



## Original Research

# Single-incision endoscopic thyroidectomy for papillary thyroid cancer: A pilot study



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## HIGHLIGHTS

- Single incision endoscopic thyroidectomy with gas inflation (SIET) can reduce the dissection field and achieve reduced post-operative pain.
- The SIET can improve patients' cosmetic satisfaction compared with conventional trans-axillary thyroid surgery.
- The SIET is a safe and acceptable procedure for papillary thyroid cancer.

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## ABSTRACT

**Background:** Recently, we have reported single incision endoscopic thyroidectomy using an axillary approach with gas inflation (SIET) in cases with benign thyroid tumors to reduce post-operative pain and invasiveness of the conventional endoscopic thyroidectomy. The aim of this study was to present our experiences with SIET for papillary thyroid cancer (PTC).

**Methods:** Patients who were diagnosed with histologically papillary thyroid carcinoma ( $\leq 1$  cm) with single, unilateral, and intra-thyroidal lesion and without clinical lymph node metastasis were included. We analyzed clinico-pathological characteristics, surgical outcomes, and oncologic adequacy of the SIET procedure.

**Results:** Between January 2011 and July 2012, a total of 75 patients underwent hemi-thyroidectomy with ipsilateral central lymph node dissection via SIET. The mean tumor size was 0.5 cm and  $4.1 \pm 2.43$  central lymph nodes were removed. Of the patients, 98.3% were satisfied with their surgical wound post-operatively and no critical post-operative complications occurred during the study, except for one case of post-operative bleeding. There was one case of disease recurrence, which occurred in the contralateral cervical lymph node region 6 months after SIET. This patient underwent completion thyroidectomy with selective neck dissection.

**Conclusion:** The SIET is a safe and acceptable procedure for PTC with a reduced dissection field, less post-operative pain, and more cosmetic satisfaction than conventional endoscopic thyroid surgery.

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## 1. Introduction

Endoscopic thyroid surgery for both benign and malignant thyroid tumors has been performed via various routes, including the axillary, anterior, and breast approaches, with good evidence of its safety and feasibility [1,2]. Miccoli et al. [3] first performed endoscopic near-total thyroidectomy on patients with papillary

thyroid carcinoma in 2002. Thereafter, several studies on endoscopic thyroidectomy for thyroid carcinoma with low-risk patients have been reported [4,5]. Among the several types of endoscopic thyroidectomy, the trans-axillary video or robotic-assisted technique seems to be the most promising approach, as it leaves no visible neck scar [6]. However, it might be an invasive procedure as it requires a wide dissection area for approaching the target lesion from the axilla. Recently, we have reported single-incision endoscopic thyroidectomy using an axillary approach with gas inflation (SIET) in patients with benign thyroid tumor, to reduce the pain and invasiveness of the conventional trans-axillary approach [7,8].

In the present study, we aimed to investigate the surgical feasibility, safety, and oncologic outcome of our SIET procedure in

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patients with papillary thyroid carcinoma (PTC).

## 2. Materials and methods

### 2.1. Patients

Between January 2011 and July 2012, a total of 75 patients with PTC underwent hemi-thyroidectomy with ipsilateral central lymph node dissection (CLND) via the SIET procedure at our institution. All of the operations were performed by the same surgeon. After thorough pre-operative evaluations, such as careful physical examination, fine needle aspiration, ultrasonography, and computed tomography, we selected patients eligible for the SIET procedure. As this study was performed before The American Thyroid Association Guidelines were published in 2016 [9], the inclusion criteria for SIET were as follows: 1)  $\leq 1$ -cm sized histologically PTC; 2) a single and unilateral lesion; 3) an intra-thyroidal lesion; 4) no clinical lymph node metastasis; and 5) no previous neck surgery or irradiation to the head and neck. Tumors around the ligament of Berry were excluded to prevent tracheal or recurrent laryngeal nerve injury during surgery.

All of the procedures were strictly based on the patient's individual decision; informed consent was obtained after explaining the surgical risks and the possible conversion to open surgery or conventional endoscopic thyroidectomy.

### 2.2. Surgical techniques

The details of our SIET procedure have been reported previously [7]. Briefly, the patient was placed in a supine position with the neck slightly extended. The arm on the side of the lesion was raised to expose the axilla. A 2–2.5 cm skin incision was then made along the skin crease at the anterior axilla (Fig. 1). After adequate dissection around the upper portion of the pectoralis major muscle, we made a single-port system using a double-ring wound retractor (Fig. 2) and carbon dioxide (CO<sub>2</sub>) gas was insufflated up to a pressure of 4–6 mmHg. After dissection to the strap muscle using electro-cautery, the medial border of the sternocleidomastoid muscle was dissected from the strap muscle. After the thyroid gland was exposed, the strap muscle was superiorly retracted via an anchoring suture with external fixation (Fig. 3). After the dissection of the lateral border and upper pole, the middle thyroid and superior thyroid vessels were identified and cauterized using an ultra-sonic device, SonoSurg (5-mm O.D., T3015; Olympus, Mountain View, CA, USA). Careful dissection was continued to identify the inferior thyroid artery and recurrent laryngeal nerve (Fig. 4). The inferior thyroid artery was cauterized close to the gland to preserve the nerve and parathyroid gland. The isthmus of the thyroid gland was dissected and resected from the trachea. For CLND, the central lymph nodes were detached from the thyro-thymic ligament area and en bloc resection with thyroid tissue was performed. Intra-operative frozen section biopsy was not routinely performed on the resected lymph nodes; instead, we investigated suspicious lymph nodes via frozen section biopsy. In cases demonstrating lymph node metastasis on the intra-operative frozen section biopsy, we performed total thyroidectomy with contra-lateral central lymph node dissection.

### 2.3. Study design

This study was a pilot study. We selected clinical variables, from the medical records, that could allow estimation the surgical feasibility, safety, and oncologic outcome of SIET procedure, as follows: (1) an operation time for surgical feasibility; (2) post-operative adverse events for safety; and, (3) the number of



Fig. 1. Surgical incision for single-incision endoscopic right hemi-thyroidectomy.

retrieved lymph nodes and disease recurrence for oncologic outcome. Additionally, we hypothesized that the post-operative pain scale and cosmetic satisfaction scale could reflect the advantages of SIET as compared with those of conventional trans-axillary endoscopic thyroid surgery or open surgery. For post-operative pain control, we used the nonsteroidal anti-inflammatory drug aceclofenac, which was administered orally twice a day (total dose, 200 mg/day). This regimen was started immediately after the operation.

Post-operative pain was evaluated using a visual analogue scale (VAS) on the 1st, 2nd and 7th postoperative day (POD). The VAS consisted of a 10-cm line with “no pain = 0” on the left side and “worst possible pain = 10” on the right side. The degree of satisfaction with cosmetic results was evaluated by a verbal response scale, which had four options (1, extremely satisfied; 2, fairly satisfied; 3, acceptable; 4, dissatisfied). All patients were asked about the cosmetic results at 3 months after surgery.

Patients were regularly monitored post-operatively by means of neck ultrasonography and thyroid function tests, at intervals of 6 months, to evaluate tumor recurrence. All patients were administered oral levothyroxine once a day (dose, 50  $\mu$ g/day) to maintain a normal level of thyroid-stimulating hormone, and the dose was adjusted according to results of thyroid function test. We ceased medication if the patient showed a normal level of thyroid-stimulating hormone at 1 year after the operation.

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