



# Is a single port enough for the learned thoracic surgeons?

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*Comment on:* Wang G, Yu Z, Li J, *et al.* Anatomical segmentectomy under uniportal video-assisted thoracoscopic surgery for early staged non-small cell lung cancer: a case report. *J Thorac Dis* 2022;14:3613-23.

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As reported in the international multidisciplinary team discussion titled “Anatomical segmentectomy under uniportal video-assisted thoracoscopic surgery (VATS) for early staged non-small cell lung cancer: a case report” by Wang *et al.* (1), anatomical segmentectomy under uniportal VATS can be a feasible and safe minimally invasive procedure. The authors also concluded that uniportal segmentectomy has equivalent oncological outcomes to lobectomy for early-stage lung cancer but needs to be performed at an experienced medical center. In this editorial, we discuss the technical aspects of uniportal segmentectomy that make this minimally invasive approach feasible and safe with potentially equivalent oncological outcomes to lobectomy in early-stage lung cancer.

The history of minimally invasive thoracic surgery dates back to 1933 when the first pneumonectomy for lung cancer surgery was performed by Graham and Singer (2). The removal of the whole lung was considered the standard operation for many years. In 1960, Cahan (3) established the “radical lobectomy” procedure, comprising lobectomy with regional mediastinal lymph node dissection. Since the first report of VATS by Lewis *et al.* (4) in 1992, the development of the thoracoscope has accelerated the search for less invasive surgery that minimizes the lung volume to be resected, which depends on the clinical stage judged from the preoperative imaging diagnosis. Recently, the exploration for selecting potential candidates who will benefit from sublobar resection compared with lobectomy has entered a transitional period. A phase III randomized trial called the Japan Clinical Oncology Group 0802/

West Japan Clinical Oncology Group 4607L (JCOG0802/WJOG4607L) trial reported that patients with clinical stage IA non-small cell lung cancer (tumor diameter  $\leq 2$  cm; consolidation-to-tumor ratio  $>0.5$ ) significantly benefit from segmentectomy to a greater extent than lobectomy in terms of overall survival (94.3% for segmentectomy *vs.* 91.1% for lobectomy,  $P=0.0082$ ), although local recurrence is more frequent after segmentectomy (10.5% for segmentectomy *vs.* 5.4% for lobectomy,  $P=0.0018$ ) (5).

Minimally invasive approaches have also been investigated to reduce the trauma of chest surgery. Since uniportal VATS was first reported by Rocco *et al.* (6) in 2004, it has become popular as a standard procedure for major pulmonary resection, and it is now used by experienced surgeons to complete more complex procedures, including bronchovascular plasty (7). Following reports of the potential benefits of the minimally invasive thoracoscopic approach, the use of uniportal VATS segmentectomy for small-sized non-small-cell lung cancer is expected to increase in the near future; therefore, thoracic surgeons should develop their surgical skills to perform this technique without increasing the risk of local recurrence.

The case described by Wang *et al.* (1) involved a 67-year-old man without any other comorbidities who presented with bilateral pure ground glass opacity lesions (a 21.1-mm lesion in the right upper lobe and a 13.2-mm lesion in the left upper lobe). The authors performed uniportal right S1 segmentectomy, followed by left upper trisegmentectomy 3 months later.

Faint pulmonary lesions are unlikely to disappear during

follow-up. To prevent the adverse effects of excessive watchful waiting for such persistent lesions, the best timing for surgical resection must be determined after careful discussion with a team of experts. Several papers have compared the results of segmentectomy by uniportal VATS versus multiportal VATS and reported similar outcomes of the two approaches (8). Cheng *et al.* (9) investigated the learning curve for uniportal VATS segmentectomy and showed that uniportal VATS is safe and feasible, and an experienced surgeon can achieve a relatively stable good outcome after 33 segmentectomies. Uniportal VATS segmentectomy is a demanding technique that seems to be an acceptable alternative to multiportal VATS when the surgeon has completed the learning curve. However, care must be taken when introducing uniportal VATS. In most reports, uniportal VATS is initiated after the thoracic team establishes their proficiency in performing the thoroscopic procedures via multiportal VATS (10). Although uniportal VATS is reportedly technically feasible and results in similar blood loss, length of stay, and postoperative pain as multiportal VATS (11), few studies have reported the long-term outcomes of uniportal VATS. Therefore, further studies are required to evaluate the survival after uniportal VATS performed by an experienced thoracic team. Because the less invasive approach should never be selected while sacrificing the long-term survival, thoracic surgeons should be cautious in introducing this novel technique in appropriately selected patients with lung cancer.

To prevent local recurrence, accurate tumor localization is essential with expert knowledge of the intraoperative hilar anatomic structures and recognition of the images on preoperative CT. A technical difficulty in uniportal VATS segmentectomy is the limited insertion angle of the stapler to create the intersegmental plane. When the tumor is located in the middle of the targeted segment, there are several methods that enable the surgeon to detect the intersegmental plane and to ensure the surgical margins, including systemic indocyanine green infusion and the inflation-deflation method. A technical tip to create the intersegmental plane is to meticulously dissect the divided distal stumps from the surrounding tissue in the peripheral direction. After creating adequate space for stapler insertion, the targeted lung is moved to exactly match the intersegmental line three-dimensionally, using the so-called “move the ground” technique to ensure adequate surgical margins. However, when the tumor is located at the edge of the targeted segment, the resection line is expected to

pass beyond conventional anatomical segments, which requires the surgeon to cut into an adjacent segment in a non-anatomical or anatomical manner to secure the surgical margins. Accurate tumor localization in the deflated lung, particularly for non-palpable small lung lesions, is sometimes challenging even with the preoperative three-dimensional images constructed from the inflated lung CT data.

In recent years, a novel wireless localization method called radiofrequency identification marking has been developed (12,13). These markers can be accurately localized via wireless communication and demonstrate the positional information with depth from the pleural surface to realize precise sublobar resection (14-17). To facilitate tumor localization in the limited single-site platform, this technological advancement comprising a preoperative marking technique and an intraoperative navigation system may contribute to the development of less invasive uniportal segmentectomy.

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