Editorial

# Advantages associated with the use of a wound retractor compared to a rigid trocar inserted via the camera port during video-assisted thoracic surgery

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Raveglia *et al.* (1), in a prospective randomized study published in the *Journal of Visualized Surgery*, showed that use of a wound retractor (compared to a rigid trocar) during video-assisted thoracic surgery (VATS) was associated with less postoperative pain and better scope maneuverability. Writing in the *Annals of Thoracic Surgery*, Raveglia *et al.* (2) advocated the use of a wound retractor rather than a camera trocar during VATS. Use of a rigid trocar may compromise patient quality-of-life; the trocar may compress the intercostal nerves and limit camera/instrument angulation. In our experience, use of a trocar of diameter ≤7 mm does not seem to cause severe intercostal pain. Dell' Amore *et al.* (3) evaluated postoperative pain induced by the use of different trocars during minimally invasive thoracic surgery: their Group 1 were treated using a 12-mm-diameter, rigid metal trocar; Group 2 employing a 15-mm-diameter mobile plastic trocar (Flexipath 15-mm®; Ethicon Endo-Surgery; Cincinnati, OH, USA); and Group 3 using an XXS-sized wound retractor (Alexis Wound Retractor XXS® 1–3 cm; Applied Medical; Rancho Santa Margarita, CA, USA). Thoracoscopes 10-mm in diameter were used to treat all patients. No significant pain difference was evident among the three groups (P=0.268). Also, no significant difference in terms of the pain score at discharge, operative time, or drainage duration was apparent.

The LAP Protector® (Hakko Medical; Nagano, Japan) is generally used during laparoscopic surgery (4). Tsunezuka *et al.* (5) highlighted certain disadvantages of this device if employed during thoracoscopy. First, the cylindrical membrane sheath is not flexible throughout its length. Second, the length is excessive in terms of chest wall applications; the device tends to exit during manipulation. Third, the silicon sheath is fragile, thus easily torn on contact with metallic endoscopic instruments. On the other hand, the Alexis Wound Retractor features a cylindrical polyurethane membrane sheath (0.08-mm in thickness) with plastic upper and lower rings. When the lower ring is inserted into the pleural cavity, the plastic sheath folds back upon itself until the sheath contacts the chest wall. The cylindrical membrane sheath diameter can be varied in terms of chest-wall thickness. The retractor thus fits incisions that differ in both shape and size. Many surgeons have reported that the instrument is useful during both laparoscopic and thoracoscopic surgery (5-7). Retraction is atraumatic, wound protection is excellent, the exposure afforded is maximal, and the incision size is minimal. Additionally, the device does not vigorously spread the intercostal space or the intercostal muscles, thus protecting the intercostal nerves. The strength and flexibility of the device allow visualization of wound margins, retention of moisture at the incision site, and a significant reduction in the incidence of wound infection (7). However, almost all thoracic surgery is non-contaminated; the device might not be as useful during abdominal surgery. To date, we have not

identified any issues. To mention one, we would mention that, as the polyurethane membrane sheath is not slippery, it can be rather difficult to move endoscopic instruments in and out. Therefore, we usually spray the sheath surface with an antifriction agent.

Pain after VATS is usually more intense when camera ports are used; the camera instrument is the only thoracoscopic device that remains in the same port throughout most of the operation (8). Therefore, it is essential to pay meticulous attention to instrument positioning and scope port construction. Cheng *et al.* (9) developed innovative surgical endoscopes. A conventional endoscope features a rod lens creating a wide spread during VATS. As the 5–10-mm-diameter shafts are made of metal, even a 5-mm-diameter endoscope is placed at an extremely acute angle to the chest wall, increasing intercostal nerve compression. Therefore, we use a 5-mm-diameter flexible thoracoscope (HD Endo EYE®, LTF-VH; Olympus, Tokyo, Japan) to increase the angle during surgery (10). This endoscope features a flexible distal section that can be both articulated and bent through ±100º in two orthogonal planes, allowing distal adjustment of the view without the need to steer the shaft body.

Moreover, neuritis of the camera-port intercostal space may be aggravated via insertion of a conventional plastic chest tube at the end of surgery. Therefore, it is essential to pay meticulous attention to the management and selection of chest drains. The advantages afforded by use of the 19-Fr Blake Silastic Drain® (Ethicon; Somerville, New Jersey, USA) (compared to a conventional chest tube) during general thoracic surgery have been reported (11). Additionally, we have described painless chest tube fixation and removal using an adhesive film and a wound-care dressing (12). The drain is inserted into the pleural cavity via the thoracoscopic access port, and a drain section featuring a bendable trocar is then inserted through the same incision. Next, subcutaneous tissue is punctured about 5 cm distant from the incision, but no suture is placed; the drain is fixed using a transparent adhesive film (Opsites®; Smith & Nephew Wound Management, Hull, UK). Thus, the drain can be rapidly removed by pressing the region above the subcutaneous tunnel with the palm of one hand. A hydrocolloid wound-care dressing (Karayahesive®; Alcare, Tokyo, Japan) is then placed over the puncture wound, which thus does not require suturing or stapling.

Although not mentioned by Raveglia, we would highlight one further advantage of wound retractor use; rigid ports sometimes fall away during manipulation. The port-site implantation/recurrence rate has increased in recent years (13). Port-site recurrence is a rare complication after VATS to treat malignancies (14). Although the mechanism remains unclear, it may be that microscopic tumor spillage from the pleural cavity enters the trocar tract, or that the chest wall directly contacts the tumor during extraction, or that tumor manipulation contaminates the instruments, or that trans-tumoral dissection is associated with residual pleural fluid inside the chest (15). Interestingly, Nose *et al.* (16) reported that implantations developed only at the second and third ports, through which the forceps and the ultrasonic scalpel had repeatedly passed. We thus surmise that port-site implantation may be attributable to frequent manipulations; instruments are thereby moved to and from the pleural space. Ludwig *et al.* (17) suggested that wound/port contamination by cancerous tissue was not attributable to use of a wound retractor or specimen bag per se but, rather, to residual cancer cells in the intrathoracic space. Parekh *et al.* (15) explored port-site recurrence in 374 patients undergoing VATS. The cited authors retrieved specimens via the port using specimen bags, or not. Only one port-site recurrence (0.26%) was noted. Downey *et al.* (14,18) reviewed 21 cases of chest wall/port-site recurrence. Six port-site recurrences after VATS developed in patients with malignant mesotheliomas; this tumor is well-known to recur in needle tracks and incisions. Of the remaining 15 cases, only 11 exhibited true port-site recurrences.

The advantages afforded by VATS (compared to open thoracotomy) include reduced invasiveness, a reduction in pain-related operative morbidity, more rapid postoperative recovery, and a shorter hospital stay (19). Postoperative pain control remains of major concern even after VATS. All of pharmacological therapy, epidural analgesia, and paravertebral and intercostal blockade control pain (20), but further pain reduction would reduce medical costs and side-effects. Pressing/crushing of the neurovascular bundle must be avoided, and thinner flexible instruments must be used during operation. Such changes would reduce the incidence of acute and chronic pain after VATS (21).

To minimize invasiveness and to reduce the number of surgical ports, Gonzalez-Rivas *et al.* (22) described a uniportal form of VATS; multiple instruments were inserted via a single port. Thin-shafted instruments are required in such crowded environments. A recent innovative endoscope was magnetically linked to the camera; no physical connection was required (23). The magnetically anchored guidance system (MAGS) featured both an external magnet and an internal (small) video camera to which permanent

 

magnets were attached; the camera was inserted via a small incision and was both attracted to and controlled by an external skin-placed magnet. The MAGS endoscope reduced the fencing risk imparted by the presence of other instruments; many different views were possible if several cameras were deployed. However, as the thoracic wall is both incompressible and rendered uneven by the rib cage [unlike the abdominal wall (24)], the advances mentioned above may not be applicable when evaluating the thoracic cavity. New MAGS processes are under development (9). We expect that such innovations will become clinically practical in the near future.

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## Footnote

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

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