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Editorial

Troubleshooting in advanced VATS procedures

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Since the introduction of VATS lobectomy in 1991 by Roviaro, the initial implementation of VATS lobectomy as a standard of care for lung cancer patients was slow (1). The main concern from the surgical community was the risk of uncontrollable bleeding from the pulmonary artery (PA) with potentially fatal outcome (2). Expert centres adopted and refined the technique (3-5). The recommendations for surgeons embarking on a VATS program were to begin with easier cases to minimize the risk of uncontrollable bleeding from the PA. Small peripheral tumours are considered appropriate for surgeons in the beginning of their learning curve for VATS lobectomy (6). But as the surgeon becomes more experienced in the technique more difficult cases may be approached. Over the last decade the adoption of VATS lobectomy has improved significantly. A recent European questionnaire conducted on European Society of Thoracic Surgeons (ESTS) members reports a 70% adoption rate of anatomical VATS resections among the surgeons. Complete questionnaire was collected from 100 institutions in 31 countries with data from the clinical practice among 461 board-certified thoracic surgeons. Some centres report a VATS lobectomy rate of 90% (7). Central tumours are considered difficult to manage by many VATS surgeons and Liu and his colleagues from the Department of Thoracic Surgery, West China Hospital, Sichuan University, Chengdu, China must be complimented for their innovative and very thorough technical instructions for how to approach a "hostile hilum" (8). They demonstrate tree ways of dealing with different kinds of complicated hili during VATS lobectomy in three videos. The VATS approach is a three-port VATS technique with an anterior utility incision and two lower ports like the standardized anterior approach (5). The cases presented have a high risk of intraoperative bleeding and of potential conversion. Similar to techniques used in open surgery the proximal main PA is clamped with detachable bulldog clamps before starting the dissection. This avoids having a vascular clamp in the utility incision taking up space. The first case is a right upper lobe lobectomy with severe carbonized lymph nodes between the PA and the upper lobe bronchus. The proximal PA is clamped with a detachable bulldog clamp and the after suturing of the first arterial branch with Prolene 4-0, the lymph nodes is dissected using scissors. Second case is a left upper lobectomy with a central tumour and dense adhesions and severe lymphadenopathy around the first arterial branch and the main PA. The proximal PA and the interlobar PA is clamped with detachable bulldog clamps. The first branch of the PA, the lingular branch and a posterior ascending artery was divided, but bleeding and laceration from another very short posterior branch occurred and a part of the main PA was divided using endo-stapler (endo-stapler angioplasty). According to the authors recommendation the stapling should comprise less than a quarter of the circumference of the PA to avoid stenosis. If more resection is required a vascular Sleeve procedure should be performed. The third and last case is a left upper lobe with a central tumour invading the main PA. Lymph nodes from station 5 and 6 are dissected and a detachable bulldog clamp applied to the proximal PA. The dissection between the PA and the upper lobe bronchus is dissected and the upper lobe bronchus is divided with an endo-stapler. Another detachable bulldog clamp is applied to the distal trunk of the PA and the involved part of the PA is removed with scissors. The endothelium is flushed with dilute

heparin (25 U/mL). Then the PA is sutured with a Prolene 5-0 and running suture (suturing angioplasty). Before tying the knot, the distal clamps are removed to escape air and avoid air embolism. At last, the proximal clamp is removed slowly.

The authors' recommendations are very instructive when dealing with a "hostile hilum" and they recommend individualizing the technique according to the case and the ability of the surgeon (8). This touches upon the topic of learning curve for complicated procedures like the three previous cases. VATS lobectomy implies a demanding learning curve. We have previously published recommendations for surgeons embarking on a VATS lobectomy program. Once a new technique is implemented, it is an advantage to perform many operations within a short time, to get familiar and confident with the procedure (6). Correct and complete training of younger surgeons has a great impact on the safety of implementation of VATS. The experience of the surgeon in training is important, refreshed details of anatomy of lungs and variations, earlier experience with other related VATS procedures, such as wedge resections, pleural biopsies and cysts resections makes it an advantage for safe implementation of VATS. Specific recommendations are: (I) to perform more than 100 minor VATS procedures; (II) attend formal courses in VATS lobectomy; (III) visit clinics with experience in this procedure; (IV) training in simulators; (V) choose one approach; (VI) consider volume/clinic/surgeon; (VII) select patients; and (VIII) a stepwise introduction of surgeons in training to surgical procedure (6). A recent review from the Simulation Centre in Copenhagen recommends the" four steps approach" in medical simulation training program (9). The program is based on: step 1: sufficient theoretically knowledge (read books, articles or e-learning) and pass a validated theoretical exam. Step 2: hands-on training to ensure the right surgical technique. Step 3: directed and self-regulated learning, short and focussed training session whenever the clinical duties allow it. Furthermore, use of assessment tools with solid evidence ensures the basic competency before allowing trainees to proceed into supervised clinical training (10). Step 4: final test, to ensure that all trainees reach a pre-defined level of skills. Even though, it is recommended that VATS training should be mandatory for surgeons in training, the study states that outcome is depending on the surgeon's skills as well as their operating team. Non-technical skills are important parameter for the high specialized VATS teams (11).

Successful performed VATS procedures and avoidance of major complications depends on several of factors. The surgeon's own technical ability, training, experience/numbers of surgeries, size of centre and furthermore competent VATS operating team—all have an influence on a positive outcome. The three different techniques described in the study by Liu and his colleagues have shown to be effective and for future implementation and adoption of VATS lobectomy as standard of care for lung cancer patients a structured mastery training program is recommended.

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Footnote

Conflicts of Interest: RH Petersen speaker fee from Medtronic. The other author has no conflicts of interest to declare.

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