

Robotic lobectomy leads to excellent survival in lung cancer patients

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Pulmonary lobectomy has been the standard of care for patients with early-stage lung cancer (1). Over the years, advances in imaging technology and instrumentation have allowed us to provide surgical resection with smaller incisions. The development of video-assisted thoracic surgery (VATS) techniques and the ability to perform lobectomy with smaller incisions have significantly improved peri-operative morbidity, post-operative pain and length of stay compared to open thoracotomy (2-4). The initial concern with the VATS platform was that there would be worse survival rates compared to an open platform. This concern had been alleviated with studies showing that VATS lobectomy for lung cancer procedures provides better perioperative outcomes without any hinderance on 5-year survival (5-7) with some reports indicating that the VATS platform provides better survival (8-10). As the operative theater continues to improve, the newest advanced technology is computer-aided surgery, also known as robotic surgery. Outcomes of the robotic platform have shown similarly improved peri-operative morbidity, less post-operative pain and shorter length of stay compared to open surgery like the VATS platform (11). In addition, studies show that the robot platform has the added benefit of allowing more cases to be completed using minimally invasive approaches with fewer conversions to open thoracotomy compared to the VATS platform (12).

One of the questions with the robot platform has been the impact of the use of robot in pulmonary lobectomy on overall 5-year survival in non-small cell lung cancer

patients. The study by Cerfolio *et al.* (13) addresses this issue by performing a multi-institutional retrospective review study of a consecutive series of 1,339 patients from 2003 to 2016. The study collects data about the impact of robotic surgery in lung cancer survival from four major institutions with expert robot pulmonary surgeons. The study shows excellent stage specific 5-year survival rates with a median follow-up of 30 months and with an overall metastatic recurrence rate of 15% and local recurrence rate of 3%. The authors point out that the excellent survival with the robot surgery may be due to improved lymph node dissection that allows for better pathologic staging. The rationale is that those patients who would benefit from adjuvant chemotherapy are getting it because they are accurately staged.

The robot platform indisputably makes lymph node dissection easier compared to the VATS platform, but as the authors note, this is an operator dependent factor rather than a purely platform dependent factor. Thus, even with the robot platform, if the surgeon does not remove the lymph node, then the impact of robot platform on lymphadenectomy will be miniscule. Regardless of the platform, the degree of lymphadenectomy will be dependent on the surgeon performing the operation. However, this study shows that in expert hands with surgeons who are committed to lymphadenectomy, the robot platform can provide excellent overall survival.

This study adds to the growing literature about the benefits of robot pulmonary resection. Robotic surgery provides better short-term outcomes than open surgery and

allows more of the operation to be completed in minimally invasive means compared to VATS surgery and this study shows that it has acceptable 5-year survival results. The main question this study leaves for the thoracic community is whether the robot platform improves survival compared to VATS or an open platform especially for patients with higher stage lung cancer. Yang *et al.* (14) found that there was no significant difference in the survival for clinical stage I non-small cell lung cancer regardless of the surgical platform, however, questions remain about the benefits of the robot for patients with metastatic disease to the lymph nodes. To help answer this important question, researchers must at best conduct a randomized controlled trial comparing the three platforms with the end point of stage specific survival, but at minimum conduct a propensity match study for patients who underwent surgery with these different platforms. The results from these studies would help quantify the effectiveness of the robot platform compared to VATS or open platform in lung cancer survival.

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Footnote

Conflicts of Interest: The author has consulted for Intuitive Surgical, Olympus, and Medtronic.

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