

Thoracoscopic sleeve resection—the better approach?

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In the past, thoracoscopic sleeve resection has been reserved for the most adventurous and capable minimal invasive thoracic surgeons. However, with improvements in thoracoscopic competency, greater exchange of knowledge and technical know-how, and advances in equipment, increasing number of centers are able to perform sleeve resections thoracoscopically. Jianxing He's team from China, a group known for their innovation and thoracoscopic excellence, has recently published their experience of bronchial sleeve resections (1). Among the 49 patients, 20 (41%) received the bronchial sleeve lobectomy thoracoscopically, with one patient requiring half-carinal reconstruction in combination with right upper sleeve lobectomy. A 3-port VATS technique was used, with the utility thoracotomy placed anteriorly, and the camera port inferiorly. In just under half of their initial cases, a modified interrupted suture anastomosis technique of closing the membranous posterior wall of the bronchus with continuous 4-O polypropylene followed by alternating figure-of-eight and mattress with 4-O single-strand absorbable suture for the cartilaginous anterior wall was used. For the subsequent remaining cases, a continuous suture technique was used for both the posterior and anterior bronchial walls. Neither covering nor buttressing techniques were needed for the anastomoses, and no postoperative anastomotic leakage was detected. With no perioperative mortality and excellent immediate results, this study seem to further support the relative safety and efficacy of thoracoscopic sleeve resection in experienced thoracoscopic surgery centers. In addition, the study has highlighted the evolution in thoracoscopic bronchial anastomotic technique from the traditional emphasis on the security of interrupted suturing (2), to the increasing use of the more convenient continuous suturing

techniques over recent years (1,3,4). Evidently, continuous suturing techniques will result in less suture tangling and may be quicker, while proponents of interrupted suturing have emphasized the potential advantages of less anastomotic site ischemia and security of their technique. It seems impossible to have a meaningful comparison of clinical outcomes between the different anastomotic approaches for thoracoscopic sleeve lobectomy because of the relatively low case numbers, patient heterogeneity and the wide variations in technique within each anastomotic approach, for example, suture size and type used, or stitch spacing, just to mention a few. In thoracic surgery, perhaps more so in thoracoscopic surgery, it is often the technique which the surgeon has been trained and is most comfortable with which produces the best results. The bronchial anastomotic technique chosen should be the one most familiar to the surgeon.

Doing less for more

Although there are no randomized trials comparing outcomes following thoracoscopic sleeve resection lobectomy with thoracoscopic pneumonectomy in patients suitable for both procedures, it is well known that the latter is associated with a higher perioperative mortality rate and complications, including pleural space infection, bronchopleural fistula, atrial fibrillation and respiratory failure (5). Furthermore, less clinically apparent parameters such as right ventricular strain and pressure are likely to be higher following thoracoscopic pneumonectomy compared with thoracoscopic sleeve resection lobectomy. Therefore, despite the improving outcomes following thoracoscopic pneumonectomy over the years (6,7), few would argue

against sleeve resection lobectomy being the procedure of choice for those patients with suitable anatomy, to achieve better lung preservation, and lower morbidity and mortality.

There is currently no prospective study comparing outcomes between thoracoscopic and open sleeve lobectomy. However, we know that the thoracoscopic approach to major lung resection has been associated with attenuated inflammatory cytokine response (8), better preserved postoperative immune function (9,10), attenuated postoperative angiogenic environment (11), less impairment of lung function (12), reduced postoperative pain and less disturbed shoulder dysfunction (13) amongst other advantages, when compared with their open counterparts. Of greater importance is the positive effect of minimizing surgical access trauma through thoracoscopic lung cancer resection on patient survival. Several studies have shown a small 5-year survival advantage in those who underwent thoracoscopic lobectomy for early stage lung cancer when compared with open approach (14,15). Interestingly, a similar survival advantage can be detected in other cancers, such as colon cancer, when resections were performed laparoscopically rather than by open laparotomy (15). Another often forgotten advantage of a quicker postoperative recovery from the thoracoscopic approach is earlier commencement and higher tolerance to adjuvant therapy for advanced lung cancer patients (16). Future studies may be needed to determine if similar advantages can be found following minimally invasive thoracoscopic sleeve lobectomy when compared with open approach.

The new horizon

Thoracoscopic sleeve lobectomy, and indeed the whole of minimal invasive thoracic surgery, is undergoing a major evolution (17), from hybrid mini thoracotomy procedures with video-assistance (18), to the 2-port thoracoscopic technique (19), and more recently the single port approach (20). The challenges of thoracoscopic sleeve lobectomy, particularly when the surgery is increasingly being performed through smaller and fewer incisions, are achieving good visualization, utilizing endoscopic instruments for tissue dissection and manipulation, and reducing the difficulty associated with thoracoscopic bronchial anastomosis. Specialized thoracoscopic instruments continue to undergo refinement by producing angulated double hinged and narrower shafted instruments which significantly improves ergonomics and minimize fencing when placed through small surgical incision(s) (21).

Another recent advancement is the development of variable wide angled thoroscopes that allow up to 120 degrees of vision by either flexible scope tip or rotating prism mechanism. These thoroscopes improve the surgeon's visual field and flexibility, even when the scope movement and position is limited within the confines of a small single incision (22). The laborious task of intracorporeal knot tying for bronchial anastomosis can now be significantly simplified by using an endoscopic "knot tying" device, such as TK Ti-KNOT® (LSI Solutions, Rochester, USA), that conveniently tightens and then secures the suture using a titanium crimp (23). Also, rapid development in barbed suture technology may soon obviate the need for intracorporeal knot tying. On the horizon will be endoscopic robotic arm devices that open inside the thoracic cavity capable of tissue recognition and precision automated micro-suturing (24). Until that day, many of us flesh and bone mortals will need to continue to strive for technical excellence, and be acquainted with the latest and best equipment for our endeavours.

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References

1. Xu X, Chen H, Yin W, et al. Thoracoscopic Half Carina Resection and Bronchial Sleeve Resection for Central Lung Cancer. *Surg Innov* 2014;21:481-6.
2. Mahtabifard A, Fuller CB, McKenna RJ Jr. Video-assisted thoracic surgery sleeve lobectomy: a case series. *Ann Thorac Surg* 2008;85:S729-32.
3. Yu D, Han Y, Zhou S, et al. Video-assisted thoracic bronchial sleeve lobectomy with bronchoplasty for treatment of lung cancer confined to a single lung lobe: a case series of Chinese patients. *J Cardiothorac Surg* 2014;9:67.
4. Yang R, Shao F, Cao H, et al. Bronchial anastomosis using complete continuous suture in video-assisted thoracic surgery sleeve lobectomy. *J Thorac Dis* 2013;5:S321-2.
5. Ng CS, Wan S, Lee TW, et al. Post-pneumonectomy empyema: current management strategies. *ANZ J Surg* 2005;75:597-602.
6. Nwogu CE, Yendamuri S, Demmy TL. Does thoracoscopic pneumonectomy for lung cancer affect survival? *Ann Thorac Surg* 2010;89:S2102-6.
7. Lau KK, Ng CS, Wan IY, et al. Video-assisted

- thoracoscopic pneumonectomy is safe and may have benefits over open pneumonectomy. European Society of Thoracic Surgeons (ESTS), 21st European Conference on General Thoracic Surgery, Birmingham, UK. 2013;17:abstract F108.
8. Yim AP, Wan S, Lee TW, et al. VATS lobectomy reduces cytokine responses compared with conventional surgery. *Ann Thorac Surg* 2000;70:243-7.
 9. Ng CS, Lee TW, Wan S, et al. Thoracotomy is associated with significantly more profound suppression in lymphocytes and natural killer cells than video-assisted thoracic surgery following major lung resections for cancer. *J Invest Surg* 2005;18:81-8.
 10. Ng CS, Wan S, Hui CW, et al. Video-assisted thoracic surgery lobectomy for lung cancer is associated with less immunochemokine disturbances than thoracotomy. *Eur J Cardiothorac Surg* 2007;31:83-7.
 11. Ng CS, Wan S, Wong RH, et al. Angiogenic response to major lung resection for non-small cell lung cancer with video-assisted thoracic surgical and open access. *ScientificWorldJournal* 2012;2012:636754.
 12. Garzon JC, Ng CS, Sihoe AD, et al. Video-assisted thoracic surgery pulmonary resection for lung cancer in patients with poor lung function. *Ann Thorac Surg* 2006;81:1996-2003.
 13. Li WW, Lee RL, Lee TW, et al. The impact of thoracic surgical access on early shoulder function: video-assisted thoracic surgery versus posterolateral thoracotomy. *Eur J Cardiothorac Surg* 2003;23:390-6.
 14. Ng CS, Wan S, Hui CW, et al. Video-assisted thoracic surgery for early stage lung cancer - can short-term immunological advantages improve long-term survival? *Ann Thorac Cardiovasc Surg* 2006;12:308-12.
 15. Ng CS, Whelan RL, Lacy AM, et al. Is minimal access surgery for cancer associated with immunologic benefits? *World J Surg* 2005;29:975-81.
 16. Petersen RP, Pham D, Burfeind WR, et al. Thoracoscopic lobectomy facilitates the delivery of chemotherapy after resection for lung cancer. *Ann Thorac Surg* 2007;83:1245-9; discussion 1250.
 17. Ng CS, Lau KK, Gonzalez-Rivas D, et al. Evolution in surgical approach and techniques for lung cancer. *Thorax* 2013;68:681.
 18. He J, Shao W, Cao C, et al. Long-term outcome of hybrid surgical approach of video-assisted minithoracotomy sleeve lobectomy for non-small-cell lung cancer. *Surg Endosc* 2011;25:2509-15.
 19. Jiao W, Zhao Y, Huang T, et al. Two-port approach for fully thoracoscopic right upper lobe sleeve lobectomy. *J Cardiothorac Surg* 2013;8:99.
 20. Gonzalez-Rivas D, Fernandez R, Fieira E, et al. Uniportal video-assisted thoracoscopic bronchial sleeve lobectomy: first report. *J Thorac Cardiovasc Surg* 2013;145:1676-7.
 21. Ng CS, Wong RH, Lau RW, et al. Minimizing chest wall trauma in single-port video-assisted thoracic surgery. *J Thorac Cardiovasc Surg* 2014;147:1095-6.
 22. Ng CS, Wong RH, Lau RW, et al. Single Port Video-Assisted Thoracic Surgery: Advancing Scope Technology. *Eur J Cardiothorac Surg* 2014. [Epub ahead of print].
 23. Demmy TL. Thoracoscopic Left Upper Lobe Sleeve Lobectomy for Inflammatory Myofibroblastic Tumor. 94th Annual Meeting American Association for Thoracic Surgery (AATS), April 26-30, 2014, Toronto, Canada. [video presentation].
 24. Ng CS, Rocco G, Wong RH, et al. Uniportal and single-incision video-assisted thoracic surgery: the state of the art. *Interact Cardiovasc Thorac Surg* 2014. [Epub ahead of print].

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