



Where is the difficulty of a myasthenia gravis patient operation 35 years ago? – “a comparison of robotic and transsternal early stage thymoma resection by Marulli”

Alper Toker^{1,2}

¹Department of Thoracic Surgery, Group Florence Nightingale Hospitals, Istanbul, Turkey; ²Department of Thoracic Surgery, Istanbul University, Istanbul Medical School, Istanbul, Turkey

Correspondence to: Alper Toker. Department of Thoracic Surgery, Istanbul University, Istanbul Medical School, Istanbul, Turkey. Email: salpertoker@gmail.com; Alper.toker@florence.com.tr.

Comment on: Marulli G, Comacchio GM, Schiavon M, *et al.* Comparing robotic and trans-sternal thymectomy for early-stage thymoma: a propensity score-matching study. *Eur J Cardiothorac Surg* 2018. [Epub ahead of print].

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I would like to thank the editors of new brand journal *Mediastinum* for requesting me to write an editorial about the manuscript by Marulli *et al.* “Comparing robotic and trans-sternal thymectomy (TST) for early-stage thymoma: a propensity score-matching study” (1), published in *European Journal of Cardio-Thoracic Surgery (EJCTS)* March, 2018 issue. In this article, authors aimed to evaluate the surgical and oncological results after robotic thymectomy for early-stage thymoma and compared the outcomes with open approaches. One hundred sixty-four patients underwent early stage thymoma (Masaoka I and II) resection in the past 35 years (1982 and 2017). Median sternotomy (108 patients) or the robotic surgery (56 patients) were the performed procedures. Perioperative, long term outcomes and total costs were retrospectively analyzed. In this study, robotic thymectomy had longer duration of operation but less intraoperative bleeding, less complications, shorter duration of chest tube drainage and shorter hospital stay. The median cost of the trans-sternal procedure was higher than the cost of the robotic surgery. It was proposed to be related to longer hospitalization. Thymoma recurrences were similar in both groups. Authors claimed that robotic thymectomy for early-stage thymoma is safe and feasible. This procedure has low complication rate and shorter hospital stay when compared to the open approach.

Why such studies are needed and important

Complete surgery with meticulous dissection and sufficient safety margins is the cornerstone of treatment in early-stage thymoma (2). Video-assisted thoracoscopic surgical (VATS) techniques are promising alternatives to open surgery, however, adoption rate is low and learning curve is steep due to presence of vital organs in mediastinum (3). Increased risk of local recurrence may be related to the reduced safety surgical margins and the rupture of the capsule. These are the reasons of the drive back (4). Robotic surgery with higher technical and dissection capabilities may overcome the hurdles during VATS.

Critics of the paper

To the readers of the journal, the number of patients operated during this long period may be very limited, however actual number is not 164 but 278 patients. All patients with a thymic tumor operated from June 1982 to December 2016 in the University of Padova, were analyzed. Advanced disease (stage III or IV according to Masaoka), incomplete resection (R1 or R2) and surgical resection other than trans-sternal or robotic technique were excluded. This is an appreciable effort to homogenize the group.

In this manuscript, several points deserve attention. I

will try to clarify these points:

- (I) During this long study period, degree of difficulty in dissection and the evaluating and understanding the level invasion and the expertise in solving the technical problems may not be homogenous mainly due to long study period. Imaging modalities were not comparable with today's high capability computerized tomography. The level of expertise among surgeons may vary. Patient selection criteria with robotics are well described. Preferred radiological characteristics are as follows: anterior mediastinum location, distinct fat plane, unilateral predominance, encapsulation, presence of normal thymus and no mass effect. A diameter of less than 5 cm was preferred. We do not have any idea about the details of the open patients.
- (II) Authors reported that there is no difference in terms of recurrence. The follow-up of the TST group was significantly longer. In a generalized and anonymized knowledge, for a thymoma average time to recurrence is approximately 4 to 5 years, it may range from 3 to 4 months to 10 to 15 years. Commonly it is 10 years in patients with a stage I thymoma, whereas 3 years in patients with a stage II to IV thymoma. However, the median duration of the follow-up was significantly different between the 2 groups, with a median length of 90.7 months [interquartile range (IQR) 46.8–149.5 months] in the median sternotomy group, compared to a median length of 30.9 months (IQR 8.5–67.8 months) in the latter. Even after propensity score matching follow-up duration was confirmed to be longer again for the TST group (median =88.3 *vs.* 28.3 months). No difference in terms of recurrence rate may lose its meaning to some extent after having the abovementioned knowledge.
- (III) In calculating the cost of the procedure, main capital cost (cost of the robot/per case) and maintenance costs (generally 150 K USD/number of operations in the same year) should have been included. Only the arms and drapes are calculated in the robotic surgery costs which may create an economic impact in the benefit of TST surgery.
- (IV) One important issue is the number of patients with myasthenia gravis. In this study we do not see any details regarding the details of the patients with myasthenia gravis in both groups. Myasthenia

gravis may affect the outcome in thymoma surgery as a predominant factor. Among the early stage patients, I would expect to see higher rate of Myasthenia gravis. As it may be approved by the anesthesiologists and chest surgeons, today it is much easier to handle and manage a myasthenic patient during an aggressive surgery due to development in anesthetic, neurologic and immunologic medications. As a surgeon who operated on myasthenic thymomas at early 1990s', I can reassure the readers the management of myasthenia gravis after a thymoma resection was much harder. Lower rate of complications in the robotic surgery group may be attributed to this explanation too. Seven patients in the TST group had the following major complications: 3 respiratory failures, 2 myasthenic crisis, 1 sternal dehiscence and 1 cardiac arrest. Two patients in the robot-assisted thoracic surgery (RATS) group presented with myasthenic crisis and hemothorax. According to this presentation 5 patients suffered from severe postoperative complications which may have a potential to develop due to myasthenia gravis or a transitional or permanent injury to phrenic nerve among TST patients.

- (V) After propensity score matching, 41 patients from the TST group were compared with 41 patients from the RATS group. Patient baseline characteristics and pathological data were similar in the 2 groups, except for tumor dimension. There may still a homogeneity problem existing.

Conclusions

The present study has some limitations, as authors stated. The number of patients, the non-randomized and retrospective fashion are the major limitations. The follow-up is still inadequate in RATS group. This does not allow for a definitive conclusion for the oncological outcome of the robotic surgery. By the propensity score matching the 2 populations may become comparable. I would argue that myasthenic patients hidden in both groups would have been the bottom line of this study.

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Footnote

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Ethical Statement: The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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