

Endoscopic Thyroid Lobectomy via Axillary-Breast-Shoulder Approach versus Open Thyroid Lobectomy

Donyarat Reunmarkkaew, Pichit Sittitrai*

Department of Otolaryngology, Chiang Mai University, Chiang Mai, Thailand

Email: donyarat@hotmail.com, *psittitrai@yahoo.com

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Abstract

Introduction: The aim of the study was to compare the feasibility and safety of endoscopic thyroid lobectomy via axillary-breast-shoulder approach (ET via ABS) with a conventional open thyroid lobectomy (OT). **Methods:** From November 2014 to December 2015, 20 patients with unilateral benign thyroid nodules were treated with ET via ABS and another 20 patients were treated with an OT. We analyzed the clinical characteristics postoperative complications, pain, and patient satisfaction. **Results:** No statistically significant differences occurred between groups except the mean ages of the OT group and the ET via ABS group were 55 and 44 years, respectively ($p = 0.015$). The mean operative time was almost the same in both groups (116 min in the OT group and 114 min in the ET via ABS group). Blood loss was significantly higher in the OT group than in the ET via ABS group ($p = 0.042$) but postoperative drainage was detected more in the ET via ABS group ($p < 0.001$). Early postoperative pain was significantly less in the ET via ABS group ($p = 0.026$). The hospital stay was three days in OT group and four days in ET via ABS group ($p = 0.909$). Postoperative complications such as hematoma, hoarseness, dysphagia, and prolonged subcutaneous emphysema were detected only in the ET via ABS group but without statistical difference. More patients were “very satisfied” with the treatment in the ET via ABS group than in the OT group. **Conclusion:** The ET via ABS is as safe and effective as the OT for patients with unilateral thyroid nodules. With less early postoperative pain and higher patient satisfaction, this endoscopic thyroidectomy approach should be considered in patients who concern about cosmetic results.

Keywords

Endoscopic Thyroidectomy, Axillary-Breast-Shoulder Approach, Unilateral Thyroid Nodule

1. Introduction

Conventional open thyroidectomy remains the treatment of choice for benign and malignant thyroid nodules, but the surgery requires a transverse incision in the anterior lower neck. Such an incision may lead to prominent scarring and cervical paraesthesia or hypesthesia [1]. Since the prevalence of thyroid disease is significantly higher in women, cosmetic outcomes are an important consideration in thyroid surgery. Endoscopic neck surgery for the parathyroid and thyroid were introduced by Gagner in 1996 [2] and Huscher *et al.* in 1997 [3]. Since then, various incision sites for endoscopic thyroidectomies such as the neck, chest wall, axilla, breast, and submandibular areas have been reported [4]-[9]. Among these approaches, combined axilla and breast is the most popular technique. Although the axillobilateral-breast approach which was introduced by Shimazu *et al.* [10] has favorable cosmetic results and easy instrumentation, three large incisions for 10-mm trocar are required and extensive subcutaneous dissection under the anterior chest wall. Koh *et al.* [11] developed a unilateral axillo-breast approach without gas insufflation that produced relatively good cosmetic results without the side effects of CO₂, but required a larger skin flap elevation and longer axillary incision. These two approaches were designed to provide a good surgical view, good cosmetic results, and facilitated instrumentation but required an invasive tissue dissection which may increase incidences of postoperative hematoma, pain, extended drain insertion and a large area of skin numbness [12] [13]. To minimize these possible complications, an axillary-breast-shoulder approach with CO₂ insufflation was introduced by Tran Ngoc Luong [13] and a similar technique was reported by Lee *et al.* [12].

To the best of our knowledge, there has been no comparative study between this approach and the open thyroidectomy. The purpose of this study was to compare an endoscopic thyroid lobectomy via axillary-breast-shoulder approach (ET via ABS) with a conventional open thyroid lobectomy (OT) which emphasized postoperative complications, pain, and patient satisfaction.

2. Materials and Methods

From November 2014 to December 2015, 20 patients with unilateral benign thyroid nodules were treated with ET via ABS approach at the Department of Otolaryngology, Faculty of Medicine, Chiang Mai University. All patients concerned with the cosmetic appearance of their neck and chose this procedure as the preferred approach. During the same period, another 20 patients treated with OT served as a matched control group. It should be noted that, there was no male patient in the ET via ABS group because of less cosmetic concern. All operations in both groups were performed by the same surgical team. Patients with a diagnosis of thyroid cancer, abnormal thyroid function test, nodule size larger than 7 cm, previous thyroid surgery, previous neck and breast surgery, and previous neck and chest irradiation were excluded from the study. The patient's records of age, sex, underlying disease, vocal cord function, nodular

size measurement from ultrasonography, cytological report from fine needle aspiration biopsy of the nodule, final pathological result, operative time, surgical blood loss, amount of blood from drainage at postoperative period, pain score, length of hospitalization, and patient satisfaction were collected. The common postoperative complications of both surgical approaches including: hematoma, vocal cord dysfunction, dysphagia, subcutaneous emphysema, wound infection, and hypercarbia were recorded.

All patients were followed up at postoperative week two and eight.

The statistical analysis was performed using the SPSS software, version 20.0. Clinical demographic and disease variables were analyzed using non-parametric qualitative and quantitative tests. The Fisher's exact test, independent t-test, and Chi-square test were used to compare the data. A p -value of <0.05 was considered to be statistically significant.

Surgical Techniques

ET via ABS Approach: Under general anesthesia and endotracheal intubation, the patient was placed in a supine position with extension of the neck. The head was turned to the opposite side of the thyroid nodule. The ipsilateral arm was abducted at 90 degree to the body side. Xylocaine 1% with 1:80,000 adrenaline was injected subcutaneously into the anterior chest wall. A first skin incision, 1.5 cm in length was made at the anterior axillary line.

Electrocautery was used to dissect tissue to expose the superficial fascia of the pectoralis major muscle and create a space in this tissue plane to the level just below the clavicle with the direction to the thyroid. A 10-mm trocar was inserted and CO₂ insufflation at a pressure of 8 mmHg was applied. A 0-degree 10-mm rigid endoscope was inserted through the trocar. Two more 5-mm incisions at the shoulder and circumareolar line were made with an equal distance from the first incision and two 5-mm trocars were inserted into the space with visualization from video-assisted endoscopic system. The working space was continued at the subplatysmal plane to the midline of the neck at the level of the thyroid cartilage cranially and suprasternal notch caudally by unipolar electrocautery, ultrasonic coagulation device (Harmonic Scalpel, Ethicon Endosurgery) and suction cannula via the lateral trocars. After the strap muscles were dissected and lifted from the lateral to the midline, the thyroid lobe was exposed. The superior thyroid vessels were identified, coagulated and cut with the ultrasonic coagulation device. The middle thyroid vein was then coagulated and cut and the thyroid lobe was lifted to expose the tracheoesophageal groove. A 30-degree 10-mm rigid endoscope was used to identify the inferior thyroid vessels, both parathyroid glands and recurrent laryngeal nerve (RLN). The inferior thyroid vessels were cut with preservation of the parathyroid glands and their vessels. The RLN was securely preserved through its course.

The thyroid isthmus was coagulated and cut from the contralateral lobe. The excised lobe was removed in the plastic bag through the center incision. The surgical space was irrigated with normal saline and the bleeding was checked and stopped. Two vacuum drainage tubes were inserted through the axilla and

shoulder incisions. A pressure dressing was applied over the chest wall.

Open Thyroid Lobectomy: Under general anesthesia, the patient was in a supine position and the neck was extended. An approximately 6-cm incision in the natural skin crease was made in the midline, two cm above the sternal notch. A subplatysmal plane dissection was made from the level of the thyroid notch superiorly to the sternal notch inferiorly and both medial sides of the anterior border of the sternocleidomastoid muscles laterally. The strap muscles were divided at the midline fascia and retracted laterally to expose the thyroid lobe. The thyroid lobectomy was performed in the same manner as the endoscopic procedure. One vacuum drainage tube was placed and the wound was closed. No pressure dressing was applied.

3. Results

The clinical characteristics are summarized in **Table 1**. The mean ages of OT and ET via ABS groups were 55 and 44 years, respectively and the difference was statistically significant ($p = 0.015$). The remaining parameters including sex, nodular size, cytological result, and pathological result were similar in both groups. No preoperative abnormal vocal cord function was detected in any patients.

Table 1. Clinical characteristics of patients in the open thyroid lobectomy group and endoscopic thyroid lobectomy via axillary-breast-shoulder group.

Variables	OT group n = 20 (%)	ET via ABS group n = 20 (%)	p-value
Age (mean \pm SD), y	55.4 \pm 13.5	44.1 \pm 8.5	0.015
Sex			
Male	4 (20)	0	0.106
Female	16 (80)	20 (100)	
Nodular size (cm)	3.5 \pm 1.8	2.7 \pm 0.7	0.112
Cytological reports			
Colloid	9 (45)	7 (35)	9.469
Goiter	4 (20)	7 (35)	
Adenomatoid nodule	5 (25)	6 (30)	
Suspicious PTC	2 (10)	0	
Pathological reports			
Goiter	10 (50)	9 (45)	0.923
Adenomatoid nodule	4 (20)	5 (25)	
Follicular neoplasm	2 (10)	1 (5)	
PTC	2 (10)	4 (20)	
FTC	1 (5)	1 (5)	
HTC	1 (5)	0	

OT = open thyroid lobectomy, ET via ABS = endoscopic thyroid lobectomy via axillary-breast-shoulder, PTC = papillary thyroid carcinoma, FTC = follicular thyroid carcinoma, HTC = Hurthle cell carcinoma.

The mean operative time was almost equal in both groups (116 min in the OT group and 114 min in the ET via ABS group). The mean intraoperative blood loss was significantly higher in the OT group than in the ET via ABS group ($p = 0.042$) while the postoperative blood and serosanguineous drainage were detected more in the ET via ABS group ($p < 0.001$). The patients in the OT group had a significant higher pain score at postoperative hour four compared to the ET via ABS group ($p = 0.026$) but there was no significant difference in pain at postoperative hour 8, 24, 48, and 72. The mean length of hospitalization was approximately three days in the OT group and four days in the ET via ABS group ($p = 0.909$). To evaluate the satisfaction with the treatment, the patients expressed having greater satisfaction in the ET via ABS group (65%) than in the OT group (50%) but the difference was not significant ($p = 0.522$). All the operative outcomes are presented in **Table 2**.

Postoperative complications including hematoma, vocal cord dysfunction, dysphagia, and prolonged subcutaneous emphysema after seven days were observed more in the ET via ABS group but there was no statistical significance. No surgical site infection and hypercarbia occurred in any patients (**Table 3**).

Table 2. Operative outcomes of patients in the open thyroid lobectomy group and endoscopic thyroid lobectomy via axillary-breast-shoulder group.

Variables	OT group n = 20	ET via ABS group n = 20	p-value
Operative time (mean \pm SD), min	116 \pm 38.1	114 \pm 28.6	0.464
Blood loss (mean \pm SD), mL	60.5 \pm 43.7	36.9 \pm 22.7	0.042
Postoperative drainage (mean \pm SD), mL	84.3 \pm 48.6	173.4 \pm 72.1	<0.001
Postoperative pain score (mean \pm SD)			
Hour 4	5.9 \pm 2.6	3.9 \pm 1.8	0.026
Hour 8	4.6 \pm 2.0	3.6 \pm 1.7	0.080
Hour 24	3.0 \pm 1.6	2.8 \pm 1.7	0.858
Hour 48	2.7 \pm 1.8	1.8 \pm 1.2	0.128
Hour 72	1.5 \pm 1.6	1.4 \pm 0.8	0.602
Length of hospitalization (mean \pm SD), d	3.6 \pm 0.7	4.7 \pm 5.4	0.909
Patient satisfaction (%)			
No	-	-	
Satisfied	10 (50)	7 (35)	0.522
Very satisfied	10 (50)	13 (65)	

OT = open thyroid lobectomy, ET via ABS = endoscopic thyroid lobectomy via axillary-breast-shoulder.

Table 3. Postoperative complications in the open thyroid lobectomy group and endoscopic thyroid lobectomy via axillary-breast-shoulder group.

Variables	OT group n = 20 (%)	ET via ABS group n = 20 (%)	p-value
Hematoma			
No	20 (100)	19 (95)	1.000
Yes	-	1 (5)	
Vocal cord dysfunction			
No	20 (100)	18 (90)	0.487
Yes	-	2 (10)*	
Dysphagia			
No	20 (100)	18 (90)	0.487
Yes	-	2 (10)	
Prolonged subcutaneous emphysema			
No	20 (100)	19 (95)	1.000
Yes	-	1 (5)	
Infection			
No	20 (100)	20 (100)	-
Yes	-	-	
Hypercarbia			
No	-	20 (100)	-
Yes	-	-	

OT = open thyroid lobectomy, ET via ABS = endoscopic thyroid lobectomy via axillary-breast-shoulder.
*One patient had vocal cord immobility and the other had vocal cord impaired mobility.

4. Discussion

The goals of endoscopic thyroidectomy are to limit external scarring and improve cosmesis, to reduce postoperative pain, to enhance postoperative recovery, and to increase patient satisfaction without compromising treatment efficacy [13] [14]. Various approaches such as the neck, chest wall, axilla, breast, and submandibular areas have been devised to fulfill these goals but all these techniques have their own advantages and pitfalls [4]-[9] [14]. The neck and chest wall approaches are minimally invasive but leave a visible scar [7] [8] [13] [14]. The axillary approach has maximized cosmesis but has difficult instrument manipulation [4] [13] [14]. The combined axilla and breast approach either axillo-bilateral-breast approach or unilateral axillo-breast approach has disadvantages of extensive tissue dissection and longer operative time [10] [11] [12] [13] [14]. The axillary-breast-shoulder approach with CO₂ insufflation was developed and claimed to have good cosmetic results, small area of dissection, and easy instrumentation [12] [13]. We performed this surgical approach and carried out

the clinical observation to provide a match with conventional open thyroidectomy.

The only significant difference in demographic data was lower mean age in ES group. This could be due to the cosmetic concerns in the younger age patients. The mean operative time was 116 min in the OT group and 114 min in the ET via ABS group and we had a slightly shorter operative time in the ET via ABS group when compared to the previous reports of the same approach (121 min of Lee *et al.* [12] and 120 min of Irawati [13]) and obviously shorter when compared with the other combined axilla and breast approaches (188 min of Shimazu *et al.* [10] and 154 min of Koh *et al.* [11]). The mean intraoperative blood loss was significantly higher in the OT group although we used the same instrument in coagulation and cutting. The blood loss in the ET via ABS group was 36 mL which was comparable to the previous reports (30 mL of Irawati [13] and 53 mL of Shimazu *et al.* [10]). The average amount of postoperative drainage was significantly more in the ET via ABS group than in the OT group (173 mL vs. 84 mL). This could be explained by the larger surgical space of this approach.

The patients in the ET via ABS group had significantly less pain than in the OS group at postoperative hour four and no difference was detected in the remaining periods. There were, however, trends of less pain in the ET via ABS group. The complications were detected more in the ET via ABS group (hematoma = 1 case, vocal cord dysfunction = 2 cases, dysphagia = 2 cases, and prolonged subcutaneous emphysema = 1 case) but these had no statistical significance. This directly relates to the endoscopic experience of the surgeons because all the complications occurred in the early operative cases. Cosmetic results and patient satisfaction are difficult to evaluate because of reliance on the subjective judgment [14], however there were relatively more patients who were “very satisfied” in the ET via ABS group than in the OT group.

The limitations of our study include its non-randomized trial which had selection bias, single center, and small sample size.

5. Conclusion

In conclusion, the ET via ABS provides a good and magnified surgical view, and the same view as the OT in RLN identification with same complication rate as the OT but less pain and better cosmesis. Therefore, ET via ABS should be considered in patients with unilateral thyroid nodules who concern about cosmetic results.

Conflicts of Interest

We declare no conflict of interest.

Ethical Approval

This study was performed in accordance with the Declaration of Helsinki (as revised in Fortaleza, Brazil, October 2013) and institutional guidelines. The study

was approved by the Ethical Committee of Faculty of Medicine, Chiang Mai University.

Consent

Consent exempted.

Authors Contribution

- 1) Donyarat Reunmarkkaew: conception of study design, data collection, analysis, manuscript writing, and revision.
- 2) Pichit Sittitrai: data analysis, manuscript writing, and manuscript submission.

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