

Video-assisted thoracoscopic lobectomy in lung cancer patients: a “patient-tailored” surgical approach according to the degree of pulmonary fissure completeness

Filippo Lococo¹, Dania Nachira², Stefano Margaritora³

¹Unit of Thoracic Surgery, Azienda Unità Sanitaria Locale-IRCCS di Reggio Emilia, Reggio Emilia, Italy; ²Chirurgia Toracica, Fondazione Policlinico Universitario A.Gemelli IRCCS, Roma, Italy; ³Chirurgia Toracica, Fondazione Policlinico Universitario A.Gemelli IRCCS, Roma—Università Cattolica del Sacro Cuore, Roma, Italy

Correspondence to: Filippo Lococo, MD. Unit of Thoracic Surgery, IRCCS-Arcispedale Santa Maria Nuova, via Risorgimento 80, 42100 Reggio Emilia, Italy. Email: filippo_lococo@yahoo.it.

Provenance: This is an invited Editorial commissioned by the Section Editor Laura Chiara Guglielmetti (Cantonal Hospital Winterthur, Kantonsspital Winterthur, Switzerland).

Comment on: Li S, Wang Z, Zhou K, *et al.* Effects of degree of pulmonary fissure completeness on major in-hospital outcomes after video-assisted thoracoscopic lung cancer lobectomy: a retrospective-cohort study. *Ther Clin Risk Manag* 2018;14:461-74.

Submitted Jun 11, 2018. Accepted for publication Jul 13, 2018.

doi: [10.21037/jtd.2018.07.72](https://doi.org/10.21037/jtd.2018.07.72)

View this article at: <http://dx.doi.org/10.21037/jtd.2018.07.72>

In the past few years, the advantages of mini-invasive pulmonary video-assisted thoracoscopic lobectomy (VATS-lobectomy) have been gaining increasing evidence, if compared to those of previous “traditional” approach (open thoracotomy), particularly as management of post-operative pain is concerned. Nevertheless, following VATS lobectomy (1), postoperative cardiopulmonary complications (PCCs) still record 20–35% rates even in high-volume top-quality Centres, thus affecting both short-term and long-term outcomes of lung cancer surgery (2).

Among PCCs, prolonged air leak (PAL) is the most common complication following pulmonary resection. PAL results in a prolonged chest tube duration, which increases the risk of pleural infection, respiratory distress, pulmonary embolism and associated thoracic discomfort/pain. Consequently, PAL and associated co-morbidities increase the length of in-patient hospital stay (LOS), this resulting in a detrimental effect on procedure related costs related to VATS-lobectomy (3).

Current evidence indicates that, when largely accepted risk factors such as right upper lobectomy, pleural adhesions and, above all, incomplete fissures sum up, PAL is more likely to develop (4). Incomplete interlobar fissures might increase the surgical complexity of VATS-lobectomy. Surgical approach to pulmonary parenchyma within fissures

might be the most relevant determinant for the occurrence of post-op PAL (5).

Recently, Li and co-workers (6) investigated how pulmonary fissure completeness (PFC) can impact on early-term outcomes following VATS-lobectomy in non-small cell lung cancer (NSCLC).

Authors retrospectively reviewed in-hospital outcomes related to 563 patients undergoing VATS lobectomy for NSCLC. Overall morbidity rate in patients with incomplete pulmonary fissures turned out considerably higher if compared to that of patients with well-developed fissures (42% *vs.* 25%, $P < 0.001$). Focusing on PAL among the different post-operative pulmonary complications (i.e., pneumonia, pleural effusion), a remarkable difference was recorded by comparing the rate of patients suffering from incomplete pulmonary fissure (around 22%) with other patients (8%). Moreover, an incomplete degree of PFC was significantly associated to hospital stay and chest-tube duration after surgery.

Incomplete pulmonary fissures require dissection of pulmonary parenchyma, this resulting in tissue disruption and prolonged air leakage from ruptured alveoli, mainly in emphysematous patients (7).

In the last few years, mainly due to worldwide dissemination of VATS-lobectomy procedures, surgical

techniques have provided different approaches to fissure parenchyma (“fissure-less techniques”). Fissures are mainly divided by stapling (usually from the anterior to the posterior direction), thus avoiding direct dissection into fissure parenchyma. A fissure-less technique might reduce PAL incidence (8-10), particularly when staplers are used to cut lung parenchyma.

In Li’s research (6), all patients underwent a triportal VATS lobectomy, stapling the fissures after ligation of broncho-vascular elements of the hilum (“hilum-first-fissure last” technique), thus avoiding early dissections through fissural parenchyma.

What approach to choose between fissure-first technique or fissure-last one during VATS-lobectomy has triggered a wide debate within the scientific community.

Stamenovic *et al.* (9) stated that a fissureless fissure-last VATS lobectomy is better than conventional VATS lobectomy in preventing PAL and reducing length of stay. Nevertheless, according to Decaluwe and colleagues (11) by creating a tunnel between the bronchovascular structures and parenchyma from anteriorly to posteriorly, the fissure can be completely opened with staplers at an early stage of pulmonary anatomical resection. Such technique combines the advantages of both the “fissureless” fissure-last technique and conventional (open) fissure-first dissection.

We suppose that the further VATS-lobectomy techniques go, the more likely PALs decrease, thus further improving early post-operative outcomes. In this scenario, widely accepted PFC definition and standardization represent a crucial point. Such evaluation could be based on visual assessment of fissures during surgery, although it could be anticipated by an accurate analysis of Chest Ct 3D-reconstructions in the pre-operative work-up. Despite encouraging results (12), such computerized techniques need to be still validated, especially for heterogeneous lung diseases, when anticipation of lung fissures completeness is suboptimal and often under dispute between the radiologist and the clinician (13). Nevertheless, we could reasonably think that, improved computerized methods could lead to an accurate identification of completeness of the interlobar fissure already in the pre-op setting.

Surgeons will then be able to best plan the most appropriate surgical technique (fissure dissection method, type of cutting tool, aerostatic materials ...) taking into account clinical, radiological and surgical issues leading to PAL occurrence, in order to reduce postoperative complications. “Patient-Tailored” surgical approach requires skills in managing different surgical techniques, in

addition to flexibility in using them on a case-by-case basis, thus overcoming strict surgical protocols.

PFC degree should be taken into account not only when informing patients about the risks of post-operative morbidity or during selection of cases according to surgeon’s early learning curve of VATS-techniques, as correctly stated by Li and colleagues (6). It should be carefully considered also when surgical techniques of VATS-lobectomy are scheduled according to a flexible and patient-tailored model of surgery.

Acknowledgements

We thank Dr. Daniela Masi (Reggio Emilia AUSL-IRCCS) for her support in English editing.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

References

1. Laursen LØ, Petersen RH, Hansen HJ, et al. Video-assisted thoracoscopic surgery lobectomy for lung cancer is associated with a lower 30-day morbidity compared with lobectomy by thoracotomy. *Eur J Cardiothorac Surg* 2016;49:870-5.
2. Nojiri T, Inoue M, Takeuchi Y, et al. Impact of cardiopulmonary complications of lung cancer surgery on long-term outcomes. *Surg Today* 2015;45:740-5.
3. Brunelli A, Pompili C, Dinesh P, et al. Financial validation of the European Society of Thoracic Surgeons risk score predicting prolonged air leak after video-assisted thoracic surgery lobectomy. *J Thorac Cardiovasc Surg* 2018. [Epub ahead of print].
4. Brunelli A, Cassivi SD, Halgren L. Risk factors for prolonged air leak after pulmonary resection. *Thorac Surg Clin* 2010;20:359-64.
5. Li SJ, Zhou K, Li YJ, et al. Efficacy of the fissureless technique on decreasing the incidence of prolonged air leak after pulmonary lobectomy: A systematic review and meta-analysis. *Int J Surg* 2017;42:1-10.
6. Li S, Wang Z, Zhou K, et al. Effects of degree of pulmonary fissure completeness on major in-hospital outcomes after video-assisted thoracoscopic lung cancer lobectomy: a retrospective-cohort study. *Ther Clin Risk Manag* 2018;14:461-74.

7. Elsayed H, McShane J, Shackcloth M. Air leaks following pulmonary resection for lung cancer: is it a patient or surgeon related problem? *Ann R Coll Surg Engl* 2012;94:422-7.
8. Ng T, Ryder BA, Machan JT, et al. Decreasing the incidence of prolonged air leak after right upper lobectomy with the anterior fissureless technique. *J Thorac Cardiovasc Surg* 2010;139:1007-11.
9. Stamenovic D, Bostanci K, Messerschmidt A, et al. Fissureless fissure-last video-assisted thoracoscopic lobectomy for all lung lobes: a better alternative to decrease the incidence of prolonged air leak? *Eur J Cardiothorac Surg* 2016;50:118-23.
10. Refai M, Brunelli A, Salati M, et al. Efficacy of anterior fissureless technique for right upper lobectomies: a case-matched analysis. *Eur J Cardiothorac Surg* 2011;39:1043-6.
11. Decaluwe H, Sokolow Y, Deryck F, et al. Thoracoscopic tunnel technique for anatomical lung resections: a 'fissure first, hilum last' approach with staplers in the fissureless patient. *Interact Cardiovasc Thorac Surg* 2015;21:2-7.
12. Koenigkam-Santos M, de Paula WD, Owsijewitsch M, et al. Incomplete pulmonary fissures evaluated by volumetric thin-section CT: semi-quantitative evaluation for small fissure gaps identification, description of prevalence and severity of fissural defects. *Eur J Radiol* 2013;82:2365-70.
13. Koenigkam-Santos M, Puderbach M, Gompelmann D, et al. Incomplete fissures in severe emphysematous patients evaluated with MDCT: incidence and interobserver agreement among radiologists and pneumologists. *Eur J Radiol* 2012;81:4161-6.

Cite this article as: Lococo F, Nachira D, Margaritora S. Video-assisted thoracoscopic lobectomy in lung cancer patients: a "patient-tailored" surgical approach according to the degree of pulmonary fissure completeness. *J Thorac Dis* 2018;10(Suppl 26):S3092-S3094. doi: 10.21037/jtd.2018.07.72