**ORIGINAL ARTICLE**

# Minimally Invasive Video-assisted Thyroidectomy and Parathyroidectomy

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**Abstract**

The history of endoscopic endocrine surgery of the neck started in 1992 with the first endoscopic parathyroidectomy. Less simple procedures were proposed after this preliminary experience, some still involving gas insufflation and some not involving it at all, better defined as video-assisted parathyroidectomy.

Not much later also thyroid gland started to be operated endoscopically although thyroid diseases quite soon proved to constitute a big limit in the diffusion of these techniques because of the large size typical of most goiters and/or tumors which represent the most common indication for thyroid surgery. All these procedures though are largely utilized and certainly have heavily stimulated all surgeons to reduce the length of their incision and consequently the invasiveness of both thyroidectomy and parathyroidectomy. Furthermore, in spite of the scepticism existing among endocrine surgeons, some significant advantages offered by these techniques have been reported in prospective studies even though they involved a scarce number of patients.

It must be stressed that endoscopic or video-assisted parathyroidectomy is at present much more widespread than thyroidectomy to the point that it must be considered a valid option for most of the cases of primary hyperparathyroidism (PHPT) and in some centers it is regarded as the first option.

**Keywords:** Thyroidectomy, parathyroidectomy, minimally invasive, videoassisted.

## INTRODUCTION

The history of endoscopic endocrine surgery of the neck started in 1992 with the first parathyroidectomy performed by Michel Gagner.[1] Less simple procedures were proposed after this preliminary experience, some still involving gas insufflation[2] and some not involving it at all, better defined as video-assisted parathyroidectomy.[3]

Not much later also thyroid gland started to be operated endoscopically[4-7] although thyroid diseases quite soon proved to constitute a big limit in the diffusion of these techniques because of the large size typical of most goiters and/or tumors which represent the most common indication for thyroid surgery. All these procedures though are largely utilized and certainly have heavily stimulated all surgeons to reduce the length of their incision and consequently the invasiveness of both thyroidectomy and parathyroidectomy. Furthermore, in spite of the scepticism existing among endocrine surgeons, some significant advantages offered by these techniques have been reported in prospective studies even though they involved a scarce number of patients.[8-10]

It must be stressed that endoscopic or video-assisted parathyroidectomy is at present much more widespread than thyroidectomy to the point that it must be considered a valid option[11] for most of the cases of primary hyperparathyroidism (PHPT) and in some centers it is regarded as the first option.[12,13]

## METHOD

The access is the same for both procedures: parathyroidectomy and thyroidectomy. Briefly[14] it is characterized by a unique central incision of 1.5 cm, 2 cm above the sternal notch. The operative space is maintained by means of an external retraction: no gas insufflation is utilized. Subcutaneous fat and platysma are carefully dissected so to avoid any minimum bleeding. The cervical linea alba is divided longitudinally as much as possible (3-4 cm). A 30° 5 mm endoscope is inserted through the skin incision. Under endoscopic vision the dissection of the thyrotracheal groove is completed by using small (2 mm in diameter) instruments: atraumatic spatulas in different shapes, spatula-shaped aspirator, ear-nose-throat forceps and scissors. Hemostasis is achieved by means of small (3 mm) vascular clips either conventional or disposable and in particular when operating on thyroid by ultrasonic shears (Harmonic®).

## PATIENTS

### Parathyroid

Between 1997 and 2009, 786 parathyroidectomies were performed according to the technique previously described: they represented more than three fourths of the patients referred to our Department in the same period for primary hyperparathyroidism. A correct preoperative localization of the lesion

is necessary so as to perform safely MIVAP and to obtain the best results. We utilized either an ultrasound examination or a double phase 99 mTc sestamibi scan. Mean age of the patients was 55 years (20-87), there were 662 women and 127 men. Mean operative time of the procedure was 29.5 minutes (range 10-180). Forty patients had a concurrent video-assisted thyroid resection for associated diseases (microfollicular nodule, small papillary cancer): 29 thyroid lobectomies (19 ipsilateral and 10 contralateral) and 11 total thyroidectomies.

Conversion to traditional cervicotomy was required in 47 patients (5.9%). The reasons for conversion were multiglandular disease in 3 (double adenoma), intrathyroid adenoma in 4, difficult dissection in 14, negative exploration in 24 (in 10 cases the adenoma was not found even after conversion), intraoperative suspicion of parathyroid carcinoma in 1 (confirmed by frozen section and thus treated with synchronous thyroid lobectomy), inadequate intraoperative PTH assay in 1. In one case the operation consisted of a video-assisted near-total parathyroidectomy[7-8] for hyperplasia. In 45 cases MIVAP was perfomed under loco-regional anesthesia (bilateral cervical block).

There were 4 permanent laryngeal nerve palsies (0.5%) (6 months after surgery), 2 transient laryngeal nerve palsies. There was one postoperative bleeding (0.3%) from a displaced clip on a middle thyroid vein, that required a reoperation two hours after surgery. Transient hypocalcemia occurred in only 19 patients. Five (1.1%) patients had persistent hyperparathyroidism. In three patients the adenoma was not found at exploration even after conversion. These patients are being re-evaluated. In two patients the persistence was due to false positive qPTHa. A further video-assisted exploration revealed a second adenoma on the opposite side that was successfully removed.

## Thyroid

2009 patients have been operated (1708 females and 301 males) between 1998 and 2009.

The cases considered eligible for MIVAT were those presenting with nodules of less than 3.5 cm of diameter with a total thyroid volume not over 20 ml in absence of any echographical stigmata of thyroiditis; enlarged lymph nodes suspicious for metastasis constitute a clear contraindication. Mean age was 40.2 (range 10-77) years. Mean thyroid volume (echografically extimated) was: $15.1 \pm 6.6$ (range 4-40) ml, while the mean diameter of the thyroid lesion was: $1.9 \pm 0.8$ (range 0.4-4.5) cm. Total thyroidectomy was performed in 1480 cases, lobectomy in 529 cases. This series also encompasses 30 patients with familial medullary carcinoma (RET gene mutation carriers) where a central compartment lymphadenectomy was associated to thyroidectomy.

Mean operative time of total thyroidectomy was 41,1 (range 25-140) minutes; while lobectomy was accomplished in 31,1 (range 15-120) minutes. Central compartment lymphadenectomy took a mean time of 60 minutes.

Preoperative diagnosis is shown in Table 1: the main indication was papillary carcinoma (low risk), the second most frequent was follicular tumor and multinodular goiter, then Graves' disease, Hurtle cells tumor, toxic adenoma, gene RET mutation carriers, completion thyroidectomy and thyroglossal duct carcinoma.

Forty-one procedures were converted to traditional cervicotomy; in one case conversion was due to bleeding from the upper vascular pedicle; in two cases we converted to perform completion thyroidectomy through an open approach in a patient with positive frozen section (papillary cancer) because at the beginning we were concerned about the duration of the procedure. In 10 cases conversion was needed for unexpected infiltration of papillary carcinoma, and the last 22 conversions were due to difficult dissection caused by thyroiditis, in 5 cases conversion was mandatory for the presence of VI level metastatic lymph nodes from papillary carcinoma.

In 21 cases where definitive diagnosis of carcinoma (either papillary or follicular) was made after video-assisted lobectomy a completion total thyroidectomy was performed through the same access and using the same procedure on the opposite side.

All 30 carriers of RET gene mutation who underwent a total thyroidectomy plus central compartment lymphadenectomy, had undetectable serum levels of calcitonin 6 months after surgery.

Complications in this series include 22 permanent recurrent nerve palsies, 52 transient recurrent nerve palsies, 6 permanent hypoparathyroidism, 70 transient hypocalcemias, and 6 postoperative bleeding.

Postoperative hospital stay was the same as in other patients who underwent traditional thyroid operation (overnight discharge).

## DISCUSSION

Although many surgeons still do not accept video assisted procedures in the neck (thyroid and parathyroid) as a new standard, there are many studies demonstrating that minimally invasive surgery, in particular for primary hyperparathyroidism, is now widely used in most of the patients presenting with this

**Table 1:** MIVAT–Preoperative diagnosis

| | |
|---|---|
| Papillary carcinoma | 611 |
| Multinodular goiter | 427 |
| Microfollicular nodule | 652 |
| Hurtle | 114 |
| Graves | 102 |
| Toxic goiter | 15 |
| Completion thyroidectomy | 21 |
| Toxic adenoma | 35 |
| RET oncogene | 30 |
| Thyreoglossal duct carcinoma | 1 |

pathology.[11,13,15,16] Even though some do not use the endoscope but just magnifying lenses it can be concluded that open standard parathyroidectomy is today basically reserved only to a minority of the cases (MEN syndromes, familial cases, redo surgery, big concomitant goiters). In fact with a central access such as the one we described and routinely perform in our hospital even not localized adenomas can successfully be searched taking advantage from the possibility of exploring both sides of the neck through the single middle incision. In our series then there are few cases of thyroid pathology treated during the same operation for PHPT (4% of the cases): this is always possible as long as the goiter is not too large.

After 6 years of experience we can also conclude that in terms of both complications and primary hyperparathyroidism's outcome, the literature shows no difference between the standard approach and video-scopic procedures.[12,13,15-17] In particular neither more cases of persistent PHPT have been demonstrated nor more cases of recurrent disease, even though the follow-up might be regarded as still quite short.

The same conclusions can be drawn regarding thyroidectomy: MIVAT proved to show the same complication rate as standard open surgery.[14,18,19]

A new promising indication for this operation seems to be prophylactic thyroidectomy for patients carrying a RET gene mutation: already 30 cases underwent a video-assisted thyroidectomy and central compartment node clearance in our Department with excellent results; no major complications were registered in this small series.[20] Moreover, in spite of the short follow-up (6 to 42 months) the results in terms of postoperative calcitonin are very encouraging. In fact, this highly sensitive marker for medullary carcinoma was undetectable in all cases and this is the best proof that, at least in terms of completeness of the procedure at the neck level, a satisfactory result was fully reached.

Finally it should be considered the real impact of MIVAT on the patients' population that can at present undergo minimally invasive approaches to thyroid. Actually only a minority of them fulfil the criteria for undergoing these procedures; probably not more than 10-13% of the cases, particularly in iodine deficient countries where generally surgeons have to deal mainly with big goiters. This probably limited the diffusion of thyroid minimally invasive surgery. In fact these operations should be carried out in centers where a great number of surgical cases are recruited so as to select enough patients to allow a correct learning curve in acceptable time.

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