



Subxiphoid Thymectomy Via Multiportal Video-Assisted Thoracoscopic Surgery (VATS)

José de Sá Moraes Neto*, Jaqueline Schaparini Fonini, Alessandro Wasum Mariani, Paulo Manuel Pego Fernandes

Instituto do Coracao, Hospital das Clinicas HCFMUSP, Faculdade de Medicina, Universidade de Sao Paulo, Sao Paulo, SP, BR.

***Corresponding author:** José de Sá Moraes Neto, Instituto do Coracao, Hospital das Clinicas HCFMUSP, Faculdade de Medicina, Universidade de Sao Paulo, Sao Paulo, SP, BR. Email: josedesamoraesneto@hotmail.com

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Abstract

The development of Video-Assisted Thoracoscopic Surgery (VATS) for the treatment of thymic disorders has led to reduced hospital stays, decreased postoperative pain, and faster patient recovery. VATS has gained popularity over the past decade. Recently, new surgical approaches have demonstrated, through robust publications, reduced intraoperative bleeding, shorter pleural drainage time, and lower complication rates when using the subxiphoid route compared to the lateral approach. This technical note aims to describe the surgical technique of subxiphoid video-assisted thoracoscopic thymectomy.

Keywords: Subxiphoid; Thymectomy; Thymic Lesions

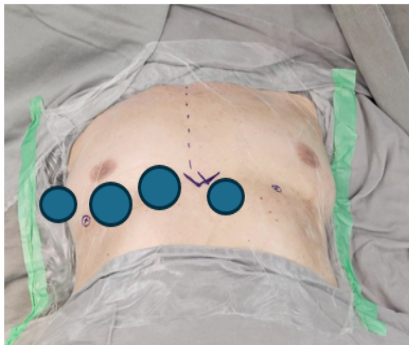
Introduction

The thymus is a gland located in the anterior mediastinum, essential for immune system development, especially during childhood. Thymic alterations may be benign, such as hyperplasia, or malignant, including thymomas and thymic carcinomas, posing significant diagnostic and therapeutic challenges. Due to the low prevalence of thymic diseases, most studies in the field are retrospective case series. However, according to the latest ESMO, ITMIG, and ESTS guidelines, upfront thymectomy is the recommended treatment algorithm for resectable thymic lesions. Among benign thymic-related conditions, Myasthenia Gravis-a neuromuscular junction disorder with an estimated prevalence of 0.5 to 20.4 cases per 100,000 individuals-has thymectomy as one of the pillars of adjunctive treatment in patients with poor disease control. Given this context, and with the advent of minimally invasive surgery, new therapeutic approaches for thymic tissue removal have emerged. Numerous studies have demonstrated

the benefits of lateral VATS thymectomy as well as robotic thymectomy. Therefore, the objective of this study is to describe and standardize the minimally invasive multiportal video-assisted thoracoscopic approach with subxiphoid optics positioning for thymic disease treatment.

Surgical Technique

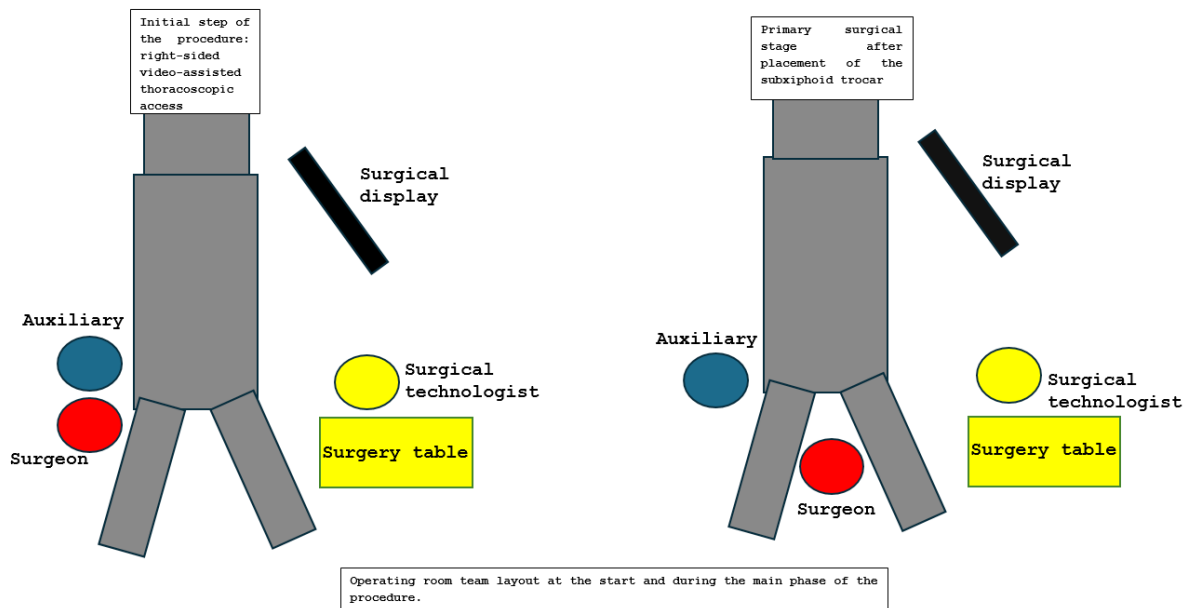
The procedure begins with general anesthesia and selective intubation, followed by patient positioning. The patient is placed in the dorsal decubitus position with a subscapular support. The lower limbs are abducted at a 45° angle, and the surgical table is tilted 15° in the Trendelenburg position. After antisepsis and asepsis, surgical ports are created. The right-sided ports include a 12 mm port at the intersection of the right mammary sulcus and anterior axillary line, and a 5 mm port placed inferiorly along the right hemiclavicular line (approximately 8 cm from the right parasternal line). A 10 mm transverse subxiphoid incision is made, along with a left-sided auxiliary port mirroring the right 5 mm port.



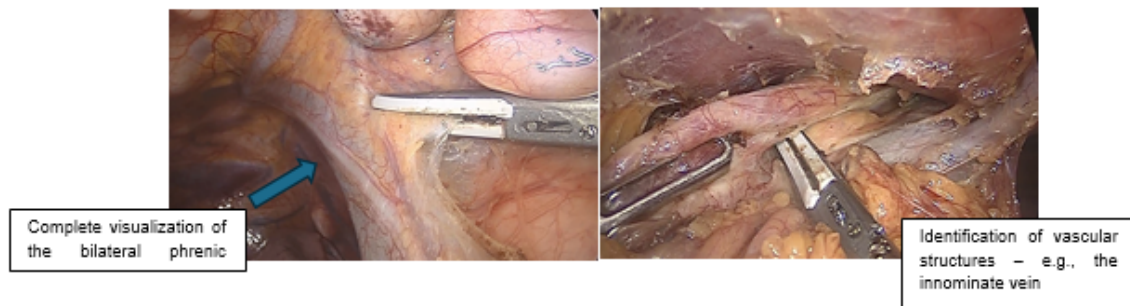
Initial step of the procedure: right-sided video-assisted thoracoscopic access



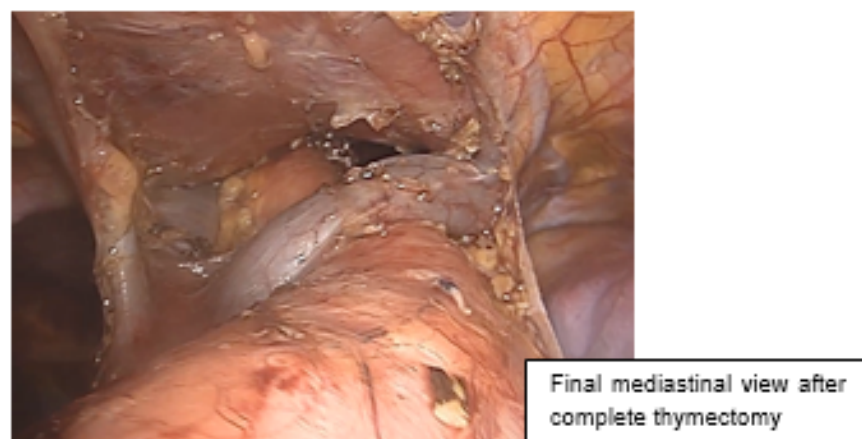
Primary surgical stage after placement of the subxiphoid trocar



The procedure begins with the surgeon and assistant on the patient's right, dissecting and freeing the mediastinal fat from the posterior sternal surface. The contralateral pleura is then opened to place the left port. A wide craniocaudally dissection allows for the insertion of the subxiphoid port under direct visualization. Once all ports are established, the surgeon moves to a caudal position, and the assistant positions the scope through the subxiphoid port, enabling direct visualization of the mediastinum and both phrenic nerves.



Dissection proceeds from the lateral margins of the phrenic nerves bilaterally toward the cephalad direction, identifying the innominate vein. The thymic poles are released, and en bloc, resection of the thymic tissue is performed down to the diaphragmatic pillars. Dissection is performed using an advanced energy device, preferably bipolar. After complete resection, the scope is repositioned to the right lateral port, and a retrieval bag is introduced via the subxiphoid incision, which may be extended transversely if needed. Pleural drainage is inserted on the right, and the cavity is closed.



Discussion

The advancement of minimally invasive surgical techniques has gained prominence in recent years. Major studies comparing traditional techniques (sternotomy or thoracotomy) with minimally invasive approaches for thymic lesion resection have demonstrated superior outcomes with thoracoscopic or robotic methods [1,2]. Due to the growing evidence supporting surgical resection of thymic tissue—whether benign or malignant—there has been a push to develop techniques with fewer complications and faster return to normal activities. Minimally invasive access has been shown to reduce operative time, intraoperative bleeding, pleural drainage duration, and hospital stay [3,4]. However, achieving bilateral visualization of the phrenic nerves and complete exposure of mediastinal fat remains a technical challenge with lateral thoracoscopic approaches, including robotic methods. This limitation has led to extensive research into alternative access routes [3]. In the past five years, multiple studies have supported

the subxiphoid approach over the lateral approach. The subxiphoid route offers superior visualization of critical structures (innominate vein, phrenic nerves and pericardium) and thymic poles, reducing perioperative complications such as phrenic nerve palsy and vascular injury. A meta-analysis of 1,198 patients demonstrated significant reductions in intraoperative blood loss (47.68 vs. 66.69 mL, SMD = -0.57, 95% CI: -0.95 to -0.18, $p = 0.004$), postoperative drainage days (2.12 vs. 2.72 days, SMD = -0.46, 95% CI: -0.74 to -0.18, $p = 0.001$), and length of hospital stay (4.53 vs. 5.91 days, SMD = -0.64, 95% CI: -0.96 to -0.31, $p = 0.0001$) [5-8]. Although the subxiphoid approach requires more incisions compared to the lateral route, it may reduce postoperative pain. Recent studies indicate lower Visual Analogue Scale (VAS) pain scores from days 0 to 7 in the subxiphoid group (difference -4.82; 98.3% CI: -8.84 to -0.80) with no significant difference in cumulative opioid consumption (difference -4.630; 98.3% CI: -9.530 to 0.272) [7,9,10]. Surgical approach selection should be

individualized based on patient and surgeon factors. Despite the growing prevalence of thymectomy in thoracic surgical practice, there is still no standardization in surgical access choice due to the predominance of case-based studies in the literature. Hence, more detailed technical publications are needed to prospectively evaluate the impact of different approaches on the perioperative patient experience. A key differentiator of this technical note is initiating the procedure with right-sided thoracoscopy using two ports, unlike other techniques that begin with a bluntly dissected, enlarged subxiphoid incision. Starting with meticulous subxiphoid dissection before trocar insertion results in a cleaner surgical field, less bleeding, and better gas retention, improving operative efficiency

Conclusion

The surgical resection of thymic entities, both malignant and benign, has increased significantly in recent years, supported by evidence demonstrating the efficacy of these procedures. While there is no standardized surgical access, the subxiphoid approach appears promising, offering superior visualization of critical structures (phrenic nerves, vessels, heart) and increased surgical safety via direct mediastinal anatomy exposure. Initiating dissection from the right side prevents surgical inefficiencies related to gas leakage and scope cleaning.

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