for stage IIIA disease. Furthermore, locoregional recurrence was not different between groups, but distant recurrence was significantly greater for the pneumonectomy patients invoking the more advanced stage in this group. It is not entirely clear if neoadjuvant or adjuvant therapy was employed in these patients and if there was any impact on survival.

This study represents the largest single-center study comparing outcomes for sleeve lobectomy and pneumonectomy. One should take note that recurrence was greater for pneumonectomy in all stages and was most significant for stage III disease. The distinction of worse overall and disease-free survival of pneumonectomy (n = 250) versus sleeve lobectomy (n = 256) for N2 disease is a novel finding and is rather striking on the Kaplan–Meier curves in the supplementary data. This observation may be a metric that surgeons can use when considering pneumonectomy

for resectable N2 disease where clearance of all original central lymphatic disease may become less important with improving systemic therapies.

References

1. Deslauriers J, Gregoire J, Jacques LF, Piraux M, Guojin L, Lacasse Y. Sleeve lobectomy versus pneumonectomy for lung cancer: a comparative analysis and sites of recurrence. *Ann Thorac Surg*. 2005;79:1467.
2. Pagès PB, Mordant P, Renaud S, Bouchet L, Thomas PA, Dahan M, et al. Sleeve lobectomy may provide better outcomes than pneumonectomy for NSCLC. A decade in a nationwide study. *J Thorac Cardiovasc Surg*. 2017; 153:184-95.
3. Abdelsattar ZM, Shen RK, Yendamuri S, Cassivi S, Nichols FC, Wigle DA, et al. Outcomes after sleeve lung resections versus pneumonectomy in the United States. *Ann Thorac Surg*. 2017;104:1656-64.
4. Forde PM, Chaft JE, Smith KN, Anagnostou V, Cottrell TR, Hellmann MD, et al. Neoadjuvant PD-1 blockade in resectable lung cancer. *N Engl J Med*. 2018;378: 1976-86.
5. Chen J, Soultanis KM, Sun F, Gonzalez-Rivas D, Duan L, Wu L, et al. Outcomes of sleeve lobectomy versus pneumonectomy: a propensity score-matched study. *J Thorac Cardiovasc Surg*. 2021;162:1619-28.e4.

See Article page 1619.

Commentary: To sleeve or not to sleeve: Still a question?

Kenneth P. Seastedt, MD,^a and
Chuong D. Hoang, MD^b

Despite sleeve resections being performed since the 1940s as an alternative to pneumonectomy for lung cancers, the benefits of this technique continued to be debated.¹ Chen and colleagues,² in this issue of the *Journal*, retrospectively summarize their experience of patients who underwent pneumonectomy versus bronchial sleeve resection (with or without vascular sleeve or arterioplasty) for centrally

Kenneth P. Seastedt, MD (left), and Chuong D. Hoang, MD (right)

CENTRAL MESSAGE

Analysis of a large, single-institution series of sleeve resection versus pneumonectomy for central lung cancer supports the preference of a lung-sparing technique whenever the anatomy is permissible.

located tumors. It represents among the largest series and attempts to improve the ongoing discussion regarding the benefits of sleeve resection.³ Certainly, their results will serve as a benchmark for future clinical comparisons.

In total, 1981 patients met inclusion criteria and were propensity score-matched to groups of 665 patients in each

From the ^aDepartment of Surgery, Uniformed Services University of the Health Sciences F. Edward Hébert School of Medicine; and ^bThoracic Surgery Branch, National Cancer Institute–National Institutes of Health, Center for Cancer Research, and The Clinical Center, Bethesda, Md.

Disclosures: The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication Aug 30, 2020; revisions received Aug 30, 2020; accepted for publication Aug 31, 2020; available ahead of print Sept 3, 2020.

Address for reprints: Chuong D. Hoang, MD, 10 Center Dr, Mail Code 1201, Room 4-3940, Bethesda, MD 20892 (E-mail: chuong.hoang@nih.gov).

J Thorac Cardiovasc Surg 2021;162:1630-1

0022-5223/\$0.00

Published by Elsevier Inc. on behalf of The American Association for Thoracic Surgery

<https://doi.org/10.1016/j.jtcvs.2020.08.100>

treatment arm. The authors found significant differences among those patients undergoing sleeve resection compared with pneumonectomy that include lower 90-day mortality, lower postoperative complications, lower incidence of bronchopleural fistula, lower rates of postoperative acute respiratory distress syndrome, and shorter postoperative stay. Regarding survival differences, the authors analyzed each study cohort according to 3 groupings of 5-year intervals: 2003-2007, 2008-2012, and 2013-2017. Sleeve lobectomy significantly improved 1-, 3-, and 5-year overall survival (OS) and disease-free survival (DFS) compared with pneumonectomy. At 3 years, there were fewer overall recurrences in the sleeve resection group, with no significant difference in local recurrence. Five-year OS and DFS were significantly longer in the sleeve group for N0 and N2 nodal status, but not for N1 disease.

Overall, this report echoes some findings of previous studies but, given the multiple instances of dissimilarity from historical data, certain results should be interpreted with caution. Namely, postoperative complications after sleeve (3.61%) and pneumonectomy (8.72%) were exceedingly low compared with other series, as exemplified in a meta-analysis of 14,194 patients reporting rates of 29.3% and 30.6% respectively.³ The authors did not observe any arrhythmias in either group over the entire 15-year study, which raises concerns for unaccounted data. In addition, they found improved OS and DFS for N2 disease with sleeve resection, whereas previous reports found no difference.⁴ Lastly, clinical practices evolved over the long time-span of this analysis, which can bias outcome measures in a complex manner. For example, endobronchial ultrasound mediastinal staging and positron emission tomography scan were only employed in the most recent 5-year interval, leading to a lower incidence of N2 and stage III as compared with the earlier time intervals. The less-rigorous clinical

staging in the earlier time intervals may have skewed the outcomes (ie, recurrence rate, 3-, or 5-year survival) to obscure the specific effects of the surgical method used.

This report and many others support sleeve resection for patients with appropriate anatomy because of similar oncologic outcomes, improved quality of life, and cost-effectiveness.³⁻⁵ It will not be practical to compare these surgical approaches in a randomized prospective manner. However, given continuous technical advancement in medicine and technology, we look forward to the conversation centering on the best approach of sleeve resection for yet-unanswered questions of tissue coverage, open versus minimally invasive, and the impact of neoadjuvant/adjuvant therapy on outcomes.⁶⁻⁸

References

1. Mason GA. The present position relating to cancer of the lung: symposium by the Thoracic Society. *Thorax*. 1960;15:1-21.
2. Chen J, Soultanis KM, Sun F, Gonzalez-Rivas D, Duan L, Wu L, et al. Outcomes of sleeve lobectomy versus pneumonectomy: a propensity score-matched study. *J Thorac Cardiovasc Surg*. 2021;162:1619-28.e4.
3. Li Z, Chen W, Xia M, Liu Y, Inci I, Davoli F, et al. Sleeve lobectomy compared with pneumonectomy for operable centrally located non-small cell lung cancer: a meta-analysis. *Transl Lung Cancer Res*. 2019;8:775-86.
4. Deslauriers J, Grégoire J, Jacques LF, Piraux M, Guojin L, Lacasse Y. Sleeve lobectomy versus pneumonectomy for lung cancer: a comparative analysis of survival and sites or recurrences. *Ann Thorac Surg*. 2004;77:1152-6.
5. Ferguson MK, Lehman AG. Sleeve lobectomy or pneumonectomy: optimal management strategy using decision analysis techniques. *Ann Thorac Surg*. 2003;76:1782-8.
6. Cusumano G, Marra A, Lococo F, Margaritora S, Siciliani A, Maurizi G, et al. Is sleeve lobectomy comparable in terms of short- and long-term results with pneumonectomy after induction therapy? A multicenter analysis. *Ann Thorac Surg*. 2014;98:975-83.
7. Xie D, Deng J, Gonzalez-Rivas D, Zhu Y, Jiang L, Jiang G, et al. Comparison of video-assisted thoracoscopic surgery with thoracotomy in bronchial sleeve lobectomy for centrally located non-small cell lung cancer. *J Thorac Cardiovasc Surg*. March 25, 2020 [Epub ahead of print].
8. Storelli E, Tutic M, Kestenholz P, Schneiter D, Opitz I, Hillinger S, et al. Sleeve resections with unprotected bronchial anastomoses are safe even after neoadjuvant therapy. *Eur J Cardiothorac Surg*. 2012;42:77-81.