Commentary

A decade of robotics in lung cancer surgery

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Provenance: This is an invited Commentary commissioned by the Section Editor Feichao Bao (Department of Thoracic Surgery, The First Affiliated Hospital, Zhejiang University, Hangzhou, China).

Comment on: Yang HX, Woo KM, Sima CS, *et al*. Long-term Survival Based on the Surgical Approach to Lobectomy For Clinical Stage I Nonsmall Cell Lung Cancer: Comparison of Robotic, Video-assisted Thoracic Surgery, and Thoracotomy Lobectomy. Ann Surg 2016. [Epub ahead of print].

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Minimally invasive approaches to cancer surgery have been widely embraced by many surgical specialties and for many the less invasive approach is used preferentially. For thoracic surgeons, lung cancer and pulmonary lobectomy is the dominant oncologic procedure but open thoracotomy remains the most commonly used approach to lung cancer resection. Minimally invasive lobectomy using a video assisted approach or VATS was first reported nearly 25 years ago (1) and despite multiple studies demonstrating clear benefits adoption has been slower than anticipated.

Just over a decade ago, robotic assisted lobectomy was introduced to North America with the hope that the perceived shortcomings of VATS lobectomy would be minimized and it might allow for great adoption of minimally invasive approach (2). In that decade, the use of robotic lobectomy has risen steadily and now comprises 14% of all minimally invasive lobectomies in the STS General Thoracic Surgery database (3). The performance of robotic lobectomy has been compared to VATS (4,5) and open lobectomy (6,7) in terms of clinical outcomes, complications and cost (8,9) with similarities to VATS in outcomes, a more favorable length of stay and pain than open and a higher cost per case.

However, the most important outcome that has yet to be evaluated is survival. Until recently, the quality of oncologic performance was being assessed using the surrogate measure of nodal upstage and short term survival (10). However, it is long term survival that matters most to patients with lung cancer. In a recent comparison of approaches for pulmonary lobectomy, Yang and colleagues from Memorial Sloan Kettering Cancer Center (MSKCC) (11) reviewed 2,132 patients with clinical stage I lung cancer using one of three surgical approaches. They propensity matched 470 patients (robotic =172, VATS =141, open =157) to analyze overall and disease free survival and determined the prognostic factors for death.

The results of this analysis confirm that in clinical stage I lung cancer that any one of the three approaches results in an overall 5 year survival rate of close to 80%. While this is a significant accomplishment, only about 60–65% of the cohort is non-small cell lung cancer. The remaining is made of up carcinoid tumors and "other" for which we cannot ascertain how the inclusion of these tumor types influences the overall survival duration. It is clear that histology was not shown to be a prognostic factor but a well-differentiated tumor was a positive influence on survival in the multivariable analysis.

The surrogate measure of nodal upstaging (pN0 to pN1/pN2) was similar between the groups though more nodal stations were sampled in the robotic group. While this remains a common measure to judge the quality of surgery, its association with survival or ability to be a marker for survival is less strong and likely should remain a marker of the quality of surgery rather than an estimator of survival. It also remains a marker of the surgeon's philosophy of care because even in the series there are patients who had no lymph nodes stations sampled. A reasonable goal should be at least a systemic nodal station sampling (12) but in my opinion a thorough thoracic lymphadenectomy should

be our goal in stage I tumors. There will always be a small but not insignificant number of patients that will benefit from resection of that nodal metastasis that might impact survival.

I think an important take home message from this study is that there are three options to perform lobectomy and all three yield similar oncologic results. However, both robotic and VATS provide a shorter length of stay likely from an ability to mobilize early due to lower levels of pain experienced. The importance of these findings is not to put one approach on notice, but to encourage more thoracic surgeons to embrace one of the minimally invasive platforms for treatment of early stage lung cancer for the benefit of their patient.

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Footnote

Conflicts of Interest: Dr. Louie has been a proctor for Intuitive Surgical and currently is a recipient of a restricted research grant from Intuitive Surgical.

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