional open or video-assisted procedures will develop prominent postoperative scars in the visible neck area, which might be prevented by endoscopic surgery.

However, there is also evidence of functional benefits in terms of swallowing and postoperative globus sensation within the first year after surgery. In conventional thyroid surgery, postoperative dysphagia is common, especially in the first six months after the procedure. This is most likely caused by adhesions between the laryngotracheal unit and the suture of the platysma. In extracervical endoscopic procedures and NOTES, the platysmal layer is not transected, mobility is less restricted and swallowing is unencumbered.

During the first 3 postoperative days following thyroidectomy for Graves disease less pain was noted especially in transoral thyroid surgery. Due to minimal thermal injury of the surrounding tissue, tissue dissection by modern ultrasound technology achieves better results than standard advanced bipolar technologies.

Conventional thyroid surgery is established, safe and suited to all pathologies. Over a hundred years ago, the reduction in perioperative mortality was groundbreaking. Today, thyroid surgery is one of

the safest procedures in visceral surgery. Functional benefits and intact body surface in exposed locations have become increasingly important.

Endoscopic thyroid surgery is inconceivable without the so-called energy devices. The advantage of ultrasound technology is obvious, for example, the cutting blade which can be used to penetrate the tissue. Ever since our first endoscopic thyroid operation in 2006 we have been working with the ultrasound shears "Harmonic ACE+7" by Ethicon.

Summary

Endoscopic thyroid surgery is a possible option for benign thyroid pathologies in selected patients who would like to keep their cleavage without scars. In the last two decades, endoscopic operations have been performed with increasing frequency in specialized centers. Transoral surgery via a vestibular approach is one of the most promising techniques in recent years and has become increasingly important when combined with a retroauricular specimen retrieval trocar. The surgeon's expertise is of fundamental significance. There is evidence of functional benefits compared to standard surgery.

Literature available from the author

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