Deciphering postoperative respiratory function after pulmonary resections

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Risk assessment in lung cancer surgery has become increasingly important as the indications for minimally invasive surgery expand to include the elderly and patients with complex comorbidities. Clinicians routinely perform a comprehensive evaluation of the patient's general condition to determine the surgical approach. Measuring predictive lung function plays a vital role in decision-making. Whether postoperative pulmonary function prediction should be performed in high-risk patients, as in other patients, is controversial. Subotic reported a narrative review in response to several clinical questions regarding postoperative lung function (1). Subotic concluded that some evidence gaps and specific situations should be considered, as well as adherence to evidence-based guidelines. We read this paper with interest and offer the following comments.

The American College of Chest Physicians guidelines recommend calculating predicted postoperative respiratory function in all patients scheduled for pulmonary resection (2). A large United States database analysis showed that predicted postoperative forced expiratory volume 1 (FEV1)% was a significant predictive factor for perioperative pulmonary complications after lobectomy and predicted that postoperative diffusing capacity for carbon monoxide (DLCO)% was a significant predictor of pulmonary complications and operation-related death after lobectomy. Therefore, the importance of calculating predicted postoperative respiratory function was supported (3).

The decrease in FEV1 in chronic obstructive pulmonary disorder (COPD) patients is smaller or improves postoperatively compared with the change in FEV1 in non-COPD patients (1). However, no long-term and sustained improvement in lung function has been observed in patients with COPD. We suspect that compensatory dilation of the residual lung is completed earlier in COPD owing to the fragile elasticity of the lungs. Lung volume reduction surgery for patients with severe emphysema, especially those with heterogeneous disease, could affect the positive correlation between changes in quality of life and FEV1, forced vital capacity (VC), and 6-minute walking distance (4). However, excessive expectations of volume reduction effects on lung cancer surgery in patients with COPD should be avoided. Increased postoperative pulmonary complications have been reported in patients with emphysema with increased emphysematous changes (5). Although postoperative lung function may be underestimated in patients with emphysema, a

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comprehensive surgical decision that includes performance status, other comorbidities, and social background is desirable.

Lung surgery for lung cancer with interstitial pneumonia (IP) is a high-risk procedure, and great care is required to determine the indication for surgery. Mimae *et al.* reported postoperative pulmonary function in 37 (13.4%) patients with IP (6). They assessed respiratory function by subtracting the predicted postoperative VC% based on the preoperative values from the actual postoperative %VC after lobectomy. The calculated %VC deviation was 9.4% (0.3% to 14.8%) for normal lungs, −2.9% (−10.9% to 8.0%) for possible usual IP (UIP), and −6.7% (−7.9% to 8.5%) for UIP (data were shown as medians with interquartile ranges). The %VC after lobectomy worsened with increasing severity of IP. Thus, in these patients, it is necessary to consider the risk of acute postoperative exacerbation, a greater decline in respiratory function, and a related decline in life function.

A recent phase 3 randomized controlled trial (JCOG0802/WJCOG4607L) evaluated the difference in prognosis between segmentectomy and lobectomy in patients with clinical stage IA non-small cell lung cancer (NSCLC) (tumor diameter ≤2 cm; consolidation-to-tumor ratio >0.5) (7). With regard to respiratory function, the median reductions in FEV1 after segmentectomy and lobectomy were 10.4% (range, 4.7–16.6%) versus 13.1% (range, 7.0–20.5%) at 6 months, respectively. At 12 months, the median reductions in FEV1 after segmentectomy and lobectomy were 8.5% (range, 3.5–14.8%) and 12.0% (range, 5.6–18.8%), respectively. The segmental resection group had better postoperative lung function than the lobectomy group. However, they did not reach the 10% clinical significance threshold predefined for this study. The better-than-expected recovery of lung function after lobectomy is speculated to be the reason for the slight difference in postoperative lung function between lobectomy and segmentectomy. Meanwhile, the 5-year recurrence-free survival rates were 88.0% for segmentectomy and 87.9% for lobectomy [hazard ratio (HR) =0.998; 95% confidence interval (CI): 0.753–1.323; P=0.9889]. Local relapse rates were 10.5% and 5.4% for segmentectomy and lobectomy, respectively (P=0.0018). However, the 5-year overall survival was better with segmentectomy (94.3%) than with lobectomy (91.1%) (HR =0.663; 95% CI: 0.474–0.927; P<0.0001). In the lobectomy group, excessive deaths occurred because of other cancers and respiratory or cerebrovascular diseases. However, some pulmonary segmentectomies require complex procedures. In previous reports, postoperative complications were higher than in lobectomies (8). In the future, the indication for early-stage lung cancer segmentectomies will likely be recommended, but comprehensive and more careful operative decisions are needed. Finally, challenges regarding optimal diagnostic and therapeutic approaches remain in clinical practice.

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References

1. Subotic D. Lung function assessment before anatomical lung resections—is everything so clear?—a narrative review. AME Med J 2022;7:27.
2. Brunelli A, Kim AW, Berger KI, et al. Physiologic

evaluation of the patient with lung cancer being considered for resectional surgery: Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. Chest 2013;143:e166S-90S.
3. Burt BM, Kosinski AS, Shrager JB, et al. Thoracoscopic lobectomy is associated with acceptable morbidity and mortality in patients with predicted postoperative forced expiratory volume in 1 second or diffusing capacity for carbon monoxide less than 40% of normal. J Thorac Cardiovasc Surg 2014;148:19-28, dicussion 28-9.e1.
4. Seadler B, Thuppal S, Rizvi N, et al. Clinical and Quality of Life Outcomes After Lung Volume Reduction Surgery. Ann Thorac Surg 2019;108:866-72.
5. Makino Y, Shimada Y, Hagiwara M, et al. Assessment of emphysema severity as measured on three-dimensional computed tomography images for predicting respiratory complications after lung surgery. Eur J Cardiothorac Surg 2018;54:671-6.
6. Mimae T, Miyata Y, Kumada T, et al. Interstitial pneumonia and advanced age negatively influence postoperative pulmonary function. Interact Cardiovasc Thorac Surg 2022;34:753-9.
7. Saji H, Okada M, Tsuboi M, et al. Segmentectomy versus lobectomy in small-sized peripheral non-small-cell lung cancer (JCOG0802/WJOG4607L): a multicentre, open-label, phase 3, randomised, controlled, non-inferiority trial. Lancet 2022;399:1607-17.
8. Ohtsuka T, Kamiyama I, Asakura K, et al. Thirty-day outcomes after lobectomy or segmentectomy for lung cancer surgery. Asian Cardiovasc Thorac Ann 2015;23:828-31.

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