



# Patient selection for minimally-invasive resection of complex, central lung tumors: taking account of the surgeon's eyeball test

Nathaniel Deboever, Mara Antonoff

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

Correspondence to: Nathaniel Deboever, MD. Department of Thoracic and Cardiovascular Surgery, University of Texas MD Anderson Cancer Center, 1400, Pressler Street, Houston, TX 77030, USA. Email: [ndeboever@mdanderson.org](mailto:ndeboever@mdanderson.org).

Comment on: Nitsche LJ, Jordan S, Demmy T, *et al.* Analyzing the impact of minimally invasive surgical approaches on post-operative outcomes of pneumonectomy and sleeve lobectomy patients. *J Thorac Dis* 2023;15:2497-504.

**Keywords:** Video-assisted thoracic surgery (VATS); sleeve lobectomy; pneumonectomy

Submitted Apr 28, 2023. Accepted for publication Jun 09, 2023. Published online Jul 04, 2023.

doi: [10.21037/jtd-23-715](https://doi.org/10.21037/jtd-23-715)

View this article at: <https://dx.doi.org/10.21037/jtd-23-715>

Surgical planning for lung cancer resection is a complex process that is influenced by a multitude of variables, including patient-specific factors, the extent and location of the disease, and the operative environment, expertise, and resources (1). Advanced surgical techniques, such as sleeve lobectomy and pneumonectomy, may be required in order to achieve adequate oncologic resection of centrally located tumors (2). These procedures may be approached using either thoracotomy or minimally-invasive techniques (3-5). The decision to undertake such procedures should be made after a thorough multidisciplinary discussion at a center that possesses adequate surgical and perioperative experience to ensure optimal recovery and oncologic outcomes (6,7).

In a recent issue of the *Journal of Thoracic Disease*, Nitsche and colleagues present a retrospective review of patients who underwent either sleeve resection or pneumonectomy, via thoracotomy or thoracoscopy (8). The authors report outcomes from this heterogeneous cohort of 108 patients, showing that patients who underwent sleeve resection had better survival rates than those who underwent pneumonectomy. A multivariable analysis confirmed this finding and further revealed that the surgical approach did not correlate with survival differences, despite a convincing odds ratio (3.09, 95% confidence interval: 1.62–5.89) associated with the receipt of thoracotomy. This investigation conducted by the Roswell Park Comprehensive Cancer Center group is highly relevant to thoracic surgical practice, as it has the potential to provide

valuable insights into the optimal resection technique and approach for patients with central lung tumors.

While we acknowledge the important merits of this study, it is essential to also consider that there are limitations to these analyses, which ultimately influence their prospective applicability in the clinical setting. Certainly, there are a number of nuances that may necessitate consideration during discussions of informed consent and surgical planning, as well as intraoperative surgical decision making. Therapeutic strategies in this population are multidimensional and include patient- and disease-related factors, rendering the retrospective pooled evaluation of patients requiring two different operations to be flawed. While we acknowledge that, from a surgeon's perspective, patients undergoing sleeve resections and pneumonectomies may have similar anatomic appearances to their tumors, these patient populations are simply not at the same risk for postoperative events. This pooled analysis represents a heterogeneous group, recognizing that postoperative issues after parenchymal sparing procedures are very different than after removal of an entire lung. Conducting a univariate analysis of baseline characteristics could have helped to identify these differences.

Furthermore, patient selection for thoracotomy versus thoracoscopy also depends on disease and patient factors (9). Therefore, comparing outcomes without including patient performance status or disease location may not represent a controlled assessment. The nuances that influence the

decision of operative approach may not be captured in collected variables but may be considered by the surgeon who selects one operative approach over another. It is important to note that expected surgical complexity should also be considered in patient selection for these procedures. Our group has previously shown that resections following the receipt of neoadjuvant systemic or radiation therapies, while challenging, can still be performed safely (7,10,11). The receipt of systemic therapy is not mentioned in the discussed manuscript but may have caused an increase nodal fibrosis or extensive tissue scarring leading to varying outcomes depending on the procedure and approached used (12).

With regard to the differences in short-term mortality between the operations evaluated (as shown in *Tab. 2* of the discussed manuscript), it's important to consider that these findings may be attributed to differences in post-operative physiological changes. These factors should be taken into consideration when making treatment decisions for patients requiring resection of central tumors. The most common acute events specific to each of the operations, such as acute respiratory distress syndrome or bronchopleural fistulas occurring at higher rates following pneumonectomy (9), may potentially drive this difference in mortality, as nicely highlighted in *Tab. 3* of the discussed manuscript.

The study conducted by Nitsche and colleagues provides valuable insights into the outcomes of both sleeve lobectomy and pneumonectomy performed via varying approaches. We believe that these findings can set a foundation for future innovations as well as baseline of expected outcomes, provided that one acknowledges that the decision-making process for selecting the appropriate surgical approach remains complex and multidimensional. It is important to consider factors clearly inherent to the patient's disease, their comorbidities, their performance and social status, as well as expected surgical complexity, in order to achieve optimal outcomes. Moreover, we cannot negate the influence of surgeon gestalt and experience in selecting patients for minimally invasive versus open operations, recognizing that surgeons will likely choose an open approach for patients whom they expect to have more complex operations and who are also at risk for greater postoperative adverse events and poorer long-term recurrence and survival outcomes.

Ultimately, in advanced centers, such as that of the authors, resections of complex cases can be performed safely with careful consideration of patient and disease characteristics. Extrapolation to other centers will require

careful evaluation of all resources, experience, and expertise available, with clear acknowledgement of the inherent surgical gestalt that led the authors to be able to select patients for minimally invasive versus open operations.

## 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-23-715/coif>). MA serves as an unpaid editorial board member of *Journal of Thoracic Disease* from August 2021 to July 2024. The other author has 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.

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**Cite this article as:** Deboever N, Antonoff M. Patient selection for minimally-invasive resection of complex, central lung tumors: taking account of the surgeon's eyeball test. *J Thorac Dis* 2023;15(7):3522-3524. doi: 10.21037/jtd-23-715