Editorial

Size should not be an absolute contraindication: the case for robotic resection of ever larger anterior mediastinal masses

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Anterior mediastinal masses represent a heterogenous collection of histologic pathologies, but the one most likely to involve the care of a thoracic surgeon, is that of a thymic epithelial neoplasm, either thymoma or thymic carcinoma (1). Common evaluation of thymomas for surgical resection include obtaining a high quality chest computed tomography (CT) scan, to assess for tumor size, presence and extent of involvement of adjacent structures and assessment for evidence of distant metastatic spread (2). Findings that are concerning for risk of invasion include tumor size greater than 5 cm, tumors with broad contact with the pericardium or adjacent lung, and interdigitation between or incasement of the great vessels (1).

The goal of surgical resection for a thymoma is complete removal of the thymic mass, the remainder of the thymus, which may harbor invisible trans-capsular spread, and *en-bloc* resection of all involved adjacent, non-vital structures (2). Non-vital structures include pericardium, lung, unilateral phrenic nerve, brachiocephalic vein and the superior vena cava. The additional resection of these adjacent structures is in hopes of creating a microscopically negative resection (R0) (3), as this has been found to be the main factor associated with long term survival following thymoma resection (4). Furthermore, it is imperative to minimize manipulation of the tumor itself, as disruption of the tumor capsule can result in pleural and chest wall implants, tumor recurrence, and negatively impacted overall survival (5).

Transsternal thymectomy has long been considered the gold standard for resection of the thymus as it provides excellent exposure to the anterior mediastinum, including both phrenic nerves and all of the great vessels, and provides an oncologically sound operation while minimizing the possibility of pleural drop metastasis (1,6-8). This surgical technique, however, involves the division of the long sternal bone and the inherent associated morbidities associated with wound infections and sternal wound dehiscence. Therefore, the advent of video assisted surgery, brought the possibility for minimally invasive procedures in the anterior mediastinum and avoidance of division of the sternum. These operations were associated with shorter operative times, less blood loss, and shorter hospital stays than their open counterparts (9). They were also technically challenging in the anatomically confined anterior mediastinum and were therefore limited to fairly small and early-stage thymic tumors, without involvement of the phrenic nerve or venous invasion (2,5). Enthusiasm for minimally invasive procedures was tempered by the realization of what can be done safely and with the same or better oncologic outcomes as the contemporary open operation.

The advent of the da Vinci robotic surgical platform helped to overcome some of the technical challenges of video assisted surgery. The robotic platform has benefits in

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the approach to complex surgical procedures in relatively small anatomic spaces, especially the pelvis and the mediastinum, and its adaptability to the mediastinum is demonstrated by a short learning curve (10). The three-dimensional visualization, ×10 magnification, surgeon control of the camera, 7 degrees of freedom wristed instruments, and tremor filtration all make the robotic system ideally suited to the limited space in the anterior mediastinum (11,12). The anterior mediastinum can be approach from either the right or the left chest at the discretion of the operating surgeon. The author prefers to utilize the side of predominant laterality of the tumor, and for tumors in the midline the right chest as it affords more room and maneuverability with the absence of the heart, however this does male visualization of the contralateral phenic nerve more challenging. Following resection, the specimen must be placed into an endoscopic specimen bag in order to be removed, to minimize capsule disruption within the pleural cavity and decrease the potential for pleural drop metastastasis (13). Comparisons between the open and the robotic surgical approach are often still limited to small tumors, less than 4 or 5 cm, and without involvement of the pericardium or surrounding vessels (14). In these comparisons the robotic approach resulted in fewer complications, shorter hospital stay, and faster recovery of physical and social functioning in comparison to open thymectomy (14). Additionally, in two propensity matched studies comparing robotic to open thymectomy, the robotic group had less blood loss, fewer post-operative complications, shorter hospital length of stay, and no difference in overall survival or recurrence (6,10). Size of a lesion that can be removed minimally invasively is still somewhat controversial, with some contemporary publications listing size greater than 8 cm as an absolute contraindication to attempting robotic assisted thymectomy (6).

In the recent edition of *Mediastinum*, a case series of 4 patients operated on via a robotic assisted approach for very large anterior mediastinal masses was presented (15). All four of these patients had tumors that exceeded 10 cm in at least one dimension, and all were successfully resected via a minimally invasive robotic assisted approach. They therefore concluded that size should not preclude attempt at resection of an anterior mediastinal mass via a robotic minimally invasive approach. Other factors that would affect the complexity of the operation were mentioned for consideration of a minimally invasive approach, such as pericardial, great vessel, and lung involvement.

Tumor size does not always in and of itself correlate to the complexity of a given operation, and the decision to perform a surgery minimally invasively should be made on an individual case by case basis. If the surgeon feels that a minimally invasive approach is unlikely to lead to a complete resection or that it will violate any other tenet of oncologic surgical resection, than conversion to open thymectomy should be performed. However, as the field of robotic surgery continues to evolve and individual surgeons comfort level with the technology increases, the limits of its application will continue to be stretched and larger and more complicated tumors will be resected safely and with similar long-term outcomes to open surgery.

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References

1. Limmer KK, Kernstine KH. Minimally invasive and robotic-assisted thymus resection. Thorac Surg Clin 2011;21:69-83, vii.

2. Koppitz H, Rockstroh JK, Schüller H, et al. State-of-the-art classification and multimodality treatment of malignant thymoma. Cancer Treat Rev 2012;38:540-8.
3. Friedant AJ, Handorf EA, Su S, et al. Minimally Invasive versus Open Thymectomy for Thymic Malignancies: Systematic Review and Meta-Analysis. J Thorac Oncol 2016;11:30-8.
4. Rea F, Marulli G, Girardi R, et al. Long-term survival and prognostic factors in thymic epithelial tumours. Eur J Cardiothorac Surg 2004;26:412-8.
5. Demmy TL, Krasna MJ, Detterbeck FC, et al. Multicenter VATS experience with mediastinal tumors. Ann Thorac Surg 1998;66:187-92.
6. Kang CH, Hwang Y, Lee HJ, et al. Robotic Thymectomy in Anterior Mediastinal Mass: Propensity Score Matching Study With Transsternal Thymectomy. Ann Thorac Surg 2016;102:895-901.
7. Savitt MA, Gao G, Furnary AP, et al. Application of robotic-assisted techniques to the surgical evaluation and treatment of the anterior mediastinum. Ann Thorac Surg 2005;79:450-5; discussion 455.
8. Li WW, van Boven WJ, Annema JT, et al. Management of large mediastinal masses: surgical and anesthesiological considerations. J Thorac Dis 2016;8:E175-84.
9. Hwang SK, Park SI, Kim YH, et al. Clinical results of surgical resection of mediastinal teratoma: efficacy of video-assisted thoracic surgery. Surg Endosc 2016;30:4065-8.
10. Seong YW, Kang CH, Choi JW, et al. Early clinical outcomes of robot-assisted surgery for anterior mediastinal mass: its superiority over a conventional sternotomy approach evaluated by propensity score matching. Eur J Cardiothorac Surg 2014;45:e68-73; discussion e73.
11. Chen K, Zhang X, Jin R, et al. Robot-assisted thoracoscopic surgery for mediastinal masses: a single-institution experience. J Thorac Dis 2020;12:105-13.
12. Bodner J, Wykypiel H, Greiner A, et al. Early experience with robot-assisted surgery for mediastinal masses. Ann Thorac Surg 2004;78:259-65; discussion 265-6.
13. Su KW, Luketich JD, Sarkaria IS. Robotic-assisted minimally invasive thymectomy for myasthenia gravis with thymoma. JTCVS Tech 2022;13:270-4.
14. Balduyck B, Hendriks JM, Lauwers P, et al. Quality of life after anterior mediastinal mass resection: a prospective study comparing open with robotic-assisted thoracoscopic resection. Eur J Cardiothorac Surg 2011;39:543-8.
15. Alqudah O, Purmessur R, Hogan J, et al. Robotic resection of anterior mediastinal masses >10 cm: a case series. Mediastinum 2023;7:29.

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