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Clinical Evaluation of Gasless Endoscopic Thyroid Surgery

MICHIO INUKAI and YOSHIYUKI USUI

Department of Surgery, National Okayama Medical Center, 1711-1 Tamasu, Okayama 701-1195, Japan

Abstract

Purpose. To determine the feasibility of gasless endoscopic thyroid surgery becoming a standard thyroid operation.

Methods. We retrospectively examined the surgical results of 191 patients who underwent thyroid operations at our hospital between December 1999 and June 2003. We also conducted a survey based on a questionnaire sent to 150 patients who underwent thyroid surgery between December 1999 and September 2002.

Results. Although gasless endoscopic thyroid surgery took significantly longer to perform than conventional open surgery, the postoperative stay was significantly shorter and patients had fewer complaints about their surgical scar.

Conclusions. These results indicate that although there are some challenges to overcome, especially the long operative time, gasless endoscopic thyroid surgery could become a standard procedure.

Key words Endoscopic thyroidectomy · Gasless · Endoscopic neck surgery

Introduction

Video-assisted neck surgery was initially described in 1998 by Shimizu et al.[1] At our hospital, gasless endoscopic surgery was first used for thyroid and parathyroid procedures in December 1999. The gasless endoscopic method does not provide as much working space as the CO_2 insufflation method[2] and therefore, to create a better operative field, we devised a new retractor.[3] Using this new retractor, we have performed gasless endoscopic thyroid surgery on 100 patients. To evaluate the likelihood of gasless endoscopic thyroid surgery becoming a standard operation for thyroid surgery, we retrospectively examined the results of 191 thyroid operations done between December 1999 and June 2003 in our hospital. We also conducted a questionnaire survey of 150 patients who underwent thyroid surgery between December 1999 and September 2002 in this hospital.

Patients and Methods

Patient Selection

In our hospital, the indications for gasless endoscopic thyroid surgery are: a benign thyroid tumor ≦5 cm in diameter, Graves' disease of 60 g or smaller, or a malignant thyroid tumor ≦1 cm in diameter. If gasless endoscopic thyroid surgery is indicated, we explain both the conventional and gasless endoscopic methods to the patient, who then decides which procedure they want.

Surgical Technique[3]

Just before the operation, while the patient is sitting up, the surgeon makes a mark on the neck where the incision is to be made. After the induction of general anesthesia, the patient is placed in the supine position with the neck hyperextended. A transverse incision 3.0–3.5 cm long is made 2 cm below the clavicle on the side where the tumor is located. The scar from this incision is normally low enough to be later covered by open-

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Reprint requests to: M. Inukai, 403-13-7 Okamachi, Okayama 700-0867, Japan
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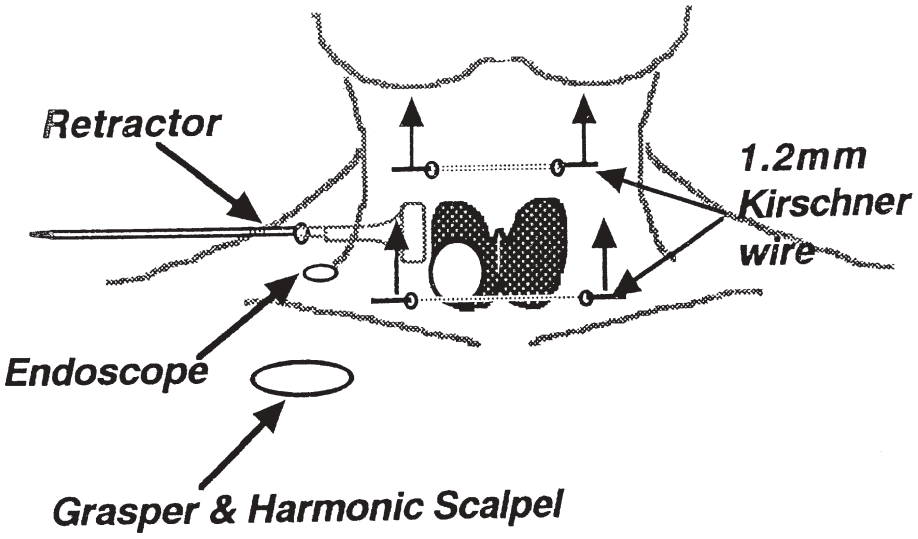

Fig. 1. Schema of the setup for gasless endoscopic thyroid and parathyroid surgery. One working port 3–3.5 cm long is opened below the clavicle and one 5-mm camera port is opened in the lateral neck. Two pieces of *Kirschner wire* are transversely inserted subcutaneously and lifted anteriorly. A *retractor* is positioned in the lateral neck

necked clothes. Another 0.5-cm incision is made on the lateral side of the neck where the tumor is located, to insert a 5-mm endoscope. The platysma muscle and strap muscle are manually separated without visual aids. Either a 5-mm laparoscopic grasper or conventional forceps and an ultrasonically activated scalpel (Harmonic Scalpel, Johnson & Johnson, Cincinnati, OH, USA) are passed through the transverse incision. After dissection of the subplatysmal plane, two lengths of Kirschner wire, 1.2 mm in diameter, are inserted horizontally into the subcutaneous layer of the anterior neck. These wires are then lifted up and fixed to an L-shaped pole to create a working space (Fig. 1). The strap muscles are split longitudinally near the anterior border of the sternocleidomastoid muscle to expose the ipsilateral thyroid gland. We devised a new retractor for both the sternocleidomastoid and split strap muscles. This retractor consists of a conventional retractor and a shaft, 15 cm long and 1.2 mm in diameter, with a sharpened end to penetrate the skin. The end of the retractor is inserted into the subclavian incision and the shaft penetrates the skin to the outside. Thus, the retractor can be controlled from the outside through a tiny hole, and no additional incision is required. The retractor is flattened slightly near the end to avoid rotation, and it is fixed to a special holder. This new retractor creates a surgical working space, sufficient even for the removal of a large tumor.

The methods we use for thyroid and parathyroid operations are similar to conventional methods. For thyroid lobectomy, the isthmus is first incised with an ultrasonically activated scalpel because only the trachea is located posteriorly and no anatomically fragile areas, such as the recurrent nerve and the thyroid arteries, are located here. After the procedure, the incision is washed out with saline and a drain is routinely inserted.

Table 1. Patient questionnaire

Tell us about the surgical wound.
(A) Do you feel any odd sensations around the scar?
  (a) Not at all.
  (b) Yes, a little, but it rarely bothers me.
  (c) Yes, a little.
  (d) Yes, it bothers me all the time.
(B) When you eat or drink, do you feel any tension around the scar or the neck?
  (a) Not at all.
  (b) Yes, a little, but it rarely bothers me.
  (c) Yes, a little.
  (d) Yes, it bothers me all the time.
(C) Does the scar bother you?
  (a) Yes, it bothers me very much all the time.
  (b) Yes, it does.
  (c) Yes, sometimes.
  (d) No, it rarely bothers me.
  (e) No, not at all.
(D) How do you feel about your scar?
  (a) Completely satisfied.
  (b) Satisfied.
  (c) OK.
  (d) Sometimes conscious of the scar.
  (e) Very conscious of the scar.
(E) How is your voice?
  (a) The same as before surgery.
  (b) It is a little difficult to speak now.
  (c) It is difficult to speak now.
  (d) It is almost impossible to speak now.

Patient Questionnaire

The questionnaire sent out to the patients is shown in Table 1. It was completed by 145 patients we were able to be traced from among 150 patients who underwent thyroid surgery in our hospital between December 1999 and September 2002. Five patients were eliminated, two of whom were suffering from dementia and the

Table 2. Breakdown of operations

	Gasless endoscopic thyroid surgery (no. of patients)	Conventional surgery (no. of patients)
Type of operation		
Thyroid partial resection	29	4
Thyroid lobectomy	61	26
Subtotal thyroidectomy	5	32
Total thyroidectomy	0	34
Total	95	96
Underlying conditions		
Benign thyroid tumor		
Follicular adenoma	67	26
Adenomatous goiter	11	8
(incidental papillary carcinoma)	(12)	(5)
Thyroid cancer		
Papillary carcinoma	10	26
Follicular carcinoma	3	5
Medullary carcinoma	None	3
Graves' disease	4	25
Hashimoto's disease	None	3
Total	95	96

There was no conversion from gasless endoscopic thyroid surgery to conventional surgery

whereabouts of three being unknown. The anonymous questionnaire was mailed to each patient in October 2003.

Statistical Analysis

The results are expressed as arithmetic means ± standard deviation, except for some discrete variables. The Mann-Whitney *U*-test was used to test the equality of two distributions of continuous variables. The difference between dichotomous variables was analyzed by the chi-square test. A two-tailed *P* value of <0.05 was considered to indicate significance. All statistical analyses were carried out with Stat View statistical software version 5.0 (SAS Institute, Cary, NC, USA).

Results

A total of 191 thyroid operations were performed in our hospital between December 1999 and May 2003, 95 of which were performed as gasless endoscopic thyroid procedures and 96 of which were performed as conventional procedures (Table 2). The average ages of the patients who underwent conventional surgery and gasless endoscopic thyroid surgery were 53.0 ± 16.7 and 49.1 ± 17.0, respectively. Among the patients who underwent gasless endoscopic thyroid surgery, 13 were men and 82 were women, whereas among those who underwent conventional surgery, 25 were men and 71 were women. These was a significantly higher percentage of women undergoing gasless endoscopic thyroid surgery than conventional thyroid surgery. The average diameter of the tumors removed by the conventional method was 37.7 ± 19.9 mm whereas that of those removed by gasless endoscopic thyroid surgery was 31.0 ± 10.9 mm, which was significantly smaller. The average operative time for thyroid partial resection and lobectomy was 112.5 ± 57.2 min with conventional surgery and 138.2 ± 29.9 min with gasless endoscopic surgery, the latter being significantly longer. Bleeding was 101.9 ± 171.6 ml with conventional surgery and 56.6 ± 149.7 ml with gasless endoscopic thyroid surgery. The postoperative stay was 6.57 ± 3.73 days after conventional surgery and 5.31 ± 1.39 days after gasless endoscopic thyroid surgery. The postoperative stay after gasless endoscopic thyroid surgery was significantly shorter. Postoperative recurrent laryngeal palsy developed in two patients after conventional surgery and in four patients after gasless endoscopic thyroid surgery (Table 3).

A survey was conducted of 150 patients who had undergone thyroid surgery between December 1999 and September 2002 in our hospital. Of those 150 patients, 145 were asked to complete the questionnaire, resulting in a collection rate of 92.4%. The answers to questions related to concern about the scar were significantly more positive after gasless endoscopic thyroid surgery. No answers indicated a better result after the conventional method (Fig. 2).

Table 3. Results of thyroid surgery

	Gasless endoscopic thyroid surgery	Conventional method	
Age (years)	49.1 ± 17.0	53.0 ± 16.7	NS
Sex	Men: 13 Women: 82	Men: 25 Women: 71	$P < 0.05$
Tumor diameter (mm) (Graves' disease and Hashimoto's disease excluded)	31.0 ± 10.9	37.7 ± 19.9	$P < 0.01$
Duration of operation (min) (thyroid partial resection and lobectomy)	138.2 ± 29.9	112.5 ± 57.2	$P < 0.01$
Bleeding (ml) (thyroid partial resection and lobectomy)	56.6 ± 149.7	101.9 ± 171.6	NS
Postoperative stay (days)	5.31 ± 1.39	6.57 ± 3.73	$P < 0.01$
Complications (recurrent laryngeal palsy)	4 patients	2 patients	NS

NS, not significant

Discussion

More and more operations are being performed endoscopically because they are less invasive and the cosmetic results are so much better. In 1997, Huscher et al.[4] performed an endoscopic thyroid right lobe excision. In 1998, in Japan, Ishii et al.[5] performed endoscopic surgery to remove a thyroid tumor using the CO_2 insufflation method, and Shimizu et al.[1] performed gasless endoscopic thyroid surgery using the video-assisted lifting method. Conventional thyroid surgery does not require a large surgical field or invasive operative procedures, and patients generally recover quickly. Considering these characteristics of the conventional method, the advantages of endoscopic thyroid surgery have been considered only from a cosmetic point of view, in that the incision is made below the clavicle, allowing the scar to be covered by clothes.[6] Therefore, endoscopic thyroid operations are currently carried out only in a few centers.

For endoscopic surgery to become accepted as a standard option for thyroid procedure, the surgery should be safe, not require specialized surgical skills, result in patient satisfaction, and provide the same or similar long-term prognosis as other types of surgery.[7] A clinical evaluation was made of gasless endoscopic thyroid surgery based on the results of thyroid operations performed at our hospital and the questionnaire compiled from our patients. However, this was a clinical study and the operations were not all performed under the same conditions. We found that gasless endoscopic thyroid surgery offered more than simple cosmetic advantages. We must take into consideration the fact that many of the patients who underwent conventional surgery had larger tumors, which required larger-scale surgery, resulting in more complaints than after gasless endoscopic thyroid surgery. In addition, more women underwent gasless endoscopic surgery than conventional surgery. However, it should be noted that patient satisfaction was no lower after gasless endoscopic surgery than after conventional surgery. Furthermore, endoscopic surgery requires a shorter postoperative stay. Even though the same clinical pathway is used, regardless of the surgical method the postoperative stay after gasless endoscopic thyroid surgery was significantly shorter than that after conventional surgery, which could also contribute to the low number of complaints. After endoscopic surgery, the patients were less worried about the scar and more relaxed overall, which consequently resulted in an earlier discharge.

All these factors seem to account for the higher satisfaction. In regard to safety, there is much less bleeding in endoscopic surgery than in conventional surgery. On the other hand, gasless endoscopic thyroid surgery presents different challenges, not least of which is the operative time involved. In our hospital, the conventional method is now used only for large tumors, so the average operative time is longer than that for a regular operation. However, gasless endoscopic thyroid surgery takes even longer than this. The average operative time of the ten most recent gasless endoscopic thyroid operations was 124 min, which is less than that of earlier cases. This shows that even though the endoscopic surgical process is not very complicated, some experience is needed to reduce the operative time.

Another consideration is the postoperative development of temporary recurrent laryngeal palsy, which was seen in 4% of our patients who underwent gasless endoscopic thyroid surgery. However, because this percentage was not significantly higher than that after conventional surgery, endoscopic surgery cannot be considered disadvantageous in this respect, although it is important to reduce the incidence of this complication. Considering that the location of the recurrent

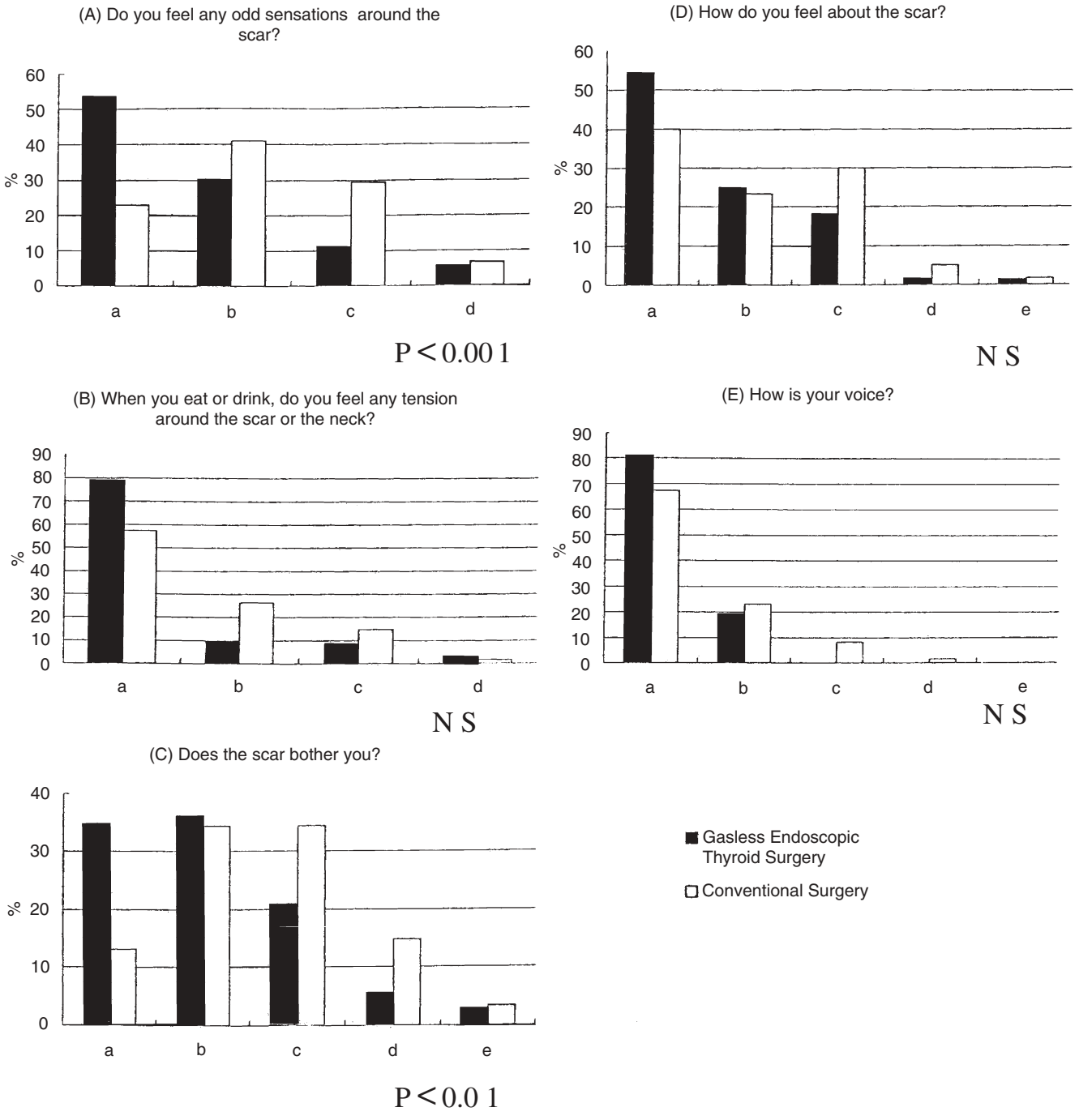

Fig. 2. Answers to the patient questionnaire (Table 1). Patients who underwent gasless endoscopic thyroid surgery had fewer complaints about their surgical scar than patients who underwent conventional thyroid surgery. *NS*, not significant

laryngeal nerve is carefully checked during surgery, regardless of the method used, it should be easier to locate with gasless endoscopic thyroid surgery because the endoscope provides an enlarged view. Despite this, recurrent laryngeal palsy developed in 4% of our patients who underwent gasless endoscopic thyroid surgery. This could be attributed to inappropriate use of the ultrasonically activated scalpel or the narrow field of vision, or both. Several measures could be taken to overcome this, such as not using the ultrasonically activated scalpel near the recurrent laryngeal nerve, limiting the application of this method to small tumors, and ensuring there is a sufficiently large field of vision by using the new retractor.[3] When these problems are re-

solved or minimized, gasless endoscopic thyroid surgery could become a standard surgical option. In our hospital, gasless endoscopic thyroid surgery is almost routinely used for benign thyroid tumors ≦5 cm in diameter.

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