Technical Tricks to Facilitate Totally Endoscopic Major Pulmonary Resections

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Lobectomies using video-assisted thoracoscopic surgery (VATS) are becoming more and more accepted since several recent studies have demonstrated their safety and efficacy for stage I lung cancer. However, "video-assisted thoracoscopic surgery lobectomy" usually means that a utility incision or a mini-thoracotomy is used for insertion of conventional instruments. We use a totally endoscopic approach in which only endoscopic instruments and video display are used. On the basis of our preliminary experience of 81 cases with this approach, we present some technical details that are important for a successful endoscopic procedure.

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Large series of video-assisted thoracoscopic surgery (VATS) lobectomies have recently been reported [1, 2]. The VATS technique means that a utility incision is used for insertion of conventional instruments. Few authors perform totally endoscopic major pulmonary resections, termed a "complete VATS" [3, 4] technique or "closed" technique [5], in which only video-display and endoscopic instrumentation are used. Apart from a retrospective comparative study [3], so far, it has not been demonstrated that this approach may be superior to the more commonly used video-assisted approach, but in some aspects it may be interesting. In this technique, there is no access incision, and the specimen is retrieved through one of the port sites that is enlarged at the end of the procedure. The main obstacles are the fissures that may be partly fused, the risk related to the dissection of large and fragile pulmonary vessels, and eventually the difficulty in completing a radical lymphadenectomy. This full endoscopic approach requires time, a thorough dissection, and use of the appropriate technology. In 2005, Demmy and colleagues [6] proposed troubleshooting guides for surgeons embarking on a VATS lobectomy program. Although most of their recommendations are relevant, they are mainly applicable to a video-assisted technique with an access incision. The aim of our article is to stress several technical details that we have found helpful in completing totally endoscopic lobectomies.

Technique

Enhancing Vision and Video-Imaging

During open surgery or VATS, the surgeon usually stands at the patient's back because the anatomical landmarks are more familiar that way. We have found that it is often preferable to stand at the patient's front [7] or to switch from behind to the front, according to the steps of the operation. For instance, it is usually more natural to divide the anterior part of the fissure from the front and its posterior part from behind. This means that at least two monitors should be used.

Because the procedure is long lasting, the endoscope tip may be soiled by blood drops that slide down along the trocar sheath. This annoying issue can be partly overcome by using a 12-mm trocar instead of a 10-mm trocar. Smoke aspiration is achieved by using a 3-mm suction device that is left in place throughout the procedure.

Maintaining optimal vision of the whole operative field with a single 0° optic is almost impossible. One of the main concerns with a direct viewing scope (0°) is the difficulty in controlling the instrument tip, which may be out of the field of vision (Fig 1). Formerly, to overcome this problem, we switched from a direct (0°) to an oblique viewing endoscope (30°) as vision became too tangential. However, these maneuvers were time consuming and tedious. Recently, we changed to a rigid scope with a deflectable tip (Olympus LTF; Olympus, Tokyo, Japan; Fig 2). Its angle of vision varies from 0° to 100°, and the flexibility is controlled by a lever located on the handle. Once chosen, the angulation can be locked. This allows the surgeon to have a bird's-eye view, making dissection more natural and safer. The endoscope tip houses a distal charge-coupled device connected to a high definition television standard camera (Exera II; Olympus) that provides dramatically sharp viewing, thus allowing for close-up vascular dissections.

Dedicated Instrumentation

To avoid conflicts with the instruments or the hands of the assistant, or both, we always use a mechanical telescope holder whose manipulation is easy and does not require locking, because its stability is ensured by a system of weight and counterweight (Olympus SH-1). It is placed at the back of the patient, at the level of the scapula tip, thus avoiding conflict with instrument shafts.

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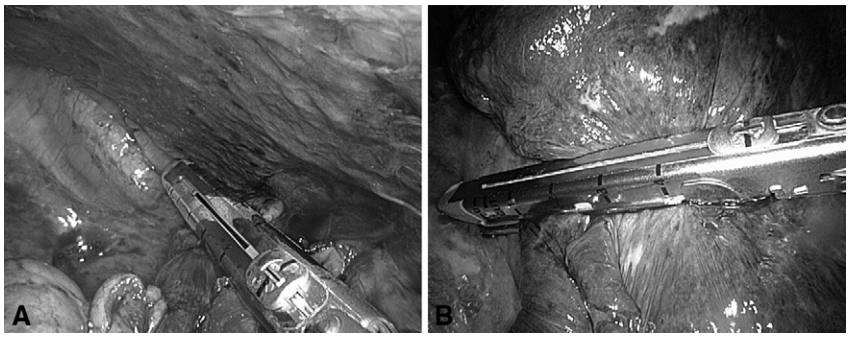

Fig 1. Example of the limitation of a direct viewing endoscope (0°) during the division of the fissure during thoracoscopic right upper lobectomy. (A) With a 0° scope, the tip of the endostapler is out of the vision field, (B) although it can be perfectly controlled with a deflectable scope.

Exposure of the hilum or fissure, or both, may require a number of grasping forceps or retractors (ie, 5-mm ports, or even 10-mm ports) that can be a cause of postoperative pain and discomfort. We have partly overcome this concern by using 3-mm grasping forceps (Fig 3), thus reducing parietal trauma to a minimum.

Laparoscopic conventional straight instruments are useful for some steps of the dissection. However, getting "round the corner" is necessary when dissecting large and fragile vessels, such as the pulmonary vein or branches of the pulmonary arteries. Dissection must be as smooth as possible, which means that no traction and no force must be exerted on the vessel. We use a deflectable dissector and grasping forceps (Endoflex; Surgical Innovations, Leeds, United Kingdom; Fig 4). For example, clamping the bronchus or the parenchyma to determine an intersegmental plane is achieved with a dedicated endoscopic 5-mm clamp (Storz, Tuttlingen, Germany; Fig 5).

Guiding and Manipulating Endostaplers

The lack of manual manipulation of lung tissue and instruments may make accurate positioning of staplers difficult, even with articulated ones. It is of utmost importance to load the fissure or the bronchus or the vessels without friction. Two tricks may be used: (1) passing a tape around the vessel so that it can be lifted up, thus helping passing the endostapler smoothly, (2) using a chest tube or a 16-French suction tube [8] (Gentle-Flow, Kendall). Its base is secured to the anvil by simple pressure. This can be done inside or outside the chest. Its distal end is passed around the structure to be divided and pulled out trough the trocar tube. The stapler tip is thus guided around the tissue to be stapled (Fig 6).

Hemostasis and Control of Small Vessels

Whenever possible, clips should be avoided because they may slip or conflict with staples. However medium diameter vessels, such as some of the segmental pulmonary branches, are too small for an endostapler and too large to be coagulated with electrocautery or ultrasounds. When clips are used they are always doubled or even

Fig 2. High definition deflectable tip thoracoscope allows performing the whole procedure with a single endoscope and avoids the problems related to tangential vision.

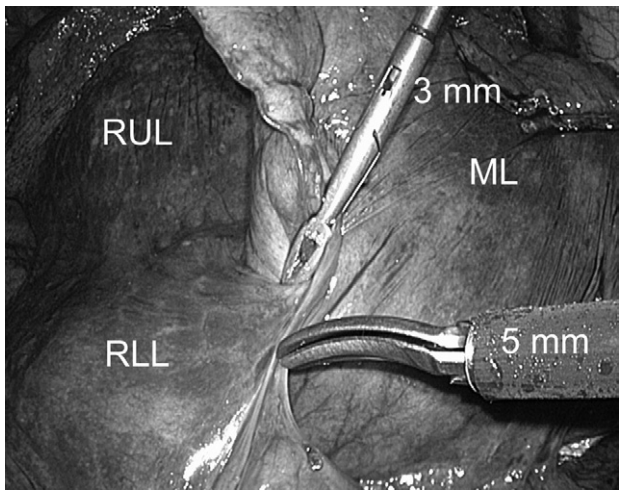

Fig 3. Opening the fissure during a thoracoscopic middle lobectomy using 3-mm grasping forceps for better exposure. (ML = middle lobe; RLL = right lower lobe; RUL = right upper lobe.)