



Acceptance of minimally invasive surgery as a whole will dictate the future of robotic surgery

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Minimally invasive surgery (MIS) for thoracic diseases has proven advantages including decreased postoperative pain and hospital length of stay when compared to thoracotomy, and multiple studies provide data to suggest that MIS is oncologically equivalent to thoracotomy for the treatment of early stage lung cancer. Despite the evidence, thoracotomy remains the more commonly performed procedure with video-assisted thoracic surgery (VATS) being performed in about 30% of lobectomies (1-4). The question remains as to whether robotic or VATS is a superior approach to lobectomy for non-small cell lung cancer (NSCLC). This topic has also been the focus of many previous studies which reveal no clear-cut differences between the two in regards to post-operative outcomes (4-9). What makes the study by Yang *et al.* unique, is the use of propensity matching to differentiate between robotic, VATS, and open approaches to lobectomy (10). More specifically, this is a retrospective review of prospectively collected data from a single institution, Memorial Sloan-Kettering Cancer Center, comparing overall survival, disease-free survival, and perioperative outcomes among propensity matched patients with clinical stage I NSCLC who underwent lobectomy via either robotic surgery, VATS, or thoracotomy.

The cases included were propensity matched within a 3% probability of having a robotic procedure for age, sex, clinical stage, cell differentiation, lung function, and smoking status, yielding a total of 470 unique patients. Significant findings included a shorter hospital length of stay for those who underwent MIS, and specific to the robotic group, a greater number lymph node stations,

approximately five, were sampled. These perioperative differences, however, did not translate into improved 5-year overall survival or disease-free survival among the three groups. As expected, older age, current smoking status, clinical stage IB, poor cell differentiation, and reduced DLCO were prognostic factors for recurrence or death. Surgical approach was not a significant factor for recurrence or death upon multivariate analysis. Of note, although the authors point out an increased number of sampled lymph node stations in the robotic procedure, the details of lymph node harvest are not addressed. What one should consider is that the results of lymph node sampling may not be directly related to the capacity of the technique but rather to the effort and expertise of the operating surgeon. This phenomenon has previously been demonstrated. In a study by Boffa *et al.*, in clinical stage I primary lung cancers, nodal upstaging from cN0 to pN1 occurred more frequently using an open approach, yet as the use of VATS increased and when cases from VATS-predominant participants were compared to open-predominant participants, upstaging was identical (11). In another study by Medbery *et al.*, VATS resulted in a greater number of examined lymph nodes, but nodal upstaging occurred more often with an open approach. When patients underwent surgery at an academic facility, the significant difference in nodal upstaging during open surgery versus VATS was eliminated (2).

We would like commend the authors on this well organized and thorough comparison of the various surgical approaches to early stage lung cancer. Without the ability to conduct randomized controlled trials allocating patients

to either robotic, VATS, or thoracotomy for lobectomy, this is the best information that we have to date and may finally solidify the notion that MIS is as efficacious as open surgery. Related to this topic is the use of muscle sparing thoracotomies and enhanced recovery after surgery (ERAS) protocols for lobectomy when MIS is not technically feasible and the positive effects on perioperative outcomes (12). Further research is needed to determine the role of ERAS following open lobectomy.

In conclusion, although minimally invasive techniques for lobectomy are increasing in frequency, they still have not become mainstream. The results of this study provide further evidence that MIS is as oncologically sound as open techniques and highlights the similarities between VATS and robotic surgery. Nonetheless, a true comparison of VATS and robotic surgery is not realistic until MIS is accepted as oncologically equivalent to open cases and robotic technology becomes more readily available.

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