Editorial

Editorial on "robotic versus thoracoscopic combined anatomic subsegmentectomy for early stage lung cancer: early results of a cohort study"

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As reported in the study titled "Robotic versus thoracoscopic combined anatomic subsegmentectomy for early stage lung cancer: Early results of a cohort study", by Jian Z, Li C, Feng X *et al.* (1), it is safe and feasible for early-stage non-small cell lung cancer (NSCLC) patients to be treated using combined anatomic subsegmentectomy via robot-assisted surgery (RATS) or video-assisted thoracic surgery (VATS). The robotic approach may improve N1 and N2 lymph node retrieval.

Currently, segmentectomy is widely used and many papers have reported that its long-term outcomes in peripheral small NSCLC tumors are similar to those of standard lobectomy (2,3). Notably, the phase III randomized trial, Japan Clinical Oncology Group (JCOG) 0802/West Japan Clinical Oncology Group (WJOG) 4607L (JCOG0802/WJOG4607L), found that patients benefit more from segmentectomy than lobectomy in terms of overall survival. Thus, currently, segmentectomy can be considered to be the standard surgical intervention for peripheral small NSCLC tumors.

However, segmentectomy seems to be more technically complex than lobectomy. Based on the safety results from trial JCOG0802/WJOG4067, most postoperative measures of intraoperative and postoperative complications do not differ between segmentectomy and lobectomy patients. However, the incidence of fistula/pulmonary-lung (air leak) was 3.8% and 6.5% in patients in the lobectomy and segmentectomy arms, respectively (P=0.04). Multivariable analysis revealed that predictors of pulmonary complications, including air leak and empyema (grade ≥2) were complex in segmentectomy versus lobectomy (odds ratio: 2.07, 95% confidence interval: 1.11–3.88, P=0.023) (4). Although more complications were expected in subsegmentectomy, the authors observed only one (3.3%) and two (6.3%) air leak cases (grade ≥2) in RATS and VATS subsegmentectomy, respectively, indicating that for skilled surgeons, subsegmentectomy may be safe.

Several recent studies indicate that RATS and VATS segmentectomy have similar perioperative outcomes (5-7). A meta-analysis of 18 studies involving 60,349 patients (RATS: 8,726, VATS: 51,623) found that most clinical parameters, including conversion rate, days to chest tube removal, postoperative hospitalization time, and in-hospital mortality did not differ significantly between RATS and VATS segmentectomy. However, although the operation time was longer, the incidence of postoperative complications was lower and more lymph nodes were retrieved in the RATS group. The authors' results are consistent with those of this meta-analysis.

Based on my personal experience, I consider RATS to be more effective in segmentectomy because it offers three-dimensional vision, greater flexibility, and better assistance for surgeons, although it has disadvantages, such as unsatisfactory tactile feedback and higher cost.

There are several fundamental steps for ensuring safe and secure subsegmentectomy in early NSCLC, which every thoracic surgeon should keep in mind (*Figure 1*).

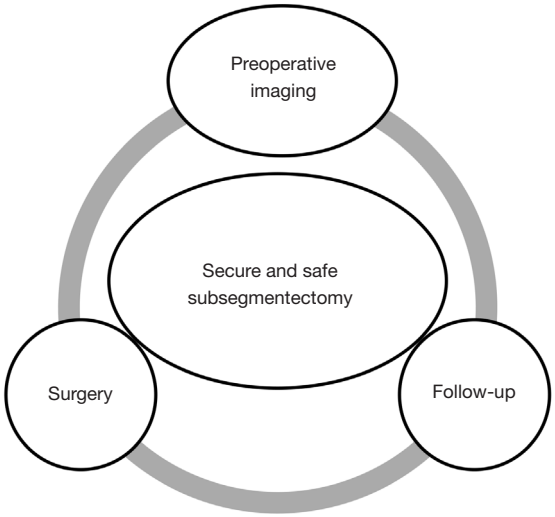

Figure 1 Fundamental steps for ensuring safe and secure subsegmentectomy in early non-small cell lung cancer.

Preoperative imaging

First, although C/T ratio is the gold standard for evaluating tumor invasiveness, where possible, SUVmax may be helpful. Second, in case the tumor is not palpable and visible, markings to identify a secure surgical margin, such as VAL-MAP (8), RFI (9), or CT-guided hook wire localization should be considered. Third, because lung segmentectomy is technically challenging because of the lungs' complex segmental and subsegmental anatomy and frequent anomalies, surgeons and their assistants must examine the anatomy of pulmonary arteries and veins using 3D-CT before surgery. Recently, several reports on the precise anatomy of each lobe have been published, which is very helpful (10). Finally, in future, chest CT screening programs will reveal small GGO-dominant NSCLC tumors more frequently. A multi-institutional, single-arm confirmatory trial on the efficacy and safety of watchful waiting in patients with radiologically non-invasive lung cancer has been conducted (11). This study will clarify how to follow up small tumors that do not require surgery.

Surgery

First, intraoperative lymph node examination is needed to avoid incomplete resection of potential N1 or N2 disease, and if positive, standard lobectomy should be performed. We have previously reported the effectiveness of the semi-dry dot-blotting (SDB) method of detecting intraoperative lymph node (LN) metastasis as a quick, cost-effective procedure that does not require special technical expertise (12). Moreover, another study described intraoperative LN diagnosis during segmentectomy using rapid immunohistochemistry and noncontact alternating current electric field mixing (13). Second, air-leak management is also important. We usually perform stapler-based segmentectomy and use fibrin glue and polyglycolic acid sheet. Finally, it is very important to obtain a sufficient surgical margin and not to emphasize on subareolar resection.

Follow up

Because GGO-dominant small NSCLC tumors requiring segmentectomy often have small lesions in other lobes (i.e., synchronous multiple lung cancers), follow-up on these lesions, as well as the primary lesion is also necessary. Additionally, long-term follow up might be required for metachronous lung cancer (14). Moreover, other complications, such as suture granuloma or recurrence may occur. Usuda *et al.* (15) have reported on the usefulness of diffusion-weighted magnetic resonance imaging or FDG-PET/CT in distinguishing them.

There are several limitations in this article. First, as mentioned by the authors, this was a retrospective study involving a small cohort. I think the study had a lot of bias and it may have been difficult to report the oncological results because of the short follow up period. Second, as mentioned above, PET/CT has recently emerged as an essential modality for qualitative diagnosis of small lung cancer tumors, along with C/T ratio (16). I understand that the uptake of FDG by small GGO-dominant tumors is sometimes low and that this strategy is expensive to use in early NSCLC. Third, there is controversy about postoperative pain levels associated with VATS versus RATS. I would like to know about postoperative pain in this population since uni- or bi-portal VATS needs less endoscopic scope, which results in more intercostal damage (17) when compared with RATS. It is reported that VATS patients experience more improvement in select quality of life measures after lobectomy when compared with RATS patients (18). Because robotic surgery is expensive, it is necessary to conduct an evaluation that includes postoperative pain and quality of life.

Further prospective studies and more clinical data are needed to address these limitations and to improve patient treatment and management because based on the

results of the JCOG0802/WJOG4067L trial, the number of segmentectomies, including subsegmentectomies, is increasing each year.

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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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