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Minimally invasive video-assisted thyroid surgery: how can we improve the learning curve?

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SUMMARY: **Minimally invasive video-assisted thyroid surgery: how can we improve the learning curve?**

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Objective. *Minimally invasive video-assisted thyroidectomy (MIVAT) is a technically demanding procedure and requires a surgical team skilled in both endocrine and endoscopic surgery. A time consuming learning and training period is mandatory at the beginning of the experience. The aim of our report is to focus some aspects of the learning curve of the surgeon who practices video-assisted thyroid procedures for the first time, through the analysis of our preliminary series of 36 cases.*

Patients and methods. *From September 2004 to April 2005 we selected 36 patients for minimally invasive video-assisted surgery of the thyroid. The patients were considered eligible if they presented with a nodule not exceeding 35mm in maximum diameter; total thyroid volume within normal range; absence of biochemical and echographic signs of thyroiditis. We analyzed surgical results, conversion rate, operating time, post-operative complications, hospital stay, cosmetic outcome of the series.*

Results. *We performed 36 total thyroidectomy. The procedure was successfully carried out in 33/36 cases. Post-operative complications included 3 transient recurrent nerve palsies and 2 transient hypocalcemias; no definitive hypoparathyroidism was registered. All patients were discharged 2 days after operation. The cosmetic result was considered excellent by most patients.*

Conclusions. *Advances in skills and technology have enabled surgeons to reproduce most open surgical techniques with video-assistance or laparoscopically. Training is essential to acquire any new surgical technique and it should be organized in detail to exploit it completely.*

RIASSUNTO: **Tiroidectomia totale mini-invasiva video-assistita: come migliorare la curva di apprendimento?**

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Obiettivo. *La tiroidectomia totale mini-invasiva video-assistita è una procedura che richiede chirurghi esperti sia in chirurgia endocrina che endoscopica. All'inizio dell'esperienza con questa metodica è comunque richiesto un periodo di apprendimento e pratica. Lo scopo del nostro lavoro è focalizzare alcuni aspetti della curva di apprendimento di questa procedura attraverso l'analisi della nostra serie preliminare di 36 casi.*

Pazienti e metodi. *Dal settembre 2004 ad aprile 2005 abbiamo selezionato 36 pazienti per chirurgia mini-invasiva video-assistita della tiroide. I criteri di elegibilità erano: nodulo più grande di dimensioni minori di 35mm di diametro, volume tiroideo totale nei limiti della norma, assenza di segni biochimici ed ecografici di tiroidite. Abbiamo analizzato risultati chirurgici, tasso di conversione, tempo operatorio, complicanze post-operatorie, degenza, risultati estetici.*

Risultati. *Abbiamo eseguito 36 tiroidectomie totali mini-invasive. La procedura è stata portata a termine con successo in 33 casi su 36. Le complicanze post-operatorie hanno incluso 3 paralisi transitorie ricorrenziali e 2 ipocalcemie. Tutti i pazienti sono stati dimessi due giorni dopo l'intervento. Il risultato estetico è stato considerato eccellente dalla quasi totalità dei pazienti.*

Conclusioni. *I miglioramenti della tecnologia e dell'esperienza dei chirurghi hanno consentito di riprodurre molte tecniche operatorie "open" con la video-assistenza o laparoscopicamente. L'addestramento pratico è essenziale per acquisire qualsiasi nuova tecnica chirurgica e dovrebbe essere organizzato nel dettaglio per essere espresso con i migliori risultati.*

KEY WORDS: Thyroidectomy - MIVAT - Learning curve.
Tiroidectomia - MIVAT - Curva di apprendimento.

Introduction

Minimally invasive video-assisted thyroidectomy (MIVAT) is a technically demanding procedure and requires a surgical team skilled in both endocrine and endoscopic surgery. The real advantages of this technique lie in its lower postoperative pain and optimal aesthe-

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tic result. A time-consuming learning and training period is mandatory at the beginning of the experience, although MIVAT should be easily learned by skilled endocrine surgeons, as it allows to carry out an operation essentially identical to conventional thyroidectomy through a smaller skin incision (1).

The aim of our report is to point out some aspects of the learning curve of the surgeon that faces video-assisted thyroid surgery for the first time, through the analysis of our preliminary series of 36 procedures (surgical results, conversion rate, operating time, post-operative complications, hospital stay, cosmetic outcome).

We reviewed our own experience with minimally invasive thyroid surgery and reported some devices in order to minimize the risks of the procedure in the early phase of its use and to decrease the time needed to gain a reasonable confidence with the technique.

Patients and methods

From September 2004 to April 2005 we selected 36 patients for minimally invasive video-assisted surgery of the thyroid: 29 females (85,5%) and 7 males (14,5%) with a mean age of 50,4 years (range 28 to 72 years).

The patients were considered eligible if they presented with a nodule not exceeding 35mm in maximum diameter; total thyroid volume within normal range (<20ml echographically determined); absence of biochemical and echographic signs of thyroiditis; no enlarged lymph nodes in the neck; previous neck surgery or irradiation therapy and preoperative diagnosis of thyroid carcinoma were considered further exclusion criteria. We decided not to include in selection "low risk" papillary carcinoma either (3) as we were at the beginning of our experience, even if oncologically possible (4).

All patients were treated by the same surgical team, which consisted of two seniors and one resident with experience in thyroid surgery.

MIVAT is characterized by a single incision of 1,5/2 cm above the sternal notch. We performed the thyroidectomy following Miccoli's technique .We retracted the muscle with a first retractor, and we pushed the thyroid medially with a second retractor located on the thyroid lobe .Using a specific instrument designed for the MIVAT and a 5-mm endoscopic camera (at 30 mm degree) inserted through the skin incision, we performed the dissection of thyrotracheal groove. The vessel's ligation was conducted with clips or an Ultracision Harmonic Scalpel (Ethicon Endosurgery, Cincinnati, OH, USA).Before lobectomy, we always identified the inferior and superior laryngeal nerves and parathyroid glands. In the total thyroidectomy , an identical procedure was conducted on the contralateral lobe (5-8). The skin was closed with an intradermal suture in 4/0 Nylon. All patients were screened for values of calcemia.

Pre-operative diagnoses were as follows: follicular lesion in 18 cases (50%); benign multinodular goiter in 9 cases (25%); toxic adenoma in 8 cases (22,2%); Hürthle cell nodule in 1 case (2,8%) (Table 1).

We used small conventional surgical forceps and instrumentation derivated from earnose- throat and spinal surgery (forceps, scissors, spatulas, spatula-shaped aspirator) for dissection in the first five procedures, then the Karl Storz Endoscopy dedicated set for the following ones. No drainages were left inside. 45 days after operations, all patients were asked to evaluate the cosmetic result of the video-assisted procedure by means of a four grade scale: not sufficient, sufficient, good, excellent (1).

TABLE 1

Preoperative diagnosis	Number of patients	%
Follicular lesion	18	50
Benign multinodular goiter	9	25
Toxic adenoma	8	22,20
Hürthle cell nodule	1	2,80

Results

We performed 36 total thyroidectomy. In one case we carried out a parathyroidectomy for adenoma (15 mm in largest diameter) during surgery for benign goiter. The procedure was successfully carried out in 33/36 cases. In 3 patients conversion to conventional surgery was necessary (conversion rate 8,3%): in 2 cases difficulties in lobe dissection made the identification of the recurrent laryngeal nerve (RLN) uncertain; in one patient bleeding from the upper pedicle was too hazardous to manage endoscopically. The mean operating time was 107 minutes (range 80-240 minutes).

Final hystology showed benign goiter in 13 cases (36,1%), follicular adenoma in 10 cases (27,8%), toxic adenoma in 8 cases (22,2%), Hürthle cell adenoma in one case (2,8%), low risk T1 papillary carcinoma in the remaining 4 cases (11,1%). (Table 2).

Follicular nodules proved to be benign lesions in most of the patients (14/18 cases, 77,8%). Post-operative complications included the following: 3 transient RLN palsies (registered among the first 5 video-assisted procedures performed) and 2 transient hypocalcemias; no definitive hypoparathyroidism was registered. No patient required post-operative administration of an analgesic.

All patients were discharged 2 days after operation: post-operative calcium supplementation therapy was not needed in all patients except 2, who were administered with 1000 mg calcium for 10 days after surgery. Mean follow up was 1 month.

TABLE 2

Definitive hystology	Number of patients	%
Benign goiter	13	36,1
Follicular adenoma	10	27,7
Toxic adenoma	8	22,2
Low risk papillary cancer	4	11,1
Hürthle adenoma	1	2,77

The cosmetic result 30 days after operation was considered excellent by most patients (34/36, 94,5%), good by 2 ones (5,5%).

Discussion and conclusions

Advances in skills and technology have enabled surgeons to reproduce most open surgical techniques with video-assistance or laparoscopically. For a minimally invasive procedure to gain universal acceptance, however, several conditions should be met. A crucial point is that the intrinsic goal of the treatment should not be compromised in the pursuit of less-invasive surgery.

Mortality and morbidity rates should be at least comparable to those of conventional surgery and the new procedure should take additional benefits to patients, such as reduced post-operative pain, shorter hospital stay and a better cosmetic results (Figure 1). Finally, the technique should be reproducible (5).

The training is a crucial step while gaining any new surgical technique and it should be defined in detail to exploit it completely.

Minimally invasive approach to thyroid surgery requires all the issues above mentioned.

Currently , we have performed over 300 MIVAT. Therefore, we decided to evaluate retrospectively the beginning of our experience ,until the end of our learning curve with MIVAT, which is estimated of 30-40 procedures (1, 8). We decided to analyze the difficulties we met during our training and to suggest useful devices in order to minimize the risks of the procedure in the early phase of its use and to decrease the time needed to gain a reasonable confidence with the technique. In the following our considerations are described. First, the performance of safe and effective video-assisted thyroid surgery requires in-depth knowledge of biology and pathology of thyroid diseases and maximum ability: as suitable surgical skills evolve from appropriate time demanding training, surgeon should plan the training period in detail and establish reasonable educational goals and objectives. To this purpose, we attended intensive surgical courses and practical training on live tissue (minipigs) in centers of excellence for a year, before attempting MIVAT on patients; we measured the effectiveness of our improvements periodically: achieving low morbidity rates demands meticolous attention to operative technique and anatomic details. Particularly, it must be emphasized that video-assisted thyroid surgery requires fine technique to prevent injuries to the RLN and parathyroid glands. Acceptable rates of permanent RLN injury should be 1% or less and permanent hypoparathyroidism 2% or less (6). During our preliminary experience we registered 3 temporary palsies of the RLN (8,3%), a too high rate of injury if compared with

Fig. 1 - Cosmetic results.

our results with open thyroidectomy. It was probably due to excessive traction over the thyroid lobe, which resulted in stretching of the recurrent nerve (1). After first five procedures we rigorously avoided every potential traumatic maneuvers and no more nerve lesion occurred. On the contrary, transient symptomatic hypocalcemia was slightly more frequent with the standard procedure than with MIVAT, thus being a very encouraging result. Second, patients should be strictly selected, on the basis of the actual confidence of the surgeon with the technique at the time of the diagnosis. Although the number of patients eligible for this approach remains low, the learning curve demonstrated a sharp increase in selection criteria with increasing experience.

We do recommend not to perform MIVAT in cases in which selection criteria are not respected: such attempt to speed the course of the training period does not bring any real advantage and results in a higher conversion rate. Moreover, the surgical team should be always the same, everyone at the same step of the training, to get on well together rapidly. Finally, we believe essential the use of dedicated instrumentation. It is extraordinary useful to create a comfortable working space and maintain a clear operating field (5). At the beginning of our experience we used small conventional surgical forceps and instrumentation derivated from ear-nose-throat and spinal surgery for dissection. We noticed a rapid ascent in our learning curve in terms of feasibility and operating time from the first procedure we performed with the more comfortable dedicated instrumentation. In conclusion, MIVAT is a very specialized approach, which certainly requires a surgeon to be well experienced in both video-assisted and endocrine surgery, but it should not imply that excellence can be achieved only in center of excellence (9). When properly trained, surgeons carry such a quality in their daily practice elsewhere.

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