



New technique using an energy-based device versus conventional technique in open thyroidectomy[☆]

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ARTICLE INFO

Article history:

Received 21 September 2012

Accepted 25 April 2013

Available online 6 June 2013

Keywords:

LigaSure[®] Small Jaw Instrument

Thyroid surgery

Operating time

Blood loss

Complications

ABSTRACT

Objective: Thyroid surgery is a common basic procedure in otorhinolaryngology. The purpose of this study was to assess the efficiency of using a new LigaSure[®] vessel sealing system (LigaSure[®] Small Jaw Instrument; Covidien, Boulder, CO, USA).

Methods: We evaluated 83 patients who underwent thyroid surgery between July 2009 and June 2012. The patients were allocated to two groups, which underwent thyroid surgery using either the LigaSure[®] Small Jaw Instrument or conventional techniques. We investigated the duration of operation, estimated blood loss, pathological characteristics, postoperative complications, and length of hospital stay. As for duration of operation and estimated blood loss, we also performed analyses by subgroups according to the extent of thyroid resection, as either total thyroidectomy or hemithyroidectomy.

Results: The study groups showed no significant differences in age, sex, indications, extent of operation and estimated blood loss. Complication rates for recurrent laryngeal nerve palsy, hypoparathyroidism, hematoma, and wound infection did not differ between groups, except for temporary hypoparathyroidism. Operation time was significantly shorter in the LigaSure[®] Small Jaw Instrument group than in the conventional group for all extents of thyroid resection.

Conclusion: Use of the LigaSure[®] Small Jaw Instrument seems likely to reduce the operating time for thyroid surgery without increasing estimated blood loss or the frequency of postoperative complications compared to conventional techniques.

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1. Introduction

Thyroid surgery is one of the basic operations for otorhinolaryngologists, and the most frequently performed surgery in the head and neck area. However, there is still a risk of complications such as hematoma and recurrent laryngeal nerve (RLN) palsy. The occurrence of hematoma may lead to suffocation and RLN palsy can cause vocal dysfunction [1].

The LigaSure[®] vessel sealing system (LVSS) (Covidien, Boulder, CO, USA) is an automatic vessel occlusion system allowing improved vessel sealing through the application of a bipolar electrocoagulator. The efficiency and safety of using the LVSS have been reported in various areas, such as gastric, laparoscopic,

gynecological, and urological operations [2–7]. In thyroid surgery, several studies have also reported on the efficiency and safety of using the LVSS [8–11]. Most of those reports have emphasized shorter operating times and lower or comparable complication rates compared with conventional surgical techniques.

A new electrosurgical device developed for incision surgery, the LigaSure[®] Small Jaw Instrument (LSJI) (Covidien), was released in 2011 (Fig. 1). This device was designed to be smaller (18.8 cm) than the old type of LigaSure[®] and suitable for operations in a narrow operative field such as thyroid surgery. The head of the device has an appropriately angled jaw (28°) that enables separation of tissues. This LSJI also has a special feature, a cutting function. The old type of LigaSure[®] does not have these functions. To the best of our knowledge, no reports have examined thyroid surgery using the LSJI. The aim of this study was to evaluate clinical outcomes between LSJI and conventional methods in thyroid surgery.

2. Materials and methods

This study was a retrospective historical control study. We reviewed the clinical outcomes of total thyroidectomy and

[☆] Presented in part at the 63rd Annual Meeting of the Japan Broncho-Esophagological Society, Nagoya, Japan, 10–11 November, 2011.

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Fig. 1. LigaSure[®] Small Jaw Instrument; Covidien, Boulder, CO, USA (LSJI). (a) Photograph of the whole handpiece. (b) Top of the handpiece, showing appropriate angle and cutting function.

hemithyroidectomy performed at Dokkyo Medical University Hospital between July 2009 and June 2012. Patients who needed to undergo neck dissection or complicated ablation of the trachea or who experienced serious preoperative complications were excluded. In total, 82 patients were enrolled in this study. Among them, from July 2009 to June 2011, 43 patients (conventional group) underwent surgery using conventional clamp-and-tie techniques, whereas from June 2011 to June 2012, 39 patients (LSJI group) were operated on using the LSJI. All operations were performed by the same two surgeons (H.H. and W.K.), who were considered to have the same skill level and both of whom had more than 10 years of experience in thyroid surgery and had operated on more than 100 patients. Data collected included duration of operation, estimated blood loss (EBL), pathological characteristics, presence of hypoparathyroidism, RLN palsy, hematoma and wound infection, and length of hospital stay (LOS).

Patients were assessed preoperatively by flexible endoscopy for RLN palsy, and on postoperative day 1 for vocal cord mobility. Permanent RLN palsy was defined when the presence of vocal cord dysfunction was identified ≥ 3 months after surgery. Serum calcium levels were checked preoperatively, within 24 h after surgery, and 3 days and 2 weeks postoperatively to evaluate parathyroid function. Serum calcium level lower than 8.5 mg/dl was considered to indicate hypoparathyroidism, and calcium or vitamin D was administered. When calcium or vitamin D was required more than 1 month after surgery, hypoparathyroidism was considered to be permanent.

2.1. Statistical analysis

Statistical analysis of data was performed using SPSS version 11.0 software (SPSS, Chicago, IL, USA). Comparisons of continuous variables were assessed using the Mann–Whitney U test. Categorical data were compared using the χ^2 test. For all statistical tests, values of $p < 0.05$ were considered to indicate a significant difference.

3. Results

The characteristics of patients in the LSJI and conventional groups are indicated in Table 1, including age, sex, pathology and extent of operation. Each group was also divided into subgroups according to the extent of thyroid resection, as either total thyroidectomy or hemithyroidectomy. No significant differences in background were apparent between groups. Indications and extent of operation likewise showed similar frequencies.

Mean operating time for each subgroup of hemithyroidectomy and total thyroidectomy and mean total operating time in both subgroups were all significantly shorter in the LSJI group than in the conventional group. Mean total operating time was 89.2 ± 42.8 min in the LSJI group and 104.2 ± 41.4 min in the conventional group ($p = 0.03$). In patients who underwent hemithyroidectomy, mean operating time was 69.4 ± 22.0 min in the LSJI group and 83.5 ± 27.6 min in the conventional group ($p = 0.03$). With total thyroidectomy, mean operating time was 124.2 ± 47.5 min in the LSJI group and 142.7 ± 35.2 min in the conventional group ($p = 0.04$) (Fig. 2). EBL did not differ significantly between groups (Fig. 3).

Postoperative complications are summarized in Table 2. These include RLN palsy, hypoparathyroidism, hematoma, and wound infection. With the exception of temporary hypoparathyroidism, postoperative complications did not differ significantly between groups. The incidence of temporary hypoparathyroidism was significantly higher in the conventional group (16.3%) than in the LSJI group (5.1%; $p < 0.05$). Permanent hypoparathyroidism was identified in 1 case in the LSJI group, a patient with Graves' disease who required long-term administration of calcium and vitamin D. Two patients (5.1%) in the LSJI group and 1 patient (2.3%) in the conventional group developed postoperative hematoma. All hematomas occurred within 24 h postoperatively and required reoperation to achieve proper hemostasis. After this procedure, no accidental outcomes were found in any patients. Six patients with RLN palsy were seen in the LSJI group, comprising 5 patients (12.8%) with temporary palsy and 1 patient (2.6%) with permanent palsy, whereas 7 patients (16.3%) with temporary palsy were seen in the conventional group. No cases of wound infection were encountered in either group. No significant difference in LOS was apparent between groups.

4. Discussion

Many reports have examined the efficiency and safety of LigaSure[®] in surgery, especially in areas other than the thyroid [2–7]. Other devices, such as the harmonic scalpel, have also been suggested as alternatives in thyroid surgery [12,13]. However, no reports have investigated thyroid surgery using the LSJI. Even in other surgical fields, no studies appear to have reported operating times and other such parameters with the LSJI. This is therefore the first report examining operative times, blood loss, and complications, comparing conventional methods with the LSJI in thyroid surgery. This historical controlled study identified significant differences in operating time for both total and hemithyroidectomy and in the complication rate for temporary hypothyroidism

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