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Case Report

Robotic thymectomy: a gateway to the art of mediastinal surgery highlighting technical details and instrument choreography

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ABSTRACT

Robotic thymectomy represents a paradigm shift in the surgical treatment of thymic tumors and associated myasthenia gravis (MG). This article presents preoperative planning, anesthetic considerations, and clinical outcomes, while highlighting operative nuances in patient positioning, port placement, robot docking, and instrument choreography. With special emphasis on large thymoma excision, this review integrates case-based reflections and practical insights to serve both as a guide for early-career robotic surgeons and an academic contribution to the evolving literature on thoracic robotics.

Keywords: Robotic thymectomy, Thymic tumors, Mediastinal surgery, Myasthenia gravis, Minimally invasive surgery, Instrument choreography

INTRODUCTION

Thymic tumors, particularly thymomas, account for the most common neoplasms of the anterior mediastinum. Their surgical excision forms the cornerstone of management. Open sternotomy, once standard, is increasingly being replaced by minimally invasive options. Robotic-assisted thymectomy offers magnified 3D vision, tremor filtration, and superior instrument maneuverability.[1,2] Furthermore, its gentle learning curve-especially in comparison to lobectomy or esophagectomy-makes it an ideal entry point into thoracic robotics.[3,4]

Why robotic thymectomy is ideal for beginners

Robotic thymectomy is the most accessible thoracic robotic procedure for beginners not only because it avoids single-lung anesthesia but also due to its simplicity in dissection. The tumor is typically well-encapsulated, rarely involves adjacent structures, and does not require stapling or complex vascular dissection. If one is meticulous in hugging the capsule with bipolar dissection in both hands, the tumor can be safely and completely removed.[5] This makes thymectomy an ideal foundational procedure for thoracic robotic surgery.[6]

CASE REPORT

A 60-year-old male, presented with sudden-onset binocular diplopia, maximal at onset and more pronounced in bright sunlight. The diplopia was not associated with ptosis, bulbar symptoms (dysphagia, dysarthria), limb weakness, respiratory distress, or diurnal variation. Ophthalmological evaluation excluded a primary ocular pathology, and he was referred for neurological opinion.

Neurological evaluation with antibody testing confirmed the diagnosis of myasthenia gravis, despite the absence of overt generalized muscle weakness. A contrast-enhanced computed tomography (CECT) thorax revealed a wellcircumscribed, lobulated, heterogeneously enhancing anterior mediastinal mass measuring 7.4×6.9×4.2 cm on the left side. After multidisciplinary evaluation, the patient underwent robotic-assisted thymectomy at Fortis Hospital, Mohali.

Operative technique and instrument choreography

The patient is positioned supine with a 10–15° tilt away from the side of operation. The ipsilateral arm is suspended below table level in a sling to prevent external collision with the robotic arms, which operate under the sternum. The robotic cart is docked from the contralateral side.

Port placement

Camera port

8 mm, placed ~15–20 cm from the target, typically in the 7th intercostal space at the mid clavicular line.

Right hand instrument

8 mm port in the 3rd intercostal space, axillary line.

Left hand instrument

8 mm port in the 7th intercostal space, forming a gentle arc.

Assistant port

12 mm, placed inferiorly in a triangular configuration with the robotic ports.

Tip

The first port is placed blindly in the anterior axillary line/triangle of safety; the rest are placed under vision. If arms clash after initial docking, the surgeon should not hesitate to undock and insert a new port at a more favorable location to prevent instrument conflict.

Instruments

Right hand

Maryland bipolar dissector.

Left hand

Fenestrated bipolar forceps. Bipolar energy in both hands is preferred.

Dissection begins by incising the bluish pleura overlying the tumor. From there, the surgeon hugs the tumor capsule, gently shelling it out. Continuous visualization of the phrenic nerve or innominate vein is not necessary if the dissection remains close to the capsule.

Tumor retrieval

Due to the large size of the tumor, one of the existing port incisions was extended to facilitate removal. The specimen was first enclosed in an endobag to ensure containment and prevent spillage. Retrieval was accomplished using sponge-holding forceps under direct vision. To create sufficient space and allow for controlled extraction, a Finochietto rib retractor was employed, gently separating the ribs and providing optimal exposure for specimen deliver.

Myasthenia gravis and thymoma

Thymectomy is a cornerstone in the treatment of MG, whether or not a thymoma is present especially in ACh R positive cases.[6,7] Preoperative optimization includes steroid tapering, anticholinesterase adjustment, and immunosuppressive review by a neurologist. Neuromuscular monitoring may be considered intraoperatively. In this case, the patient was extubated and mobilized the same evening without complications.

Postoperative course

As per institutional protocol, two intercostal drains are routinely inserted-one thin apical and one thicker basal drain. These are always clamped overnight before removal, with a confirmatory chest radiograph performed after 12–16 hours to ensure no pneumothorax or fluid collection. In this particular case, both drains were clamped on the evening of postoperative day 2, and removed on day 3 morning. The patient was discharged in excellent condition.

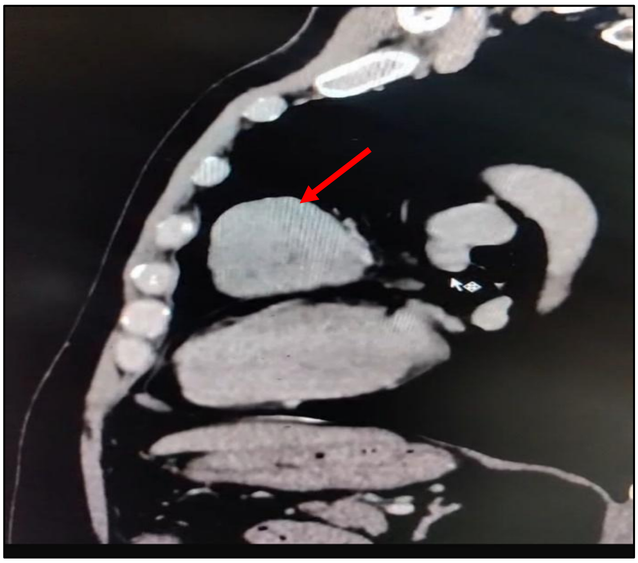

Figure 1: Preoperative CT scan (sagittal view) showing anterior mediastinal mass abutting the sternum (red arrow).

Figure 2: CT axial view depicting the tumor in close relation to great vessels (red arrows).

Figure 3: Patient positioning with ipsilateral arm suspended on a sling below the level of the operating table.

Figure 4: Port placement on the chest wall demonstrating ideal triangulation.

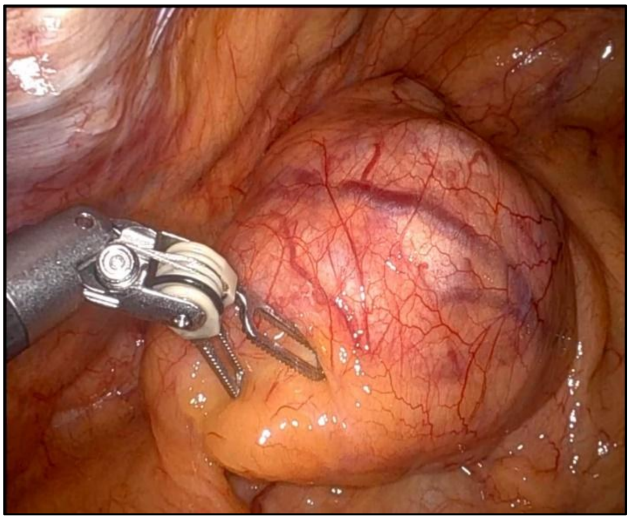

Figure 5: Initial intraoperative view of the encapsulated thymoma prior to dissection.

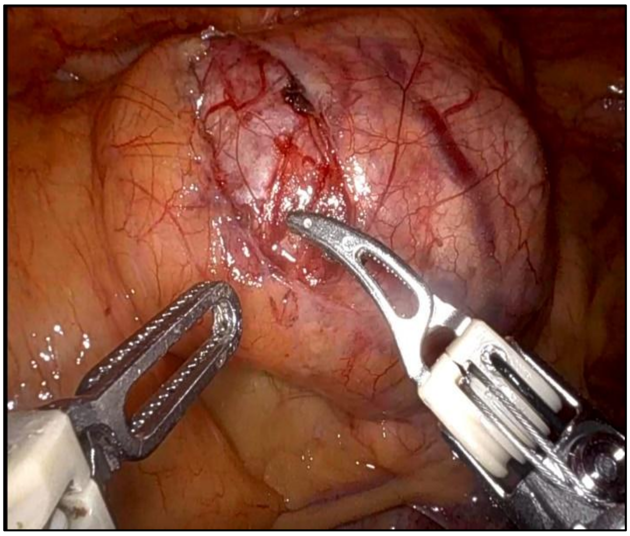

Figure 6: Robotic bipolar dissection in progress, hugging the tumor capsule.

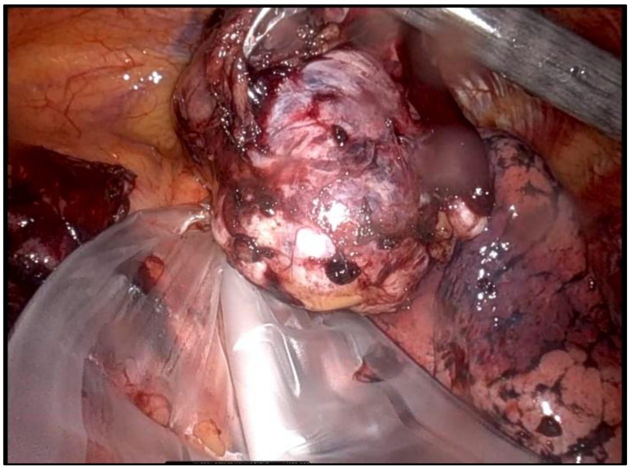

Figure 7: Tumor being placed into endobag with robotic graspers.

Figure 8: Excised thymoma specimen (~10 cm), laid next to scale.

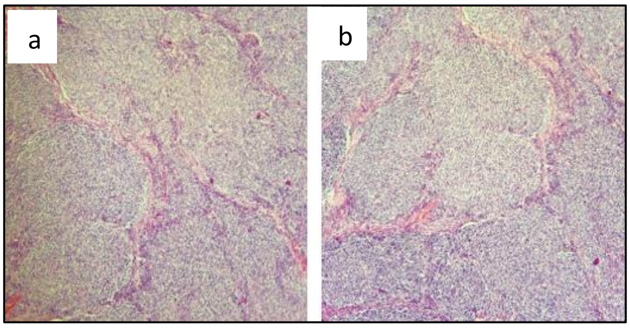

Figure 9: (a, b) Photomicrograph showing lobulated architecture and intersecting fibrous band H&E, 10X.

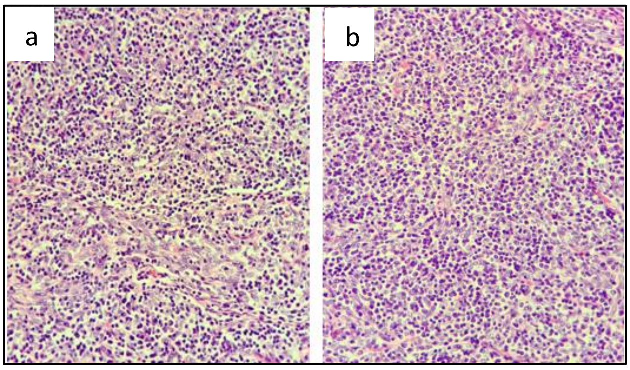

Figure 10: (a, b) Photomicrograph showing spindle shaped neoplastic cells intermixed with lymphocytes H&E, 40X.

DISCUSSION

Robotic thymectomy has evolved as a reproducible, elegant alternative to traditional approaches.[1] Compared to VATS, it offers better dexterity, visualization, and ergonomics.[8] The surgical field is minimally vascular, staplers are not required, and complications are few.[9] Beginners can perform robotic thymectomy with confidence, using it as a gateway into more advanced thoracic procedures.[10]

The ease of dissection, absence of lung isolation, and reproducible instrument choreography simplify the procedure significantly. Our technique emphasizes accurate port placement, optimal patient positioning, and use of bipolar instrumentation on both hands to avoid thermal injury. Furthermore, for patients with myasthenia gravis, thymectomy remains a cornerstone of long-term disease control.[7] Intraoperative and ICU protocols vary, but patients often tolerate robotic procedures well and can be extubated early. Our patient exemplified the benefits of early mobilization and fast recovery. Robotic thymectomy is thus an excellent bridge between basic robotic skills and more advanced mediastinal procedures. It empowers newer surgeons to gain confidence in a relatively low-risk field while achieving oncologic safety.

CONCLUSION

Robotic thymectomy is a refined, elegant, and effective option for managing thymic tumors and MG. It offers a gentle entry into thoracic robotics, with reproducible outcomes and a short learning curve. With proper imaging, thoughtful port placement, and careful choreography, even large thymomas can be resected bloodlessly and safely. This article is a reflective surgical narrative highlighting the technique and advantages of robotic thymectomy. The accompanying case serves to illustrate the described principles and operative choreography.

Disclaimer

This manuscript was prepared with the assistance of ChatGPT (OpenAI, 2024) to support the author in structuring, editing, and refining the scientific narrative. All clinical content, surgical details, and final interpretations are original, based on the author's direct experience and expertise. The AI tool was used strictly as an editorial aid and did not contribute to the generation of medical data, analysis, or clinical decision-making.

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