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Postauricular and Axillary Approach Endoscopic Neck Surgery: A New Technique

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Abstract
Background While the bilateral axillo-breast approach (BABA) to endoscopic neck surgery resolves various benign and malignant thyroid and parathyroid diseases with minimal adverse effects and excellent cosmetic outcomes, it involves circumareolar incisions. Many patients, especially young female patients, are reluctant to have their breast involved. Consequently, we developed the postauricular and axillary approach (PAA) that uses postauricular incisions.
Methods From June 2006 to December 2007, we treated 10 patients with PAA endoscopic neck surgery. After subcutaneous infiltration with diluted epinephrine solution, the subplatysmal and subcutaneous spaces were dissected. Two axillary ports and two postauricular ports were used and low-pressure CO_2 insufflation generated operative space. After dividing the midline between the strap muscles, the isthmus was divided and the thyroid lobe was dissected with ultrasonic shears and excised after careful identification of the recurrent laryngeal nerve and parathyroid glands. Malignant lesions were treated with contralateral thyroid lobectomy. For parathyroid adenomas, we performed parathyroidectomy after dividing the strap muscles in the midline.
Results Two thyroid lobectomies, one parathyroidectomy, one subtotal thyroidectomy, and six total thyroidectomies were performed by PAA endoscopic neck surgery. The mean operation time was 210.0 ± 43.7 min. There were no cases of conversion to open surgery, permanent vocal cord palsy, or facial nerve palsy. None of the thyroidectomy patients exhibited hypocalcemia. The cosmetic outcomes were excellent and all patients were satisfied.
Conclusions PAA endoscopic neck surgery is a feasible method for thyroid and parathyroid surgery that permits good operative visualization and has minimal adverse effects and excellent cosmetic outcomes.

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Introduction

We developed the bilateral axillo-breast approach (BABA) endoscopic neck surgery in 2004 and used it to successfully treat over 400 cases of various thyroid and parathyroid diseases [1, 2]. This approach permits a full and symmetrical surgical view of important anatomic structures such as the superior and inferior thyroidal vessels, the recurrent laryngeal nerves, the parathyroid glands, and the trachea. Thyroidectomies performed by using the BABA endoscopic method have similar complication rates as open thyroidectomies but also have excellent cosmetic outcomes. However, one disadvantage of the BABA method is the reluctance of patients to have their breast involved, especially young female patients. Consequently, we developed a new technique that uses postauricular incisions. This technique, which we call the postauricular and axillary approach (PAA) endoscopic neck surgery; avoids the use of circumareolar incisions (Fig. 1).

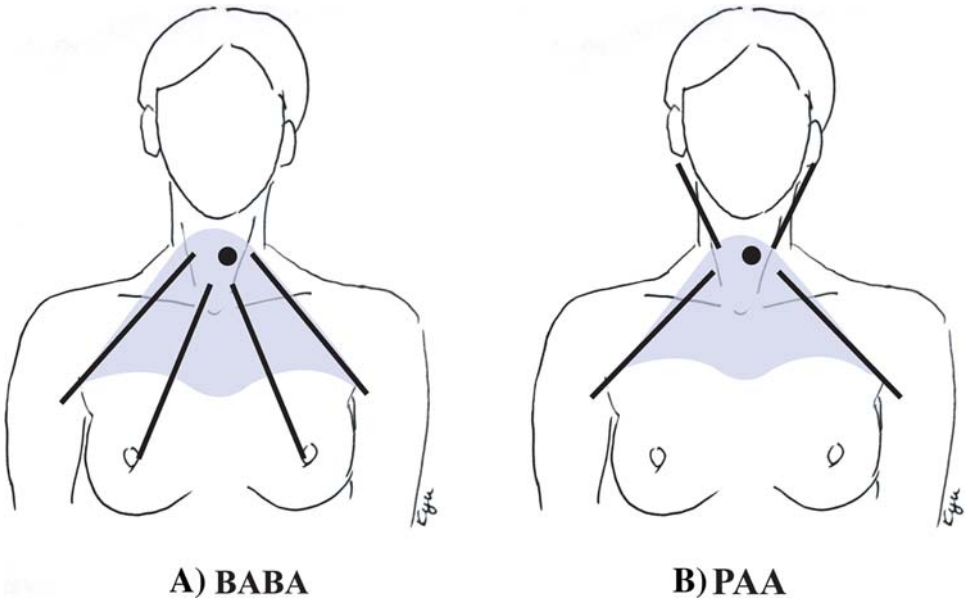

Fig. 1 Comparison of the bilateral axillo-breast approach (BABA) and the postauricular and axillary approach (PAA) to endoscopic neck surgery. The gray zone represents the area of flap dissection. Note that the area of flap dissection is narrower in PAA surgery than in BABA surgery

Patients and methods

Patient selection

We used the same eligibility criteria as for the BABA operation, namely, benign thyroid mass less than 4 cm in its largest diameter, papillary thyroid carcinoma not larger than 1 cm with low risk, follicular neoplasm less than 3 cm, and parathyroid adenoma localized preoperatively [1]. All patients consented to undergo PAA endoscopic neck surgery.

Patient position and operating room setting

Under general endotracheal anesthesia with nasal intubation, the patient was placed in a supine position. The neck was slightly extended and both arms were mildly abducted to provide space for the insertion of the axillary ports. The operator stood on the side of the lesion, the camera was placed on the opposite side, and two assistants were situated at the head of the patient. Monitors were placed where the operator and assistants could watch easily (Fig. 2).

Operative technique

We used 21-gauge spinal needles to subcutaneously infiltrate the subplatysmal space of the neck and the subcutaneous space of the axillary and anterior chest area with diluted epinephrine solution (0.1 ml of epinephrine [1:1000] in 200 ml of normal saline). The infiltration provides space for flap dissection and prevents bleeding. The 12-mm axillary incision was made at the lesion side, and the subplatysmal and subcutaneous spaces were dissected bluntly by using a vascular tunneler. The working space was extended superiorly, laterally, and inferiorly to the level of the thyroid cartilage, the medial border of each sternocleidomastoid muscle, and the anterior chest, respectively. After establishing the required working space,

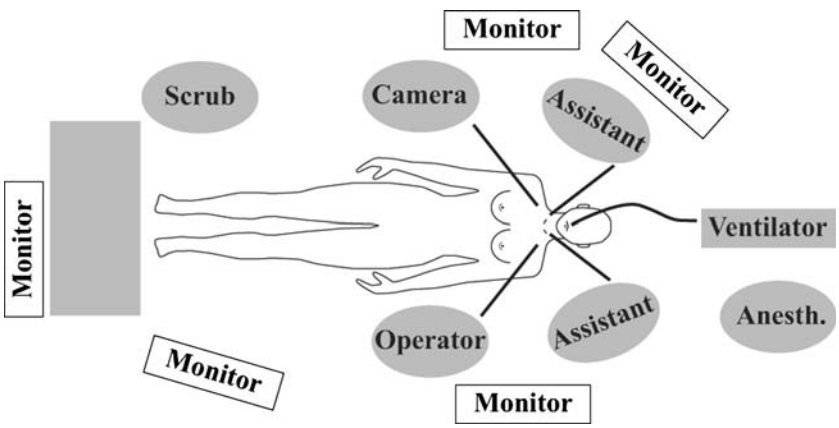

Fig. 2 The operating room setting. The operator stands on the side of the lesion, the camera is located on the opposite side, and the assistants are situated at the head of the patient

a 12-mm trocar was inserted and the operative space under the flap was insufflated with low-pressure carbon dioxide gas (5-6 mmHg). Another incision was made on the contralateral axillary region and a 5-mm trocar was inserted. By using 5-mm ultrasonic shears (Harmonic Scalpel; Ethicon Endosurgery, Cincinnati, OH, USA), the rest of the dissection was completed with the visual guidance of a 5-mm flexible videoscope. Bilateral postauricular incisions were then made and two 5-mm trocars were inserted (Fig. 3).

The midline was estimated by external palpation. By using a monopolar dissector (5-mm hook; Ethicon Endosurgery), a midline incision was made between the strap muscles from the level of the thyroid cartilage to the suprasternal notch. During the dissection, the bilateral strap muscles were retracted laterally with right-angled graspers via the postauricular ports. The isthmus was divided by using the ultrasonic shears. A snake-shaped retractor was used to retract the strap muscles to the lateral side and the thyroid lobe was retracted medially. The superior vessels of the thyroid gland were coagulated with the ultrasonic shears. The inferolateral side of the thyroid gland was approached and the recurrent laryngeal nerve and the parathyroid glands were identified and saved. Berry's ligament was divided by using the ultrasonic shears. The resected specimen was pulled out through the 12-mm axillary port by using a plastic bag. A frozen section of the resected specimen was examined for confirmation of the suspected pathology. After confirmation by frozen-section histology that the lesion was malignant, a contralateral thyroid lobectomy was performed in the same manner. Meticulous hemostasis was attained and the midline was repaired with endosutures. A suction drain (Jackson-Pratt) was left in place. The skin was reapproximated cosmetically (Fig. 4). With regard to parathyroid gland adenomas, after division of the midline of the strap muscles, the parathyroid gland was excised.

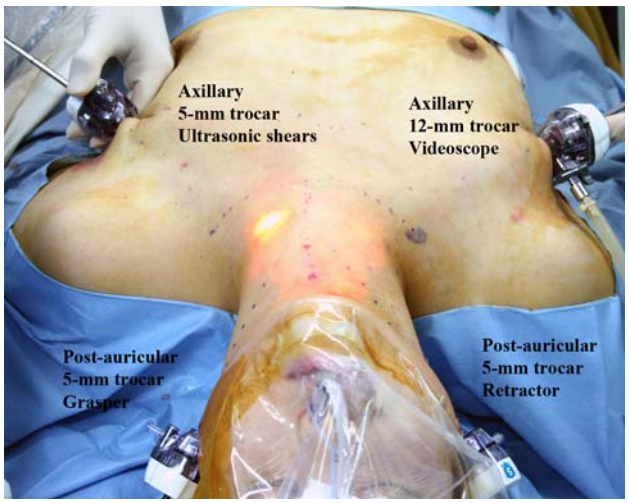

Fig. 3 Operative view of postauricular and axillary endoscopic neck surgery. One 12-mm trocar and one 5-mm trocar are inserted through axillary incisions and two 5-mm trocars are inserted through postauricular incisions

Results

From June 2006 to December 2007, 10 patients underwent PAA endoscopic neck surgery. All patients were female and their ages ranged from 16 to 53 years. There were seven patients with papillary thyroid microcarcinoma, one with adenomatous goiter, one with parathyroid adenoma, and one with microinvasive follicular thyroid carcinoma. PAA endoscopic neck surgery was used for two thyroid lobectomies, one parathyroidectomy, one subtotal thyroidectomy, and six total thyroidectomies. The largest diameter of the thyroid or parathyroid tumors ranged from 0.5 to 3.5 cm. The thyroid lobe with the tumor or the parathyroid gland tumor could be pulled out of the 12-mm incision site because of the narrower dimensions of the thyroid or tumor and with the help of the plastic bag. The mean operation time was 210.0 ± 43.7 min (range = 165–280 min) (Table 1). The estimated blood loss was minimal. There were no cases of conversion to open surgery.

In all cases, we examined the vocal cord preoperatively and postoperatively by direct laryngoscopy. Three patients complained of transient hoarseness but it resolved within 1 month after surgery. There were no cases of transient hypocalcemia in the thyroidectomy patients, and permanent vocal cord palsy and permanent hypocalcemia were never observed. Patients complained of pain and loss of sensation in the area where the flap dissection was performed but the pain was well controlled with oral analgesics and sensation returned to normal within several months after surgery. Facial nerve palsy was never observed. The patients were discharged on postoperative day 3.4 ± 1.07 after removing the drain. The cosmetic results were excellent as all the scars were hidden in natural skin creases (Fig. 5).

Discussion

The evolution of ultrasound imaging devices and the increase in people's concern about their health, especially cancer, had led to an increased incidence of thyroid cancer detection during cancer-screening programs. Because thyroid cancer is the most prevalent cancer in young females in Korea [3], the need for endoscopic thyroidectomy that does not cause recognizable scarring in noticeable areas like the neck is increasing. Gagner et al. [4] and Huscher

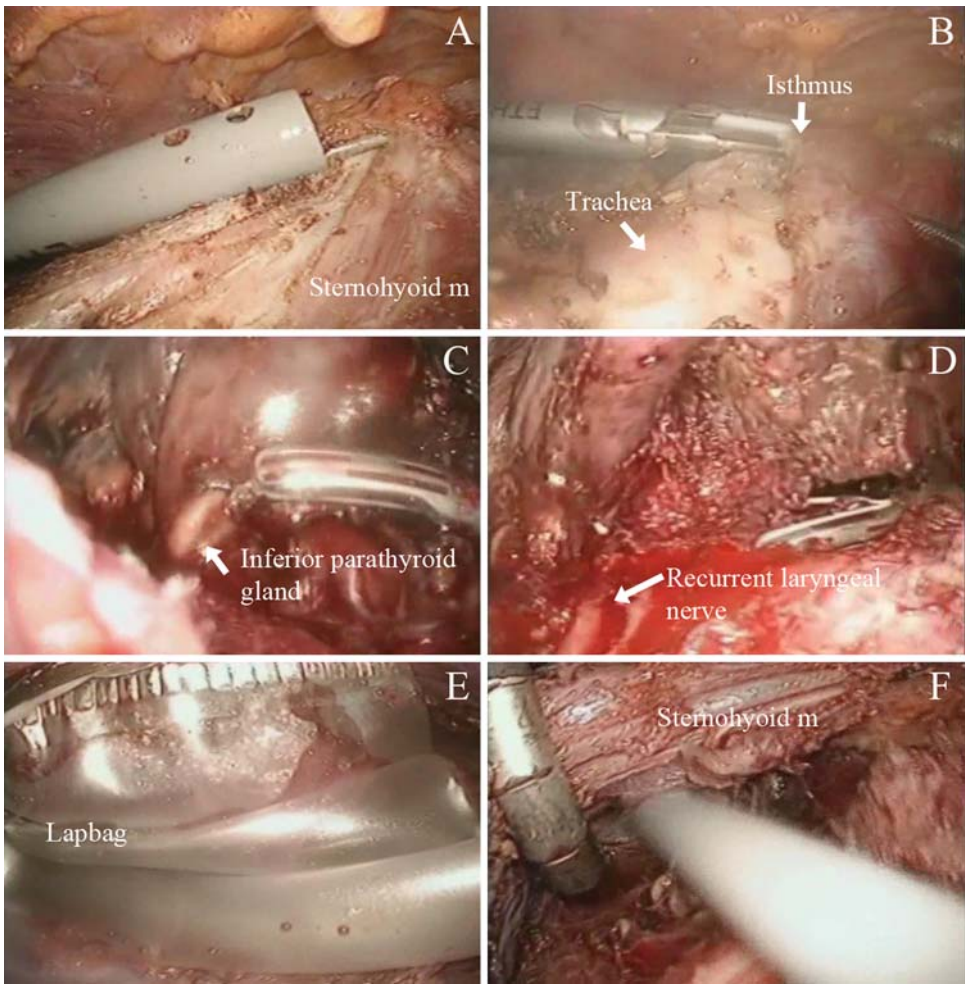

Fig. 4 Surgical procedure for postauricular and axillary endoscopic thyroidectomy. **a** Division of the midline. **b** Division of the isthmus. **c** Identification and conservation of the inferior parathyroid gland. **d** Identification of the recurrent laryngeal nerve. **e** Removal of the thyroid specimen with a plastic bag. **f** Hemostasis and irrigation

Table 1 Summary of postauricular and axillary endoscopic neck surgery cases

Case	Gender	Age	Pathology	Size (cm)	Operative procedure	Operative time (min)
1	Female	53	Adenomatous goiter	1.7	Left lobectomy	230
2	Female	26	Minimally invasive follicular thyroid carcinoma	1.2	Right lobectomy	195
3	Female	16	Papillary thyroid microcarcinoma	0.6	Right total thyroid lobectomy and left subtotal thyroidectomy	280
4	Female	25	Parathyroid adenoma	3.5	Rtigh lower parathyroid gland excision	180
5	Female	29	Papillary thyroid microcarcinoma	0.5	Total thyroidectomy	195
6	Female	50	Papillary thyroid microcarcinoma	0.5	Total thyroidectomy with central node dissection	245
7	Female	35	Papillary thyroid microcarcinoma	0.9	Total thyroidectomy	155
8	Female	30	Papillary thyroid microcarcinoma	0.7	Total thyroidectomy	165
9	Female	34	Papillary thyroid microcarcinoma	0.7	Total thyroidectomy	185
10	Female	36	Papillary thyroid microcarcinoma	0.7	Total thyroidectomy	270
				1.1 ± 0.9		210.0 ± 43.7

et al. [5] first reported on the endoscopic approach to neck surgery. Thereafter, many different adaptations of this approach have been developed. Some of these approaches minimize the incision in the neck area while others use incisions in areas other than the neck such as the anterior chest, axilla, or breast [6]. We had developed the BABA endoscopic neck surgery method that uses bilateral axillo-breast incisions. This approach permits a full symmetrical

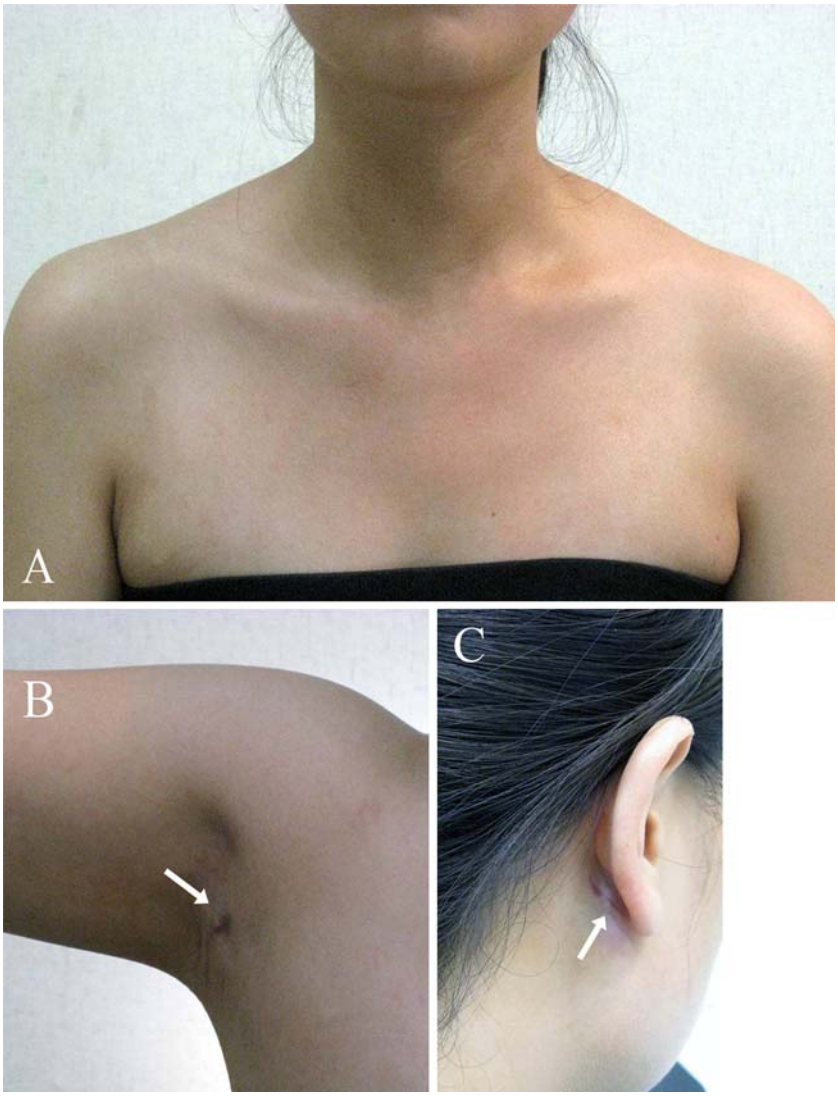

Fig. 5 Cosmetic outcome of postauricular and axillary endoscopic neck surgery. The photograph was taken 6 weeks after the operation. **a** No scars are visible when the patient is in an ordinary posture and there are no scars on the neck or anterior chest. **b, c** White arrows indicate the postoperative axillary and postauricular scars

surgical view of important anatomic structures and the application of symmetrical retractions that facilitates the medial approach to thyroidectomy, which is an advantage of open surgery [1]. BABA endoscopic thyroidectomy has complication rates similar to those of open thyroidectomy, provides excellent cosmetic results, and can be used to treat early-stage well-differentiated thyroid cancer safely [2]. However, as Yeung has pointed out [7], Western women and young female patients in Asian countries may still find scarring of the breast area unacceptable, despite the cosmetic benefits relative to scarring in the neck area. Consequently, other studies have advocated the axillary approach to endoscopic neck surgery [8, 9]. However, the axillary approach suffers from numerous drawbacks such as (1) the surgeon must use the lateral approach for thyroidectomy, which is not the same as the medial approach permitted by open surgery; (2) the working space is narrow, which interferes with the placement and use of the instruments; and (3) the scar left in the axillary region is readily detectable afterwards. The PAA endoscopic neck surgery method that we describe here overcomes these drawbacks because it not only saves the breast from scarring, it permits the medial approach to thyroidectomy that is the advantage of open thyroid surgery.

To make PAA endoscopic neck surgery possible, we first had to find some technical solutions to several potential problems. One of these possible problems was that dissecting the postauricular area could injure the facial nerve. This problem is overcome by dissecting the plane from the already established operative space in the neck area. The postauricular incision and trocar insertion are accomplished after saline injection followed by subcutaneous tunneling from the neck area. As a result, the possibility of injuring the nerve is negligible. Indeed, the 10 patients described here said that the flap area pain was tolerable, and the loss of sensation that they experienced normalized a few months after surgery. Moreover, facial nerve palsy was never observed. Another potential problem

of PAA endoscopic neck surgery is that the view of the assistants is mirror-imaged and time is required to develop appropriate eye-hand coordination. However, this problem is readily resolved by using a mirror-imaging monitor. Finally, we use retractors that have a joint that can be flexed after they are inserted into the port. These flexible retractors allow the thyroid lobe to be manipulated from the postauricular ports.

It should be emphasized that this article is an early report on the feasibility of the PAA endoscopic neck surgery method. While the operative time is longer than the average time for all our BABA endoscopic series of cases, it is less than the operative time that was needed for our earlier BABA endoscopic surgery cases. We also speculate that this approach will become more practical as techniques and instruments evolve. For example, the da Vinci robot system, which is now widely used in conventional laparoscopic and endoscopic surgery, could be useful in PAA endoscopic neck surgery.

Conclusion

PAA endoscopic neck surgery is a feasible method for thyroid and parathyroid surgery that permits a relatively good operative visualization and minimal adverse effects. Since circumareolar incisions are not used and all incisions are hidden in natural skin creases, the cosmetic outcomes of this method are excellent.

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