Hypothesis: Video-assisted thyroid lobectomy improves the cosmetic outcome of the cutaneous scar and reduces postoperative pain.

Participants: Patients admitted to the Division of Endocrine Surgery of the Università Cattolica del Sacro Cuore, Rome, Italy, between March 1999 and December 2000 who were candidates for thyroid lobectomy because of a single, small (<3 cm) thyroid nodule were considered eligible. Of the 62 patients who were randomized, 31 underwent conventional thyroid lobectomy (COS group), and 31 underwent video-assisted surgery without carbon dioxide neck insufflation (VAS group), a new technique created by the authors.

Results: The cosmetic outcome was evaluated by scoring patients' satisfaction with their scars. Satisfaction was higher in the VAS group (mean±SD, 9.2±0.5) than the COS group (mean±SD, 5.8±0.7) (P<.001). Postoperative pain in the first and second days after surgery was lower in the VAS group (mean±SD, 1.8±0.2 and 1.2±0.1, respectively) than in the COS group (mean±SD, 6.2±0.2 and 5.8±0.2, respectively) (P<.001). There were no significant differences in complications (eg, bleeding, wound infection, permanent recurrent nerve palsy). Postoperative hospital stay was lower in the VAS group (mean±SD, 1.1±0.1 days) than in the COS group (mean±SD, 2.2±0.2 days) (P<.05).

Conclusion: Video-assisted thyroid lobectomy is a valid alternative to conventional surgery in patients with single, small nodular thyroid lesions.

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Neck surgery is one of the newest and most interesting applications of minimally invasive surgery. However, reports on the use of this technique in thyroid surgery are scarce, particularly with regard to eliminating the unattractive scars sometimes caused by conventional surgery.1-11 Different techniques for video-assisted neck surgery, all requiring carbon dioxide (CO2) neck insufflation, have been described.1-6 However, CO2 neck insufflation may cause hypercapnia, respiratory acidosis, and subcutaneous emphysema.7-9 To avoid these complications, Hüscher et al4 used a wall lifter to perform thyroid lobectomy with lower pressure levels of CO2 insufflation.

In 1999, we described an original technique for minimally invasive, totally gasless video-assisted thyroid lobectomy performed on a patient with a follicular nodule on the left lobe of the thyroid.11 The aim of the present study is to compare conventional and video-assisted gasless thyroid surgery in terms of cosmetic results, intraoperative and postoperative complications, postoperative pain, and hospital stay.

See Invited Critique at end of article

Of the 62 patients randomized, 31 were in the COS group, and 31 were in the VAS group. In the VAS group, a conversion to conventional surgery was required in 4 cases (13%) because the recurrent nerve could not be identified (Figure 3). Conversion was performed in 1 (4.7%) of 21 patients in whom the thyroid nodule was 2 cm in diameter or less and in 3 (30%) of 10 patients in whom the thyroid nodule was bigger than 2 cm in diameter. In all cases the lobe was easily removed through the 2-cm incision, even when the nodule was 3 cm in diameter. The cutaneous incision was never enlarged, and no lobes or nodules were fractured either by accident or on purpose to aid removal. The mean ± SD age of the patients was 52.1 ± 1.8 years in the COS group and 51.8 ± 1.6 in the VAS group. There were 7 men and 24 women in the COS group and 4 men and 27 women in the VAS group. Surgical findings were similar in the 2 treatment groups (Table 1).
PARTICIPANTS AND METHODS

STUDY POPULATION AND INCLUSION CRITERIA

All participants were admitted to the Division of Endocrine Surgery of the Universita Cattolica del Sacro Cuore, Rome, Italy, between March 1999 and December 2000. Candidates for thyroid lobectomy with evidence of a single, small ($\leq 3$ cm) thyroid nodule at neck ultrasonography and without evidence of cancer at fine-needle aspiration biopsy were eligible to participate in the study. Patients with previous neck irradiation, thyroid operation, or any other anterior cervical operation were excluded from the study. Patient eligibility was evaluated by one of us (R.B.). The study protocol was approved by the ethical committee of the Universita Cattolica del Sacro Cuore.

After written consent was obtained, patients were randomly assigned to undergo thyroid resection by conventional surgery (COS) or video-assisted surgery (VAS). A randomization schedule balanced every 12 patients was generated by computer. Treatment assignments were made by a surgeon (M. Bossola) on the ward before the operation. All surgical interventions were performed by one surgeon (R.B.), who was always assisted by the same surgeon (C.P.L.).

SURGICAL TECHNIQUE

The general rules for performing the conventional thyroid lobectomies were as follows. Briefly, the thyroid was approached via a low transverse collar incision. After elevation of the platysma flat, superiorly and inferiorly, the strap muscles were divided in the midline and elevated sharply from the underlying thyroid gland. The dissection of the thyroid began with early identification of the recurrent laryngeal nerve near the inferior pole of the thyroid lobe. Following identification of the nerve, attention was directed toward visualization of the inferior and superior parathyroid glands. Once they were identified, efforts were made to preserve the blood supply to these glands. In turn, the inferior thyroid artery was elevated from the pretracheal fascia, the superior pole vessels were ligated, and the thyroid was elevated from the pretracheal fascia. The dissection was carried across the midline and completed by mobilizing the isthmus and pyramidal lobe of the thyroid.

With regard to video-assisted thyroid lobectomy, the patient, under general anesthesia, was placed in a supine position with his or her neck in slight extension. A 15- to 20-mm horizontal skin incision was made 1 cm above the sternal notch (Figure 1). After dissection below the platysma, the strap muscles were identified and divided vertically in the midline, along the cervical linea alba. The strap muscles were pulled back with 3 small conventional retractors to expose the inferior part of the lobe (Figure 2).

The mean operating time was 62±4 minutes in the COS group and 81±3 minutes in the VAS group ($P<.001$). In the last 20 patients in the VAS group the operative time decreased (68±3 minutes) and approached that of the COS group. The mean amount of bleeding was 32±5 mL in the VAS group and 34±5 mL in the COS group ($P=.18$).

In 9 patients in the COS group and 10 patients in the VAS group, histologic tests revealed the presence of cancer. Among these patients, after a mean follow-up of 23.1 months and 22.8 months, respectively, no local or distant recurrences were found. In all these patients, serum thyroglobulin and circulating levels of thyroglobulin messenger RNA were not detected. At 12 weeks after thyroid lobectomy, 87% of patients in the VAS group and only 45% of patients in the COS group thought the outcome of their operation was excellent (Table 2). Moreover, patients who underwent VAS were more satisfied with their scars.
with the appearance of their scars ($P<.05$) (Table 2). Patients’ satisfaction with their scars was higher in the VAS group (mean ± SD, 9.2±0.5) than in the COS group (mean ± SD, 5.8±0.7) ($P<.001$).

In the first and second days after surgery, postoperative pain was lower in the VAS group (mean ± SD, 1.8±0.2 and 1.2±0.1, respectively) than in the COS group (mean ± SD, 6.2±0.2 and 5.8±0.2, respectively) ($P<.001$). Similarly, the need for postoperative analgesia, expressed as the number of 100-mg doses of ketoprofen administered postoperatively, was lower in the VAS group (mean ± SD, 2.1±0.2) than in the COS group (mean ± SD, 5.3±0.3) ($P<.001$). As expected, no patients in the COS group or the VAS group needed postoperative calcium or vitamin D substitution. Other complications (eg, postoperative bleeding, wound infection, permanent recurrent nerve palsy) were absent in both groups. The mean ± SD postoperative hospital stay was 1.1±0.1 days in the COS group and 2.2±0.2 days in the VAS group ($P<.05$).

**Table 1. Participant Characteristics**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>COS (n = 31)</th>
<th>VAS (n = 31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y†</td>
<td>52.1 ± 1.8</td>
<td>51.8 ± 1.6</td>
</tr>
<tr>
<td>Sex ratio, F/M</td>
<td>24/7</td>
<td>27/4</td>
</tr>
<tr>
<td>Duration of operation, min†</td>
<td>62 ± 4</td>
<td>81 ± 3</td>
</tr>
<tr>
<td>Weight of preparate, g†</td>
<td>48.3 ± 3.2</td>
<td>50.4 ± 2.8</td>
</tr>
<tr>
<td>Type of thyroid disease, No. of patients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follicular adenoma</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Thyroiditis</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Carcinoma</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Oxyphilic adenoma</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Nodular stroma</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

*COS indicates conventional thyroid lobectomy; VAS, video-assisted thyroid lobectomy.
†Data given as mean ± SD.

**COMMENT**

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. Mortality and morbidity rates must be comparable or lower than those of conventional surgery; control of the underlying disease should equal the results of the open procedure; and the new procedure should have additional benefits to patients, such as reduced postsurgical pain and hospital stay.
and improved cosmesis. Finally, the technique should be reproducible. In the present prospective randomized controlled study, we determined whether video-assisted thyroid lobectomy met all these conditions.

Overall, patients who underwent video-assisted thyroid lobectomy were highly satisfied with the surgical procedure. Moreover, the cosmetic outcome, evaluated by measuring patients’ satisfaction with their operation scars, was significantly higher in the VAS group than the COS group, and more patients in the VAS group (100%) than in the COS group (83%) were very or moderately satisfied with their scars 24 weeks after surgery.

Postoperative pain was much less frequent and much less intense in the VAS group than in the COS group, as demonstrated by the lower need for postoperative analgesia and by the lower score given by the patients on the visual analog scale. Possibly, the decrease of postoperative pain in the VAS group is due to the smaller size of the scars and the light extension of patients’ necks during surgery.

The video-assisted procedures were extremely safe. The mean ± SD blood loss during surgery was 32±5 mL in the VAS group and 34±5 mL in the COS group. Furthermore, postoperative complications (eg, recurrent nerve palsy and wound infection) were absent in both groups. Finally, postoperative hospital stay was significantly shorter in the VAS group than in the COS group.

It must be emphasized that video-assisted thyroid surgery requires fine technique to prevent injuries to the laryngeal nerve and parathyroid glands. Therefore, it is important to create a comfortable working space and avoid blood loss so that a clear operating field can be achieved and maintained. The totally gasless video-assisted approach to thyroid surgery employed in the present study was easily performed and warranted a good position of the neck structures.

With regard to control of the underlying disease, no recurrence of the thyroid disease occurred in either group after a mean follow-up of 18.8 months and 19.2 months, respectively. In patients with cancer, no local or distant recurrences were observed after a mean follow-up of 23.1 months and 22.8 months, respectively. All patients with neoplasms had undetectable serum levels of thyroglobulin.

The time required for video-assisted thyroid lobectomy (mean ± SD, 81 ± 3 minutes) was significantly longer than that for conventional surgery (mean ± SD, 62 ± 4 minutes). In addition, the time required was longer in the first 11 patients (mean ± SD, 90 ± 8 minutes) than in the last 20 (mean ± SD, 67 ± 2 minutes). A plot of operative time vs number of operations performed showed a progressive decrease in the duration of the video-assisted procedure (data not shown). The reduction was more evident between the first and 15th procedures, whereas the duration was quite constant between the 16th and 31st procedures.

Finally, reproducibility of the video-assisted technique through a uniform approach is an important factor for universal acceptance. In 4 (12.9%) of 31 patients in the VAS group, a conversion to conventional surgery was needed because the recurrent nerve could not be identified. However, we believe that such a percentage can be considered acceptable and will decrease in the future.

Our study shows that video-assisted thyroid lobectomy is a safe procedure that leads to a better cosmetic outcome, produces less and lower postoperative pain, and reduces hospital stay compared with conventional surgery. Thus, video-assisted thyroid lobectomy could be a valid alternative to conventional surgery in patients with small, solitary nodular lesions.

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REFERENCES