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ENDOSOCOPIC THYRIOD SURGERY

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Introduction

Thyroid resection is one of the most common operations performed throughout the world. This procedure is classically realized through a transverse cervical incision and associated with a very low morbidity and mortality rate. However, the visible scar on the anterior surface of the neck is disliked by many patients, especially by young women in whom this operation is commonly performed.

With general tendency to perform less invasive surgery, an endoscopic approach has been applied to neck surgery. The first endoscopic neck exploration was performed in 1995 for parathyriodectomy[1]. Since then, endoscopic parathyroid resections have been performed worldwide, and large series have been reported[2,3].

After experimentation on animal models[4] showing the feasibility of the technique. Huscher performed the first endoscopic thyroid resection in 1997[5]. Nonetheless, endoscopic thyroid surgery is more technically challenging, compared to parathyriodectomy, due to the size of the thyroid gland, the extent of the dissection required, and the higher rate of malignancy.

The aim of most studies apart from being cosmetically superior has been to be minimally invasive offering all associated advantages such as minimal postoperative pain and low analgesic requirement[6-8].

Preoperative workup

In addition to a detailed, physical examination, and thyroid function tests, the following exams are usually realized.

1. *Ultrasonograpgy* is performed to define the dimension, nature and localization of the thyroid pathology and to evaluate the contra lateral lobe. A Doppler study is also used to assess the vascularization of the gland in case of the thyrioditis.
2. Fine *needle aspiration* is used to define the histology of "cold" nodules and, before endoscopic thyroid surgery, to rule out carcinoma. Atypical or suspicious cytology and currently considered as a contraindication for an endoscopic resection. One concern about fine needle aspiration is that sub clinical hemorrhage can create substantial adhesion, making endoscopic dissection difficult.
3. Other preoperative imaging studies (seintigrapgy, CT, MRI) are performed according to the suspected lesion and are similar to the classical workup used for thyroid pathologies.

Indication

The ideal indication for endoscopic thyroid surgery is a 1- solitary, nonfunctioning thyroid nodule of less than 30mm in diameter. Other current indications include 2-solitary toxic nodule, 3-recurrent thyroid cyst, 4- small multi-

nodular goiters, 5- papillary micro carcinomas (<1cm in size and no evidence of clinical or radiological lymphadenopathy) and some cases of Grave's disease reported sporadically[9,10]. Moreover, a thin patient, with a long narrow neck is more suited for an endoscopic approach.

Contraindication

Contraindications to an endoscopic approach include 1-nodules larger than 3cm in diameter, 2- a large multinodular goiter, 3-history of prior neck surgery, 4-thyrioditism and 5- patients with recent infection, inflammation, irradiation, 6- burn to the neck[7,11]. 7-Grave's disease, with enlarge and highly vascular thyroid gland, is also considered a contraindication by most surgeons, due to the higher risk of bleeding. 8-Obesity associated with a short, wide neck is also relative contraindication, as space and exposure can be reduced. 9-Patients with atypical, highly suspicious, or malignant cytology should be excluded of the tumor.10- Finally, elderly patients or those with sever associated pathologies may not tolerate CO_2 insufflations and should be excluded.

Procedure

After induction of a general anesthesia, the patient is positioned with neck slightly extended or even slightly folded[12], with the table in reserved Trendelenburg position. The sternal notch, anterior border of the sternocleidomastoid muscle (SCM), and external jugular veins are marked with a pen. The procedure requires a 5mm endoscope, instruments, and trocars. Three main endoscopic approaches have been described: 1- the cervical, 2- the axillary and 3- the breast approach.

Cervical Approach (supraclavicular)

Incision and Creation of the working space. A 10-mm incision is made at the sternal notch or just above it and cervical fascia is opened. A subplatysmal space is created by blunt dissection and introduction of a swab in the opening. A 5mm trocar is inserted and secured in place with Prolene purse string suture. CO_2 insufflations are started to a pressure of 8-12 mmHg. Initial dissection is made with the tip of a 0^o.5mm endoscopic along the anterior border of the SCM. Once a sufficient space is obtained, three additional trocars are inserted under visual control and a 30^o or occasionally 45^o endoscope is used to perform the rest of procedure.

Dissection of the Thyroid Lobe

The strap muscles are mobilized from anterior surface of the thyroid gland. The use of electrocautery is usually avoided when laryngeal nerve is not yet exposed. Vascular clips, 5mm or 5-mm ultrasonic scalpel are used for hemostasis. The middle thyroid vein is first dissected and divided between clips or with ultrasonic shear.

Dissection of the Recurrent Laryngeal Nerve and Parathyroid Gland

The inferior thyroid artery, inferior parathyroid and recurrent laryngeal nerve (RLN) are identified. With the nerve under visual control, the inferior thyroid artery is divided between clips. If the laryngeal nerve cannot be localized, the procedure should be converted to a classical, open approach. The laryngeal nerve is then separated from posterior aspect of the thyroid gland using blunt dissection. The inferior and superior parathyroid glands are mobilized and preserved. The superior thyroid vessels are dissected and transected between clips after identification of the superior laryngeal nerve. The thyroid gland is retracted in the anteromedial direction, and the ligament of Berry and isthmus are divided using ultrasonic scalpel. The specimen is then placed in a retrieval bag and extracted through the superolateral trocar site. This cervical (supraclavicular) approach has advantages such as rapid access to thyroid and applying external pressure for hemostasis[13].

Transaxillary Approach

In order to avoid and visible scars in the neck, Ikeda et al[14,15] performed endoscopic thyroid resections using an axillary approach. A 30 mm incision is made in the axillar, and the lower layer of the platysma muscle is dissected through the upper layer of the pectoralis major. A 12 mm trocar is inserted, and CO_2 is insufflated with pressure of 4 mmHg. Two other trocars are then inserted below the first one. Access to the thyroid is then gained through the subplatysmal space. The thyroid gland is exposed by dividing the sternothyiod muscle. The recurrent laryngeal nerve is then identified, as are the parathyroid glands. The inferior and superior pedicles are then controlled as described above. A closed suction drain is usually left in place at the end of the procedure. The advantages of this technique include avoidance of any scars in the neck, the lateral approach to the thyroid bed (similar to the classical approach), an easier dissection of the superior and inferior pores, and an easier access to parathyroid fascia, which can be opened without injury to the glands or to the recurrent laryngeal nerve. The main disadvantages of the technique are probably the technical difficulties, the extent of the dissection, and duration of the procedure (about 3hr).

Breast Approach

In 1998, Ishii et la[16]. Described a technique of thyroid resection using breast approach. The aim of this technique is also avoid the presence of any scars in the neck. A 15 mm incision is made in the right or left parasternal border at the level of the nipples. A subcutaneous tunnel is created using blunt dissection, and a subplatysmal space is created. A 12 mm troacr is first inserted, and CO_2 insufflations are started, with a pressure of 5 mmHg. A subplatysmal space is developed from the superior margin of the thyroid cartilage to the lateral borders of the SCM. Two additional 5 mm trocars are then inserted at the upper margin of both mammary areolas. Dissection is started at the lower pole and proceeds to the posterior and lateral aspects of the glands. The recurrent laryngeal nerve and parathyroid glands are usually identified. Main disadvantages of this technique are the risk of keloid scars associated with incision in the chest, technical difficulty of the procedure, the risk of hematoma due to the extent of the dissection, and the impossibility to use any of the incision if a conversion is required.

Gasless Endoscopy

Intracranial pressure is increased when CO_2 insufflations of 15 mmHg are used to perform neck surgery in animal models[17]. On the opposite, pressure of 10 mmHg does not seem to increase the intracranial pressure. However, other complications due to CO_2 insufflations in the neck can occur (e.g. hypercapnia, respiratory acidosis or subcutaneous emphysema). In order to reduce those complications, Huscher et la[5]. Described the use of the lifting device to perform an endoscopic thyroid surgery, with reduced CO_2 pressure (6 mmHg). Shimizu et al[18,19]. have also performed totally gasless endoscopic thyroid resections using Kirscher wires inserted horizontally in the subcutaneous layer of the anterior part of the neck. Those wires are lifted up and fixed to an L-shaped pole to create a tent-like working space. They have performed more than 40 cases using technique and conclude that this procedure is safe and can be used is selected cases. Miccoli et al[20,21] have also described a video-assisted thyriodectomy (VAT). Dissection of the thyroid lobe is performed through a 15 mm medial incision using a 5 mm 30^o endoscope with classical instruments. Working space is maintained using an external retractor.

Discussion

The endoscopic thyroid surgery is feasible and safe. In a series of 6702 classical thyriodectomies, the overall complication rate vas 3.8% with an incidence of permanent laryngeal nerve palsy of 0.7%[22]. These rates seen to be similar to those reported after endoscopic resection (a 3.8%) morbidity rate with a 0.75% rate of laryngeal nerve (palsy).

This approach could offer different potential advantages:

1- A better cosmetic result. Most people dislike having a scar on the anterior surface of the neck, especially as thyroid pathologies are frequently found in young women, the shorter skin incision and absence of musculo-coetaneous flap offer a better cosmetic result after endoscopic resection. In a prospective randomized trial comparing a group of 25 patients undergoing a video-assisted thyriodectomy to another group of 24 patients undergoing a classical thyrodectomy. Miccoli et al[21] found a better cosmetic result in the endoscopic group (p<0.01). Ganger and Inabnet endoscopic versus conventional thyroid resections ($p < 0.005$).

2- Reduction in postoperative pain. This point is difficult to assess due to the low analgesic requirement after both classical and endoscopic thyroid surgery. Post-operative convalescence could be reduced after an endoscopic thyriodectomy, as trauma to the tissues is decreased. However, the difference was not statistically significant in the study by Ganger and Inabnet[7].

3- Potential reduction of RLN or parathyroid glands lesions: The endoscopic magnification may enhance the identification and reduce the risk of lesion to the important neurovascular structures, laryngeal nerves, and parathyroid glands with their blood supply. However, this point has to be evaluated by large, postoperative, randomized trials.

Concerns associated with endoscopic thyriodectomies have also been expressed:

These procedures are technically complex and associated with an increased operative time. However, operative time should decrease as experience is gained and the development of new instruments and techniques. This approach also requires a very careful selection of patients in that the safety and feasibility of the operation is dependent on that selection.

An increasing number of classical thyriodectomies are performed under local or local-regional anesthesia in an outpatient hospitalization. Endoscopic resections still require general anesthesia, which is not minimally invasive and usually requires an overnight stay. Even if video-assisted parathyriodectomies have been performed under local anesthesia[23], when CO_2 insufflations are used for endoscopic resection, general anesthesia is required. The length of hospital stay for endoscopic thyroid surgery ranges from 1 to 7 days and is usually increased compared to a classical approach.

Thyroid carcinoma cannot be totally ruled out by the preoperative work-up, and we still ignore the outcomes when resection is performed by endoscopy. Canalar carcinoma diagnosed on a frozen section should be converted to radicalize the thyriodectomy. For follicular carcinoma, a final histopathological exam should be required, and the patient should be reported using a classical approach if the diagnosis is confirmed. However, for some authors[20], a low risk (T1) small papillary carcinoma can resected by endoscopy, as lymphadenomectomy, is not required and resection is judged adequate.

The size of the thyroid lobe removed has varied between 20-80mm and the weigh where recorded has ranged 15-73 grams in most studies[10,19]. A thyroid

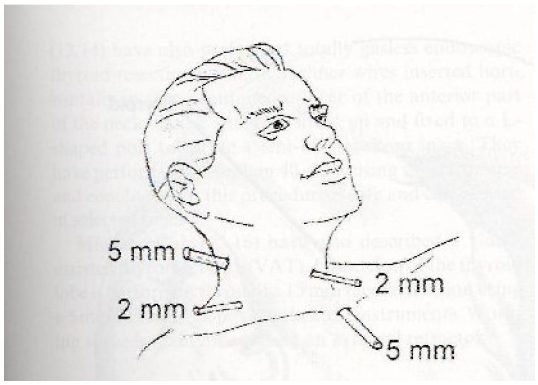
size beyond 70mm or 70 grams becomes too voluminous to provide an adequate safe working space.

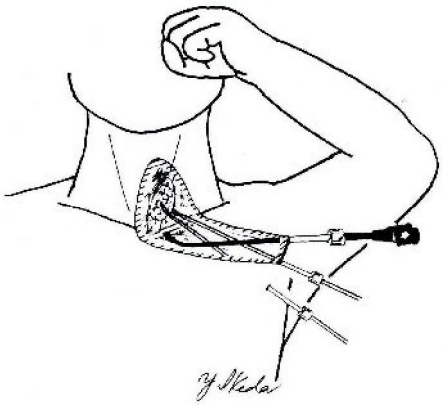
Review the results of one center for 10 years[24]

One center experience comprises 25 patients operated in 1997. About 21 patients had a solitary thyroid nodule and four patients had small multi-nodular goiter. In three patients a supraclavicular approach was adopted and 22 patients were operated by a peri-areolar approach. The surgery in one of the three patients of the supraclavicular approach was converted to a conventional exploration due to abnormally high vascularity of the gland, which turned out to be a multi-centric papillary carcinoma on histopathology. The patient subsequently underwent a completion thyriodectomy. Three patients developed subcutaneous emphysema which resolved over 24 hours and five patients show bruising in the presternal region which resolved in 2 weeks. There were no other complications; it was easier operating from periareolar approach as a larger working space was available. In 21 patients of solitary thyroid nodule a hemi thyriodectomy was performed and in three patients of multinodular goiter excision extended to a little more than half the opposite lobe. The size of the resected specimen varied from 2 x 2.4cm^2 subs to 2 x 4.1 cm^2.

Conclusion

Endoscopic thyroid resections are feasible and safe given very careful selection of patients. Potential advantages include better cosmetic results and reduced postoperative pain and morbidity rate. It is, however, technically complex and requires increased operative time, a general anesthesia, and a longer hospital stay. Large prospective randomized studies are still needed to refine the indications for endoscopic thyroid surgery and to confirm its safety and efficacy.





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