Review Article

# Robotic Unilateral Axilo-Breast Approach (R-UABA) Gas-Insufflated Thyroidectomy: Proposal of a Modified Surgical Technique

## Tireoidectomia Robótica com Insuflação Gasosa por Via Axilo-Mamária Unilateral (R-UABA): Proposta de Técnica Cirúrgica Modificada

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**https://doi.org/10.34635/rpc.1121**

## ABSTRACT

Remote access thyroid surgery demand has increased due to the burden of a visible neck scar. Several surgical techniques have been proposed over the years.

We report the surgical modified technique of a robotic unilateral axillo-breast approach (R-UABA) gas-insufflated hemi-thyroidectomy without hyperextension of the arm.

This approach combines the advantages of the use of the robotic platform, to the use of a three port gas-insufflated technique.

**Keywords:** Axilla/surgery; Breast/surgery; Insufflation; Robotic Surgical Procedures; Thyroid Neoplasms/surgery; Thyroidectomy/methods

**Received/Recebido:** 21/07//2025 **Accepted/Aceite:** 12/08/2025 **Published online/Publicado online:** ??/??/???? **Published/Publicado:**

## RESUMO

A escolha de cirurgia da tiroide por um acesso remoto tem aumentado devido ao incómodo de uma cicatriz visível no pescoço. Várias técnicas cirúrgicas têm sido propostas ao longo dos anos.

Relatamos a técnica cirúrgica modificada de uma abordagem robótica axilar-mamária unilateral (R-UABA) com insuflação de gás para hemi-tiroidectomia sem hiperextensão do braço.

Esta abordagem combina as vantagens do uso da plataforma robótica com o uso de uma técnica de três portais com insuflação de gás.



**Palavras-chave:** Axila/cirurgia; Insuflação; Mama/cirurgia; Neoplasis da Tiróide/cirurgia; Procedimentos Cirúrgicos Robóticos; Tiroidectomia/métodos


## INTRODUCTION

Thyroidectomy has always been the most practised endocrine surgery, with thyroid nodules and cancer being a common disease with an increasing incidence, affecting particularly women.[1]

Remote access thyroid surgery has gained popularity in recent decades due to its ability to achieve better cosmetic results by avoiding a visible neck scar, which is particularly relevant in certain countries, as it can represent a cultural stigma.[2,3]

The indications for remote thyroidectomy come after the expressed patient desire and must take into consideration tumour characteristics. Usually are considered for surgery follicular neoplasms or benign thyroid nodules with less than 5 cm or differentiated thyroid carcinomas less than 3 cm. These indications can, however, change and be expanded according to the surgical technique and the surgeon's experience. Patients with Graves' disease or Hashimoto thyroiditis are usually not considered for this approach, given the higher hemorrhagic risk. Extrathyroidal disease, invasion of surrounding structures, large metastatic lymph node metastasis, large substernal goitre and history of neck surgery or radiation exposure are considered contraindications.[2,4]

Several endoscopic and robotic techniques via cervical, axillary, breast, retroauricular and transoral approaches have been proposed over the years. The first endoscopic thyroidectomy was performed in 1997 using a cervical approach. The gasless techniques with the use of a flap retractor were first developed by Chung *et al*[6] and have had several modifications over the years.

In 2000, Ikeda *et al*[7] performed the first surgery using three axillary incisions with $CO_2$ insufflation. Simultaneously, Ohgami *et al*[8] proposed a three breast incisions with insufflation approach, followed by a modification by Shimazu *et al*[9] with the creation of the ABBA surgery (two breast and one axillar port) and finally the UABA (unilateral axillary-breast approach with gas), with two axillary, one breast port, proposed by Lee *at al*.[10]

We propose a modified robotic-assisted technique, with two axillary and one breast port, with $CO_2$ insufflation and without hyperextension of the arm.

## SURGICAL TECHNIQUE

### 1. PATIENT POSITIONING

The patient is in supine position, under general anaesthesia, endotracheally intubated with recurrent laryngeal nerve (RLN) monitoring. The arm ipsilateral to the lobe operated is placed on an arm board at 60º-70º abduction and 30º external rotation, below the level of the bed. On the contralateral side, a bolster is placed underneath the shoulder, and the arm rests alongside the body. The head lies with adequate padding in an anatomically straight position (Fig. 1).

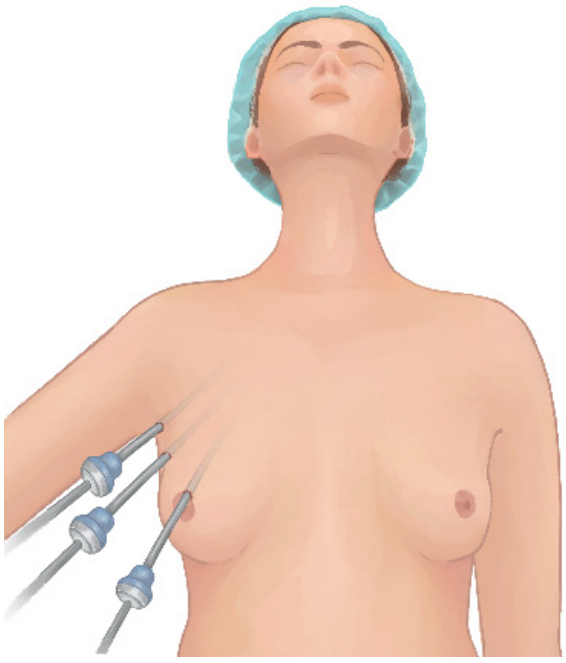

**Figure 1.** Patient positioning.

## 2. LANDMARKS AND SURGICAL PLANNING

The thyroid gland, sternal notch and hyoid bone are palpated and marked. The midline marks the limit of dissection. The first incision site is marked in the anterior axillary line, 6 cm from the nipple, with 8 mm (Fig. 2-1). This incision might need to be extended at the end of the surgery for the extraction of the specimen. The second 8 mm incision lies in the upper-medial areolar quadrant (Fig. 2-2). The final port is placed in the anterior axillary line near the axilla (Fig. 2-3).

The distance between the incisions is at least 6 cm to minimise interference between the robotic arms and instruments. All incisions are used for 8 mm robotic trocars (Fig. 2).


**Figure 2.** Incision site: 1 – First incision, 2 – Second incision, 3 - third incision.

## 3. WORKING SPACE CREATION AND DOCKING

The first incision is followed by blunt dissection, allowing for the placement of an 8 mm trocar in the supra-fascial plane of the pectoralis major muscle. $CO_2$ gas insufflation with a pressure of 6-8 mmHg facilitates the dissection and creates a working space. The areolar trocar is inserted under direct vision, in the same plane. An oblique tunnel towards the thyroid gland is carried out using a Maryland dissector. Care should be taken not to cause direct damage to the skin and to remain in the right direction. The role of the assistant is crucial in this step (Fig. 3).

Dissection extends from the sternal notch anteriorly to the sternocleidomastoid (SCM) muscle posteriorly. After the clavicle is identified, the uppermost port is inserted under direct vision.

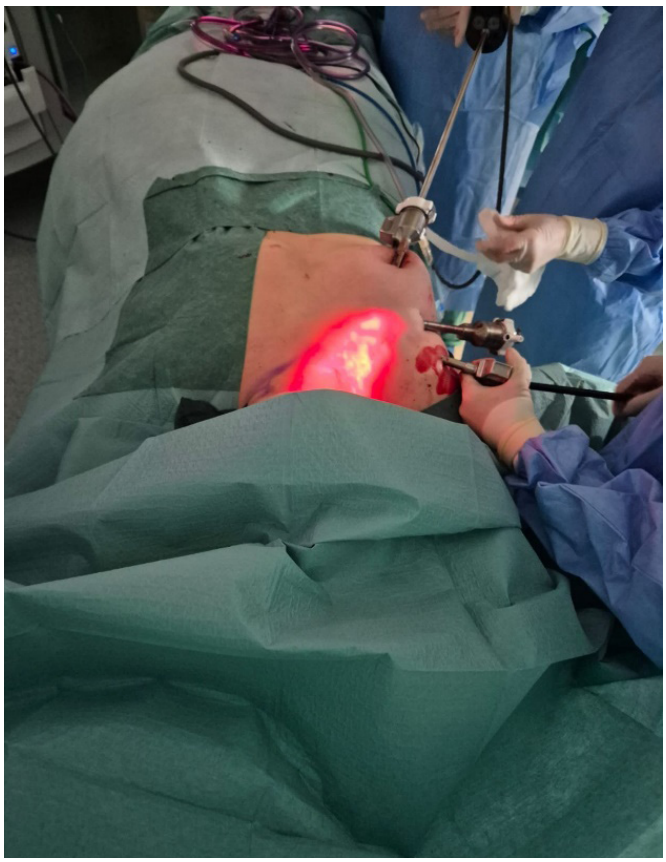

**Figure 3.** Tunnel and working space creation.

During robot docking, the Da Vinci Xi (Intuitive Surgical Inc., Sunnyvale, CA, USA) is located contralaterally to the operated lobe and 3 arms are used (prograsp fenestrated forceps, 30° endoscope and ultracision harmonic scalpel) (Figs. 4 and 5).

**Figure 4.** Robot docking – contralateral to the site of the operated lobe.

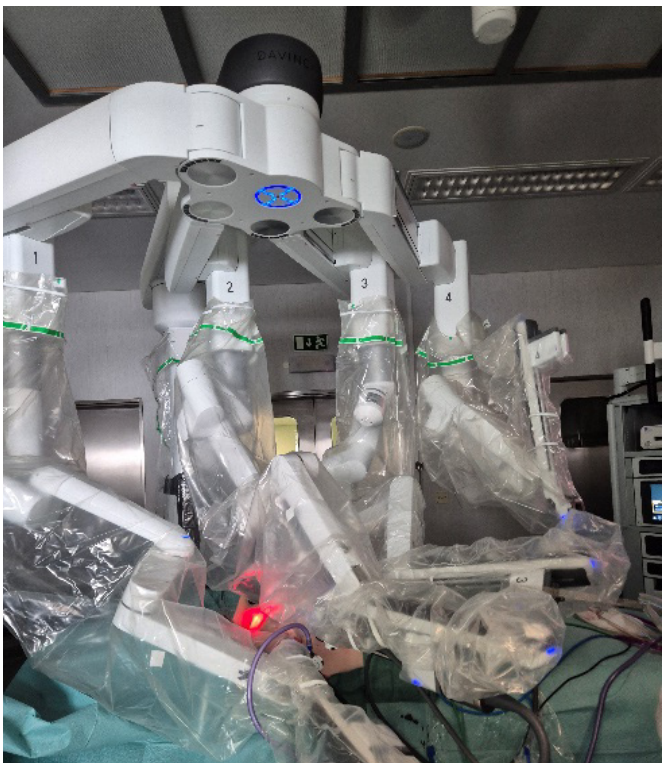

**Figure 5.** Da Vinci docked, 3 arms: 1. Prograsp fenestrated forceps; 2. 30º endoscope; 3. Ultracision harmonic scalpel.

## 4. CONSOLE TIME – ROBOTIC-ASSISTED THYROID DISSECTION

The surgeon operates the console while the assistant and scrub nurse remain by the patient's side, contralaterally to the robot.

The prograsp fenestrated forceps is used to retract the thyroid lobe, while the ultracision harmonic scalpel is used for dissection. The dissection starts with the exposure of the SCM muscle. The internal jugular vein is identified and preserved posteriorly. The strap muscles are dissected upwards to expose the lateral side of the thyroid. If necessary, to improve the working space under the strap muscles, these might be cut. After adequate exposure of the anterior and lateral aspects of the thyroid, the inferior pole is freed, and the trachea is identified, as well as the superior pole, preserving the external branch of the superior laryngeal nerve. A clip applier could be used in case large vessels or vessels close to the nerves are encountered.

The elevation and medially projection of the thyroid will allow for the identification of the RLN in the tracheal-esophageal groove. Neuromonitoring could assist in locating the nerve. The Berry's ligament is then carefully dissected. Both parathyroid glands should be identified and preserved.

Finally, isthmectomy is performed and the specimen is extracted using an endobag through the first incision.

Hemostasis is ensured with a Valsalva maneuver and hemostatic agents can be left in place. The CO2 is aspirated while removing the trocars and the incisions are closed using a subcutaneous suture.

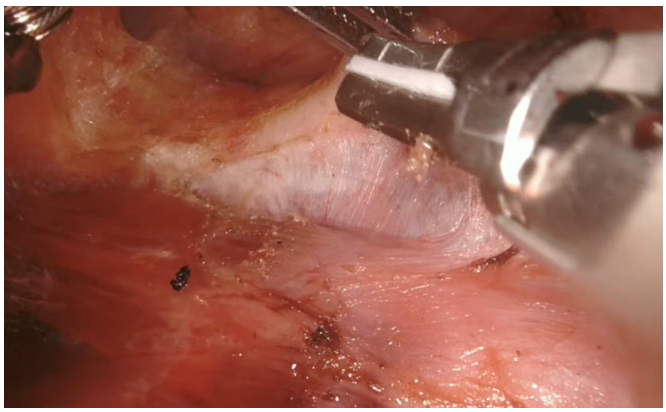

**Figure 6.** Strap muscles dissected.

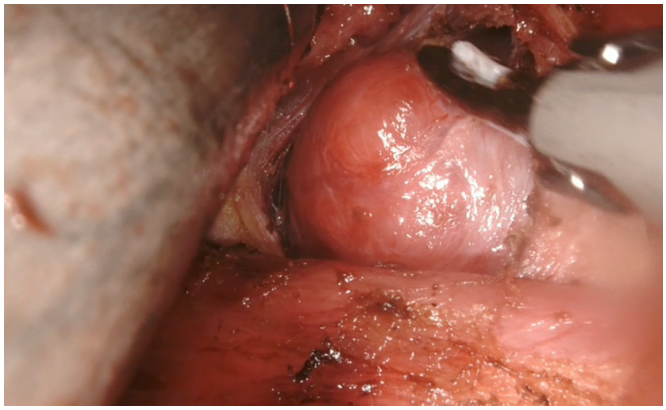

**Figure 7.** Lateral thyroid gland exposure.

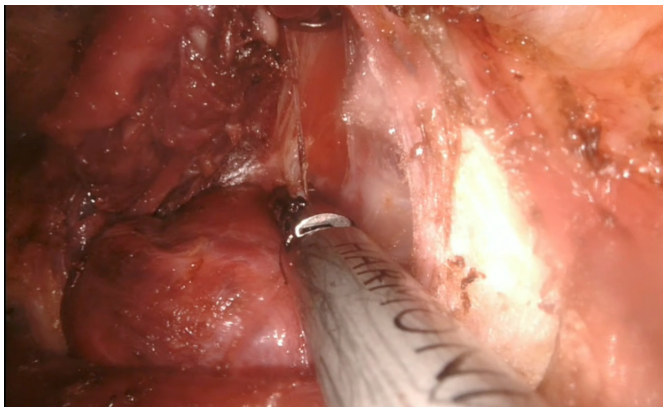

**Figure 8.** Anterior aspect of the thyroid gland dissected from the strap muscles.

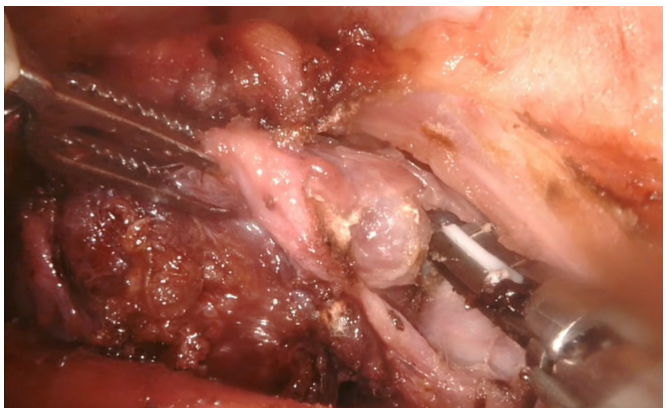

**Figure 9.** Inferior lobe dissected and tracheal exposure.

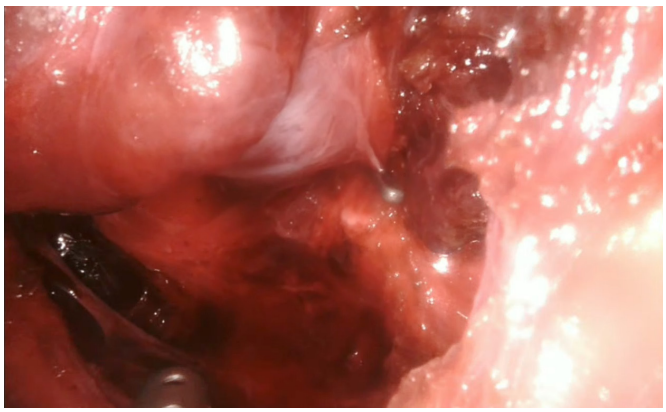

**Figure 10.** Recurrent laryngeal nerve identification and preservation.

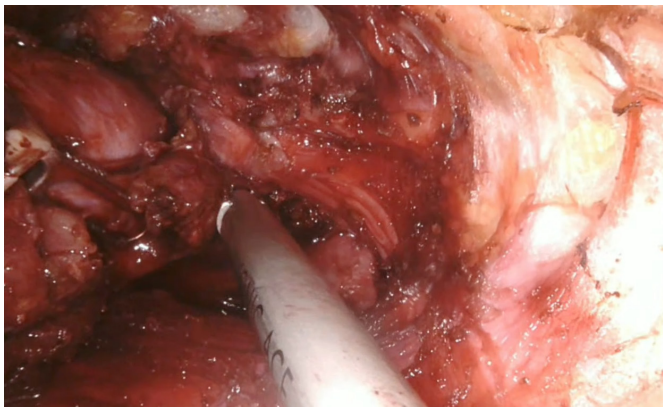

**Figure 11.** Isthmectomy.

## 5. POST-OPERATIVE CARE

A compressive pectoral dressing or surgical brasseire could be used. The specimen is sent for definitive histological examination.

# DISCUSSION

Remote access thyroidectomy represents an alternative to the classical conventional surgery through a Kocher incision, which has proven to be feasible and safe in selected patients, avoiding a visible neck scar.[11] South Korean series report similar complications and oncological results to those of conventional surgery,[12] with significantly better cosmetic results.[13,14] However, there is still no consensus on which surgical remote access technique is the best.[15]

The use of the robotic Da Vinci platform provides a magnification of the visual field, which is especially important for the identification and preservation of the laryngeal recurrent nerve and parathyroid glands, with the increased advantage of 3D visualisation, surgeon-operated camera and reduced tremor and better precision of movement.[16] However, it requires a relevant learning curve, has an increased cost when compared to conventional and endoscopic surgery and longer operating time, which have a tendency to decrease with experience.[12,17]

The post-operative complications are similar between techniques, with most commonly reported being hypocalcemia, dysphonia, recurrent laryngeal nerve palsy, bleeding, wound seroma or infection, hematoma, skin burn, neck or chest paresthesia and shoulder discomfort.[18-20]

Regarding the surgical access, studies from South Korea, Vietnam and European groups have[10,21,22] supported the UABA approach. With the peri-areolar incision, although it requires a longer dissection than three axillary ports, it remains in an imperceptible site, reduces instrument conflict[12] and permits the conversion to a BABA (bilateral axillo-breast approach) in case of contralateral thyroid lobectomy.[23]

The insufflation techniques over the gasless approaches allow for smaller scars, prevent the creation of an extensive flap and the skin sensory loss and pain associated with the use of a retractor, and shorten the time required for the tunnel dissection. On the other hand, although rare, especially if low pressure of endoscopic carbon dioxide insufflation (5–8 mmHg) is kept, CO2 insufflation can cause subcutaneous emphysema, respiratory acidosis, hypercapnia, risk of cerebral oedema and CO2 embolism[24,25]

This technique is a modified version of the Lee *et al*[10] with the ipsilateral arm located only in slight abduction and external rotation, contributing to the prevention of brachial plexus and preventing shoulder pain.

We believe that this surgical technique could be a viable option for selected patients, providing an effective alternative to other endoscopic approaches and conventional open thyroidectomy; however, further studies are required. Sharing the surgical results and knowledge between centres is essential to improve the care provided to our patients and advance the endocrine surgical field.


## ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to Dr. Oscal Vidal, MD, PhD, Dr. Jaime Vilaça, MD, PhD and Dr. Micaela Piccoli, MD for their contribution to the endocrine surgical field, their proctoring, commitment to teach and ensuring high standards in surgical practice and their unwavering support of our work. We are deeply thankful for their expertise and mentorship.


## ETHICAL DISCLOSURES

**Conflicts of Interest:** The authors have no conflicts of interest to declare.
**Financing Support:** This work has not received any contribution, grant or scholarship.
**Confidentiality of Data:** The authors declare that they have followed the protocols of their work center on the publication of patient data.
**Patient Consent:** Consent for publication was obtained.
**Provenance and Peer Review:** Not commissioned; externally peerreviewed.

## RESPONSABILIDADES ÉTICAS

**Conflitos de Interesse:** Os autores declaram a inexistência de conflitos de interesse na realização do presente trabalho.
**Fontes de Financiamento:** Não existiram fontes externas de financiamento para a realização deste artigo.
**Confidencialidade dos Dados:** Os autores declaram ter seguido os protocolos da sua instituição acerca da publicação dos dados de doentes.
**Consentimento:** Consentimento do doente para publicação obtido.
**Proveniência e Revisão por Pares:** Não comissionado; revisão externa por pares.

## CONTRIBUTORSHIP STATEMENT

**MM:** Conceptualization, writing—original draft preparation, review, editing, and visualization
**SCG:** Conceptualization, writing—original draft preparation, visualization
**PT and HPM:** Supervision and revision.
All authors approved the final version to be published.

## DECLARAÇÃO DE CONTRIBUIÇÃO

**MM:** Conceitualização, redação — preparação do rascunho original, revisão, edição e visualização
**SCG:** Conceitualização, redação — preparação do rascunho original, visualização
**PT e HPM:** Supervisão e revisão.
Todos os autores aprovaram a versão final a ser publicada.

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