Comparison between minimally invasive video-assisted thyroidectomy and conventional thyroidectomy: A prospective randomized study

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Background. Endoscopic procedures for thyroid surgery have been introduced since 1998, but their diffusion has remained limited because their advantages were never demonstrated.

Methods. Forty-nine patients undergoing surgery for either a thyroid nodule or a small papillary carcinoma were allotted to 1 of these procedures, minimally invasive video-assisted thyroidectomy (MIVAT) or conventional thyroidectomy (CT). Exclusion criteria were nodules greater than 35 mm, presence of thyroiditis, and thyroid volume greater than 20 mL. Preoperative diagnosis, operative time, postoperative pain, complications, and cosmetic result were evaluated.

Results. MIVAT group included 25 patients and the CT group 24 patients. Operative time was 66 ± 24 minutes for MIVAT and 45 ± 15 minutes for CT (P = .001). Postoperative course was significantly less painful in the patients who underwent MIVAT (P = .003). Cosmetic result evaluated by verbal response scale and numeric scale was in favor of MIVAT (P = .003 and P = .01, respectively). One recurrent nerve palsy and 1 transient hypoparathyroidism were present in CT patients; MIVAT patients experienced 2 transient palsies.

Conclusions. Despite some MIVAT advantages in terms of postoperative pain and cosmesis, CT still offers an advantage in terms of operative time and its safety should not differ. Larger series of patients are needed before deciding whether endoscopic thyroidectomy can offer important advantages. (Surgery 2001;130:1039-43.)

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The first endoscopic procedures for the removal of small thyroid nodules have been introduced since 1998, but they have not become very popular because the advantages of this minimally invasive surgery seemed to be very limited, particularly if compared to a well-standardized operation such as thyroidectomy that had reached an excellent standard during recent years.

Because we had achieved quite a good experience with this video-assisted procedure, we searched for further validation through a prospective study comparing 2 groups of patients undergoing thyroid surgery in our department. The aim of the study was to demonstrate the possible advantages offered by this technique with respect to the conventional surgery but also its drawbacks, particularly in terms of costs and operative time.

METHODS

Between March 2000 and September 2000, 49 consecutive consenting patients undergoing surgery for either a thyroid nodular disease or a “low risk” papillary carcinoma were selected on the basis of the following inclusion criteria: thyroid nodule not exceeding 35 mm of maximum diameter, absence of both echographic and biochemical signs of thyroiditis, and thyroid volume not exceeding 20 mL. They were then randomly allotted to 1 of these surgical procedures: (1) minimally invasive video-assisted thyroidectomy (MIVAT) or (2) conventional thyroidectomy (CT).

Surgical procedures. Briefly, MIVAT is characterized by a single access of 1.5 cm in the middle area of the neck, approximately 2 cm above the sternal notch; the midline is incised, and a blunt dissection is carried out with tiny spatulas to separate the strap muscles from the underlying thyroid.
lobe. From this point on the procedure is performed endoscopically on a gasless basis with an external retraction. An endoscope of 5 mm, 30 degrees, is used. The optical magnification allows an excellent vision of both the external branch of the superior laryngeal nerve and the recurrent nerve, which are prepared together with the upper parathyroid gland. The vessels are ligated between clips or with the UltraCision Harmonic Scalpel (Ethicon ENDO-SURGERY, Inc, Cincinnati, Ohio) until the lobe, completely freed, can be extracted by gently pulling it out through the skin incision. The isthmus is then dissected from the trachea and divided. After checking the recurrent laryngeal nerve once again, the lobe is finally removed. The incision is closed by means of 2 subcuticular stitches and a skin sealant. No drainage is necessary.

CT is intended as a procedure characterized by a 6-cm on average skin incision about 1 cm above the sternal notch. After dividing the platysma, the cervical linea alba 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 vascular pedicles of the thyroid lobe are sectioned between ligatures and the thyroid lobe is removed. After checking the hemostasis, we usually put a drainage in the thyroid bed. Cervical linea alba and platysma are sutured. Skin is closed with a subcuticular running suture.

The data concerning the following parameters were collected: age and gender, preoperative diagnosis, type of surgical procedure (lobectomy or total thyroidectomy), operative time, postoperative pain, complications, and cosmetic result.

Patients received the same protocol of postoperative analgesia; 30 mg ketorolac was administered intravenously at the end of the procedure and 8 and 16 hours postoperatively. Postoperative pain was assessed by means of a visual analog scale. This scale consisted of a 100-mm line with the words “no pain” on the left-hand side and “worst pain imaginable” on the right-hand side. All patients were asked to evaluate their pain 6, 24, and 48 hours after the operation by indicating its level on the line.

During this study all patients were discharged on the second postoperative day (48 hours after surgery) to evaluate better the postoperative course. Postoperative follow-up included direct laryngoscopy to check vocal cord mobility and neck ultrasonography. Serum calcium level was also measured in patients who had undergone total thyroidectomy.

Cosmetic result was evaluated by both a numeric scale and a verbal response scale. The numeric scale ranged from 0 to 10. The verbal response scale had 4 options: 1, poor; 2, acceptable; 3, good; 4, excellent. All patients were asked to grade the cosmetic appearance of their wound 1 month after surgery.

The data of the groups were analyzed and compared. The statistical analysis was performed by using the following tests: t test for age, the Mann-Whitney test for operative time and cosmetic result (both for numeric scale and verbal response scale), the analysis of variance with repeated measures for pain evaluation (visual analog scale), and the Fisher exact test for gender, surgical procedure, preoperative diagnosis, and complications. The software used was the SPSS (SPSS Inc, Chicago, Ill). A P value less than .05 was considered statistically significant.

RESULTS

MIVAT group included 25 patients, 22 women and 3 men, with a mean age of 38.0 ± 12.5 years (range, 16 to 73 years). CT group included 24 patients, 21 women and 3 men, with a mean age of 39.9 ± 12.8 years (range, 19 to 79 years). The 2
groups were well matched for age and gender. No statistically significant difference was found between the 2 groups concerning preoperative diagnosis and surgical procedure. Operative time was 66 ± 24 minutes for MIVAT and 45 ± 15 minutes for CT ($P = .001$). Patients in the MIVAT group experienced significantly less pain than those in the CT group at 6, 24, and 48 hours after operation as evaluated by visual analog scale ($P = .003$). Patients in the MIVAT group were more satisfied with the cosmetic result as evaluated by both the verbal response scale and the numeric scale ($P = .003$ and $P = .01$, respectively).

One transient recurrent nerve palsy and 1 transient hypoparathyroidism were present in the CT group, and 2 transient recurrent nerve palsies were registered for the MIVAT group. These complications lasted less than 1 month in all cases. No significant difference was found for the complication rate.

The results of the study are shown in the Table.

**DISCUSSION**

Because the 2 groups of patients were well matched in terms of age, gender, and surgical indications (Table), a comparison seemed possible. The first aspect to be examined was the operative time, which, not surprisingly, was shorter for the conventional procedure (Table). In fact, 1 of the main limitations always shown by any minimally invasive approach to thyroid surgery is their complexity and by consequence their duration. None of these preliminary reports took into account 2 important factors that heavily qualify the length of any new operation, the learning curve and the technical evolution of the surgical instrumentation. Both these factors proved to play an important role in sharply reducing the operative time in our experience. Actually it can be difficult to separate these 2 aspects, because the introduction of a new surgical tool, such as the scissor grip handle that made possible the use of the Harmonic scalpel in endoscopic neck surgery, often occurs during the learning period and not at its onset. Observing our curve (Figure), this different method of coagulating all the thyroid vessels dramatically changed the trend of the operative time, which in our complete series can now successfully rival that of standard surgery. In spite of this, any surgeon approaching this technique must carefully consider that, at the beginning of his or her experience, the procedure will be significantly longer than the standard operation. This could probably mean an additional cost in terms of operating room use, even though a 20-minute difference should not increase the overall costs dramatically.

The results of the study are shown in the Table.
A less painful postoperative course was also documented for MIVAT, and the difference was statistically significant (Table). This is not surprising when considering that minimally invasive approaches are constantly followed by a reduction of postoperative pain.9,10 In this case it is probably not only the length of the skin incision that plays a role; the position of the neck, which is not extended, and the absence of the subcutaneous flap probably interfere favorably with the distress.

The evaluation of cosmetic outcome was expressed by patients by means of both a verbal response scale and a numeric scale (Table), and once again it was in favor of MIVAT. It seems reasonable that, in terms of cosmesis, a 1.5-cm scar is better than a scar that measures not less than 5 cm for a thyroidectomy; this advantage is probably unquestionable, as it is for other minimally invasive procedures.9,10 Furthermore, in the present study cosmetic evaluation was made by patients only 1 month after the operation. Patient satisfaction with this minimally invasive approach tends to increase as time goes by as demonstrated in a previous article in which such an evaluation was requested 6 months after surgery for a different operation (minimally invasive video-assisted parathyroidectomy) that was carried out through the same access.9

In both groups we observed a couple of transient complications; obviously no statistical difference was found. No important definitive complications were experienced by patients of both groups. In spite of the reduced number of cases involved in this study, we conclude that endoscopic thyroidectomy is a procedure as safe as conventional surgery.

Finally, some concern could be expressed about the radicality of this minimally invasive procedure, because one of the indications is the low risk papillary carcinoma. Even though a lymphadenectomy is not necessary in these tumors, the surgeon should be certain of removing all the thyroid before referring the patient to nuclear doctors and endocrinologists for the follow-up. We have already evaluated whole body scannings and serum thyroglobulin dosage in all the patients who had undergone endoscopic total thyroidectomy for papillary cancer in our published series.3 The results were comparable to those of traditional surgery in terms of both iodine 131 uptake and serum thyroglobulin levels, thus demonstrating that a satisfying radicality can be achieved in these tumors for which a simple total thyroidectomy, or even a lobectomy according to some,11 is requested.

Although larger series of patients will be necessary before deciding to introduce minimally invasive thyroid surgery in selected centers, we can conclude that MIVAT is a safe procedure offering some advantages to patients who, at present, still represent only a minority of the patients who undergo thyroid surgery.

REFERENCES

DISCUSSION

Dr Clive Grant (Rochester, Minn). Recognizing that even low risk papillary thyroid cancer patients often have metastatically involved central neck nodes that may cause concern, what, if any, central neck node dissection have you undertaken with the video-assisted thyroidectomy?

Dr Miccoli. We did not perform a central compartment lymphadenectomy because they were only very low risk papillary carcinomas, ie, very small tumors in very young patients. What we can’t do this way is, of course, a lateral compartment lymphadenectomy. But according to our experience with parathyroid surgery, central compartment can be treated this way if we find some enlarged lymph nodes. Of course, we should consider also a conversion to open surgery, but the visualization at least of any enlarged lymph node in central compartment is quite easy.
Dr Quan-Yang Duh (San Francisco, Calif). There are very few prospective randomized studies for these new techniques that are being introduced. I have visited Pisa and I saw this operation; it is exactly as shown in this video. I have 2 comments.

One, this is a relatively easier technique to learn than the other minimally invasive techniques. Instead of starting with a 1.5-cm incision, you can make a 2.5-cm incision, and as you get more skilled at it, you can then shorten the incision. If you need to convert to the conventional technique, the incision can be lengthened to whatever size needed to do the job.

Second, you need a team of experts. Even the second assistant needs to really know what is going on. For those of us who have medical students as second assistants, this can be a difficult problem.

The question I have is, for the 9 and 10 patients in each group who had total thyroidectomy, did you do a postoperative radioactive iodine scan and/or serum thyroglobulin level to convince us of the completeness of the total thyroidectomy?

Dr Miccoli. Regarding your comment about having a second assistant, I was lucky enough to have Piero Berti always working with me. So I agree with you.

In terms of total thyroidectomy, what we did at the very beginning was evaluate these patients with ultrasound because we needed much more time to do a whole body scanning and thyroglobulin measurement. Of course, this was done only for patients with papillary thyroid cancer, not in other patients who, for example, were treated for nodular goiter bilaterally. All the data we have are completely identical to that obtained in patients who underwent a conventional total thyroidectomy. There are no differences either for thyroglobulin or for whole body scanning.

I am pretty sure that it is just as radical as open surgery. Of course, you can choose if you want to also do lymphadenectomies. In this case you have to modulate the choice of a video-assisted or a conventional surgery.

Dr Sally Carty (Pittsburgh, Pa). When we use the Harmonic scalpel in laparoscopic adrenalectomy, arterial vessels of the size of the inferior and superior thyroid arteries are vessels that I certainly would control with multiple clips. In this small series you have no hematomas. Can you comment in a reassuring way on your use of the Harmonic scalpel?

Dr Miccoli. I agree with you. When operating on adrenals on the right side, I put some clips on the adrenal vein. But I can assure you that ever since we started our experience with a Harmonic scalpel last November, we carried out quite a good number of cases and we have never used either clips or ligatures. No patient had any bleeding from the upper pedicle. Norman Thompson is a witness. We did a procedure in Rome, and he was with me. I think you trust him much more than me, and we had no bleeding. I left the same evening. But Norman remained a couple of days, and he had no notice of any bleeding from this patient.

Dr Norman Thompson (Ann Arbor, Mich). Dr Miccoli is absolutely correct. What he says is true.