Has the time come to declare video-assisted thoracic surgery lobectomy the standard of care for early stage lung cancer?

Steven Milman, Thomas Ng

Department of Surgery, The Warren Alpert Medical School of Brown University, Providence, USA

Correspondence to: Thomas Ng, MD. 2 Dudley Street, Suite 470, Providence, RI 02905, USA. Email: tng@usasurg.org.

Comment on: Zhao Y, Li G, Zhang Y, *et al*. Comparison of outcomes between muscle-sparing thoracotomy and video-assisted thoracic surgery in patients with cT1 N0 M0 lung cancer. J Thorac Cardiovasc Surg 2017 [Epub ahead of print].

Received: 01 August 2017; Accepted: 28 August 2017; Published: 21 September 2017.

doi: 10.21037/vats.2017.08.04

View this article at: http://dx.doi.org/10.21037/vats.2017.08.04

In the absence of a well-designed randomized trial, propensity-matched studies are often viewed as the next best level of evidence to guide patient management. Overwhelmingly, published propensity-matched studies from large national databases have all shown the video-assisted thoracic surgery (VATS) approach to be superior to thoracotomy for lobectomy in the surgical treatment of lung cancer. Propensity-matched studies using the Society of Thoracic Surgeons (STS) database (1,2), the American College of Surgeons Oncology Group (ACOSOG) Z0030 study database (3), the American College of Surgeons National Surgical Quality Improvement Program database (4), the Nationwide Inpatient Sample database (5), the surveillance epidemiology and end results (SEER)-medicare database (6), the cancer and leukemia group B (CALGB) 140202 study database (7), the European Society of Thoracic Surgeon database (8), the Premier Prospective Database (9), the French National Database (10), and the National Cancer Data Base (NCDB) (11) have all uniformly shown VATS lobectomy have a lower complication rate and a shorter length of hospital stay when compared with lobectomy by thoracotomy. The current study by Zhao *et al.* (12) adds to this growing list of published propensity-matched studies that find the VATS approach to be superior.

Zhao *et al.* (12) compared the VATS approach to muscle sparing thoracotomy for lobectomy in 482 matched patients with clinical stage I lung cancer. The VATS approach was found to have a longer operative time (98.8 *vs.* 78.0 minutes, P<0.001), fewer lymph node stations sampled (4.3 *vs.* 5.1, P<0.001), fewer lymph nodes resected (12.6 *vs.* 17.9, P<0.001), less chest tube days (3.7 *vs.* 4.8 days, P<0.001), shorter hospital stay (6.0 *vs.* 7.1 days, P=0.002) and fewer complications (3.3% *vs.* 9.1%, P=0.008). Operative mortality, recurrence free survival and overall free survival were not different between the two groups. Study weaknesses include the retrospective nature of the data, data from a single institution, the lack of complication grading, and the lack of clarity regarding if the VATS group represented the more recent cohort as the median follow up time for each group was not provided. Despite these limitations, this study by Zhao *et al.* (12) is consistent with the results from larger propensity-matched studies discussed above, finding advantage with the VATS approach for lobectomy.

Despite all the evidence in favor of VATS, the majority of resections for lung cancer in the USA continue to be performed by thoracotomy. The national rate of lobectomy by VATS is reported at approximately 25%, and even among Thoracic Surgeons, the utilization of the VATS approach for lobectomy remains under 50% as reported by STS database (11). With the preponderance of evidence pointing towards its superiority, it would seem that VATS lobectomy should be deemed the "standard of care" for the surgical treatment of early stage lung cancer. Then why has the adoption of the VATS approach been so slow? The answer lies in the fact that there is currently no well-designed multi-institutional randomized trial to provide us with the high level of evidence necessary to dramatically affected patient care. The need for such a randomized trial stems from the limitations of the current published propensity-matched studies and the concerns regarding nodal retrieval during VATS that seems to surface from time to time in the literature.

It is well known that propensity-matched studies are not substitutes for well-designed randomized trials as such studies can never account for all variables, known and unknown, that can affect the outcome. Although all the published propensity-matched studies, discussed above, effectively account for patient and tumor characteristics during matching, they all fail to account for surgeon characteristics (13). This limitation can significantly affect study results, especially in light of the study by Blasberg *et al.* (9), where the VATS approach was found to be associated with academic institutions, high volume surgeons and thoracic surgeons after multivariate analysis. VATS surgeons are likely to solely utilize the VATS approach, citing data supporting its superiority; while open surgeons are likely to solely utilize thoracotomy, citing the lack of a randomized studies and also perhaps because of their discomfort with the minimally invasive approach. Therefore even after careful application of propensity-score methods, it remains impossible to distinguish between the surgeon and the approach as they are inextricably intertwined. This limitation, termed inextricable confounding by Blackstone (14), is uniformly seen in all propensity-matched studies that compare VATS versus thoracotomy. By not accounting for surgeon characteristics, it leaves open the possibility that the advantages seen with VATS may be due to surgeon expertise rather than the approach itself, as suggested in an editorial by Wood (15).

With regards to lymph node retrieval during the VATS approach, the data is conflicting. Analysis from the STS database (16), the Danish lung cancer registry (17), meta-analysis by Zhang *et al.* (18), and even this current study by Zhao *et al.* (12), have shown that the VATS approach results in a lower number lymph nodes resected and less lymph node stations evaluated as compared to thoracotomy. In contrast, data from the SEER-Medicare database (6) and the NCDB (11) have shown the opposite, with VATS having a higher number of lymph nodes resected; while data from the ACOSOG Z0030 study (3) and the CALGB 140202 study (7) have shown no difference between the two groups with regards to lymph node retrieval. Ultimately, there is no difference between the two groups when long term oncologic endpoints of disease free and overall survival are evaluated, as shown by propensity-matched studies from the SEER-Medicare database (6), the CALGB 140202 study (7), the French National database (10), the Chinese multi-institutional registry (19) and this current study by Zhao *et al.* (12).

As to the current state of VATS lobectomy, the wide use of this minimally invasive technique continues to be hampered by the limitations of its propensity-matched studies and the continued controversy regarding lymph node retrieval continues. These issues can only be overcome by randomized trial, and we and others have long express the importance of conducting such a trial (6,10,13,15,18,20). If we truly believe that the VATS approach is better for our patients, then as VATS surgeons, we must set aside our bias to conduct a multi-institutional randomized trial. Through randomized trial, we must clearly demonstrate to the medical community its superiority in the important endpoints of complication, mortality, recurrence free survival and overall survival. If this is found to be so, VATS lobectomy should then be deemed the "standard of care" for early stage lung cancer and we should then see a rapid rise in the use this minimally invasive technique.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned and reviewed by the Section Editor Dr. Qiang Pu (Department of Thoracic Surgery, West China Hospital, Sichuan University, Chengdu, China).

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/vats.2017.08.04). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are 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.

References

1. Paul S, Altorki NK, Sheng S, et al. Thoracoscopic lobectomy is associated with lower morbidity than open lobectomy: a propensity-matched analysis from the STS database. J Thorac Cardiovasc Surg 2010;139:366-78.
2. Boffa DJ, Dhamija A, Kosinski AS, et al. Fewer complications result from a video-assisted approach to anatomic resection of clinical stage I lung cancer. J Thorac Cardiovasc Surg 2014;148:637-43.
3. Scott WJ, Allen MS, Darling G, et al. Video-assisted thoracic surgery versus open lobectomy for lung cancer: a secondary analysis of data from the American College of Surgeons Oncology Group Z0030 randomized clinical trial. J Thorac Cardiovasc Surg 2010;139:976-81; discussion 981-3
4. Phillips JD, Merkow RP, Sherman KL, et al. Factors affecting selection of operative approach and subsequent short-term outcomes after anatomic resection for lung cancer. J Am Coll Surg 2012;215:206-15.
5. Paul S, Sedrakyan A, Chiu YL, et al. Outcomes after lobectomy using thoracoscopy vs thoracotomy: a comparative effectiveness analysis utilizing the Nationwide Inpatient Sample database. Eur J Cardiothorac Surg 2013;43:813-7.
6. Paul S, Isaacs AJ, Treasure T, et al. Long term survival with thoracoscopic versus open lobectomy: propensity matched comparative analysis using SEER-Medicare database. BMJ 2014;349:g5575.
7. Nwogu CE, D'Cunha J, Pang H, et al. VATS lobectomy has better perioperative outcomes than open lobectomy: CALGB 31001, an ancillary analysis of CALGB 140202 (Alliance). Ann Thorac Surg 2015;99:399-405.
8. Falcoz PE, Puyraveau M, Thomas PA, et al. Video-assisted thoracoscopic surgery versus open lobectomy for primary non-small-cell lung cancer: a propensity-matched analysis of outcome from the European Society of Thoracic Surgeon database. Eur J Cardiothorac Surg 2016;49:602-9.
9. Blasberg JD, Seder CW, Leverson G, et al. Video-assisted thoracoscopic lobectomy for lung cancer: current practice patterns and predictors of adoption. Ann Thorac Surg 2016;102:1854-62.
10. Pagès PB, Delpy JP, Orsini B, et al. Propensity score analysis comparing videothoracoscopic lobectomy with thoracotomy: a french nationwide study. Ann Thorac Surg 2016;101:1370-8.
11. Yang CF, Sun Z, Speicher PJ, et al. Use and outcomes of minimally invasive lobectomy for stage I non-small cell lung cancer in the National Cancer Data Base. Ann Thorac Surg 2016;101:1037-42.
12. Zhao Y, Li G, Zhang Y, et al. Comparison of outcomes between muscle-sparing thoracotomy and video-assisted thoracic surgery in patients with cT1 N0 M0 lung cancer. J Thorac Cardiovasc Surg 2017. [Epub ahead of print].
13. Kuritzky AM, Aswad BI, Jones RN, et al. Lobectomy by video-assisted thoracic surgery vs muscle-sparing thoracotomy for stage I lung cancer: a critical evaluation of short- and long-term outcomes. J Am Coll Surg 2015;220:1044-53.
14. Blackstone EH. Comparing apples and oranges. J Thorac Cardiovasc Surg 2002;123:8-15.
15. Wood DE. What is most important in improving outcomes after pulmonary lobectomy: the surgeon or the approach? Eur J Cardiothorac Surg 2013;43:817-9.
16. Boffa DJ, Kosinski AS, Paul S, et al. Lymph node evaluation by open or video-assisted approaches in 11,500 anatomic lung cancer resections. Ann Thorac Surg 2012;94:347-53; discussion 353.
17. Licht PB, Jørgensen OD, Ladegaard L, et al. A national study of nodal upstaging after thoracoscopic versus open lobectomy for clinical stage I lung cancer. Ann Thorac Surg 2013;96:943-9; discussion 949-50.
18. Zhang W, Wei Y, Jiang H, et al. Video-assisted thoracoscopic surgery versus thoracotomy lymph node dissection in clinical stage I lung cancer: a meta-analysis and system review. Ann Thorac Surg 2016;101:2417-24.
19. Cao C, Zhu ZH, Yan TD, et al. Video-assisted thoracic surgery versus open thoracotomy for non-small-cell lung cancer: a propensity score analysis based on a multi-institutional registry. Eur J Cardiothorac Surg 2013;44:849-54.
20. Mathisen DJ. Is video-assisted thoracoscopic lobectomy inferior to open lobectomy oncologically? Ann Thorac Surg 2013;96:755-6.

doi: 10.21037/vats.2017.08.04

Cite this article as: Milman S, Ng T. Has the time come to declare video-assisted thoracic surgery lobectomy the standard of care for early stage lung cancer? Video-assist Thorac Surg 2017;2:66.