

# Video-assisted surgery of the thyroid diseases

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**Abstract.** – **Background:** After first endoscopic parathyroidectomy, performed and described by Gagner in 1996, several surgeons reported their experiences with minimally invasive and video-assisted (MIVA) surgery of the neck.

The patients were considered eligible for MIVA hemithyroidectomy and thyroidectomy on the basis of some criteria.

**Methods:** Completely gasless procedure, is carried out through a 15-30 mm central incision above the sternal notch. Dissection is performed mainly under endoscopic vision using conventional endoscopic instruments. Video assisted group in our experience included 5 patients. All patients were women with mean age of 56 years.

**Results:** We performed in three cases a total thyroidectomy and in two an hemithyroidectomy. Operative mean time was 189 minutes. No complications are happened. No conversion have been necessary.

**Discussion:** Traditionally, open thyroidectomy require a 6 to 8 cm, or bigger, transverse wound on the lower neck. The minimally invasive approach wound is very small in length (1.5 cm for small nodules, maximum 2-3 cm for the biggest, in respect of the exclusion criteria) upon the suprasternal notch.

Wound pain following the MIVA surgery is much less when compared with the conventional thyroidectomy, because there is less dissection and destruction of tissues.

The treated pathologies are prevalently nodular goiter; the only kind of thyroid cancer what it may be attacked with endoscopic surgery is a small papillary carcinoma without lymph node involvement.

The complications, there are the same complications of the traditional thyroidectomy.

Conversion to the traditional approach sometimes may it be required.

**Conclusions:** At the present this kind of surgery, in selected patients, clearly demonstrate excellent results regarding patient cure rate and comfort, with short hospital stay, few postoperative pain and attractive cosmetic results.

**Key Words:**

Minimally invasive thyroidectomy, MIVA, Video-assisted surgery.

## Background

After the first endoscopic parathyroidectomy, performed and described by Gagner in 1996, several surgeons reported their experiences with minimally invasive and video-assisted surgery of the neck<sup>1-11,16-17,20</sup>. Many surgeons used a classical middle-line cervical approach, some instead developed new types of procedures like small incisions in sub-mandibular area<sup>25</sup> or other methods less used currently.

The endoscopic treatment of the thyroid surgical diseases instead, has not found yet the same favour in the scientific community in the comparison to parathyroid adenomas. This was probably attributable to the different size of thyroid lesions, to suspicious malignancy of several thyroid nodules who cannot be easily predicted preoperatively and the operating time longer than in open surgery<sup>7,8,13,14,18,19,22</sup>.

Despite this scepticism, a few papers concerning endoscopic surgery have recently appeared in literature. In many papers, Miccoli at al. confirm the suitability of the minimally invasive video-assisted (MIVA) approach in performing hemithyroidectomy and thyroidectomy and define the indications and contraindications of this new minimally invasive surgical procedure<sup>2,3,7,9</sup>. In their procedure a 15-20 mm transversal skin incision was made 1 cm above the sternal notch. The patients were considered eligible

for MIVA hemithyroidectomy and thyroidectomy on the basis of the following criteria:

1. Single nodule or small goiter (toxic or not);
2. Cranio-caudal axis of the lobes must not exceed 7 centimeters;
3. Largest transversal diameter must not exceed 3.5 centimetres;
4. Total thyroid volume < 15-25 ml;
5. Small (max 2 cm) papillary carcinoma without lymph node involvement;

The exclusion criteria are subdivisible in absolute and relative.

The absolute are:

1. Previous neck surgery;
2. Big goiter;
3. Local advanced cancer;
4. Lymph node metastasis.

The relative are:

1. Previous neck radiation therapy;
2. Basedow disease;
3. Chronic thyroiditis.

For MIVA technique, the patient selection is based on the existence of a positive correlation between preoperative cervical ultrasonography and scintigraphy.

## Methods

### *Patients*

In our first year of this study 5 patients were selected for video-assisted surgery. The patients selected were 5 female with a mean age of 56.6 years (range 36 to 78). Preoperative evaluation (biochemical assessment, ultrasonography, and fine needle aspiration biopsy) was obtained in all cases. Preoperative diagnosis was multinodular goiter in 4 cases and hyperfunctioning adenoma in 1 case. Approximate thyroid volume was 14.7 ml.

### *Surgical instruments*

The instruments necessary for this kind of surgery are in part the same of that in use for

traditional one; however, this technique used in particular proper tools characterized by small diameter (max 2 mm) that could be also used in endoscopic vision: atraumatic spatulas, spatula-shaped aspirator, forceps and scissors. Nevertheless, for minimally invasive thyroidectomy, the primary instruments are the 30-degree 5-mm endoscope and the 14 cm-long Harmonic Scalpel Scissors (Ethicon ENDO-SURGERY, Inc., USA).

### *Surgical procedures*

The neck is extended but not very hyperextended. The surgical team is composed of the surgeon and two assistants, one of whom must hold the camera. A 25-30 mm skin incision performed about 2 cm above the sternal notch, in the middle line. The cervical linea alba is then opened as much as possible, taking care to avoid any minimal bleeding. The thyroid lobe on the affected side is then carefully dissected from the muscles. Two small retractors are used to medially retract and lift the thyroid and to laterally retract the muscles to maintain the operative space. A 30-degree 5-mm endoscope is inserted through the skin incision (Figure 1).

Dissection of the thyrotracheal groove is completed under endoscopic vision by using small instruments.

The area must be completely bloodless, because even minimal bleeding makes the operation more difficult or impossible. To



Figure 1. Minimally invasive video-assisted thyroidectomy. Two small retractors are used to maintain the operative space. The endoscope and the instruments are all inserted through the single skin incision (an intraoperative view).

achieve haemostasis, we use small (3 mm) clips or the 5 mm, 14 cm-long Harmonic Scalpel scissors. The first vessel to be cutted is the middle vein, if present, or the small veins between jugular vein and thyroid capsule. The spatula is used to separate the larynx from the vessels and retract them laterally. The external branch of the superior laryngeal nerve can be easily identified during most procedures once the different components of the upper pedicle have been prepared. The upper pedicle is then exposed and selectively cutted by Harmonic Scalpel Scissors (Figure 2).

The inferior vessels are also clipped and cut, exposing the antero-lateral side of the trachea. The recurrent laryngeal nerve generally lies in the thyrotracheal groove, behind the Zuckerkandl tubercle. The recurrent nerve and the parathyroid glands are dissected and freed from the thyroid – these structures are very well visualized by virtue of endoscope magnification<sup>21</sup>.

Now the operation is conducted as in open surgery; the lobe is freed from trachea, the isthmus dissected from the trachea and divided by harmonic scalpel. Finally the lobe is removed by conventional open technique. The muscles incision is sutured with reabsorbable suture and the wound is closed by intradermic adsorbable suture. We use drainage tubes (3.3 mm) laterally introduced.

## Results

In our first experience of this technique 5 patients were selected for video-assisted surgery.

We performed in three cases a total thyroidectomy and in two an hemithyroidectomy. Operative mean time was 189 minutes. No complications are happened. No conversion to the traditional approach have been necessary. The length of the wounds were about 3 cm.

In our series we obtained the excellent results regarding patient cure rate and comfort, with short hospital stay, few postoperative pain and attractive cosmetic results.

## Discussion

Traditionally, open thyroidectomy require a 6 to 8 cm, or bigger, transverse wound on the lower neck<sup>8</sup>. In the conventional thyroidectomy after dividing platysma, the cervical middle line is opened without dividing the strap muscles and the anterior cervical veins. The thyroid lobe is dissected progressively from the strap muscles. After identifying and dissecting the recurrent laryngeal nerve and the parathyroid glands, the vessels pedicles of the thyroid lobe are sectioned between ligatures and the thyroid lobe is removed. After

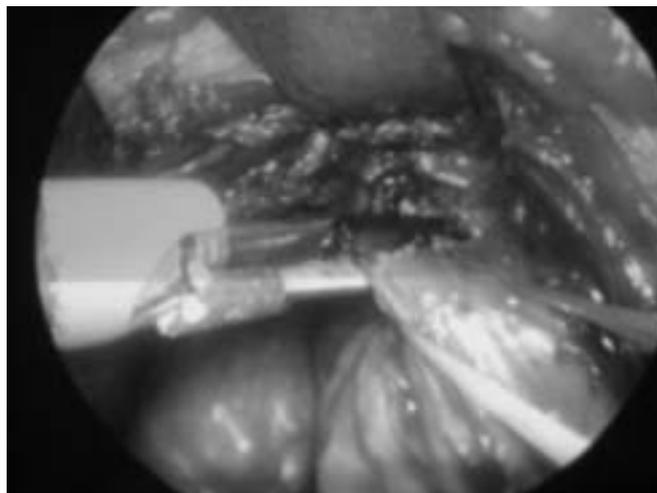


Figure 2. Minimally invasive video-assisted thyroidectomy. Upper pedicle sectioned by Harmonic Scalpel Scissor (an endoscopic view).

checking the haemostasis, are usually used drainage tubes in the thyroid bed. Cervical linea alba and platysma are sutured and skin closed with subcuticular reabsorbable suture.

Thyroid diseases primarily occurs in young to middle-aged women who usually pay a great deal of attention to the cosmetic results after thyroid surgery<sup>12,24</sup>.

The postoperative pain and recovery following the MIVA surgery is much less when compared with the conventional thyroidectomy, because there is less dissection and destruction of tissues. Another aspect is the smaller number of cases of neck paresthesia (in the wound region) in the following days after operation. The goal of MIVA thyroidectomy is the very small wound length (1-2 cm for small nodules, maximum 2-3 cm for the biggest, in respect of the exclusion criteria) placed upon the suprasternal notch, which is easily covered by a shirt (Figure 3).

However, the development of a new surgical technique that minimizes the wound size, is already possible, but the learning period is very long and the surgical technique is very hard. The operation time for minimally invasive video-assisted thyroidectomy is becoming comparable with that of conventional open technique<sup>7,8,18,19,22</sup>.

Remains unclear if the MIVA-thyroidectomy is suitable for the management of thyroid carcinoma. It is not still recommended to use

minimally invasive video-assisted thyroidectomy to manage thyroid malignancy until this surgical technique is mature enough to confidently dissect lymph nodes along the carotid sheath. The only kind of thyroid cancer what it may be attacked with endoscopic surgery is a small papillary carcinoma without lymph node involvement<sup>2,23</sup>.

Of course, minimally invasive video-assisted thyroidectomy has its limitations. MIVA-thyroidectomy is not suitable for repeated thyroid surgery because adhesions might interfere with the access of endoscope into the plane of the thyroid fascia. Thyroid size is an important factor determining how difficult MIVA-approach would be, because the working space provided by the technique is limited. At this time, the maximum cranio-caudal axis of the lobes must not exceed 7 cm and the largest transversal diameter must not exceed 3.5 cm. The total thyroid volume must not exceed 15-20 ml, echographically determined. It's not recommended to perform MIVA technique for goiter larger this size. The last limitation is the presence of a thyroiditis diagnosed by biochemical or echographic signs<sup>2,4</sup>.

About the complications, there are the same complications of the traditional thyroidectomy. Transient recurrent nerve palsy and transient hypocalcemia are the more frequent, but the rate of these complications is comparable with that for conventional



Figure 3. Video-assisted thyroidectomy. Using video-assisted endoscopic technique, the neck scar is 1.5-3 cm in length on suprasternal notch easily covered by a shirt.

surgery. The operative time was about 80 minutes for a lobectomy and 130 minutes for a total thyroidectomy<sup>11</sup>.

These operative times are slightly longer than those registered for conventional surgery, especially for when concerns the initial cases because a learning period is always to be taken in account when starting up with a new technique.

Conversion to the traditional approach sometimes may it be required for problems related to the bleeding from the vessels or the dimension of the thyroid.

A last problem of video-assisted techniques is the greater cost of this intervention type, due especially to the instruments<sup>16</sup>.

In conclusions, the studies demonstrates that minimally invasive video-assisted thyroidectomy is a feasible and safe procedure, when selection criteria are strictly followed<sup>15</sup>. It can considered a valid option because of its cosmetic advantages, which are particularly appreciated by young patients.

Nevertheless, one should consider that this procedure is indicated only for a minority of patients, at least at present. This technique is strongly limited by the size of the lesion so, in endemic iodine deficiency areas, where most of the cases represented by large goiters, MIVA surgery is not feasible. Follicular nodules instead are optimal candidates for this approach just because in Italy they are generally small. Besides in the patients affected by primary hyperparathyroidism due to a single adenoma who also present a thyroid nodule this access allows to treat both diseases during the same operation<sup>3</sup>.

The video-assisted surgery represents a notable improvement in the surgical techniques even of the surgery of the neck. Over a very important cosmetic improvement, especially for the kind of patients which is turned at this surgery (young patients in particular of female sex), this technique even reduces the invasivity of the surgical manoeuvres with a precocious reestablishment of the preoperative well-being and with precocious de-hospitalization of the patients. Besides this type method is able to be used nearly like routine surgery to facilitate the surgeon in the preparation of the upper vascular pedicle, reducing the entity of the skin opening and in the preparation of the superior miocutaneal edge, reducing the frequent paresthetic sequences that concern.

This kind of technique can be also used for parathyroid glands disease, may be with less difficult than thyroid surgery. The minimally invasive video-assisted parathyroidectomy is performed using the same position of the patients used for MIVA thyroidectomy, an identical incision is performed in the same place on the neck and then the surgeon localized the abnormal parathyroid gland with endoscope. Once identified, it is gently dissected, pushing aside the loose surrounding tissue. Its frail vascular pedicle is then double-clipped and sectioned, and the gland removed. In case of secondary hyperparathyroidism, the four glands should be identified firstly followed by a subtotal parathyroidectomy<sup>4</sup>. The last step of the procedure is the video-assisted haemostasis before the closure of the muscles without drainage. The skin wound is closed using a subcuticular continuous absorbable suture.

To precisely define and clarify the role of minimally invasive video-assisted thyroidectomy or parathyroidectomy in the management of patients with thyroid and parathyroidectomy disease, larger studies and longer follow-up are needed. At the present this kind of surgery clearly demonstrate excellent results regarding patient cure rate and comfort, with short hospital stay, few postoperative pain and attractive cosmetic results. In the future a way to optimise the benefits, might be the combination of the minimally invasive video-assisted surgery with minimal-aggressive anaesthesia, such as locoregional anaesthesia jointly with intravenous sedation<sup>4</sup>.

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