

Video-assisted thyroidectomy: lessons learned after more than one decade

Tiroidectomia video-assistita

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ABSTRACT

In selected patients, video-assisted thyroidectomy can be considered a safe and validated procedure offering significant advantages over conventional surgery, with no additional morbidity. Aim of this study was to evaluate the results obtained in a series of patients selected for video-assisted thyroidectomy over a 10-years period. All patients who underwent video-assisted thyroidectomy from June 1998 to June 2009 were considered. The eligibility criteria for video-assisted thyroidectomy are: thyroid nodules ≤ 35 mm; estimated thyroid volume < 30 ml; no previous conventional neck surgery and/or radiation therapy; small, low-risk papillary thyroid carcinoma. A total of 1363 video-assisted thyroidectomies were attempted in the time period considered. Conversion to the conventional procedure was necessary in 7 cases. Thyroid lobectomy was successfully performed in 157 cases, total thyroidectomy in 1175, and completion thyroidectomy in 24. In 126 patients, the central neck nodes were removed through the same access. Simultaneous video-assisted parathyroidectomy, for a parathyroid adenoma, was performed in 42 patients. Pathological studies showed benign disease in 986 cases, papillary thyroid carcinoma in 368 cases, C-cells hyperplasia in 1 case, and medullary microcarcinoma in 1 patients with RET germline mutation. Post-operative complications included 27 transient and 1 definitive recurrent laryngeal nerve palsy, 230 transient hypocalcemia, 10 definitive hypoparathyroidism, 4 postoperative hematoma and 5 wound infection.

KEY WORDS: Thyroidectomy • Minimally invasive thyroidectomy • Endoscopic thyroidectomy

RIASSUNTO

Questo lavoro si propone di valutare i risultati ottenuti in una serie di pazienti selezionati per VAT (Tiroidectomia VideoAssistita) operati nell'ultimo decennio presso la Unità Operativa di Chirurgia Endocrina, Istituto di Semeiotica Chirurgica, Policlinico Universitario A. Gemelli, Università Cattolica del Sacro Cuore di Roma. Sono stati valutati tutti i pazienti sottoposti a tiroideotomia con tecnica video-assistita dal Giugno 1998 al Giugno 2009. I criteri di inclusione per la VAT sono: noduli tiroidei ≤ 35 mm; volume tiroideo stimato < 30 ml; anamnesi negativa per interventi chirurgici con tecnica convenzionale e/o trattamenti radianti della regione cervicale; carcinomi papillari della tiroide (PTC) di piccole dimensioni in pazienti a basso rischio. Nel periodo considerato sono stati candidati alla VAT 1363 pazienti; in 7 casi è stata necessaria una conversione alla chirurgia tradizionale. Sono state eseguite 157 lobectomie tiroidee, 1175 tiroidectomie totali e 24 totalizzazioni di tiroidectomia. In 126 pazienti è stata eseguita anche una linfadenectomia del compartimento centrale. In 42 pazienti è stata associata una paratiroidectomia video assistita per adenoma paratiroideo. L'esame istologico ha evidenziato una patologia tiroidea benigna in 986 casi, PTC in 368 casi, iperplasia delle cellule C in 1 caso, e microcarcinoma midollare in 1 paziente con mutazione del gene RET. Le complicanze post-operatorie sono state: 27 paralisi ricorrenti transitorie ed 1 definitiva, 230 ipocalcemie transitorie e 10 definitive, 4 ematomi postoperatori e 5 infezioni della ferita. La tiroidectomia video assistita in pazienti selezionati può essere considerata una tecnica valida e standardizzata; essa offre significativi vantaggi rispetto alla chirurgia convenzionale in assenza di rischi aggiuntivi.

PAROLE CHIAVE: *Tiroidectomia • Tiroidectomia mini-invasiva • Tiroidectomia endoscopica*

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Introduction

During the last decade several techniques for minimally invasive neck surgery have been described, including totally endoscopic techniques, implying neck insufflation and video-assisted technique (VAT) without neck insufflation¹.

Although endoscopic thyroidectomy has evolved in the

last few years, the development of this procedure has been limited by several factors, the most important of which is probably related to the difficulty of the techniques, that led to the description of a considerable number of different accesses (neck, axilla, breast, chest)^{1,2}. Indeed, completely endoscopic dissection may be technically demanding even for skilled endocrine surgeons, especially if performed through an extra-cervical access.

On the other hand, VAT, has had, in the last few years, widespread diffusion^{1-3,8}, probably on account of the easy feasibility of the technique, that reproduces, in each step, conventional surgery^{3,4}.

Several comparative studies have demonstrated that VAT offers some significant advantages over conventional surgery, mainly in terms of improved cosmetic result and reduced post-operative pain, with no additional morbidity^{9,10}. Larger multi-institutional series have further demonstrated its efficacy and safety in different clinical settings¹¹.

Even if at the beginning of the experience, the use of VAT has been limited to the management of benign disease, this no longer seems to be true¹. In fact, this technique has been successfully applied in the treatment of small, low-risk, papillary thyroid carcinoma (PTC), with results comparable to those of conventional surgery in terms of the completeness of the surgical resection^{12,13} and no additional risk of cancer cell seeding¹⁴. Although VAT is usually performed under general anaesthesia, after acquiring adequate experience with this technique, we investigated the possibility of performing it under local and/or regional anaesthesia to further decrease its invasiveness¹⁵. Furthermore, we demonstrated that the incidence and the severity of early voice and swallowing post-thyroidectomy symptoms are significantly reduced in patients who undergo VAT compared with conventional surgery¹⁶.

This report refers to the entire series of patients who underwent VAT in our department over > 10 years.

Material and Methods

Among the 9042 patients who underwent thyroidectomy from June 1998 to June 2009, 1363 patients (1174 female, 189 male), mean age 44.9 ± 13.6 years (range: 10-81 years) were selected for VAT. At the beginning of the experience, the eligibility criteria were: thyroid nodules ≤ 30 mm and estimated thyroid volume within the normal range (< 20 ml); no previous neck surgery and/or radiation therapy; no thyroiditis. After an initial learning period, previous video-assisted thyroid lobectomy and thyroiditis were still not considered a contraindication for VAT. Patients with Graves' disease (pre-operatively estimated thyroid volume < 30 ml), small (T1-small T2) low-risk PTC or RET germline mutation carriers were considered potential candidates for VAT. Concomitant parathyroid adenomas can be removed by the same approach. Absolute contra-indications are represented by malignancies other than "low-risk papillary carcinoma" and the pre-operative suspicion of lymph node metastases. Nonetheless, in the event of PTC or suspicious nodules, if unexpectedly enlarged lymph nodes are identified in the central compartment intra-operatively, they can be dissected and removed by the same video-assisted procedure (VALD, video-assisted lymph node dissection)^{13,17}. All patients

gave informed consent to treatment. The surgical technique has been described elsewhere⁵.

Results

A total of 1363 VAT procedures were performed in 1332 patients. Pre-operative diagnosis was: euthyroid multinodular goitre in 585 patients (44%), toxic multi-nodular goitre in 113 (8.5%), toxic adenoma in 19 (1.4%), Graves disease in 24 (1.8%), follicular nodule in 304 (22.8%), suspicious nodule in 129 (9.7%), PTC in 156 (11.7%), elevated basal and stimulated calcitonin in 1 patient (0.07%) and RET mutation in 1 patient (0.07%). The procedure was successfully carried out in 1356 cases (99.5%): 157 submitted to thyroid lobectomy, 1175 to total thyroidectomy and 24 to completion thyroidectomy. The mean maximum diameter of the nodules was 20.3 ± 9.8 mm (range: 2-56 mm). Mean thyroid weight was 25.7 ± 21.03 g (range: 4-87 g).

Conversion to the conventional procedure was necessary in 7 patients (0.5%) because of difficult dissection in 1 case, large nodule size, underestimated at pre-operative ultrasonography (US) in 3 cases, and intra-operative findings of gross central neck and upper mediastinum lymph node metastases in the remaining 3 cases. In these cases, the final histology showed 3 benign goitres, 3 papillary carcinomas, and 1 follicular carcinoma.

VALD was performed in 126 patients with thyroid carcinoma: in 94 patients with a pre-operative diagnosis of small PTCs or suspicious nodules, only the enlarged central neck nodes were removed; in the remaining 32 patients, a complete video-assisted central compartment lymph node dissection (CCD = Central Compartment Dissection) was carried out. The mean number of lymph nodes removed, during VALD, was 6.0 ± 4.1 (range: 1-19). The mean number of nodes removed in the patients who underwent complete video-assisted CCD was 9.2 ± 3.7 (range: 6-19).

Concomitant para-thyroidectomy for a parathyroid adenoma was performed in 42 patients.

The mean operative time was 47.5 ± 19.5 minutes (range: 20-105) for thyroid lobectomy, 72.7 ± 22.1 minutes (range: 20-170) for total thyroidectomy and 45 ± 17.9 minutes (range: 30-80) for completion thyroidectomy. Mean operative time for VALD was 15 ± 5.6 minutes in all the cases in which it was performed.

Among those patients who successfully underwent VAT, the final histology results showed benign disease in 986 cases, C-cells hyperplasia in 1 case, PTC in 368 cases and medullary micro-carcinoma in 1 patients with germline RET mutation. Lymph node metastases of PTC were found in 27 patients who underwent VALD.

Post-operative complications included 27 transient recurrent laryngeal nerve palsies (about 1% of the nerves at risk), with full recovery of nerve function within 1 month

after surgery; 1 definitive recurrent laryngeal nerve palsy (0.04% of the nerves at risk); 230 transient hypocalcaemia (17%), requiring calcium and vitamin D administration for ≤ 6 months post-thyroidectomy; 10 definitive hypoparathyroidism (0.8%) requiring administration of calcium and vitamin D for ≥ 6 months; 4 post-operative haematoma (0.3%) requiring re-operation; 5 wound infection (0.4%).

Mean post-operative hospital stay was 3.7 ± 1.3 days (range: 1-9 days). The cosmetic results were considered excellent by most of the patients.

Among the patients with PTC, complete follow-up data were available in 315 (85.6%) i.e., 246 pT1 tumours, 22 pT2 tumours, and 47 pT3 tumours. Of the 246 pT1 tumours, 137 (55.7%) had a micro-carcinoma (PTC < 1.0 cm). In all the latter cases, sTg was undetectable (< 0.1 ng/ml) and the US neck scan showed no thyroid remnants or lymph node involvement.

For the remaining 178 PTCs patients, mean sTg off LT4 was 5.4 ± 7.5 ng/ml (range: 0.1-31.4) and sTg on LT4 was undetectable (< 0.1 ng/ml) in 33 patients (18.5%); post-operative US showed no residual thyroid tissue or lymph node involvement in any of the cases; mean 24-h radioactive iodine uptake (RAIU) was $1.7 \pm 2.6\%$ (range: 0-18.2%). However RAIU was $< 0.5\%$ in 33 patients (18.5%) and $< 1\%$ in 74 patients (41.5%). In the 27 patients with lymph node metastases, sTg off LT4 was 4.6 ± 4.6 ng/ml (range: 0.4-13.0) and mean RAIU was $1.8 \pm 0.8\%$ (range: 1.2-3.4%).

Visual TxWBS evaluation demonstrated lateral neck lymph-node involvement in one high-risk patient who required conventional lateral neck dissection 2 years after the initial surgery, after unsuccessful RAIU. TxWBS after the second operation showed no residual uptake.

The patient with RET germline mutation and medullary thyroid microcarcinoma and the patients with C-cells hyperplasia had undetectable basal and stimulated calcitonin.

Discussion

During the last decade, there was a strong impulse towards the development of minimally invasive techniques for thyroidectomy, and several procedures have been described, including totally endoscopic and video-assisted techniques^{1,2}. Although endoscopic thyroidectomy has evolved in the last years, its development has been limited by several factors, and the most important probably being the considerable number of accesses described (neck, axilla, breast, chest)^{1,2}. This fact probably implies that none of those techniques has been universally accepted, considering the technical difficulties and the unproven superiority of one technique compared with the others². Moreover, further concerns regarding the real "minimally invasiveness" of the endoscopic techniques have been raised tak-

ing into account not only the visibility or the size of the scar, but also the extensive dissection, the long operative time, the post-operative discomfort and the length of hospital stay^{1,2,18}.

On the other hand, it is quite clear that VAT encountered most favours, considering its widespread diffusion^{1,3-8} and the quite large series published in the literature, also multi-institutional^{1,4,5,11}.

The use of minimally invasive techniques, for thyroid surgery, was mainly determined, initially, by the attempt to improve the cosmetic result of this operation¹⁹, considering that most of the patients are young females for whom the cosmetic appearance, in a visible region as the neck, would be of great importance. Even if no advantages should be expected from VAT in terms of surgical stress, previously published papers have demonstrated that it has some advantages over conventional procedures, not only in terms of cosmetic result, but also of analgesic requirements and post-operative recovery, with a similar complication rate^{9,10,14}. Moreover, in our experience, VAT seemed to be able to reduce the risk of post-thyroidectomy voice and swallowing alterations, not related to impaired laryngeal nerve function when compared with conventional thyroidectomy¹⁶. The less extensive dissection, the better visualization of the external branch of the superior laryngeal nerve (EBSLN) thanks to the magnification of the endoscope, and a functional component related to the reduced local neck pain and, consequently, reduced psychological reaction, could be responsible for the better voice and swallowing outcome of the video-assisted procedures¹⁶.

The present data, based on a large series of patients, confirm that VAT is characterized by a complication rate no higher than conventional surgery and by excellent cosmetic results.

In spite of these results, the introduction of VAT has encountered some skepticism, focusing mainly on its role in the treatment of thyroid malignancy and its real clinical impact.

However, in a previously published comparative study, we already demonstrated that thyroid gland manipulation is not substantially different between VAT and conventional surgery, and that there is no additional risk of thyroid capsule rupture and thyroid cell seeding in patients who undergo VAT¹⁴. Furthermore, the results obtained in terms of completeness of surgery are similar to those of conventional surgical procedures¹²⁻¹⁴. Even if the main indications for VAT, in the literature, are still represented by benign or undetermined thyroid diseases¹, we propose the use of VAT for small, low-risk PTC in the absence of overt lymph node involvement, at pre-operative work-up. On the other hand, the radicality of the surgical resection should be regarded also as a possibility to perform a central neck node clearance, when indicated^{13,17}. The results of this study also confirm that removal of enlarged central

neck nodes and CCD is feasible, with no additional morbidity. Obviously, conversion is mandatory if node clearance cannot be as complete as in conventional surgery. Thus, the main limit of VAT probably still remains the relatively small number of patients who fulfill the selection criteria. Undoubtedly, this could reduce the clinical impact of the procedure. However, in the last five years, after acquiring confidence with the technique, about 27% of the patients who required thyroidectomy were candi-

dates for VAT in our Centre. Even if they still represent a minority of the patients we operated on, this percentage is not negligible.

As VAT has been demonstrated to offer significant advantages over conventional surgery, with no additional morbidity, this option should, in our opinion, be offered to patients requiring thyroidectomy, at least in selected referral centres, and indeed, should be included in the armamentarium of modern endocrine surgeons.

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