

# “Scarless” (in the neck) endoscopic thyroidectomy (SET) with ipsilateral levels II, III, and IV dissection via breast approach for papillary thyroid carcinoma: a preliminary report

Haichao Yan · Yong Wang · Ping Wang ·  
Qiuping Xie · Qunzi Zhao

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## Abstract

**Background** Endoscopic thyroidectomy with level II dissection has previously been reported to be performed endoscopically via various approaches. However, very few reports were available regarding level II dissection performed via the breast approach. In this article, we reported a series of 12 papillary thyroid carcinoma (PTC) patients with scarless (in the neck) endoscopic thyroidectomy (SET) via breast approach to level II dissection and evaluated its feasibility and safety.

**Methods** Between January 2011 and March 2013, 12 PTC female patients with suspected lymph node metastasis at level II, III, or IV were selected for this procedure. After completing thyroidectomy and central compartment dissection, dissection of ipsilateral levels II, III, and IV was performed. The steps of endoscopic lateral neck dissection were similar to those of conventional surgery except that the lateral cervical compartment was exposed by splitting the sternocleidomastoid muscle (SCM) longitudinally and dividing between the strap muscles and the anterior margin of the SCM.

**Results** This procedure was carried out in all of the 12 patients (Table 1). Mean operative time was 243 min (range 165–355 min). Nine patients (75 %) had lymph node metastasis in the lateral compartment confirmed on the final pathological report. Mean lymph node yield (LNY) in the lateral compartment (including ipsilateral level II, III, and IV dissection) was 21.8 (range 5–42). Five patients (41.6 %) had lymph node metastasis in the ipsilateral level II. The mean LNY in the ipsilateral level II was 6.7 (range 1–14). In 1 of the 12 patients, bleeding from injury to the internal jugular vein in level II was encountered intraoperatively, and a 4-cm upper neck transverse incision was made to stop the bleeding. Average postoperative hospital stay was 5.0 days (range 3–7 days).

**Conclusions** According to the present SET data, level II dissection by SET was a feasible and safe procedure. With reasonable costs and satisfactory cosmetic results, oncoplastic SET via breast approach might gain wider acceptance in the near future.

**Keywords** Papillary thyroid carcinoma · Endoscopic thyroidectomy · Breast approach · Lateral neck dissection · Level II dissection

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H. Yan · Y. Wang · P. Wang (✉) · Q. Xie · Q. Zhao  
Department of Thyroid Surgery, Second Affiliated Hospital,  
Zhejiang University, Hangzhou 310009, China  
e-mail: Thyroidsurg@yeah.net

H. Yan  
e-mail: yanhaichao@126.com

Y. Wang  
e-mail: Wangyong@126.com

Q. Xie  
e-mail: yushengxqp@yeah.net

Q. Zhao  
e-mail: zqz0167@gmail.com

Since Gagner first reported endoscopic parathyroidectomy in 1996 [3], endoscopic thyroidectomy has developed rapidly in the past decade. Endoscopic thyroidectomy for benign disease and papillary thyroid microcarcinoma (PTMC) has gained general acceptance in China. “Oncoplastic surgery” was used for breast cancer patients [11, 12] and now has also been applied on thyroid cancer patients because thyroid lesions can be oncologically resected with excellent cosmetic results [14]. However, the

**Table 1** Original article on endoscopic lateral neck dissection (including level II) by other authors

Author (Ref.)	Year	Mean age (years)	Tumor size (cm)	No. of patients	M:F	Tech.	Type of operation	Mean LNY in lateral zone	Mean operative time (min)	Postoperative bleeding	Chyle leakage	Mean PHS (days)
Wu et al. [13]	2013	43.2	1.88	26	6:20	VAT	SLND	8.3	137.7	None	None	3.6
Lee et al. [8]	2013	40.2	1.39	62	5:57	Robot	MRND	32.8	271.8	None	None	6.9
Kang et al. [5]	2012	35.8	1.14	56	10:46	Robot	MRND	31.1	277.4	1	5	6
Kang et al. [6]	2011	NA	NA	36	NA	Robot	MRND	27.7	280.91	1	3	NA
Kang et al. [4]	2009	NA	NA	13	NA	AP	MRND/SLND	18.8	286	NA	NA	5.3
Current article		31.2	1.67	12	0:12	SET	SLND	21.8	243	None	None	5

*Ref.* references, *No.* number, *M* male, *F* female, *Tech.* technique, *LNY* lymph node yield, *PHS* postoperative hospital stay, *VAT* video-assisted thyroidectomy, *SLND* selective lateral neck dissection, *MRND* modified radical neck dissection, *AP* axillary approach, *NA* not available

**Table 2** Clinical details of 12 SET patients with lateral neck dissection

Patient	Age (years)	Tumor size (cm)	Lymph node metastasis			Operation time (min)	Postoperative hospital stay (days)
			II	III–IV	II–IV		
1	24	1.5	0/4	2/6	2/10	165	3
2	29	2.5	0/1	2/7	2/8	195	4
3	26	2	1/7	0/14	1/21	250	5
4	23	1	3/8	1/22	4/30	205	5
5	16	2.3	3/14	7/18	10/32	355	3
6	21	1.5	1/1	2/7	3/8	280	5
7	28	1.7	0/6	0/36	0/42	230	7
8	44	2	0/10	0/24	0/34	280	5
9	47	0.5	0/4	0/1	0/5	210	5
10	43	1.5	4/8	7/12	7/20	270	7
11	45	1.5	1/8	2/15	3/23	210	5
12	28	2	0/9	7/20	7/29	270	6

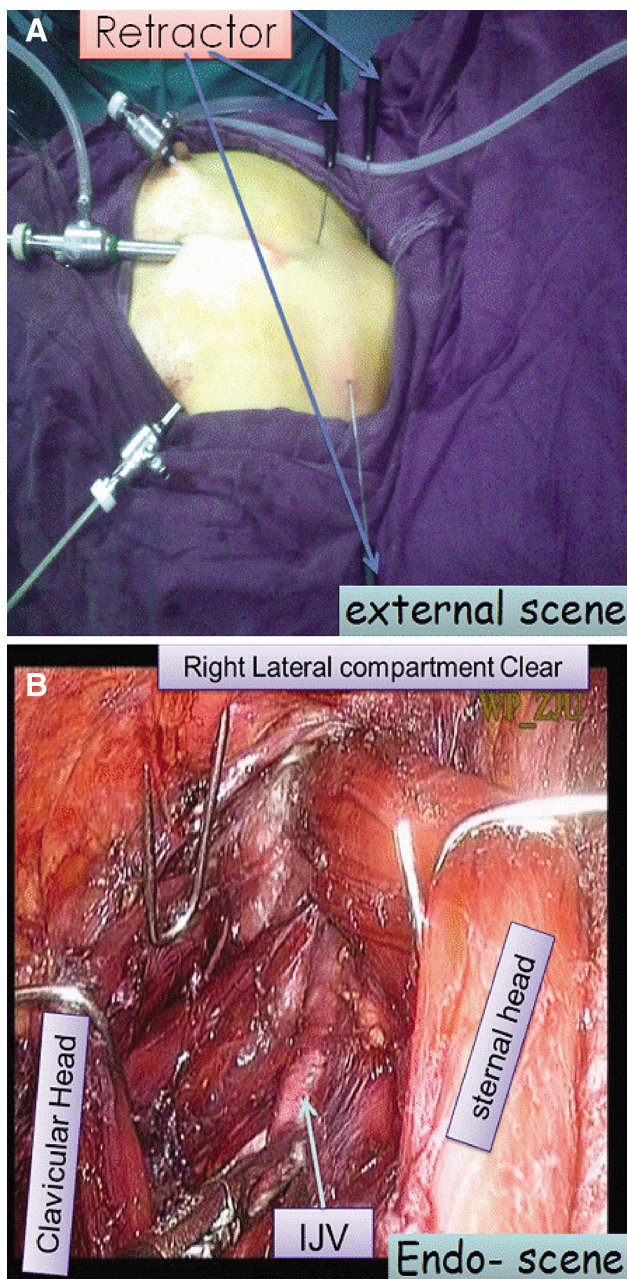
scarless (in the neck) endoscopic thyroidectomy (SET) for lateral neck dissection (LND) was still controversial. In 2011, our surgical team reported our initial experience of 11 cases with SET for LND (including level III and level IV) [9]. However, level II dissection was not studied in that report. Level II dissection has previously been reported to be performed via robotic or video-assisted surgery (Table 1). Kang et al. had reported that endoscopic thyroidectomy with level II dissection could be successfully performed via axillary approach [4]. However, very few reports were available regarding level II dissection performed via the breast approach. In this article, we reported a series of 12 patients with level II dissection being done via endoscopic breast approach.

## Patients and methods

Between January 2011 and March 2013, 12 papillary thyroid carcinoma (PTC) patients were selected for the procedure (Table 2). The mean age was 31.2 years old (range

16–47 years). Mean tumor size was 1.6 cm (range 0.5–2.5 cm). There were four patients with extracapsular spread. Suspicion that the thyroid tumor was malignant was raised preoperatively, which was mainly based on US findings; US and/or enhanced CT identified lymph node enlargement in the lateral compartment, and the enlarged nodes were suspected to be metastatic based on the US findings [1, 7]. The diagnosis of PTC was confirmed by means of intraoperative frozen section.

The selection criteria were as follows: (1) differentiated thyroid carcinoma with suspected or confirmed lymph node metastasis at levels II; (2) female; (3) 15–50 years old; (4) tumor size  $\leq 2.5$  cm; (5) The patients needed a cosmetic requirement. The exclusion criteria were as follows: (1) male; (2) fat (BMI >30); (3) short neck; (4) previous neck or chest surgical history; (5) metastatic lymph nodes in level V or metastatic lymph nodes occurred below the sternoclavicular joint; (6) metastatic lymph nodes were fused with each other or fixed in the neck; (7) invade surrounding tissue, such as trachea, esophagus, and recurrent laryngeal nerve (RLN). After completing thyroidectomy and central



**Fig. 1** **A** A skin incision (1.2 cm in length) was made at the nipple level; two 5-mm trocars were inserted through the incisions (0.6 cm in length) at the margin of bilateral mammary areolas. **B** The lateral cervical compartment was exposed by splitting the SCM

compartment dissection, dissection of ipsilateral levels II, III, and IV was performed. The steps of endoscopic LND were similar to those of conventional surgery. The majority of the steps were reported in the previous article written by our surgical team [9, 10]. After the working space was created, the lateral cervical compartment was exposed by splitting the sternocleidomastoid muscle (SCM) longitudinally and dividing between the strap muscles and the anterior margin of the SCM (Figs. 1–3).

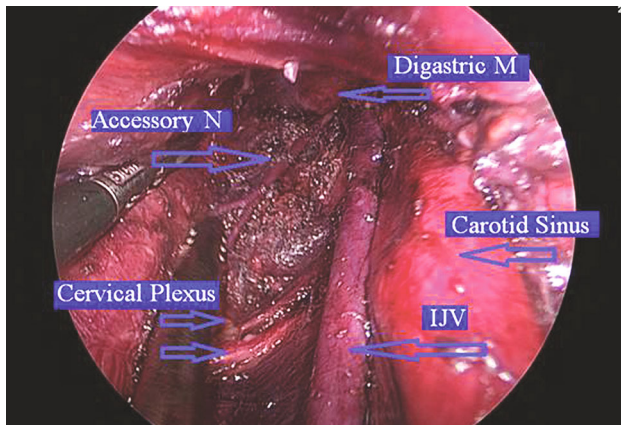
## Results

This procedure was carried out in all of the 12 patients (Table 1). Mean operative time was 243 min (range 165–355 min). Nine patients (75 %) had lymph node metastasis in the lateral compartment confirmed on the final pathological report. Mean lymph node yield (LNY) in the lateral compartment (including ipsilateral level II, III, and IV dissection) was 21.8 (range 5–42). Five patients (41.6 %) had lymph node metastasis in the ipsilateral level II. The mean lymph node yield in the ipsilateral level II was 6.7 (range 1–14). The accessory nerve and digastric muscle were exposed clearly after level II dissection (Fig. 2). Postoperative transient hypocalcemia occurred in 1 case. No evidence of residual or recurrent disease was found at follow-up (range, 2–26 months). Clinical data of the 12 patients are presented in Table 2. In 1 of the 12 patients, bleeding from injury to the internal jugular vein in level II was encountered intraoperatively, and a 4-cm upper neck transverse incision was made to stop the bleeding (Fig. 4). The final pathological diagnosis was PTC in all cases. All of the 12 patients recovered uneventfully with no severe postoperative complications, and no perioperative death occurred. Average postoperative hospital stay was 5.0 days (range 3–7 days).

## Discussion

Therapeutic neck dissection was indicated in patients with clinically evident lymph node involvement [2]. The common procedures for LND were modified radical neck dissection (MRND) and selective LND (SLND) (Table 2), which resulted in a long unsightly L-shaped scar after conventional surgery. The neck wound from conventional open surgery was often more than 20 cm, which might cause concern for young female patients. Compared to the traditional surgery, SET only requires one 1.2 cm incision in the anterior chest and two 0.6 cm incisions at bilateral areolas. These wounds were very well hidden with everyday clothing, which was especially important in patients who wished to keep their surgical history private (Figs. 3, 4). The neck scar resulting from video-assisted thyroidec-tomy (VAT) was significantly shorter than that after the conventional surgery, but might still leave a 4–6 cm scar in the neck if LND was required [13].

When SET was first published, tumor size above 2 cm was considered a contraindication for papillary thyroid cancer due to its increased probability of lateral lymph node metastasis. Wu et al. reported that for VAT, the mean tumor size was 1.88 cm [13]. Lee et al. reported that the mean tumor size of robot group was 1.39 cm [8]. In present article, the tumor size in most patients was within 2 cm.



**Fig. 2** The surgical field after lateral neck dissection was exposed between the strap muscles and the anterior margin of the SCM. IJV internal jugular vein, M muscle, N nerve



**Fig. 4** An inframandibular incision about 4 cm long was made to stop bleeding from internal jugular vein via surgical repair



**Fig. 3** A A long unsightly L-shaped scar after conventional surgery. B Oncoplastic incision after SET

However, if lateral dissection was planned preoperatively, tumor size above 2 cm was no longer an absolute contraindication for SET. In present series, the tumor size was above 2 cm in two SET patients.

LNy in the lateral compartment was correlated with surgical technique and extent of dissection. Lee et al.

reported that the mean LNy in the lateral compartment of robot MRND group was similar with that of open MRND group (32.8 vs. 31.8) [8]. However, in the VAT SLND, the mean LNy in the lateral compartment was only 8.3 (range 3–21) [13]. The mean LNy in the lateral compartment of current SLND study was 21.8 (range 5–42), which was obviously more than that in VAT. The LNy in the lateral compartment of the MRND/SLND via axillary approach was comparable to this study [4]. The robot group performed MRND which included levels IIA, III, IV, and VB. However, our SET team performed SLND which included only levels II, III, and IV, not including level VB, because none of our patients had suspicious lymph nodes in the level VB.

Wu et al. reported that the mean age of VAT was 43.2 years [13]; Lee et al. reported that the mean age was 40.2 years in the robot group [8]. In present group, the mean age was younger. All patients were less than 50 years old. The mean age was 31.2 years. 8 of the 12 cases (66.7 %) were younger than 30 years old. Because younger people belonged to low-risk group and they usually had the most concern for the neck scars, they might benefit the most from oncoplastic SET. However, old age was not an absolute contraindication for SET. The patient age of VAT was reported to be up to 68 years old.

The male patients had been reported to have LND performed by VAT [13] or robotic procedure [8]. However, in this study, all patients were female. One reason was that male patients were less demanding than female patients in terms of cosmesis; another reason was that male patients usually had stronger cervical muscle than female patients, which increased the technical difficulty. In the present article, we excluded the male patients for analysis, but the male gender itself should not be an absolute contraindication for the SET with lateral lymph dissection.

The mean operation time of endoscopic surgery for LND was usually longer than the open one. Lee et al.

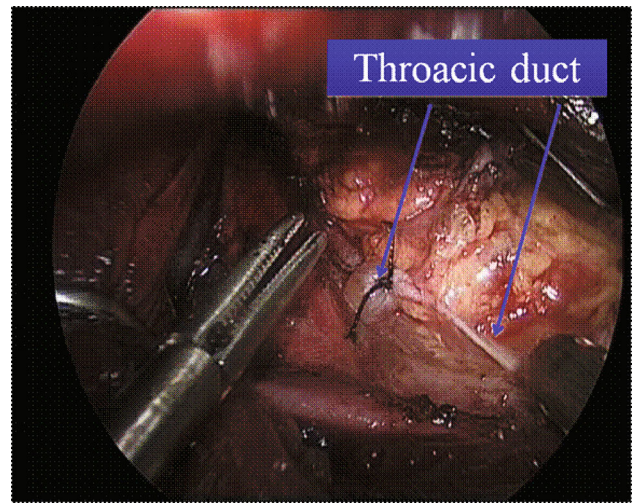
reported that the mean operative time of robot group was 271.8 min, which was significantly longer than that of open group (271.8 vs. 208.9 min) [8]. The operation time of VAT was significantly shorter than that of the robot surgery (137.7 vs. 271.8 min) [13]. In present study, the mean operation time of SET was 243 min, which was longer than that of VAT and was shorter than that of robot group. The operation time of the MRND/SLND via axillary approach was comparable with that via breast approach [4]. However, with accumulation of SET experience, the mean operation time can be reduced in the future.

In one of the 12 patients, for the intraoperative bleeding in level II, a 4-cm inframandibular transverse incision was made to stop the bleeding from the internal jugular vein (IJV) by open repair (Fig. 4). We modified the open procedure by making a small incision instead of a long conventional neck incision. When the IJV was injured, the CO<sub>2</sub> inflation should be stopped to prevent air embolism. If the repair of IJV was difficult, the IJV could be first coagulated by ultrasonic scalpel and then ligated. We emphasized that surgical safety was of paramount importance. If difficulty was encountered during SET or if intraoperative bleeding could not be stopped endoscopically, there should be no reservation to convert to open surgery.

Chyle leakage was a common problem after lateral neck lymph node dissection. Kang et al. reported <10 % chance of chyle leakage after robotic surgery [5, 6]. The chyle leakage should be avoided by careful dissection around the IJV in level IV. However, if the thoracic duct was injured, it should be ligated intraoperatively (Fig. 5).

Postoperative bleeding and hematoma after endoscopic LND were not common. Only one bleeding patient and one hematoma patient were reported to require reoperation after robotic MRND [5, 6]. The proper use of ultrasonic scalpel intraoperatively and avoidance of forceful cough postoperatively might decrease the incidence rate of postoperative bleeding. The larger vessels should be transected only after being coagulated a broad range by ultrasonic scalpel, instead of being cut in a single energy burst. The aberrant external jugular vein draining into IJV could be coagulated intraoperatively, but ligation was preferred for large vessels. Postoperative bleeding and hematoma were not encountered in the present series.

Although the results of robotic procedure for LND were satisfactory, the extremely high equipment costs might not be affordable for the majority of Chinese patients. Hence, robotic surgery might not gain popularity rapidly in China. The operation time of VAT procedure was comparatively shorter than SET, but still left a 4–6 cm scar in the neck after LND. The LNY in the lateral compartment of VAT was also less than that of the SET. In summary, according to the present SET data, level II dissection by SET was a feasible and safe procedure.



**Fig. 5** Thoracic duct was ligated endoscopically

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