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Commentary: 3D-imaging and surgical precision: How small can the anatomic resection be?

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Lung metastasectomy is a complementary step in the treatment of primary neoplasms at other sites. Guidelines based on retrospective series and analyses of large databases support the surgical resection of lung metastases when the primary cancer is controlled.^{1,2} Two concepts should be integrated when performing a metastasectomy: (1) a lung-sparing procedure and (2) a minimally invasive approach, which is known to yield superior functional outcomes, shorter hospital stays, and a shorter duration of chest tube drainage and epidural analgesia.³ One of the current oncologic criteria for pulmonary metastasectomy is that all of the tumor must be resectable with adequate pulmonary reserve.⁴ Lung function testing is important during the preoperative evaluation, and cumulative parenchymal loss must be considered when multiple lesions are present.⁵ Although parenchyma-sparing procedures, such as anatomic segmentectomy, remain the gold standard for treating lung metastases, it is unusual to perform anatomic segmentectomy of the middle lobe, because it is responsible for only about 15% of lung function.⁶ Limited pulmonary resection does not improve late postoperative lung function, and sublobar resections have a greater risk of air leak, as they do not follow anatomical planes.^{7,8} It can also be difficult to ensure that the lesion is completely resected with adequate surgical margins.

In this issue of *JTCVS Techniques*, Obayashi and colleagues⁹ present a case of a S4a subsegmentectomy



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CENTRAL MESSAGE

VATS metastasectomy with middle lobe subsegmentectomy is facilitated by 3D computed tomography imaging.

performed together with wedge resections of the right upper lobe (RUL) and right lower lobe (RLL) for the resection of 3 lung metastases of colon cancer. The 53-year-old male patient had undergone resection for sigmoid colon cancer (pathologic stage IIIB) and presented with lung metastases 1 year after colon resection. One of the metastases was located in the upper segment of the RLL, and the other 2 were located close to the fissure between the middle lobe and the RUL. Three-dimensional computed tomography imaging reconstruction facilitated the surgical planning and allowed precise localization of the lesions and vessels and assessment of the volume of parenchymal resection. The authors determined that the metastasis in the middle lobe was close to an artery and required anatomic resection, but they were concerned that right middle lobectomy with accompanying wedge resections of the RUL and RLL would be more extensive than necessary and instead opted for a procedure with greater preservation of the parenchyma. The accompanying video elegantly shows how the authors performed this subsegmental resection.

After identifying the metastasis in the middle lobe by finger palpation to secure the surgical margin, they dissected the intersegmental plane between S4a and S4b using an electrocautery along the inflation-deflation line. The intersegmental vein (V2c) was resected because the metastasis in the RUL was located along this vein. After resecting V2c, the margin on the RUL side was resected using a stapler, and the RUL and middle lobe metastases were removed together. Subsequently, the RLL metastasis was removed by wedge resection. There were no postoperative complications, chest tube drainage was necessary for 2 days, and hospital stay length was 6 days.

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Segmental resection of the middle lobe, as performed by these authors, may be a good option for patients with impaired lung function. In patients who may develop new lung metastases, preservation of the lung parenchyma might allow future treatments. Reconstruction with 3-dimensional computed tomography imaging allows adequate and appropriate surgical planning for the performance of this type of complex procedure. In addition, video-assisted, minimally invasive, thoracoscopic surgery facilitates anatomic lung-sparing resection when multiple nodules are present. The authors describe the technique in detail, with very informative images and a video of excellent quality.

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