



Hybrid video-assisted thoracoscopic sleeve lobectomy: an elegant minimally invasive technique for locally advanced non-small cell lung cancer

Alexis P. Chidi, Mara B. Antonoff

Department of Thoracic & Cardiovascular Surgery, University of Texas MD Anderson Cancer Center, Houston, TX, USA

Correspondence to: Mara B. Antonoff, MD, FACS. Associate Professor, University of Texas MD Anderson Cancer Center, 1515 Holcombe Boulevard, Unit 1489, Houston, TX 77030, USA. Email: mbantonoff@mdanderson.org.

Comment on: Zhang C, Yu Z, Li J, et al. Hybrid video-assisted thoracoscopic surgery sleeve lobectomy for non-small cell lung cancer: a case report. *J Thorac Dis* 2020;12:6836-46.

Keywords: Lung cancer; minimally invasive surgery; sleeve lobectomy

Submitted Jan 15, 2023. Accepted for publication Jan 30, 2023. Published online Mar 22, 2023.

doi: 10.21037/jtd-23-77

View this article at: <https://dx.doi.org/10.21037/jtd-23-77>

In their published case report in the *Journal of Thoracic Disease*, Dr. Zhang and colleagues presented an interesting case, “Hybrid video-assisted thoracoscopic surgery sleeve lobectomy for non-small cell lung cancer: a case report” (1). The authors of this article described a hybrid technique for performing a complex bronchial sleeve resection and arterioplasty for a patient with locally advanced non-small cell lung cancer (NSCLC) of the right upper lobe with invasion into the right mainstem bronchus. The patient had previously undergone two cycles of neoadjuvant chemotherapy for N2 disease and, per report, required partial right mainstem bronchus resection along with arterioplasty to achieve a complete resection.

The authors shared their hybrid approach designed to improve upon the limitations of both open and purely video-assisted thoracoscopic surgical (VATS) techniques. Open thoracotomy remains the gold standard for complex bronchial and vascular resection and reconstruction for patients with locally advanced disease, particularly after neoadjuvant therapy. However, due to concerns about pain and longer length of stay associated with larger thoracotomy incisions and rib spreading, surgeons have begun to consider minimally invasive techniques for increasingly complex operations. While a few studies have demonstrated the safety and efficacy of performing double sleeve lobectomy using multiport (2) and uniportal VATS approaches (3,4), these operations can be technically

complex (5,6). Intraoperative challenges are due in part to the limited visualization and dexterity inherent to the VATS approach, which may render an already tough operation even more difficult.

The hybrid approach described in this case has several potential advantages. The authors use a large, 8 cm working port, which is smaller than that of a traditional thoracotomy and does not require rib spreading. This incision has theoretical advantages in terms of pain and length of stay over a traditional thoracotomy approach. At the same time, the hybrid approach allows surgeons to continue to enjoy some of the benefits of an open approach over VATS. These strengths include the ability to use a wider range of instruments and techniques for visualization and manipulation of critical structures, vascular control, and bronchial and vascular reconstruction. The separate camera port allows for better visualization and maneuverability than a uniportal approach. Although not utilized in this case, there are options for minimally invasive harvesting of intercostal muscle or other vascularized tissue flaps to buttress bronchial and/or vascular anastomoses.

The hybrid approach to complex sleeve lobectomy may have some limitations. Although the video accompanying this case report makes the hybrid technique look remarkably easy, VATS and hybrid approaches to sleeve lobectomy typically come with a steep learning curve (2,7). The authors’ hybrid approach may make sleeve operations more

accessible to some surgeons, however early-career surgeons and those with limited experience performing minimally invasive suturing should proceed with caution. For complex vascular reconstruction, the technical challenges of a VATS or hybrid approach may outweigh its theoretical benefits, particularly for surgeons with limited experience performing minimally invasive vascular procedures.

As the neoadjuvant use of targeted and immunotherapies becomes more widespread, it will be important to carefully consider the technical difficulty of these operations and ensure that patients are carefully selected for minimally invasive approaches. To date, several studies have reported technically challenging operations for patients who have received novel agents prior to surgery. In this patient population, up to 50% of operations are attempted minimally invasively, but 12–50% are converted to open thoracotomy due to significant inflammation, fibrosis, and extensive nodal reactions (8–12). Although there are more limited reports of sleeve resection following neoadjuvant chemo-immunotherapy, a few studies have demonstrated that it is feasible yet technically challenging. One study reported a 30% rate of conversion from VATS to a hybrid approach which may be similar to that described in this study (13), while another group was more successful in using a single port VATS approach with only one of eleven patients requiring thoracotomy (14). Given this evidence, for patients requiring sleeve resections with the potential for additional technical challenges due to neoadjuvant chemo-immunotherapy, it is reasonable to consider evaluating the anatomy first with thoracoscopy before determining whether a VATS, hybrid, or open thoracotomy approach would be safest.

In addition to open, VATS, and hybrid approaches, robotic-assisted sleeve resection has emerged as a fourth option for management of patients with complex, locally advanced lung cancers. While complex robotic-assisted operations are becoming increasingly common in the United States and abroad, Dr. Zhang and colleagues made the important point that the cost and availability of the robotic platform may preclude its use in several practice settings. Still, there are several examples in the literature of robotic-assisted approaches being used successfully in similarly complex situations (15–18). For highly skilled minimally invasive surgeons with access to a robotic surgery platform, there may be a limited role for this hybrid approach.

In summary, Dr. Zhang and colleagues presented an

elegant approach to minimally invasive management of locally advanced NSCLC with bronchial and vascular reconstruction. For carefully selected patients and highly experienced surgeons, this technique could combine several of the advantages of open thoracotomy with those of a VATS approach—with a smaller incision than a traditional thoracotomy and minimized rib spreading in addition to direct visualization and increased dexterity in performing complex bronchial and vascular reconstructions. As experience grows with hybrid and minimally invasive techniques for complex airway and vascular reconstruction, innovation in surgical technique will need to be balanced with perioperative and long-term safety outcomes, particularly for patients who have undergone neoadjuvant treatment.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Journal of Thoracic Disease*. The article did not undergo external peer review.

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at <https://jtd.amegroups.com/article/view/10.21037/jtd-23-77/coif>). 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.

Open Access Statement: This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license). See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

References

- Zhang C, Yu Z, Li J, et al. Hybrid video-assisted thoracoscopic surgery sleeve lobectomy for non-small cell lung cancer: a case report. *J Thorac Dis* 2020;12:6836-46.
- Huang J, Li J, Qiu Y, et al. Thoracoscopic double sleeve lobectomy in 13 patients: a series report from multi-centers. *J Thorac Dis* 2015;7:834-42.
- Gonzalez-Rivas D, Delgado M, Fieira E, et al. Left lower sleeve lobectomy by uniportal video-assisted thoracoscopic approach. *Interact Cardiovasc Thorac Surg* 2014;18:237-9.
- Guido W, Gonzalez-Rivas D, Duang L, et al. Uniportal video-assisted thoracoscopic right upper sleeve lobectomy. *J Vis Surg* 2015;1:10.
- Caso R, Watson TJ, Khaitan PG, et al. Outcomes of minimally invasive sleeve resection. *J Thorac Dis* 2018;10:6653-9.
- Pan X, Gu C, Wang R, et al. Initial Experience of Robotic Sleeve Resection for Lung Cancer Patients. *Ann Thorac Surg* 2016;102:1892-7.
- Deng J, Jiang L, Li S, et al. The learning curve of video-assisted thoracoscopic sleeve lobectomy in a high-volume pulmonary center. *JTCVS Tech* 2021;9:143-52.
- Bott MJ, Yang SC, Park BJ, et al. Initial results of pulmonary resection after neoadjuvant nivolumab in patients with resectable non-small cell lung cancer. *J Thorac Cardiovasc Surg* 2019;158:269-76.
- Cao C, Le A, Bott M, et al. Meta-Analysis of Neoadjuvant Immunotherapy for Patients with Resectable Non-Small Cell Lung Cancer. *Curr Oncol* 2021;28:4686-701.
- Feldman HA, Zhou N, Deboever N, et al. Intraoperative challenges after induction therapy for non-small cell lung cancer: Effect of nodal disease on technical complexity. *JTCVS Open* 2022;12:372-84.
- Hu Y, Ren SY, Wang RY, et al. Surgical Outcomes After Neoadjuvant Chemoimmunotherapy for Resectable Non-Small Cell Lung Cancer. *Front Oncol* 2021;11:684070.
- Romero Román A, Campo-Cañaverl de la Cruz JL, Macía I, et al. Outcomes of surgical resection after neoadjuvant chemoimmunotherapy in locally advanced stage IIIA non-small-cell lung cancer. *Eur J Cardiothorac Surg* 2021;60:81-8.
- Liang H, Yang C, Gonzalez-Rivas D, et al. Sleeve lobectomy after neoadjuvant chemoimmunotherapy/chemotherapy for local advanced non-small cell lung cancer. *Transl Lung Cancer Res* 2021;10:143-55.
- Yao Y, Tang D, Gao W, et al. Neoadjuvant Immunotherapy: A New Perspective for Stage III NSCLC? *Front Surg* 2022;9:843987.
- Egberts JH, Möller T, Becker T. Robotic-Assisted Sleeve Lobectomy Using the Four-Arm Technique in the DaVinci Si® and Xi® Systems. *Thorac Cardiovasc Surg* 2019;67:603-5.
- Cerfolio RJ. Robotic sleeve lobectomy: technical details and early results. *J Thorac Dis* 2016;8:S223-6.
- Geraci TC, Ferrari-Light D, Wang S, et al. Robotic Sleeve Resection of the Airway: Outcomes and Technical Conduct Using Video Vignettes. *Ann Thorac Surg* 2020;110:236-40.
- Pan X, Gu C, Yang J, et al. Robotic double-sleeve resection of lung cancer: technical aspects. *Eur J Cardiothorac Surg* 2018;54:183-4.

Cite this article as: Chidi AP, Antonoff MB. Hybrid video-assisted thoracoscopic sleeve lobectomy: an elegant minimally invasive technique for locally advanced non-small cell lung cancer. *J Thorac Dis* 2023;15(4):1533-1535. doi: 10.21037/jtd-23-77