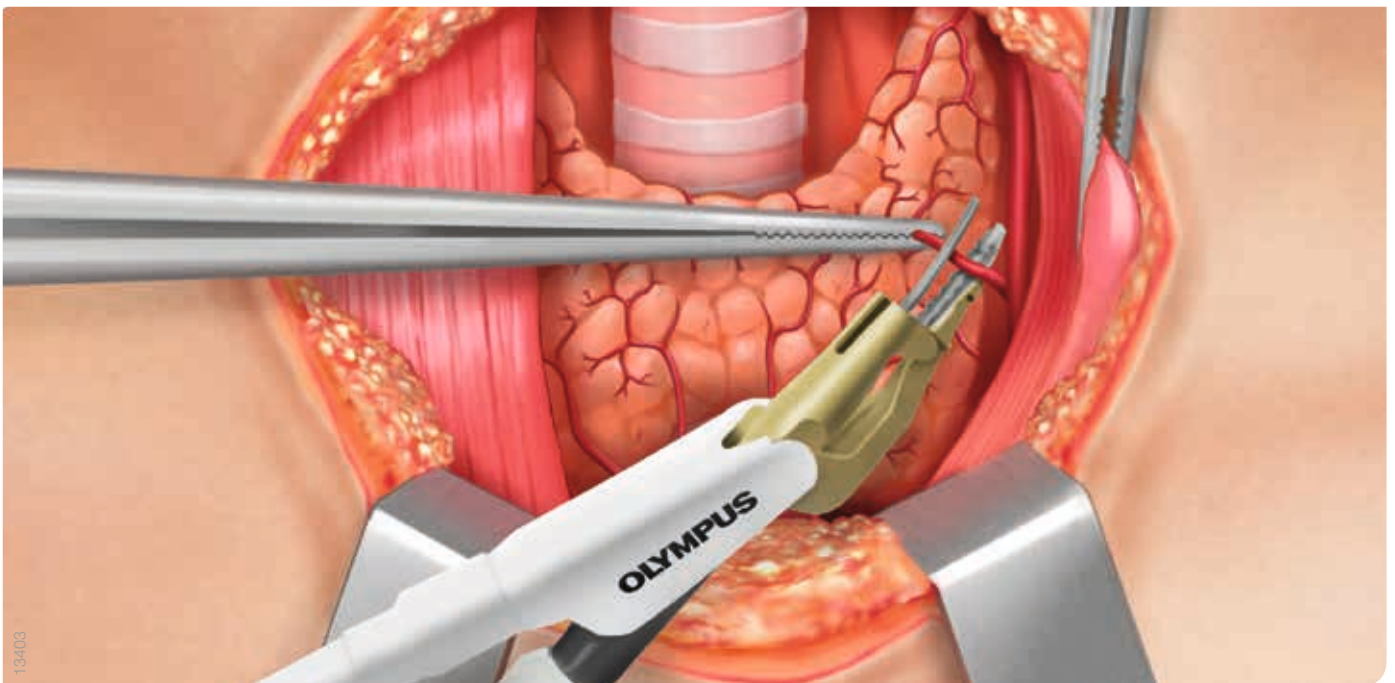


THYROIDECTOMY

Experience the Benefits of THUNDERBEAT Open Fine Jaw.



THUNDERBEAT DESIGN RATIONALE

Philosophy

Contemporary surgical instruments must be multifunctional. When the THUNDERBEAT Tissue Management System for laparoscopic surgery was introduced, the clear goal was to develop a multipurpose instrument in order to reduce instrument exchanges, surgical time, and blood loss.

This was achieved by creating an instrument that not only allows tissue cutting that is the fastest in its class and secure 7 mm vessel sealing but also functions as a true laparoscopic instrument – allowing the surgeon to grasp, manipulate, and bluntly dissect tissue.

Three Design Criteria Make This Possible:

1. Integration of Two Forms of Energy

Only the THUNDERBEAT system delivers two well-established types of energy to the tissue simultaneously:

- Ultrasonic energy, which is widely accepted for its fast tissue-cutting capability.
- Bipolar energy, which provides fast and secure hemostasis to vessels up to and including 7 mm in diameter.

The combination of both forms of energy is delivered through the unique **SEAL & CUT** mode that only the THUNDERBEAT system offers. Tissue bundles and vessels are safely sealed and rapidly cut, allowing the surgeon to reduce tissue-dissection time.

Ultrasonic Energy Only



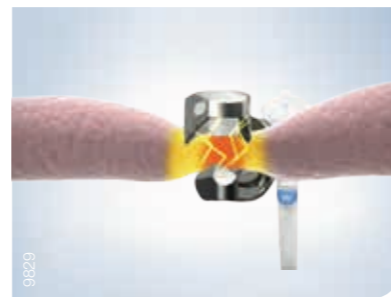
Rapid tissue cutting

Bipolar Energy Only



Reliable vessel sealing

THUNDERBEAT



Rapid tissue cutting **AND** reliable vessel sealing

2. Secondary Hemostasis and Spot Coagulation with Advanced Bipolar Energy

Advanced bipolar energy can be applied independently of ultrasonic energy with the THUNDERBEAT **SEAL** mode. This allows the surgeon to achieve secondary hemostasis and spot coagulation without the cutting effects of ultrasonic energy. This can help reduce instrument exchanges, which may streamline the surgical process further.

3. Tissue Manipulation through Innovative Instrument-Tip Design

The THUNDERBEAT instrument tip is an essential feature of the instrument. Alongside the delivery of two different types of energy, it is designed to act as a fully functional grasping and dissecting instrument. This is achieved through atraumatic serrations of the edges of the upper jaw, the even compression-force distribution across tissue, and the high tip-opening forces that enable blunt tissue dissection.

The ability to combine the proven advantages of ultrasonic and bipolar energy and the ability to provide the finest possible tissue dissection makes THUNDERBEAT one of the most versatile instruments on the market. This technology is now available for open surgery.

The THUNDERBEAT Technology in Open Surgery

Advanced energy devices in open surgery go beyond standard monopolar and bipolar applications. They allow for shorter procedure times and reduced use of hemostatic clips, sutures, or ligation ties, thus saving time and materials costs.

The THUNDERBEAT Open Fine Jaw maintains the general philosophy behind the THUNDERBEAT technology, and the instrument has been specifically designed for open surgical procedures that require delicate and fine tissue dissection, such as in thyroidectomy or various Ear-Nose-Throat (ENT) and breast procedures. The result is a highly ergonomic instrument that cuts tissue fast, seals vessels safely and securely, and allows for extremely fine tissue dissection and spot coagulation.

The THUNDERBEAT Instruments



BENEFITS OF THUNDERBEAT OPEN FINE JAW

SEAL & CUT Mode

Fastest in class tissue cutting and secure vessel sealing through the unique combination of ultrasonic and bipolar energy.

SEAL Mode

Secondary hemostasis and spot coagulation through the application of advanced bipolar energy only.



Ultrasonic and Bipolar Probe

Bipolar Jaw

Atraumatic serrations for improved tissue grasping.

Tissue Stopper

Helps to control the amount of tissue to be transected and prevents tissue squeezing without activation.



Intuitive, Easily Accessible Hand Switches

Optimized Balance and Lightweight

Precise and direct tactile feeling with scissors-type grip, similar to state-of-the-art surgical instruments.

Ergonomic Grip

Designed to help prevent hand slippage.

GENERAL INFORMATION ABOUT THYROIDECTOMY

Indications for Thyroidectomy

One of the major indications is a diagnosis of thyroid cancer.

Also, the existence of cold or hot thyroid nodules could be an indication for operative treatment.

Besides malignancies, thyroidectomy is also an option for patients with symptomatic thyroid masses or goiters. The patients have compressive symptoms including dysphagia, dyspnea, shortness of breath, and/or hoarseness due to a large goiter.

Cosmetic concerns due to an enlarged but symptom-free goiter may also be an indication for thyroidectomy.

Another indication would be with medically refractory autoimmune diseases (like Grave's disease) or

hyperthyroidism.

Types of Thyroidectomy

Depending on the indication, a thyroidectomy can include total or partial removal of the gland. For malignant diseases, the total removal of the gland is recommended.

In the case of benign pathologies that do not affect the entire thyroid gland, a lobectomy with or without isthmusectomy is sufficient.

Surgical Treatment Options

Thyroid surgery can be performed with conventional or minimally invasive techniques.

Conventional open thyroidectomy is still a standard procedure that includes a collar incision of a few centimeters depending on the indication.

For thyroid tumors smaller than 3 cm, a minimally invasive technique could be an option. The approach to the thyroid gland can be cervical (MIVAT = minimally invasive video-assisted thyroidectomy) or extracervical (axillary approach, chest approach, or clavicular approach).

Special imaging equipment and instruments are needed.

Challenges in Thyroid Surgery

A total or partial thyroidectomy can be a challenging procedure due to the complex anatomy of the gland, the limited space in the cervical area, and the surrounding structures such as nerves (e.g. recurrent laryngeal nerve) blood vessels, and several muscle layers. There is a risk of damaging these sensitive structures during surgery causing intra- and postoperative bleeding or vocal-nerve damage.

In particular, damage to the recurrent laryngeal nerve can result in paralysis of the vocal cords.

Anatomical variations of the thyroid gland and how it is attached to the surrounding tissue due to the disease could also present challenges during surgery.

Surgical Equipment

General

- Suction/irrigation unit
- ESG-400 high-frequency generator (monopolar pencil, often bipolar forceps)
- USG-400 ultrasound generator
- THUNDERBEAT
- Neuromonitoring generator for IONM
- Tracheotomy set

Instruments for Open Surgery

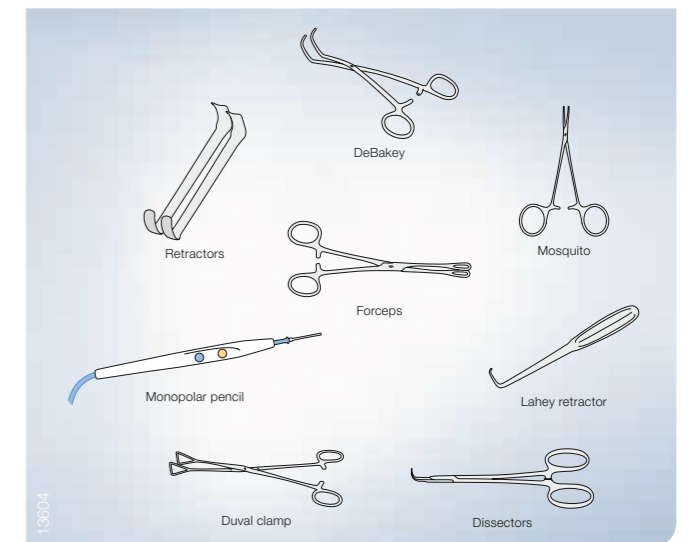
- Scalpel
- Tweezers
- Scissors
- Needle holder
- Clamps
- Forceps

Further OR Equipment:

- Ligating clip applicators
- Suture: 3-0 and 4-0 for ligation and for subcutaneous wound closure
- Drainage
- Drapes



Olympus Surgical Tissue Management System (ESG-400 and USG-400)



GENERAL INFORMATION ABOUT THYROIDECTOMY

Intraoperative Neuromonitoring IONM

The intraoperative identification and monitoring of the vocal nerves (vagus nerve, superior/inferior/recurrent laryngeal nerves) in order to protect them during surgery is mandatory.

Any nerve injury or malfunction due to intraoperative compression, crushing, thermal injury, ischemia, ligature, stretching, or traction has to be prevented.

Intermittent stimulation of the dissected field allows tracing of the nerve and its branches differentiating nerve from nearby non-nervous tissue.

The nerves' vitality and intraoperative prediction of postoperative vocal cord function are constantly checked with a stimulation electrode to detect any visible or audible signal changes immediately. The electrode signals are also documented.

Identification of the Vocal Nerves

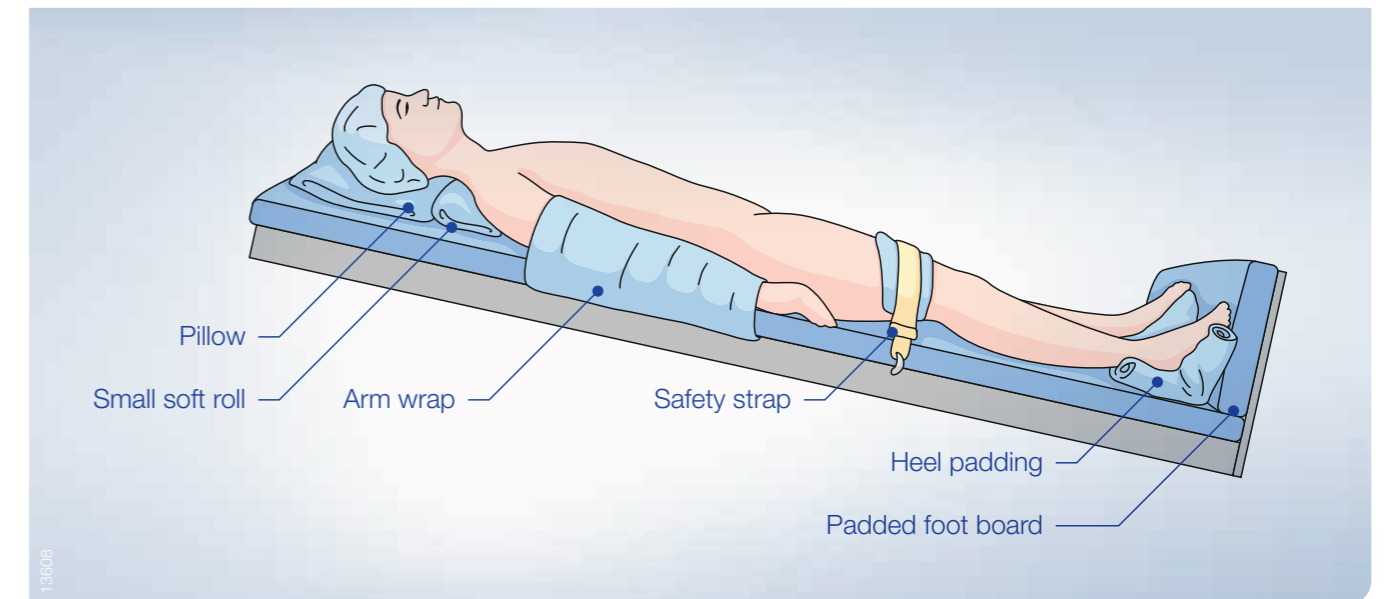
Identification of the vocal nerves (vagus nerve, superior/inferior/recurrent laryngeal nerves) during surgery for safe dissection, constant checking of nerve vitality, and intraoperative prediction of postoperative vocal cord function, including intraoperative documentation of nerve activity.

A stimulation electrode with 0.5–1 mA is placed on the nerves.

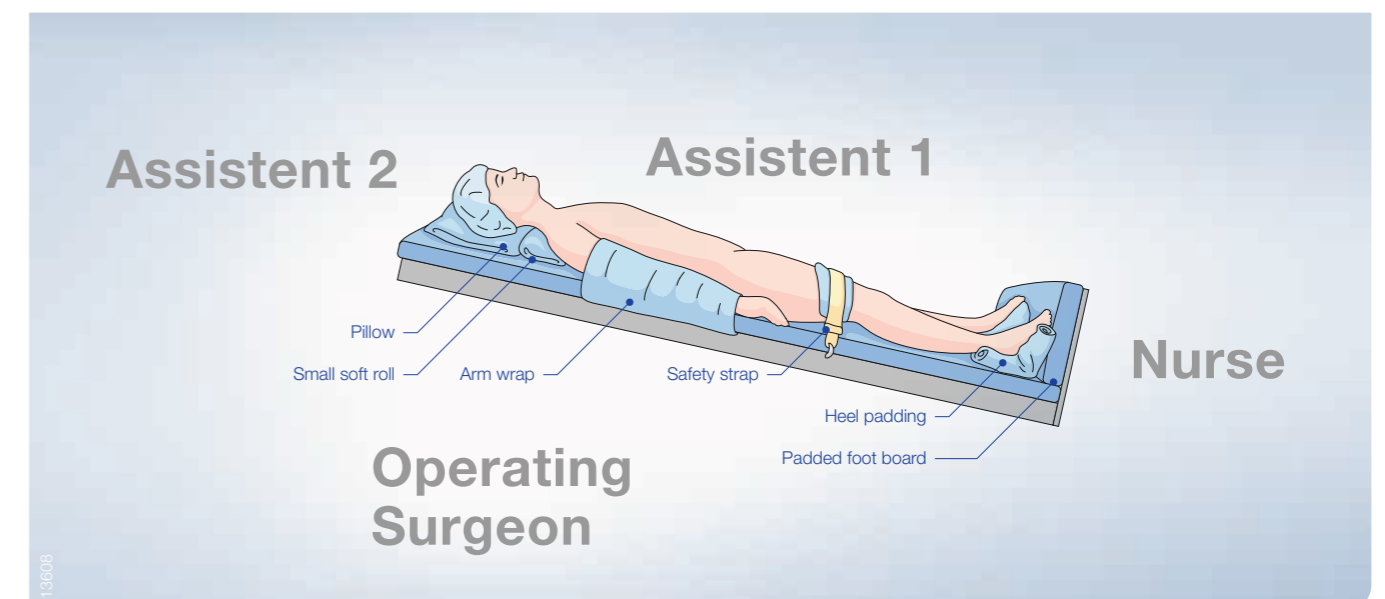
A generator is monitoring nerve activity and enables the surgeon to detect any visible / audible signal changes immediately.

PATIENT PREPARATION AND POSITION OF SURGICAL TEAM

The patient is placed on the operation table in a supine position. A pillow is placed under the patient's shoulder because the neck needs to be slightly hyperextended. The table is tilted in a 20° anti-Trendelenburg position.



The surgeon stands on the right or left side, contralaterally to the side of operation. In this brochure, the described thyroidectomy is started on the left side. Thus the surgeon is located at the patient's right side. Assistant 1 is on the opposite side of the surgeon and assistant 2 is positioned toward the patient's head. The nurse is positioned at the patient's feet. During a total thyroidectomy, the surgeon and the assistant 1 change sides.



DISCLAIMER

The surgical technique herein is presented to demonstrate the technique utilized by S. Van Slycke, MD, of the Department of General and Endocrine Surgery at the OLV Clinic, Aalst, Belgium.

Olympus as manufacturer of the THUNDERBEAT Open Fine Jaw does not practice medicine, and therefore the information on the products and procedures contained in this document is of a general nature and does not represent and does not constitute medical advice or recommendations. This information does not purport to constitute any diagnostic or therapeutic statement with regard to any individual medical case. Each patient must be examined and advised individually, and this document does not replace the need for such examination and/or advice in whole or in part.

Please refer to the instructions for use for important product information, including, but not limited to, contraindications, warnings, precautions, and adverse effects.

ACCESS TO THE THYROID GLAND

Two fingers above the sternoclavicular joint, a 4–8 cm collar skin incision is made with a scalpel. Further dissection and cutting through subcutaneous fat is continued with THUNDERBEAT or a monopolar pencil (and bipolar forceps for hemostasis).



The fibers of the platysma muscle are dissected from underlying cervical fascia and incised horizontally with THUNDERBEAT and then retracted. Hemostasis can be provided via THUNDERBEAT SEAL mode or a monopolar pencil and/or bipolar forceps.

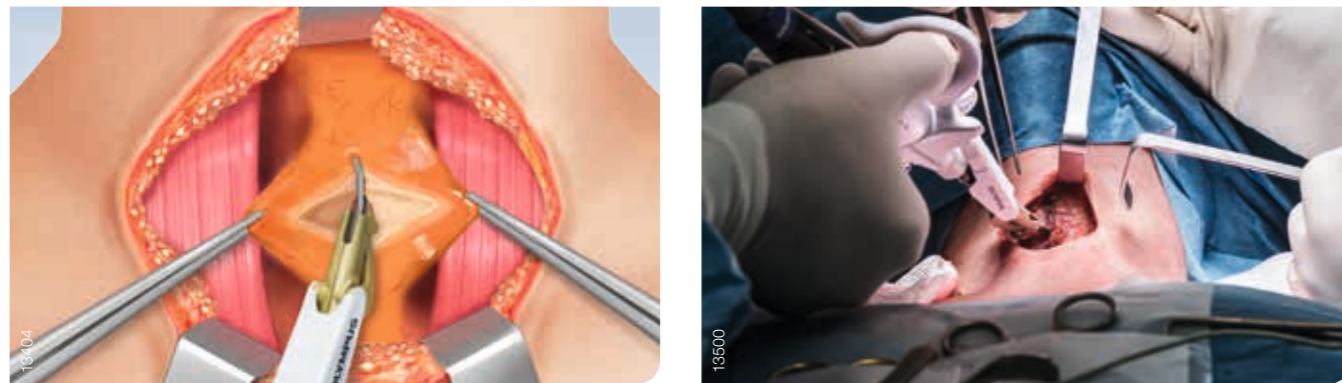
ACCESS TO THE THYROID GLAND

Upward and downward skin flaps are created with respect to the anterior jugular veins, which can easily be harmed (in this case, one can divide them with ligatures or use the THUNDERBEAT). The downward skin flap is created toward the suprasternal notch.

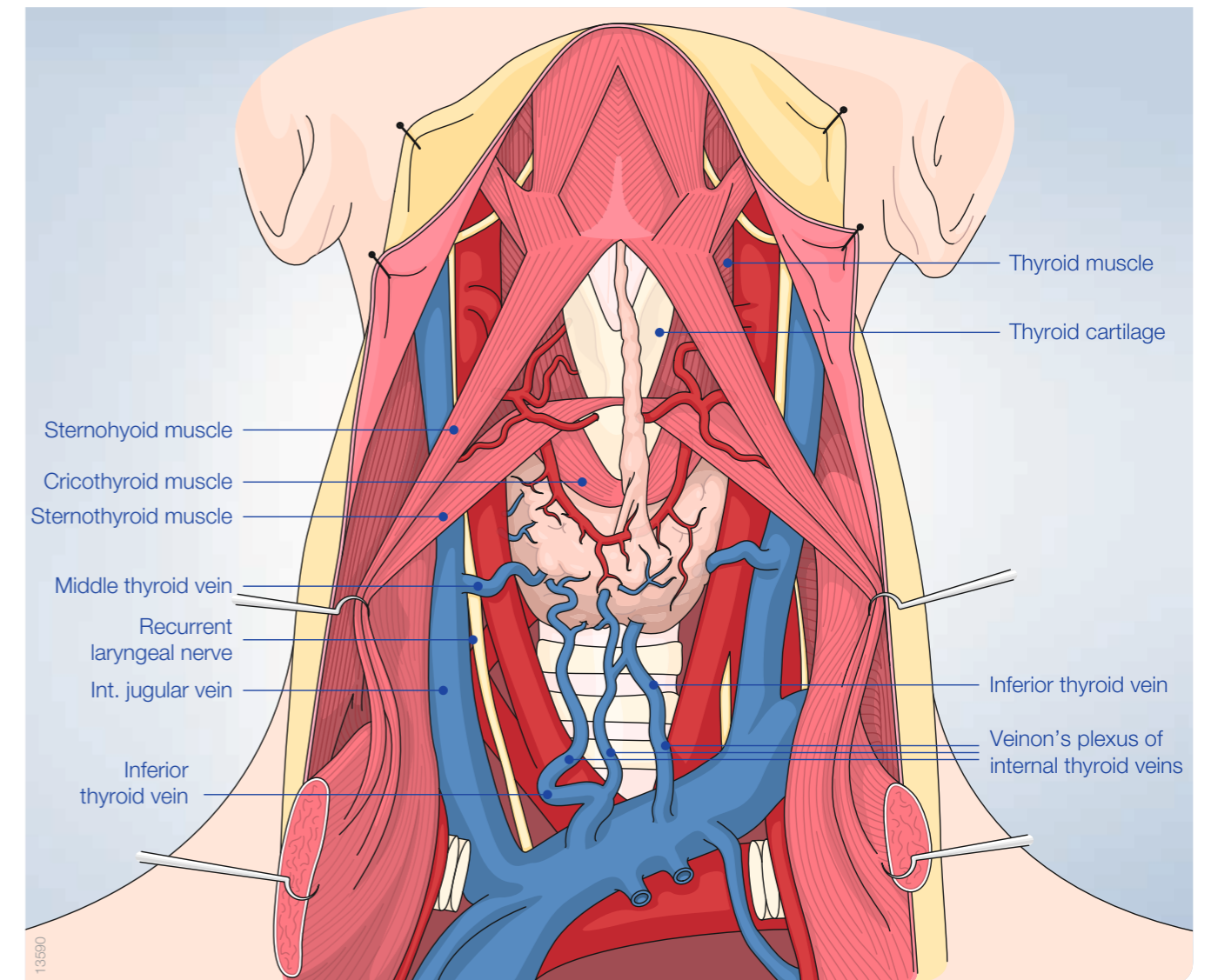


Underneath the platysma muscles, the strap muscles (infrahyoid muscles as a group of four pairs) can be found. The four infrahyoid muscle pairs are the sternohyoid, sternothyroid, thyrohyoid, and omohyoid muscles.

These are dissected bluntly and sharply in a vertical way by division of the avascular midline plane from the thyroid cartilage toward the suprasternal notch using monopolar cauterization or using THUNDERBEAT.



The medial cervical fascia is incised and a plane between the strap muscles and the thyroid gland is created with THUNDERBEAT or a bipolar device. Bleeding of the strap muscles can be controlled by using THUNDERBEAT SEAL mode. The strap muscles are separated from the underlying thyroid capsule and retracted laterally.



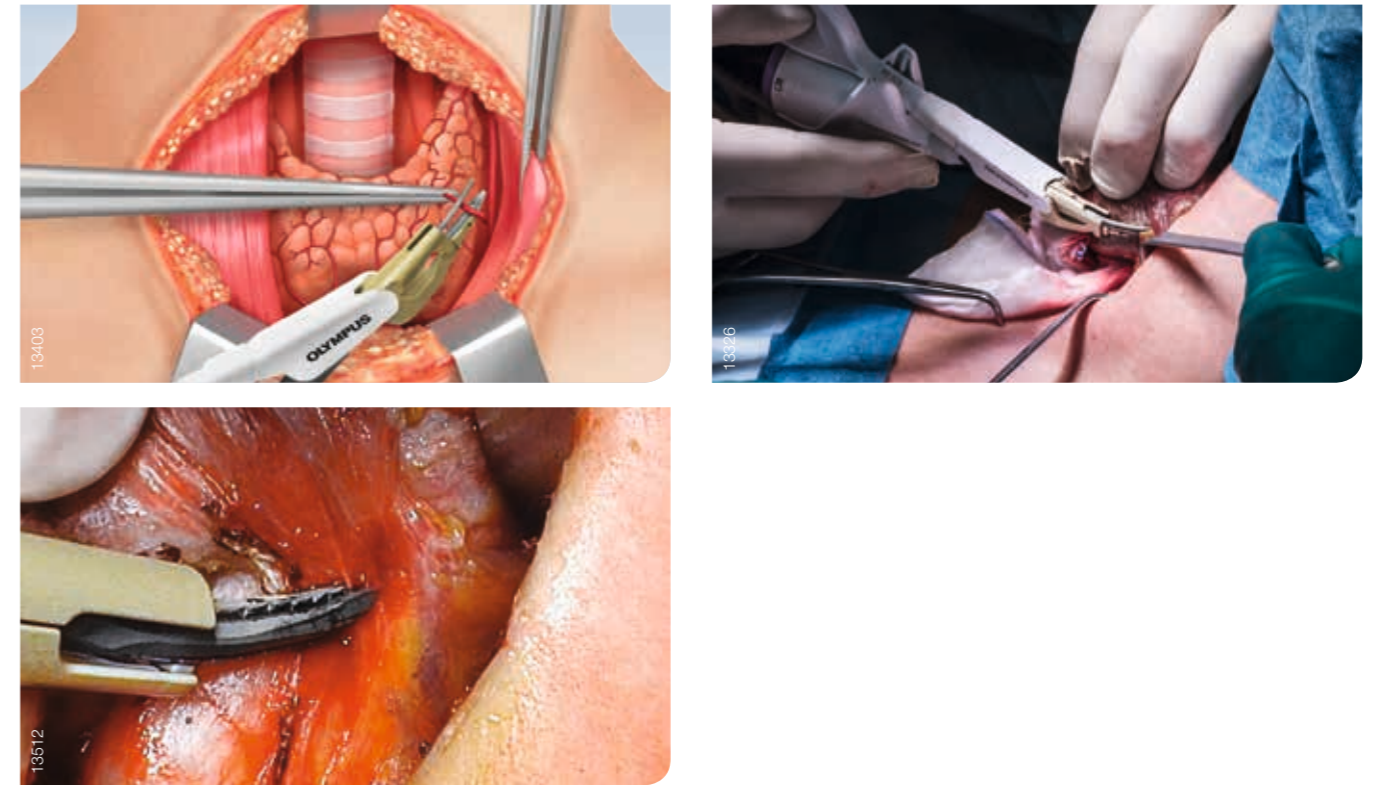
LEFT LATERAL THYROID DISSECTION

The dissection is continued laterally toward the jugular carotid sheath, where the common carotid artery, vagus nerve, and internal jugular vein are found. The lateral mobilization of the lobe should be done as far away from the gland as possible.

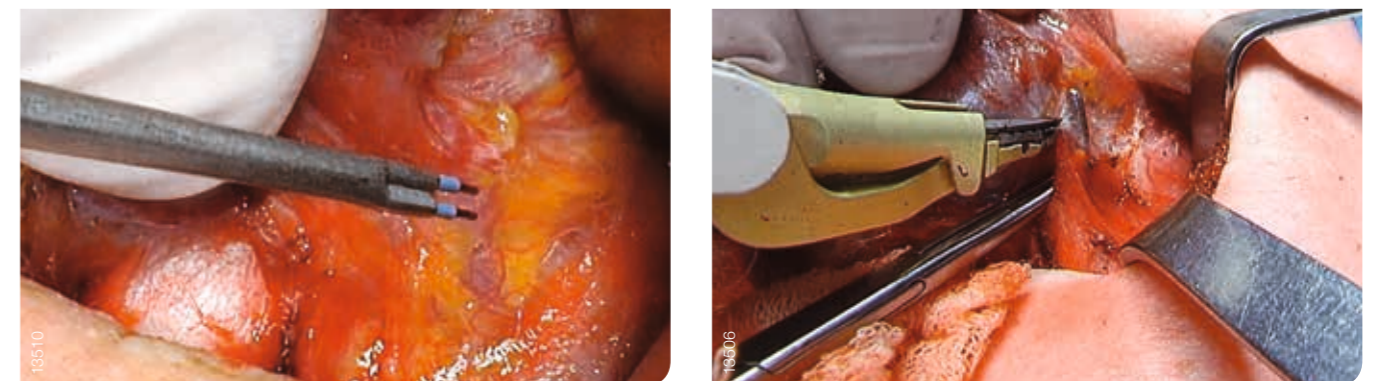


FURTHER LEFT LATERAL DISSECTION

The sheath is opened by cold dissection using a mosquito clamp or THUNDERBEAT, and the vagus nerve is dissected under constant neuromonitoring. The internal jugular vein can be divided by THUNDERBEAT. With medial traction of the lobe, the middle thyroid vein and branches of inferior thyroid artery can be seen. They can be ligated with THUNDERBEAT. Now, after opening the carotid sheath, the V1 signal is acquired (vagus stimulation).



For safe dissection, the vocal nerves should be monitored constantly during the whole procedure.

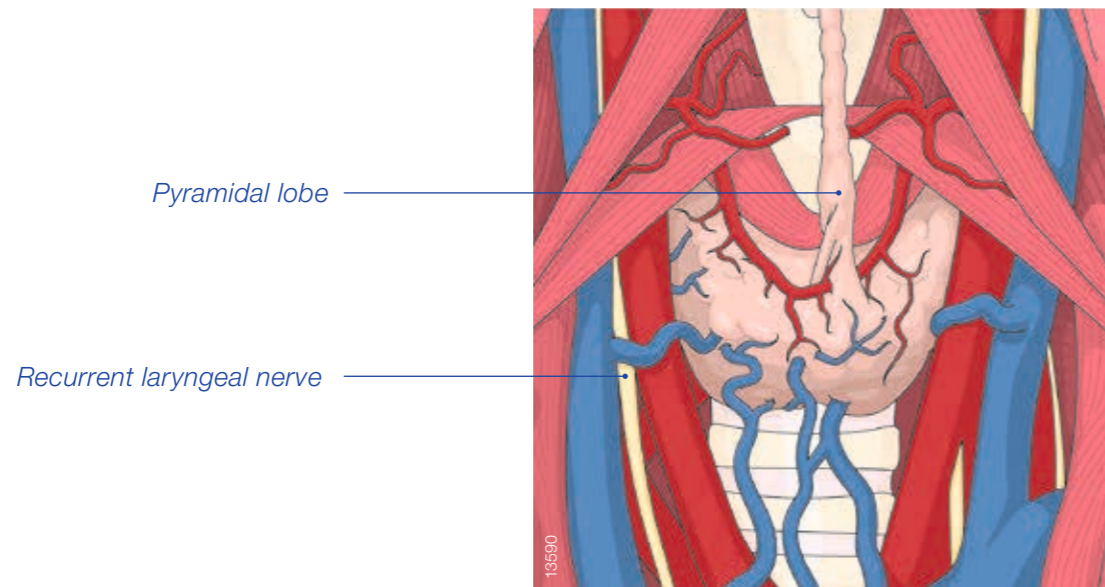


MEDIAL AND LEFT SUPERIOR THYROID GLAND DISSECTION

After the lateral dissection is finished, the procedure continues with the medial part of the thyroid and the pyramidal lobe. The pyramidal lobe is the extension of the isthmus on the midline, going to the base of the tongue; on either side just above the cricothyroid muscle, the supporting blood vessels are divided by THUNDERBEAT.

Damage to the cricothyroid muscles and external branch of the superior laryngeal nerve that run parallel has to be avoided.

If present, the pyramidal lobe is dissected first; ligation of its blood vessels using THUNDERBEAT.

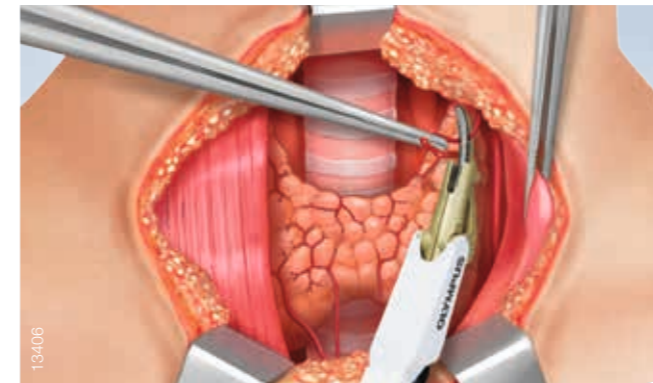


The medial dissection at the isthmus is continued at the level of the cricothyroid muscle using Kelly or mosquito clamps or with nonactivated THUNDERBEAT in order to find a plane between the thyroid lobe and the cricothyroid muscle itself. The dissection continues toward the superior pole of the lobe.

DISSECTION OF LEFT SUPERIOR THYROID POLE

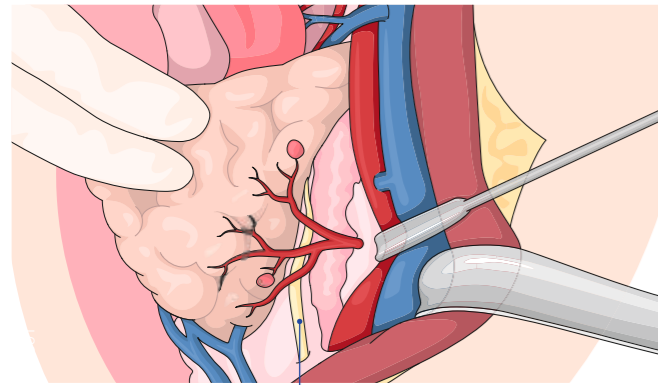
The dissection continues at the superior thyroid pole, including ligation of the superior thyroid artery and its branches with small bites made using THUNDERBEAT.

The superior laryngeal nerve needs to be identified and monitored as it is located close to the superior thyroid artery.



POSTERIOR DISSECTION OF LEFT THYROID LOBE

Posterior to the left thyroid lobe, distal branches of the superior thyroid vessels are sealed and divided close to the thyroid capsule. The recurrent laryngeal nerve has to be identified and monitored.

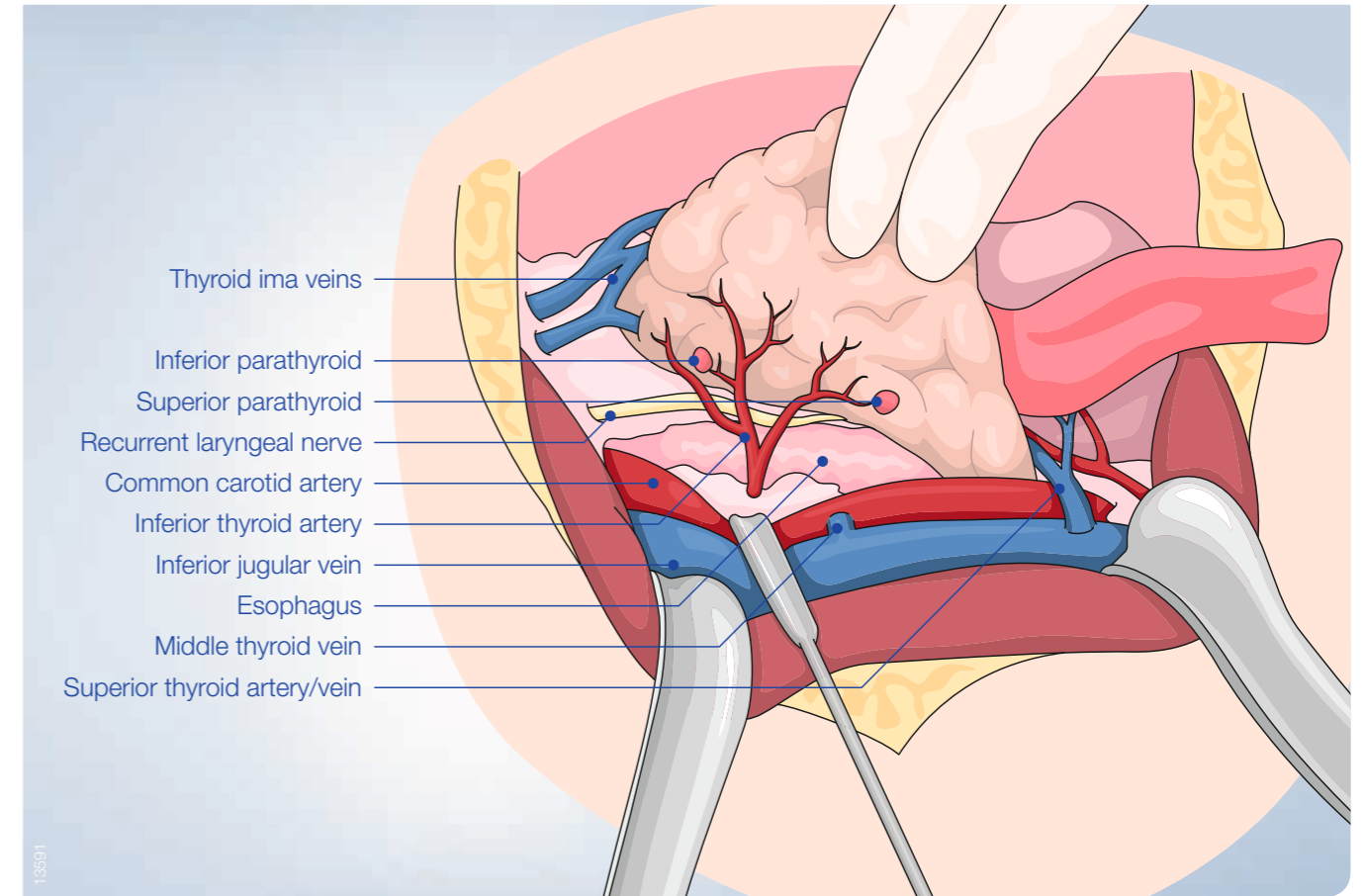


Recurrent laryngeal nerve (RLN)



FURTHER POSTERIOR DISSECTION OF LEFT THYROID LOBE

The posterior mobilization continues along the course of the recurrent laryngeal nerve with constant neuromonitoring and documentation. The left superior parathyroid glands posterior to the left thyroid lobe are identified. They are carefully separated from the thyroid capsule together with their vascular pedicles.

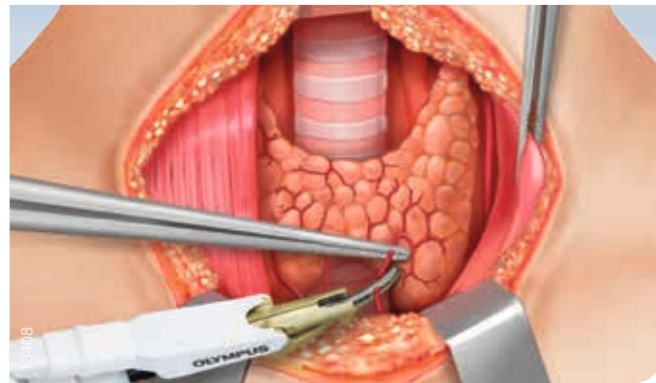


DISSECTION OF LEFT INFERIOR THYROID LOBE

Now the dissection of the lower pole is started in front of the trachea. The inferior thyroid vessels (branches of the inferior thyroid arteries and veins) are identified and ligated using THUNDERBEAT without any traction.

The lower pole has to be completely mobilized by continuing the dissection paratracheally where the recurrent laryngeal nerve (RLN) runs, crossing the inferior thyroid vessels and their branches. The RLN needs to be checked and the R1 signal must be documented.

The inferior parathyroid glands have to be identified and separated away from the posterior thyroid capsule by leaving the respective vessels intact.

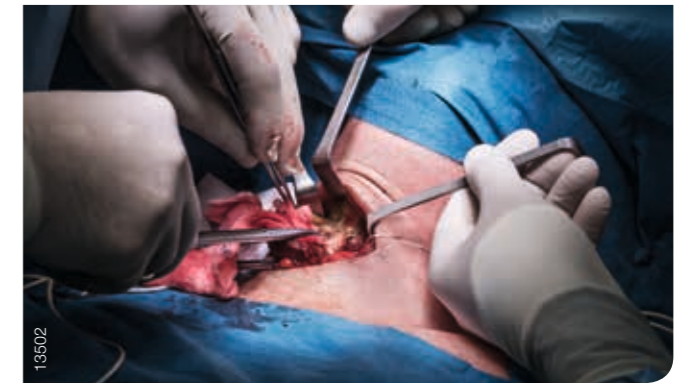
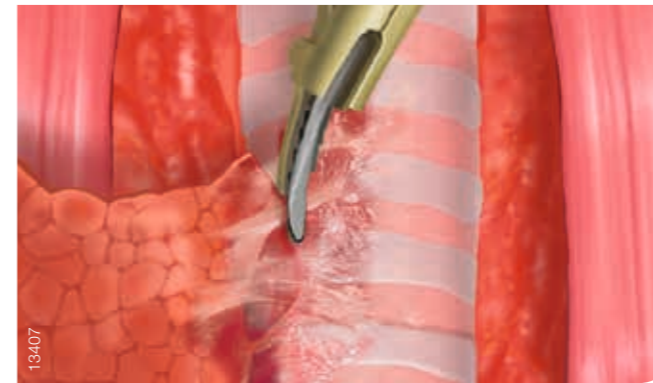


PARATRACHEAL DISSECTION OF THE THYROID

Very careful dissection between the thyroid lobe and the RLN, from inferior to superior, parallel to the course of the RLN is performed.

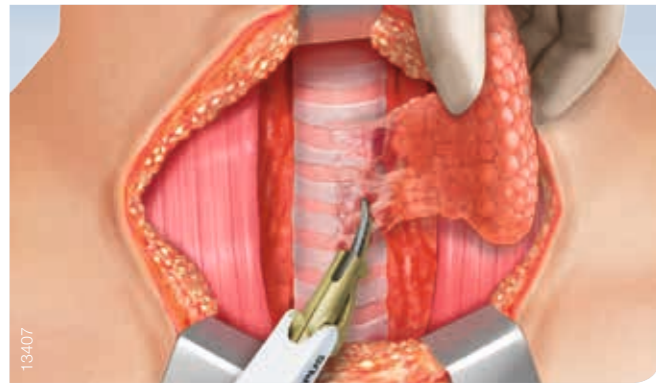
A possible accessory ima thyroid artery, running from caudally toward the inferior pole needs to be seen and monitored. A critical area is the ligament of Berry with its fine, strong tissue (attachment of thyroid to trachea) where very careful dissection is needed because branches of the superior thyroid artery may run behind the nerve and need to be ligated carefully.

Too much traction has to be avoided. Thermal effects and residual heat of any energy device could be dangerous here.



COMPLETION OF LOBECTOMY

The transection of the isthmus is completed. The pretracheal adhesions are divided using THUNDERBEAT, and a complete hemithyroidectomy is performed. The RLN and the vagus nerve are finally monitored and the R2 and V2 signals are documented. Complete hemostasis has to be secured prior to closure. Placing the patient in a head-down position with the anaesthesiologist, the Valsalva maneuver is performed on the patient to check for bleeding. Lymph node dissection is performed if necessary.



FURTHER STEPS

In the Case of a Partial Thyroidectomy

Placement of a drain and wound closure.

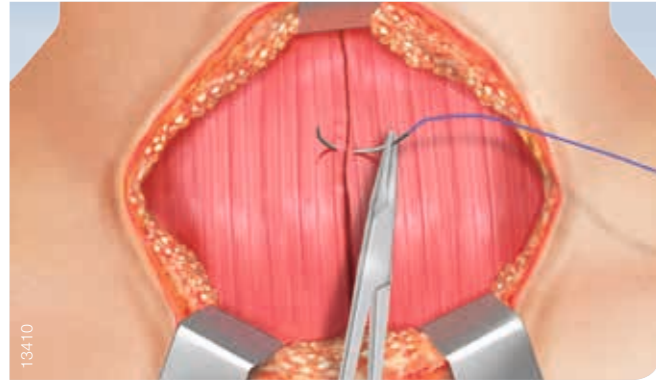
In the Case of a Total Thyroidectomy

Repetition of steps for thyroid lobe on opposite site, placement of a drain, and wound closure.



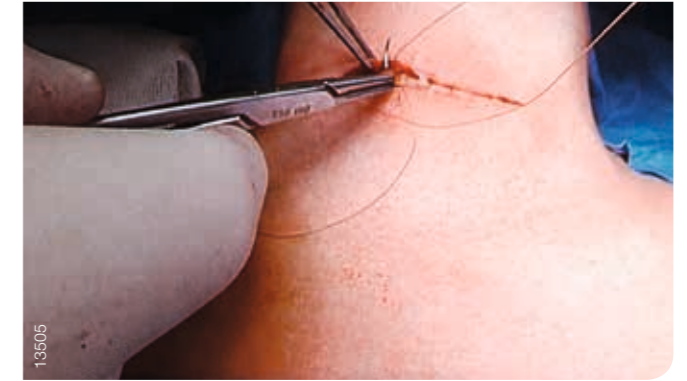
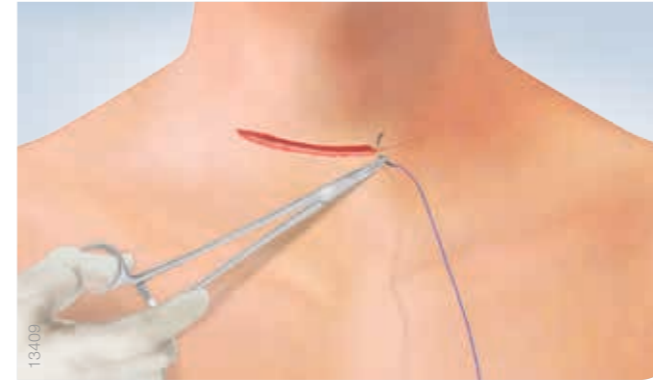
CLOSING MUSCLE LAYERS

The strap muscles are closed at the midline with continuous running suture with resorbable 4-0 suture material. The platysma fibers have to be sutured with interrupted stitches using resorbable 4-0 suture material.

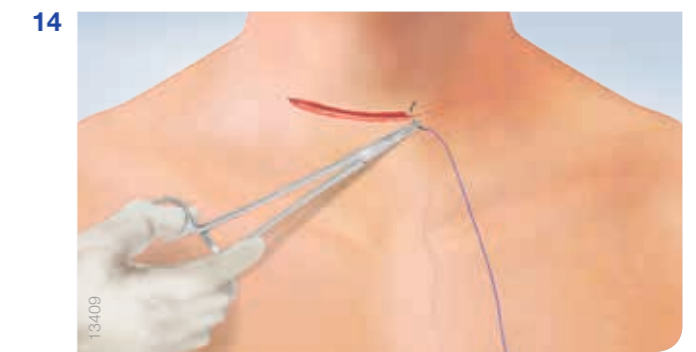
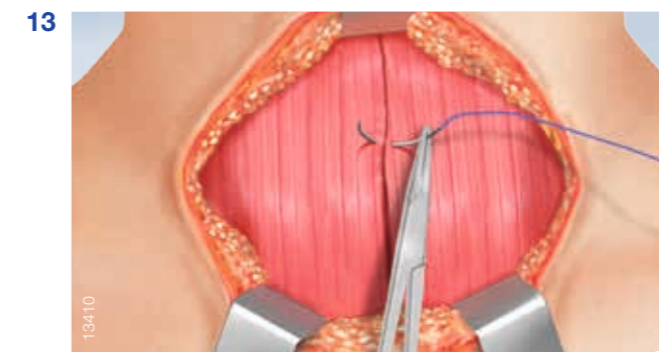
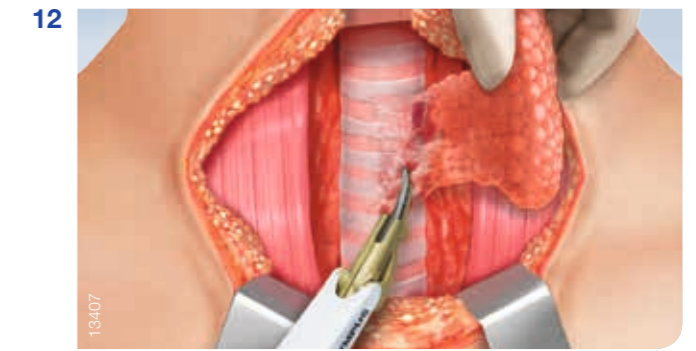
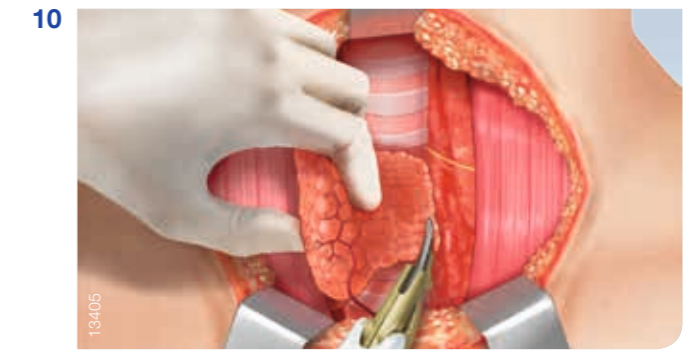
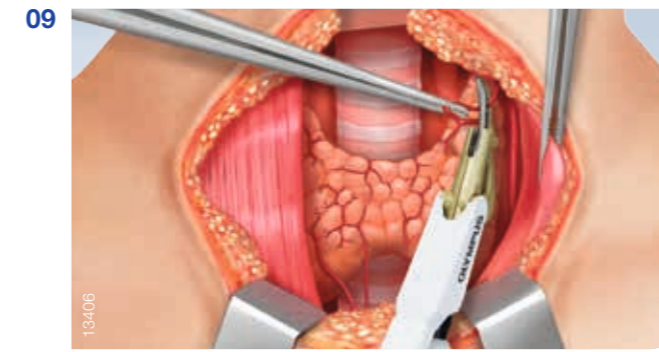
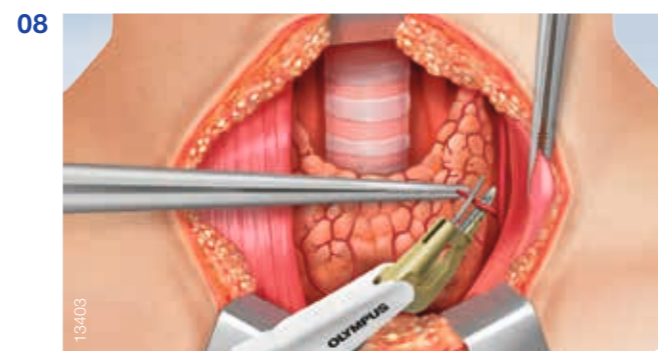
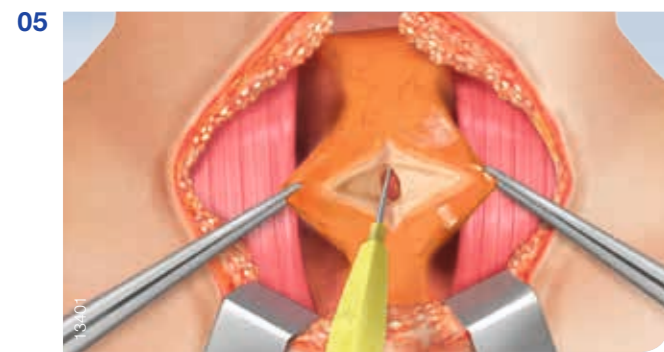
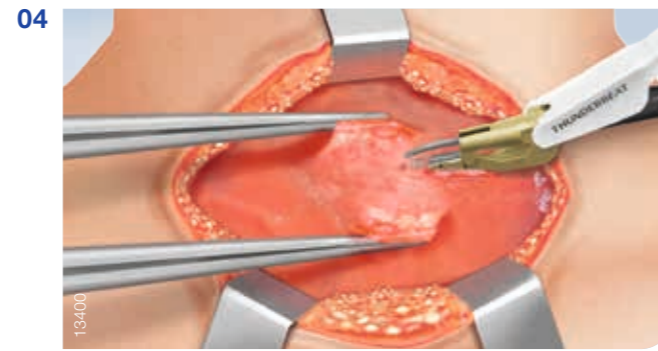
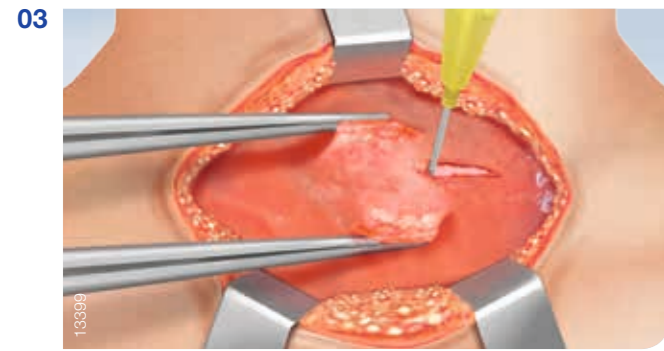


WOUND CLOSURE (INTRACUTANEOUS SUTURING)

The skin itself is closed with a continuous suture and resorbable 4-0 suture material. If applicable, steristrips or skin glue is used.



SUMMARY




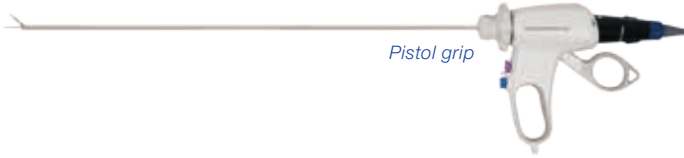
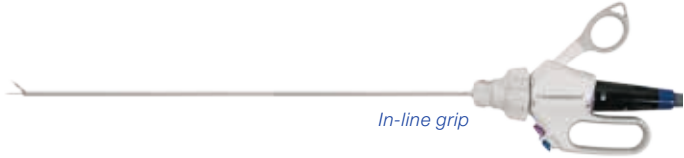
Scan the QR code or visit our website to see the procedure video:
www.olympus-europa.com/THUNDERBEAT-OFJ

ORDERING INFORMATION

THUNDERBEAT Instruments for Open Surgery

Order Nr.	Grip	Diameter	Length	Pieces	
N4505730	Scissor	–	9 cm	5/box	 <i>Open Fine Jaw</i>
N4505530	Front-actuated	9 mm	20 cm	5/box	 <i>Open Extended Jaw</i>
N3810730	In-line	5 mm	20 cm	5/box	
N3810830	In-line	5 mm	10 cm	5/box	 <i>In-line grip</i>

THUNDERBEAT Instruments for Laparoscopic Surgery

Order Nr.	Grip	Diameter	Length	Pieces	
N4488930	Front-actuated	5 mm	45 cm	5/box	
N4489130	Front-actuated	5 mm	35 cm	5/box	 <i>Front-actuated grip</i>
N5390230	Front-actuated	5 mm	20 cm	5/box	
N3810330	Pistol	5 mm	45 cm	5/box	
N3810430	Pistol	5 mm	35 cm	5/box	 <i>Pistol grip</i>
N3810530	In-line	5 mm	45 cm	5/box	
N3810630	In-line	5 mm	35 cm	5/box	 <i>In-line grip</i>

Generators and Accessories

Order Nr.	Description
WB91051W	ESG-400* electrosurgical generator
N3808660	USG-400 ultrasonic generator
N3808760	Transducer for THUNDERBEAT
N3809330	Communication cable – short: 0.25 m
N3809630	Docking fixture
WA956215	Power cable, Europlug (2x)

Optional

Order Nr.	Description
N3635730	Energy cart, TC-E400
N3809230	Foot switch for THUNDERBEAT
WB50403W	Foot switch, single (bipolar) pedal
N3809430	Communication cable – long: 10 m**
N3809530	Adapter for the connection to UHI-2 or UHI-3 insufflator**
E0427213	Neutral electrode cable (reusable)

* Including one double-foot switch

** Required for the automatic mist-and-smoke-evacuation function

Specifications, design, and accessories are subject to change without any notice or obligation on the part of the manufacturer.

OLYMPUS

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