8 Bilateral Axillo-breast Approach (BABA) Endoscopic and Robotic Thyroid Surgery

Kyu Eun Lee and June Young Choi

Introduction

Since the introduction of endoscopic thyroid surgery in the late 1990s, numerous remote access thyroidectomy techniques have been reported, including those using cervical, axillary, breast, and anterior chest approaches. One of the most widely adopted is the bilateral axillo-breast approach (BABA), performed either endoscopically or with robotic assistance.

Background

BABA endoscopic thyroid surgery was developed at Seoul National University Hospital in 2004. The introduction of BABA robotic thyroidectomy in 2008 expanded the indications for this procedure.

The advantages of endoscopic or BABA robotic thyroidectomy include the following: (1) after exposure is obtained, the view and orientation to the thyroid and surrounding structures are similar to that of conventional thyroidectomy; (2) this exposure provides a symmetrical view of the thyroid gland and the major critical structures during the operation; (3) there is no interference between instruments during the procedure; and (4) excellent cosmetic results are obtained with no visible cervical scar.

Selection Criteria

Since its introduction in 2004, BABA endoscopic thyroidectomy has been consistently performed on patients with benign thyroid nodules less than 5 cm, fine-needle aspiration biopsies results suspicious for follicular neoplasm or Hurthle cell neoplasm, and patients in whom diagnostic lobectomy revealed a well-differentiated thyroid carcinoma and now require completion thyroidectomy.

Absolute contraindications for BABA include patients with previous open neck surgery, aggressive thyroid malignancies (medullary thyroid cancer, advanced papillary or follicular thyroid cancer, and poorly differentiated thyroid cancer), patients with a history of breast malignancy, and patients with substernal goiters. Other patients who should be approached hesitantly are men, those with Graves' disease, and those with well-differentiated thyroid carcinoma over 1 cm in diameter.

Procedural Details

The patient is placed in the supine position on the operating table with a pillow under the shoulders. The patient's neck is then extended to expose the surgical area properly. In order to expose both

K.E. Lee, PhD • J.Y. Choi (✉)
Department of Surgery, Seoul National University Hospital, Seoul 110-799, Republic of Korea
e-mail: aznagran@gmail.com

D.J. Terris, M.C. Singer (eds.), *Minimally Invasive and Robotic Thyroid and Parathyroid Surgery*,
DOI 10.1007/978-1-4614-9011-1_8, © Springer Science+Business Media New York 2014

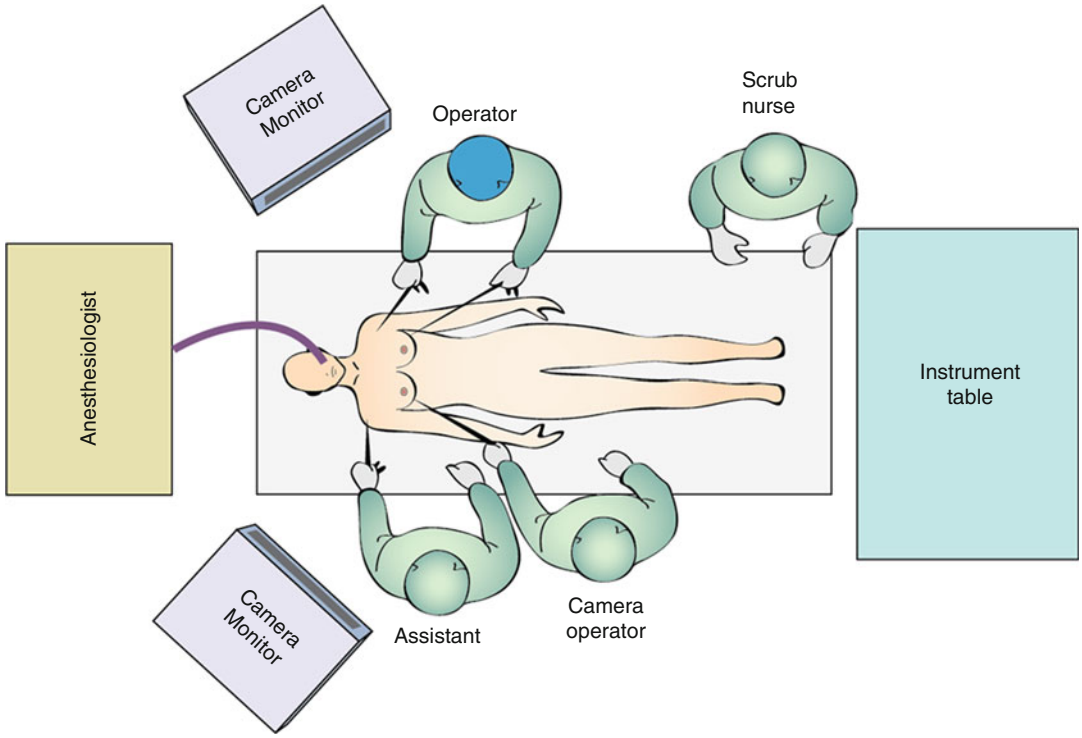

Fig. 8.1 Schematic depiction of the operating room setup for a BABA endoscopic right hemithyroidectomy

axillae, the arms should be abducted. Routine skin preparation is done with a standard antiseptic solution.

For room setup, the primary surgeon stands on the side contralateral to the side of the thyroid requiring surgery. The first assistant and camera operator stand across from the primary surgeon (Fig. 8.1).

After skin preparation, the surgeon marks the midline, the major anatomical landmarks (including the thyroid and cricoid cartilage, sternocleidomastoid muscles, clavicles, and suprasternal notch), and finally the different proposed incisions (Fig. 8.2). A 12-mm incision is marked in the axilla ipsilateral to the side of the thyroid pathology and a 5-mm incision is placed in the contralateral axilla. Symmetrical, 5-mm incisions are placed in the superomedial margins of the areolas.

A 1:200,000 epinephrine solution is then injected in the working area deep to the platysma muscle in the neck and the subcutaneous tissues on the anterior chest (Fig. 8.3a). In the neck area, a "pinch and raise" maneuver of the skin helps the injection of saline distribute into the subplatysmal space (Fig. 8.3b). This "hydrodissection" technique results in the formation of a saline pocket in the subplatysmal space, which can decrease bleeding in the flaps and makes the dissection easier.

After incisions are made in both axillae, blunt dissection is performed with a straight mosquito clamp and a vascular tunneler to elevate the flaps. The 12-mm incision is used to extract the specimen later in the case. After blunt dissection, the ports are inserted through the incisions. The working space is maintained with CO_2 gas insufflation at the pressure of 5–6 mmHg. Visualization is achieved with a 30° endoscope.

The next phase of the surgery requires sharp dissection which is achieved using a Harmonic device. The dissection should start in the infraclavicular area (Fig. 8.4). When this dissection is completed, the two 5-mm incisions in the superomedial margins of the areola of the breasts are made. The myocutaneous flap is then extended more cephalad, up to the thyroid cartilage.

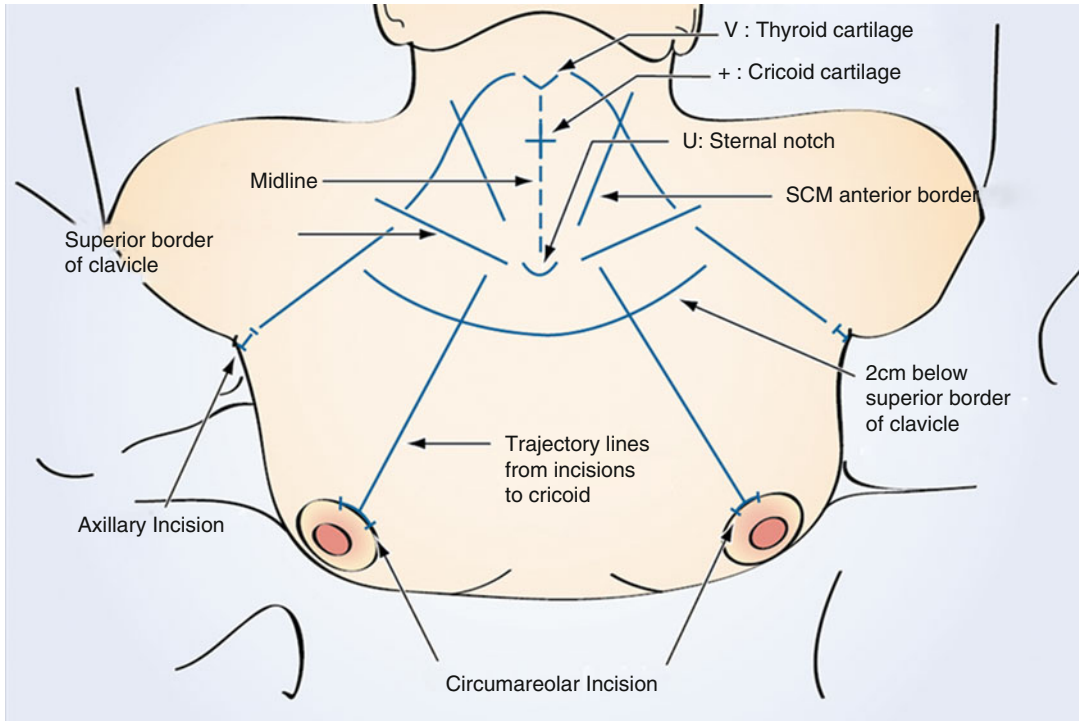

Fig. 8.2 Shown are the marks that should be made to prior to making the incisions

With the endoscope, the strap muscles and midline raphe can be well visualized. The midline is then divided with electrocautery from the thyroid cartilage to the suprasternal notch, exposing the isthmus of the thyroid gland (Fig. 8.5a, b). The thyroid isthmus is then divided in the midline using the Harmonic device. Prior to isthmectomy, the absence of isthmus lesions should be verified.

While the thyroid gland is retracted medially with an endo-clinch, the strap muscles should be retracted laterally with the forceps. Dissection is carried down to the deep aspect of the gland to expose its lateral surface. With a snake retractor drawing the strap muscles farther laterally (Fig. 8.6), additional lateral dissection can be accomplished. In order to expose the lateral part of the thyroid gland for dissection, the gland can be medially retracted with a "switching motion" of the instruments (Fig. 8.7). The middle thyroid vein is identified and divided during this stage of the procedure.

Before the inferior thyroid artery enters the thyroid glands, it passes directly under or over the recurrent laryngeal nerve. The inferior thyroid artery can thus be used as a guide to finding the recurrent laryngeal nerve. If the nerve cannot be exposed immediately, further dissection is needed of the loose fibrous tissue at the point of the artery near the tracheal esophageal groove. After the nerve is identified, it is traced from the area of the tubercle of Zuckerkandl to the ligament of Berry.

The inferior parathyroid gland can often be identified in this area. It is generally located near the branching point of the inferior thyroid artery. The gland is preserved by dissecting the gland in an inferior direction, maintaining the vascular pedicle. If the parathyroid gland cannot be preserved, reimplantation should be performed. The pectoralis major muscle serves as excellent option for reimplantation in BABA thyroidectomy.

Attention is then turned to the superior pole of the thyroid gland. Using Maryland forceps to retract the strap muscles laterally, the upper pole of the gland is dissected with the harmonic device. It is important to preserve the fascia of

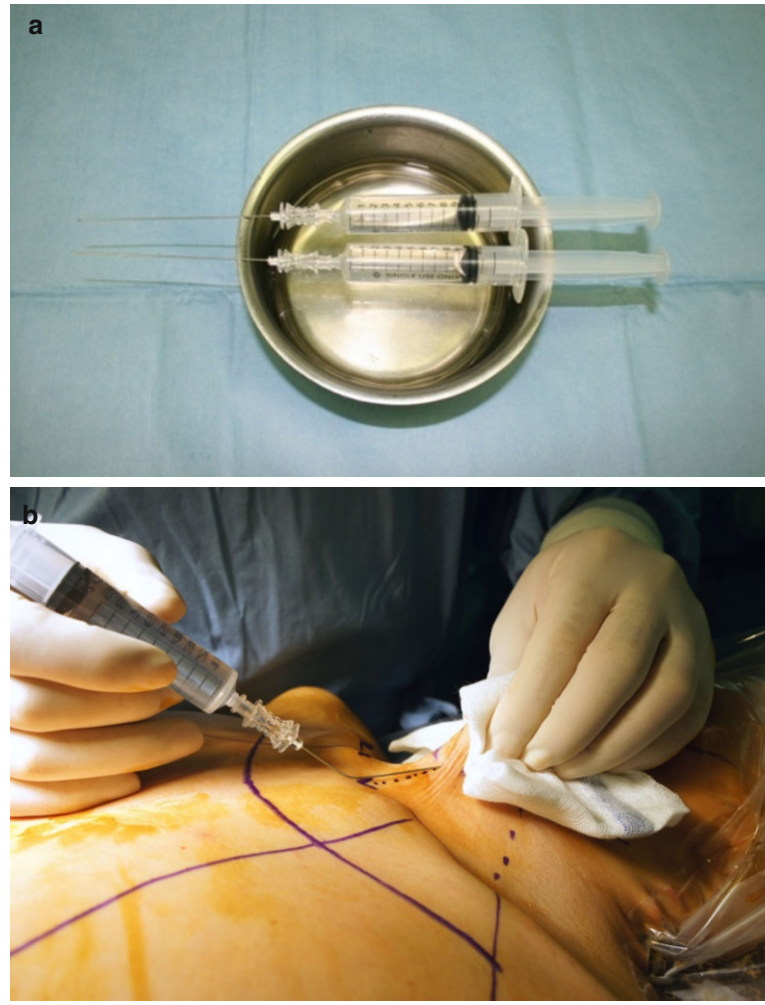

Fig. 8.3 (**a**) Saline injection preparation. (**b**) The "pinch and raise" maneuver facilitates injection into the subplatysmal plane

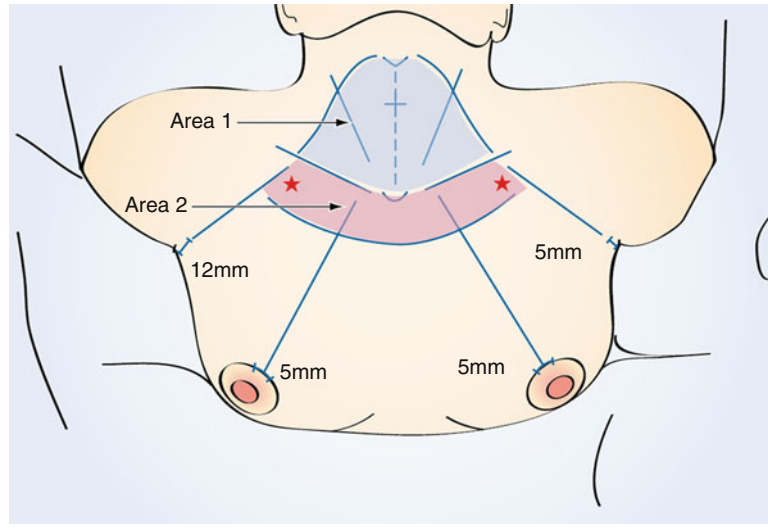

Fig. 8.4 Sharp dissection is used to elevate the flap through area 2 (marked by ★). The areolar incisions are then made and the flap is extended through area 1

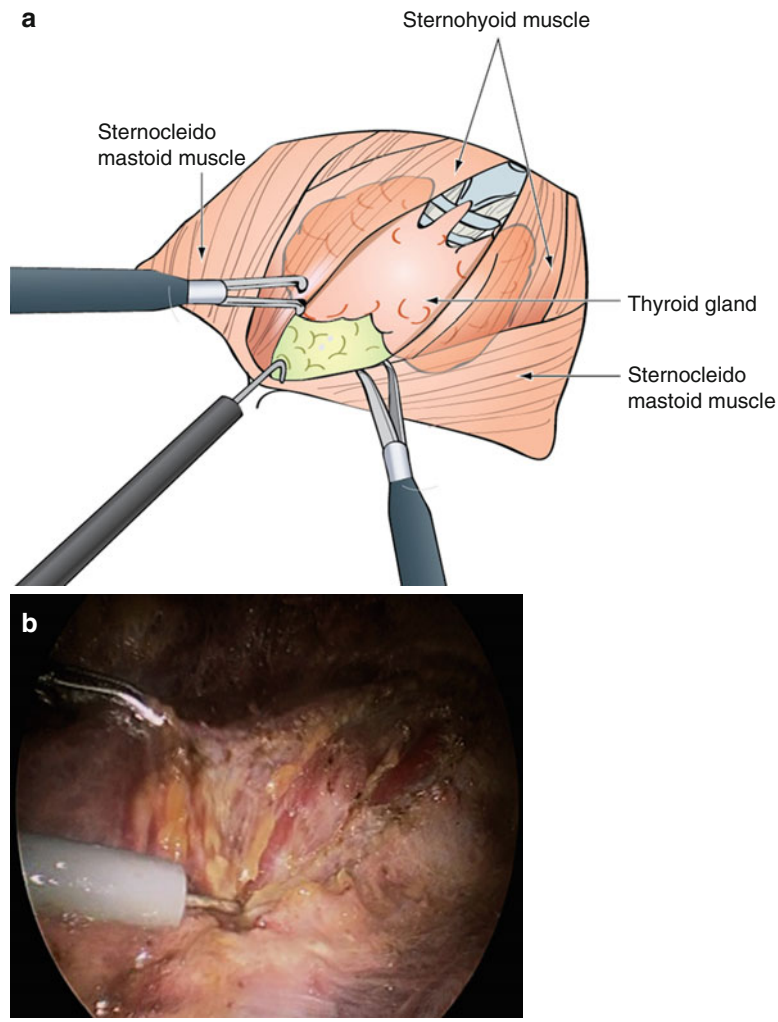

Fig. 8.5 (**a**) After flap development the midline raphe of the strap muscles is divided from the thyroid cartilage to the sternal notch. This exposes the thyroid isthmus. (**b**) The operative view

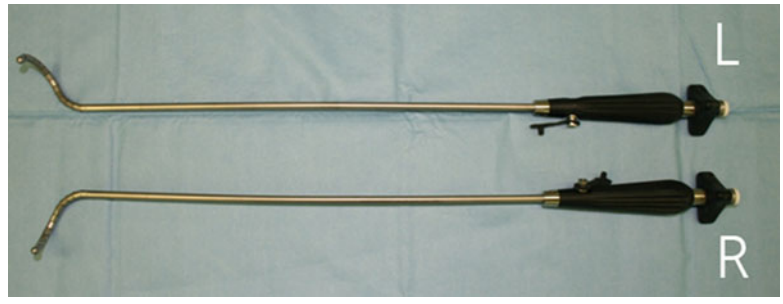

Fig. 8.6 Snake retractors used to retract the strap muscles laterally

the cricothyroid muscles, because the external branch of the superior laryngeal nerve is closely associated with it. The terminal branches of the superior thyroidal artery and vein are identified and carefully ligated with the harmonic shears. The branch that serves as the vascular supply to the superior parathyroid gland should be preserved (Fig. 8.8).

After dissecting the thyroid gland away from the trachea, the specimen is wrapped with a

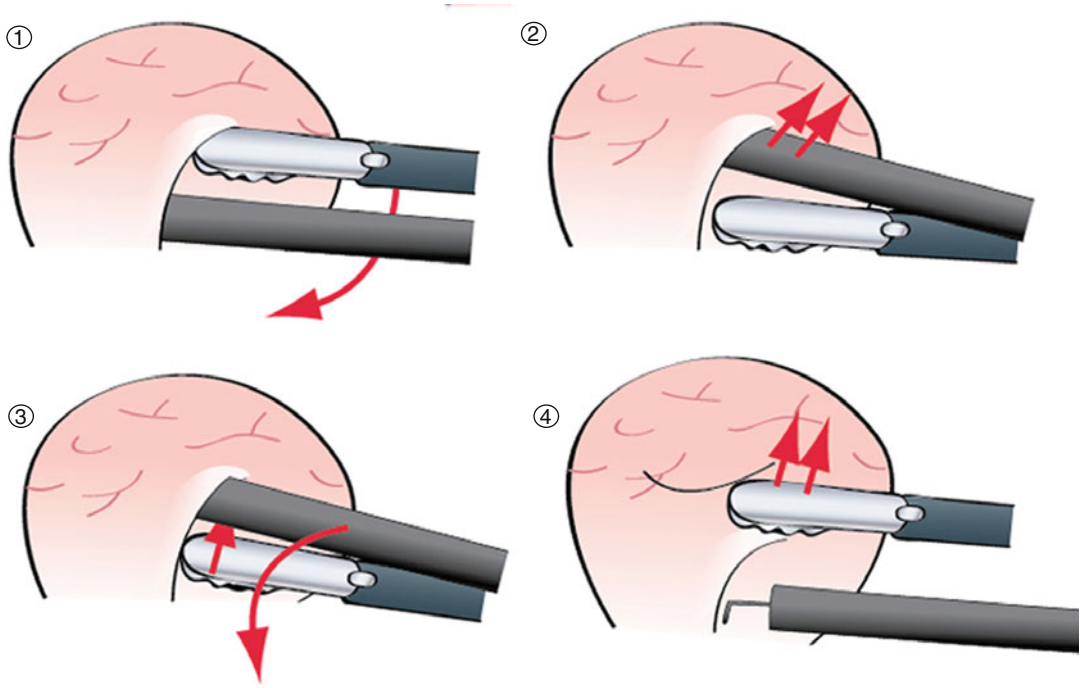

Fig. 8.7 A switching movement with the instruments can be used to draw the thyroid gland medially in order to expose its lateral aspect. *1–4* steps of the procedures (timeline)

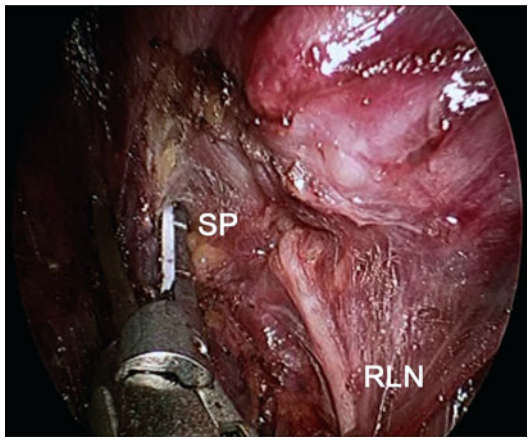

Fig. 8.8 With the right lobe of the thyroid gland retracted medially, the recurrent laryngeal nerve (*RLN*) is seen after its dissection. The superior parathyroid gland (*SP*) is deep to the nerve

Fig. 8.9 The robo-bra helps with healing postoperatively

plastic bag and removed via the 12-mm axillary port. The specimen is inspected with care to identify any excised parathyroid gland. After meticulous hemostasis is achieved with electrocautery, the right and left strap muscles are reapproximated in the midline. One Jackson-Pratt (JP) drain is placed into the thyroid pocket via an axillary port. The skin of the breasts and axillae are sutured with buried stitches with absorbable sutures.

Finally the anterior chest is compressed with a robo-bra, which applies gentle pressure over the anterior chest flap, aiding healing and providing improved patient comfort (Fig. 8.9).

The patient is admitted for 3 days after the operation. In our institution, this is the same as patients undergoing open thyroid surgery.

The drain is removed on the day of discharge. Patients are asked to wear the robo-bra for 2 weeks after the operation.

Outcomes

Results with endoscopic BABA have been excellent. Patients undergoing endoscopic BABA thyroidectomy may experience higher rates of temporary hypocalcemia and transient vocal cord palsy, compared with patients undergoing open thyroidectomy. However, permanent complication rates are the same.

In regard to cosmetic results, patients have a very high level of satisfaction. Both the axillary and areolar incisions heal well and are typically well hidden.

BABA Robotic Thyroidectomy

Background

The surgical robot provides a number of powerful qualities that makes it an excellent tool for remote access surgeries, such as BABA, which require precise movements in deep and narrow operative fields. These assets include its flexible movements, 3-dimensional visualization, and tremor reduction ability. Starting in 2008 the robot was incorporated into BABA surgery.

The robot can make thyroid surgery more efficient, effective, and comfortable, especially dissecting the central neck compartment. In our institution, central neck dissection is performed in almost all patients with papillary thyroid carcinoma. BABA robotic thyroidectomy is thus particularly well suited for patients with papillary carcinoma.

Selection Criteria

With incorporation of the robot into the procedure, the indications for BABA have widened. In addition to the indications described earlier for endoscopic BABA, BABA robotic can be performed on patients with well-differentiated thyroid carcinomas less than 2 cm, patients with Graves' disease, male patients, and patients with benign nodules up to 8 cm in diameter. Prior to the introduction of the robot, men were not typically good BABA candidates due to the prominence of the clavicle and the absence of significant breast tissue (which limits the range and flexibility of the instruments).

Absolute contraindications for BABA robotic thyroidectomy are the same as for endoscopic BABA. Thyroid nodules over 8 cm can be challenging to remove with this technique. With BABA robotic thyroidectomy, lateral neck dissection can be effectively performed, so patients with suspicious lateral neck nodal disease remain eligible for this approach. Also, previous breast surgery for breast cancer or breast augmentation is not considered a contraindication.

Procedural Details

Many details of BABA robotic thyroidectomy are the same as with the endoscopic approach. The initial positioning, preparation of the patient, markings, and injections are identical in both techniques.

One element that is different from BABA endoscopic thyroidectomy is the length of incisions. For the robotic technique, the incision on the right areola is 12 mm, in order to accommodate the robotic camera. The two axillary incisions in BABA robotic are only 8 mm, through which are placed 8-mm ports (Fig. 8.10).

After flap elevation is completed in the same manner as in endoscopic BABA, the robot is docked from left shoulder of the patient. The anesthesiologist and the ventilator are placed on the right side of the patient. The head of the patient is positioned towards the robotic system and its center column is aligned with the camera port (12-mm port) of the right breast. After docking, the robotic arms are deployed through the axillary ports (Fig. 8.11).

The midline is divided and the isthmus transected in the same manner as endoscopic BABA. The thyroid gland is then retracted medially with ProGrasp forceps, and the strap muscles are retracted laterally with a Maryland forceps.

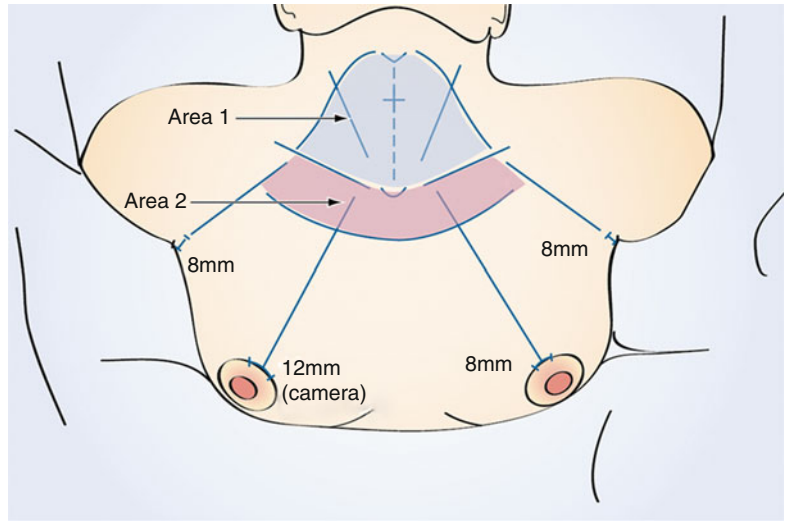

Fig. 8.10 The marks and incisions for BABA robotic thyroidectomy

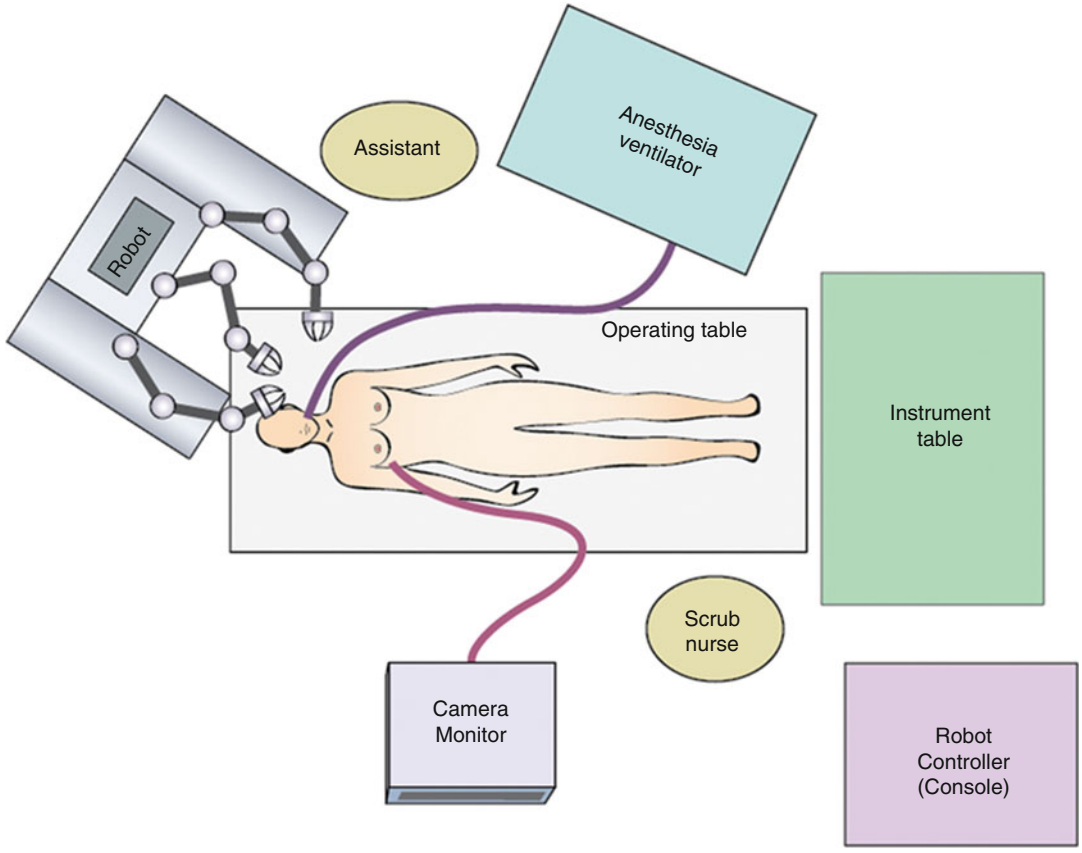

Fig. 8.11 Schematic layout of the operating room for BABA robotic thyroidectomy

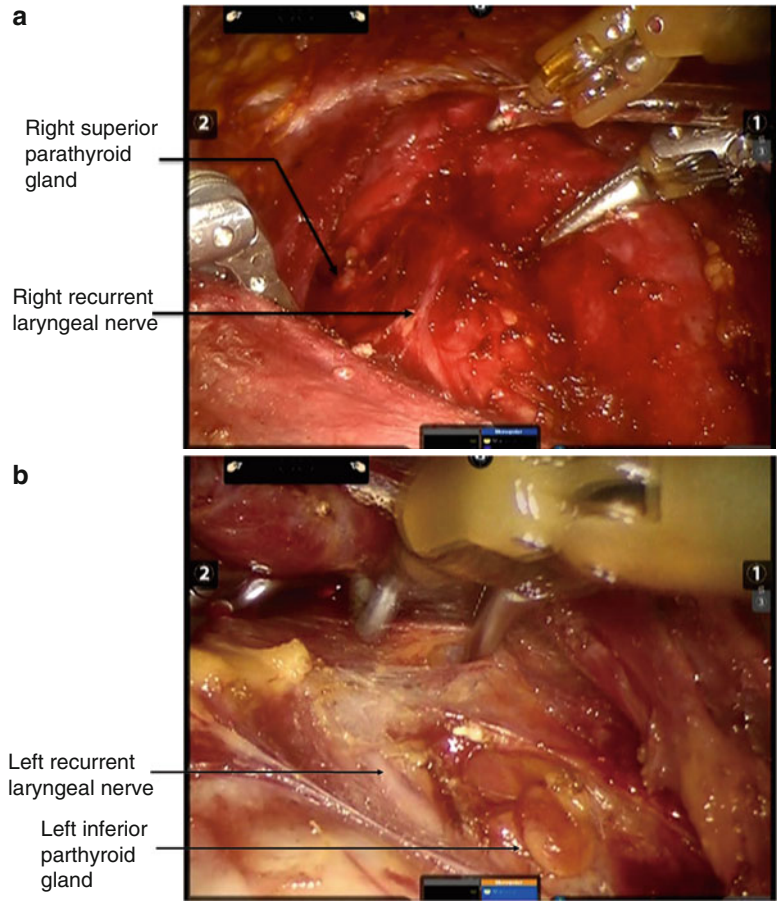

Fig. 8.12 (**a**) The results of a total thyroidectomy after exision of the gland are demonstrated. The right operative field. (**b**) The left side

In order to expose the lateral aspect of the gland, using a switching motion the instruments can retract the thyroid gland medially. The inferior parathyroid gland and recurrent laryngeal nerve are identified with dissection using the Maryland forceps. The harmonic shears, deployed through the left breast port, are used to retract the strap muscles at this moment. The dissection is continued cephalad to the point of the nerve entering underneath the inferior constrictor muscle.

After the inferior thyroid artery is divided, attention is turned to the superior aspect of the gland. With the Maryland forceps drawing the upper part of the strap muscles laterally, the thyroid upper pole is dissected with the harmonic shears. After the superior pedicle is divided, the thyroid gland is dissected away from the trachea. The specimen is then removed in the same fashion as endoscopic BABA, through the left axillary port. If the incision of the left axilla is not long enough to extract the specimen, the incision may be widened posteriorly.

Contralateral surgery can be completed in a similar fashion (Fig. 8.12a, b). Ipsilateral central neck dissection can also be performed if needed.

After achieving hemostasis, the strap muscles are sutured together with a continuous running suture. If a total thyroidectomy is performed, drains are placed into both thyroid pockets via the axillary incisions. The skin incisions are closed with buried stitches with an absorbable suture. Postoperative care is the same as with endoscopic BABA.

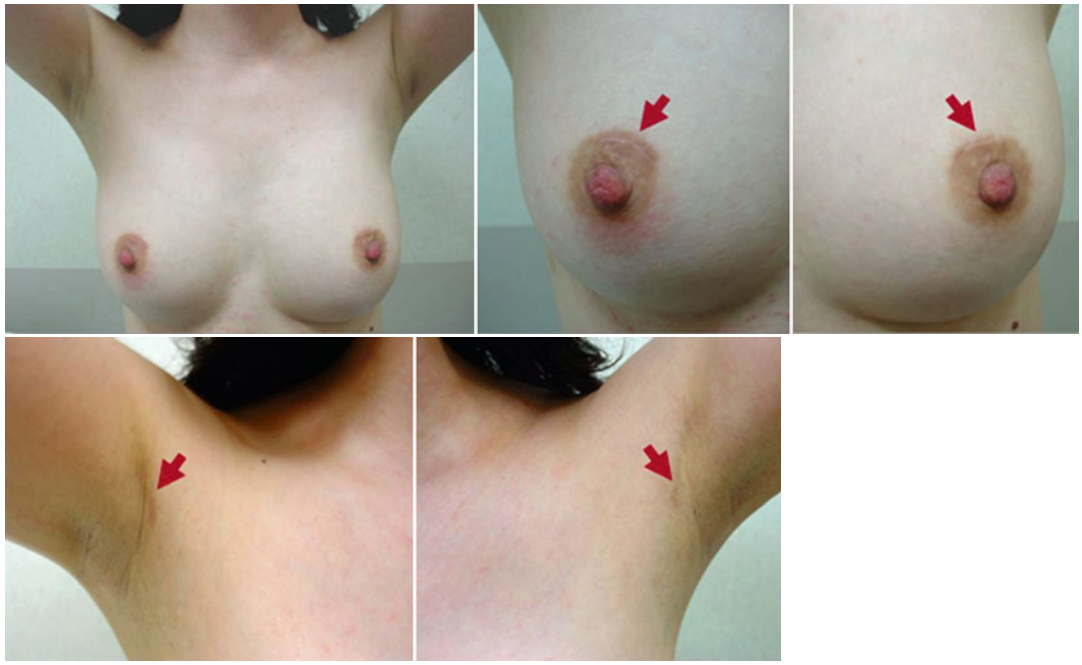

Fig. 8.13 Postoperative cosmetic results are shown. Incisions of BABA robotic surgery (*arrows*)

Outcomes

Results with BABA robotic have been excellent (Fig. 8.13). As with patients undergoing endoscopic BABA thyroidectomy, the rates of temporary hypocalcemia and transient vocal cord palsy are higher than with conventional thyroidectomy. However, permanent complication rates are the same as with open thyroidectomy. Studies have shown that for patients with low-risk thyroid malignancies, BABA robotic thyroidectomy provides excellent surgical results.

Conclusions

The BABA technique has been shown to be a safe and effective method for patients with a range of thyroid disorders. For patients interested in avoiding a cervical incision, BABA is an ideal option.

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