

Outcomes of endoscopic hemithyroidectomy via axillary–breast–shoulder approach in benign thyroid nodules

Original Article

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ABSTRACT

Background: Endoscopic thyroidectomy via the axillary, anterior, and breast approaches has been introduced in many individual surgical institutions around the world. The unilateral axillo-breast approach is a surgical resection of the thyroid lobe remotely from the neck without a neck scar shifting the scar to an area that is covered by clothing. Endoscopic thyroidectomy requires meticulous surgical dissection, absolute hemostasis, en bloc tumor resection, and adequate visualization of the operative field.

Aim: To assess the feasibility and safety of endoscopic hemithyroidectomy via the axillary–breast–shoulder (ABS) approach in the management of solitary thyroid nodules and subsequent complications of this procedure.

Patients and Methods: In all, 25 individuals with benign solitary thyroid nodules smaller than 5 cm in one lobe were included in our study. All patients have opted for endoscopic thyroid surgery. Using fine-needle aspiration cytology, the patients included met the benign criteria (FNAC). Within 48 h, we used a visual analog scale to assess postoperative discomfort. Assessment of the patient's satisfaction with the cosmetic outcomes was made 1, 3, and 6 months following surgery.

Results: The majority of studied cases (23 cases) had no intraoperative complications, while two cases had either ecchymosis or emphysema. There was a statistically significant difference as regards cosmetic results change during follow-up between 1 month and 3 months, between 1 month and 6 months, and between 3 and 6 months. There was a statistically significant difference as regards VAS change during follow-up between 12 and 24 h, between 12 and 48 h, and between 24 and 48 h.

Conclusion: This study provided evidence that, in certain individuals with benign thyroid disease, endoscopic thyroidectomy via ABS route is a safe, successful treatment that yields great esthetic outcomes. The ABS technique is a viable, safe, and aesthetically pleasing substitute for a traditional open thyroidectomy.

Key Words: Axillary–breast–shoulder approach, endoscopic thyroidectomy, fine needle aspiration cytology.

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INTRODUCTION

The open approach of hemithyroidectomy is safe, successful, and well-tolerated; nonetheless, it requires a 7–10 cm transverse neck incision. Women have thyroid issues more frequently than men, and they find these scars to be both unpleasant and unattractive. Because limited access techniques reduce or completely remove neck scars, they are becoming more and more popular in neck surgery^[1].

The transverse incision made on the anterior neck by Kocher has been the accepted surgical method for thyroid gland surgery for years. Dissection in the neck area, however, results in scarring and might lead to issues including paresthesia, hypoesthesia, and deglutition

difficulty. The resulting scar is seen to be unattractive, which might cause problems with confidence^[2].

Endoscopic thyroidectomy (ET) is an alternative method of thyroidectomy that makes use of endoscopy. Other approaches were developed, such as the axillary, breast, and anterior chest approach, after Gagner launched the operation in 1996. The most widely used technique in recent years is the axillary–breast approach (ABA)^[3].

Endoscopic technique via the axillary–breast–shoulder (ABS) approach can be used to remove large nodules of the thyroid gland. It combines the benefits of minimal access approach, instrumentation, magnification, and precision. The greater advantage of this approach is the avoidance of a neck scar as the scar will be hidden beneath the clothes

of the patient^[4]. So, this study was carried out to reveal the feasibility and safety of endoscopic hemithyroidectomy via the ABS approach in the management of solitary thyroid nodules and to evaluate postoperative outcomes such as a scar, hematoma, seroma, pain, nerve injury, and quality of life.

PATIENTS AND METHODS:

This prospective quasi-experimental study was carried out on 25 patients with benign solitary thyroid nodules of less than 5 cm in one lobe, aged between 22 and 48 years from both sexes and recruited from the outpatient clinic of the General Surgery Department, Mansoura University, Egypt from March 2022 to March 2023. Written informed consent was obtained from each patient included in this study before surgical procedure. The included patients were classified according to the American Society of Anesthesiologists (ASA) into I, II, and III with euthyroid glands, and had benign criteria by fine needle aspiration cytology (FNAC). However, we excluded patients younger than 18 or older than 60 years, pregnant women, psychologically instable patients, patients who refused to participate in our study, recurrent cases, American Society of Anesthesiologists grade VI, patients with malignant criteria by FNAC, patients with thyrotoxic gland, and patients with signs of recurrent laryngeal nerve palsy.

Methods

All patients were subjected to full medical history taking, full general examination, and local examination of the neck including the thyroid swelling, its site, size, shape, consistency, contour, mobility, relation to the surroundings, skin over, retrosternal extension, pulsation, and audible bruit. Then examination of the cervical lymph nodes was done to assess if there was enlargement or tenderness.

Full laboratory investigations included free serum triiodothyronine (T3) and tetraiodothyronine (T4), and Thyroid stimulating hormone (TSH). Radiological studies included a thyroid ultrasound. Indirect laryngoscopy was done to check the mobility of vocal cords. Ultrasound-guided FNAC was performed on all patients. Any preoperative comorbidities were controlled before surgery. In addition, we confirmed that they were euthyroid and fit for general anesthesia.

Surgical procedure

General anesthesia was used during surgery on every patient. They were placed in supine positions with a sandbag beneath their shoulders and in a 30° reverse Trendelenburg posture. The patient's ipsilateral arm on the side of the thyroid lesion was positioned at a 90° angle to the body's axis, exposing the operative axilla, and the neck was gently stretched. Locations of incisions were noted. For hemostasis and hydro-dissection, an initial plane was

made on top of the pectoralis major muscle and beneath the platysma using a solution of 50 ml 1% xylocaine and 1 ml epinephrine in 1000 ml Ringer's lactate solution. Three-port incisions were made: one in the superior-medial circumareolar location on the ipsilateral breast and two in the axilla at the anterior axillary line. A subcutaneous plane was made when the first 10 mm port was blindly introduced through an axillary incision in the direction of the thyroid gland. A 30° telescope was inserted, and CO₂ insufflation at 7–9 mmHg was attached. Two more 5 mm ports were positioned now, leading to this tunnel, and an energy device—either the Liga Sure or harmonic—was used to produce a subcutaneous plane. Dissection was performed above the sternomastoid muscle toward the infrahyoid muscles followed by separation of infrahyoid muscles. The sternothyroid muscle's upper end was resected using a vascular sealing device after the sternohyoid and sternothyroid muscles were separated from one another. Using an energy device to coagulate and cut inferior polar vessels, the thyroid's inferior pole was initially mobilized. The thyroid lobe was then moved laterally, and the parathyroid glands and recurrent laryngeal nerve were carefully seen and preserved. After that, the thyroid isthmus was removed, and finally, the thyroid lobe's upper pole was cut away. Ultimately, the lobe was extracted using the middle trocar, and the incision was closed using an in situ negative pressure drain.

Postoperative

The patient stayed in the hospital for 1 to 2 days and received antibiotics and analgesics according to hospital protocol. We assessed the amount and the color of fluid which was discharged from the drain. The wound was checked after 48 hours. Then followed up in an outpatient's clinic after 1 week and then after 1, 3, and 6 months. We evaluated postoperative pain by visual analog scale (VAS)^[5] and complications such as bleeding, recurrent laryngeal nerve injury, wound infection, and surgical emphysema at the site of dissection during the hospital stay and at follow-up visits. Evaluation of the patient satisfaction with cosmetic results at 1, 3, and 6 months after surgery (scar appearance satisfaction scale)^[6] that included extremely satisfied, satisfied, average, dissatisfied, and extremely dissatisfied.

RESULTS:

The current study included 25 patients with benign solitary thyroid nodules of less than 5 cm in a single lobe. Table 1 shows that the mean age of the studied cases was 33.14±6.44. The majority of the cases were women. Mean BMI is 27.24±2.40. The majority of the studied cases had no medical history (21 cases), while the minority had HTN (1 case). Patients were presented with swelling (17 cases), dyspnea (6 cases), and dysphagia (2 cases); 72% of the thyroid nodules (18 cases) were right and 88% (22 cases) were solid. The size of nodules in the studied cases

was 3×3cm. TIRAD classification was I in 6 cases, II in 10 cases, III in 7 cases, and IV in 2 cases. Bethesda is I in 40% and II in 60% of the studied cases.

Table 2 shows that FNAC was unsatisfactory in 2 cases of the studied cases, benign in 5 cases, and benign follicular in 18 cases. The mean operative time is 129±21.06 and the length of hospital stay was 2 days. Postoperative pathology was benign in 22 cases and malignant in 3 cases.

Table 3 shows that the majority of studied cases (23 cases) had no intraoperative complications, while cases had either ecchymosis or emphysema, 19 of the studied cases had no early postoperative complications, while two cases had seroma, one case had wound infection, and one case had hoarseness of voice.

Table 4 shows that there was a statistically significant difference as regards the cosmesis score change during follow-up.

Table 5 shows that there was a statistically significant difference as regards VAS change during follow-up.

Table 6 shows a nonstatistically significant difference between the VAS score at 12 h and operative time (min) and postoperative pathology among the studied cases. There was a statistically significant difference between the VAS score at 12 h and the length of hospital stay (days).

Table 1: Demographic characteristics, medical history, presentation, and nodule characteristics of the studied cases

<i>n</i> =25 (%)	
Age/years	
Mean±SD (min–max)	33.14±6.44 (22–48)
Sex	
Male	4 (16.0)
Female	21 (84.0)
Body mass index (Kg/m ²)	
Mean±SD (min–max)	27.24±2.40 (23–32)
Medical history	
–ve	21 (84.0)
Smoking	3 (12.0)
Hypertension	1 (4.0)
Presentation	
Swelling	17 (68.0)
Dyspnea	6 (24.0)
Dysphagia	2 (8.0)
Side of nodule	
Right	18 (72.0)
Left	7 (28.0)
Nodule size	Median (min–max)

Length (Cm)	3 (1–5)
Width (cm)	3 (1.8–5)
Composition	
Cystic	3 (12.0)
Solid	22 (88.0)
TIRADS	
I	6 (24.0)
II	10 (40.0)
III	7 (28.0)
IV	2 (8.0)
Retrosternal extension	0
Bethesda	
I	10 (40.0)
II	15 (60.0)

Table 2: Fine needle aspiration cytology, indirect laryngoscopy, operative time, pathology, and length of hospital stay among studied cases

<i>N</i> =25 (%)	
FNAC	
Unsatisfactory	2 (8.0)
Benign	5 (20.0)
Benign follicular	18 (72.0)
Indirect laryngoscopy	
Freely mobile vocal cords	25 (100.0)
Operative time	
Minutes±SD (min–max)	129±21.06 (100–180)
Postoperative pathology	
Benign	22 (88.0)
Malignant	3 (12.0)
Length of hospital stay	
Days (min–max)	2 (2–4)

Table 3: Intraoperative and postoperative complications of the studied cases

<i>N</i> =25 (%)	
Intraoperative Complications	
No	23 (92.0)
Ecchymosis	1 (4.0)
Emphysema	1 (4.0)
Early postoperative complications	
No	19 (76.0)
Emphysema	1 (4.0)
Hoarseness of voice	1 (4.0)
Seroma	2 (8.0)
Wound infection	1 (4.0)
Late postoperative complications	0

Table 4: Comparison of cosmesis score change during the follow-up

	N=25 (%)	P value
Cosmesis (1 month)		
Extremely satisfied	1 (4.0)	P1<0.001*
Satisfied	18 (72.0)	P2<0.001*
Average	6 (24.0)	P3=0.005*
Cosmesis (3 months)		
Extremely satisfied	16 (64.0)	
Satisfied	7 (28.0)	
Average	2 (8.0)	
Cosmesis (6 months)		
Extremely satisfied	22 (88.0)	
Satisfied	3 (12.0)	

P1: difference between 1 month and 3 months, P2: difference between 1 month and 6 months, P3: difference between 3 and 6 months.
*Statistically significant.

Table 5: Comparison of the visual analog score change during follow-up among the studied cases

	N=25 Median (min-max)	P value
VAS 12 H	6 (2–8)	P1<0.001* P2<0.001* P3<0.001*
VAS 24 H	3 (1–6)	
VAS 48 H	2 (1–4)	

P1: difference between 12 and 24 h, P2: difference between 12 and 48 h, P3: difference between 24 and 48 h.

Table 6: Relationship between VAS score at 12 h and operative time, pathology, and length of hospital stay among studied cases

	Vas 12 h Median (min-max)	
Operative time (min)	r=0.286	P=0.165
Postoperative pathology		
Benign	5 (2–8)	P=0.268
Malignant	7 (6–7)	
Length of hospital stay (days)	r=0.504	P=0.01*

r: Spearman correlation coefficient, used test: Mann–Whitney U test.
*Statistically significant.

DISCUSSION

For many years, the standard surgical treatment for both benign and malignant thyroid tumors has been open thyroidectomy. This technique leaves a scar on the lower anterior neck. This incision line may cause paresthesia and hyperesthesia and occasionally evolve into dark, hypertrophic, or keloid scars^[7]. With the development of laparoscopic and endoscopic surgical techniques, endoscopic techniques have been tried for thyroid and parathyroid surgery. As Gagner and Huscher initially described endoscopic thyroidectomy and parathyroidectomies^[8,9], over the past 20 years, several endoscopic thyroid surgery procedures have been launched. These include a mix of approaches, anterior or lateral cervical direct cervical surgical approach, and extra cervical access (chest wall, breast, or axilla)^[10].

The current study showed that the mean age of studied cases was 33.14±6.44. The majority of the cases were females (21 cases). Mean BMI was 27.24±2.40. Most of the studied cases had no medical history (21 cases), while the minority had HTN (1 case). Patients were presented with swelling (17 cases), dyspnea (6 cases), and dysphagia (2 cases). In agreement with our results, Phan *et al.* evaluated 54 patients who underwent a single-incision endoscopic thyroidectomy through the axillary approach, the majority were female (n=51, 94.4%). The mean age was 34.7 years (±8.5, range 17–56). Thirty-one patients suffered from dysphagia (57.4%), while 23 patients were detected in periodic health examinations (42.6%)^[11].

The current study showed that 72% of the thyroid nodules were right and 88% were solid. Also in

agreement, Phan *et al.* showed that 57.4% of the thyroid nodules were right and 58.3% were solid^[11].

The size of nodules in studied cases was 3×3 cm. TIRAD classification was one in 6 cases, II in 10 cases, III in 7 cases, and IV in 2 cases. Bethesda was I in 40% and II in 60% of studied cases. The current study showed that FNAC was unsatisfactory in two of the studied cases, benign in five cases, and benign follicular in 18 cases. Indirect laryngoscopy showed freely mobile vocal cords in all included cases. Also in agreement, Phan *et al.* showed that the mean size of the tumor was 2.7 cm (±1.0, range 1.5–3.9), eight patients were classified as TIRADS 2 (14.8%), when it was seen as TIRADS 3 in 18 (33.3%) patients, and TIRADS 4 in 28 (51.9%) patients (51.9%). The mean total operation time was 66.0 min (±12.9, range 50–120). Postoperative pathology showed 85.2% were benign and 12% malignant^[11].

The current study showed that postoperative pathology was benign in 22 cases and malignant in 3 cases. The current study revealed the surgical management of the malignant cases with completion thyroidectomy; 2 cases with open surgery and one case with endoscopic surgery. In harmony with our study, Yulian *et al.* found that one patient underwent an endoscopic completion thyroidectomy, while the other chose to have open surgery because they preferred not to have another endoscopic procedure. The other patient had low-risk carcinoma; therefore, they did not have completion surgery based on the American Thyroid Association's (ATA) guideline^[12].

The current study showed that the majority of studied cases (23) had no intraoperative complications, while 2 cases had (either ecchymosis or emphysema). In all, 19 cases had no early postoperative complications, while 2 cases had seroma, one case had wound infection, and one case had hoarseness of voice. However, Yulian *et al.* evaluated retrospectively 42 endoscopic thyroidectomies through the ABS approach with carbon dioxide insufflation of up to 8–10 mmHg and found that voice hoarseness caused by temporary RLN injury, which was diagnosed by laryngoscope, occurred in 8 (19%) patients^[12]. It was the most common complication found; 2% had seroma and 0% had surgical site infection. Koh *et al.* found that some patients experienced temporary vocal cord palsy (6,9%), hematoma (3,4%), and seroma (13,8%) following ABA^[7].

In a different research, Lee *et al.* observed that 5.8% of their ABA patients had postoperative complications; of them, half had seroma and the other half had transient vocal cord palsy^[13]. Although they noted several potential side effects, including wound

infection, bleeding, and irreversible vocal cord palsy none occurred during the study. Irawati observed that after 7–10 surgical days, transient neck swelling and shoulder pain subsided. During the research, there were no cases of seroma, hypocalcemia, or irreversible recurrent laryngeal nerve paralysis^[14].

The current study showed that there was a statistically significant difference as regards cosmesis score changes during follow-up between 1 month and 3 months ($P1 < 0.001$), between 1 month and 6 months ($P2 < 0.001$), and between 3 and 6 months ($P3 = 0.005$), where 72% of patients were satisfied at 1 month, while extremely satisfied were 64% and 88% at 3 and 6 months, respectively. Similarly, Yulian *et al.* revealed that 26 (61.9%) participants gave the response 'very satisfied' 14 (33.3%) participants gave the response 'satisfied' two (4.7%) participants gave the response 'unsatisfied,' and none gave the response 'dissatisfied'^[15]. However, Phan *et al.* revealed that all patients were happy with satisfactory cosmetic outcomes and that 14 (25.9%) patients had hypertrophic scars. Muthukumar *et al.* also observed that participants who received ET were happier with their scars than those who got traditional OT^[11,15].

The current study showed that there was a statistically significant difference as regards VAS change during follow-up between 12 and 24 h ($P1 < 0.001$), between 12 and 48 h ($P2 < 0.001$), and between 24 and 48 h ($P3 = 0.005$), where there was 1% of reduction between 12 and 24 h, 2% of reduction between 12 and 48 h, 3% of reduction between 24 and 48 h^[14]. In line with our findings, Yulian *et al.* discovered that the mean VAS on the first day had a declining tendency until the seventh day^[15] concerning postoperative pain. In addition, using the axillary and breast approach, Vimal *et al.* assessed the benefits and limitations of endoscopic thyroid surgery. On the first to the third day following surgery, the postoperative discomfort subsided^[16].

CONCLUSION

This study provided evidence that, in certain individuals with benign thyroid disease, endoscopic thyroidectomy via the ABS route is a safe and successful surgery that yields outstanding aesthetic outcomes. The ABS technique is a viable, safe, and aesthetically pleasing substitute for a traditional open thyroidectomy. To reduce the risk of mortality and complications from ET, a surgeon skilled in traditional open thyroid lobectomy is essential for this approach.

CONFLICT OF INTEREST

There are no conflicts of interest.

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