Video-assisted thoracoscopic lobectomy—from an experimental therapy to the standard of care

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Without a doubt, video-assisted thoracoscopic surgery (VATS) has completely revolutionized modern thoracic surgery and significantly improved patient outcomes over the last two decades. Now is a crucial transition point—we are witnessing the VATS lobectomy technique transforming from an experimental procedure to the standard of care for patients with early-stage non-small cell lung cancer (NSCLC).

A recent meta-analysis of propensity score matched patients by Cao *et al*. demonstrated significantly lower incidences of overall complications, prolonged air leak, pneumonia, atrial arrhythmias and renal failure, as well as shorter hospitalization compared to open thoracotomy (1). This study further consolidated the benefits of VATS lobectomy for our patients and offered the highest clinical evidence on this topic. In 2012, the Cross-sectional Survey on Lobectomy Approach (X-SOLA) involving 850 general thoracic surgeons worldwide demonstrated that VATS lobectomy has been accepted as a standard surgical procedure (2). The debate regarding the safety of VATS lobectomy is clearly a flavor in the past (2). Not only is it safe to perform lobectomy and segmentectomy using a total VATS approach, it is also technically feasible for resection of locally advanced lung tumors (3,4). To the best of my knowledge, there has been no publication thus far demonstrating inferior outcomes of VATS lobectomy compared to conventional open thoracotomy. On the contrary, a meta-analysis published in the *Journal of Clinical Oncology* once again confirmed that VATS lobectomy is an appropriate procedure for early-stage NSCLC, in terms of its safety, local oncological control, and survival, when compared with open surgery (5).

The VATS Lobectomy Consensus Meeting was held in Edinburgh, UK in November 2012, which marked the 20th anniversary of this procedure. For the first time in history, 50 world-leading minimally invasive thoracic surgeons from 16 countries reached consensus agreements on several important issues on VATS lobectomy, including its definition, patient eligibility, surgical standard of care and future training (6). It is clear that the Cancer and Leukemia Group B (CALGB) definition represents the globally accepted state-of-the-art VATS lobectomy technique (7). Eligibility for VATS lobectomy should include tumor size ≤7 cm, N0 or N1 status and FEV1 or DLCO >30% (6). More interestingly, the great majority of the experts regarded a randomized-controlled trial (RCT) comparing VATS lobectomy with open thoracotomy for early-stage NSCLC not necessary. There are generally two groups of people who are still demanding a RCT to come forward. One group is the non-believers who use the lack of RCT as the argument for not doing VATS lobectomy at all and will likely carry on with the traditional open surgery, irrespective of a RCT. But there is little doubt that the trajectory of open lobectomy will eventually follow the course of open cholecystectomy. The other group includes the skeptics who are open-minded and waiting to be convinced. But as a RCT is not going to happen, a more pragmatic approach to evidence-based practice is required.

By now, we need to be realistic that a RCT is never going to happen. Although I agree that this research methodology may have scientific merit, the logistical problems with such a trial are probably insurmountable for several reasons. Few, (if any), patients would agree to the random assignment. I seriously doubt that any patients would subject themselves to open thoracotomy upfront, in a center where VATS lobectomy technique is proficient and the patient is properly informed about both procedures. At the Royal Infirmary of Edinburgh, such an attempt of randomization was made with only two patients recruited during a 6-month period. As a result, this trial was terminated prematurely. Indeed, given the promising results of the VATS approach achieved today and the lack of any published

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evidence on the superiority of open lobectomy over VATS, one has to appreciate the real logistic difficulties of recruiting sufficient numbers of patients to identify small differences (if any) in long-term outcomes. In addition, the surgical quality control on such a multi-institutional, or even multinational study would be exceedingly difficult at best. Furthermore, there would be significant challenges to identify surgeons who are proficient in both VATS lobectomy and open thoracotomy and more importantly, willing to randomize their patients. Finally, we know of no available funding agency for such a trial, and the costs of involved would make participation costs prohibitive for what would be a low-accruing study at all but a handful of centers.

One needs to acknowledge that the acquisition of level I evidence by performing RCTs may not be necessary for experimental therapies to mature into the standard of care. For example, there was never a RCT demonstrating the superiority of metastasectomy for pulmonary metastases. It needs to be emphasized that a lack of RCT does not equate to a lack of evidence. Despite this, many of us continue to pursue high-level evidence for VATS lobectomy. The European and Asian collaborative groups are independently starting randomized studies comparing VATS segmentectomy versus VATS lobectomy for patients with small peripheral early-stage NSCLC. Our consensus project not only amalgamated the current expert recommendations, but also provided a pivotal role in setting the stage for further multi-institutional databases, the creation of mentoring workshops and standardized training programs to progressively develop this technique widely amongst thoracic surgical trainees and specialists (6).

The scientific question regarding the long-term oncologic efficacy of VATS lobectomy is an important one. However, the current data shows no long-term survival difference or even better survival outcomes with the VATS approach (5). Because of the marked perioperative benefits and equivalent long-term oncologic efficacy, VATS lobectomy must be considered as a standard surgical option for patients to choose. If the patient's informed decision is VATS lobectomy, the patient should be referred to specialist VATS center for assessment. Denying the patient a chance to choose VATS lobectomy due to the lack of surgical expertise is not justifiable.

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In summary, both current evidence and expert consensus indicate that patients undergoing VATS lobectomy for early stage NSCLC, even with suboptimal pulmonary functions, will obtain better perioperative surgical outcomes and at least equivalent long-term efficacy when compared with the open thoracotomy approach. These patients should be considered for VATS lobectomy before embarking on an open thoracotomy, at least in a center with this surgical expertise. In other words, VATS lobectomy for NSCLC after 20 years of surgical refinement should be the current state-of-the-art treatment for early stage NSCLC, unless any future studies demonstrate superior results for open lobectomy.

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