Trans-diaphragmatic chest surgery: Bringing owls to Athens?

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Tiny, magnetic, anchoring, actuated endoscope allows it to be placed within the chest cavity.

Central Message

The LTD route is a novel approach to chest surgery and may enhance the armamentarium of minimally invasive surgeons. Its limitations and outcomes require further assessment.

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It has long been the ethos of minimally invasive thoracic surgeons to pursue ways to reduce surgical access trauma. Minimizing the number of incisions, namely, uniportal video-assisted thoracic surgery (VATS), may be associated with potentially less injury to intercostal nerves¹ and is gaining popularity worldwide. The idea of reducing intercostal nerve injury has to be taken a step further by altogether avoiding incisions at intercostal spaces. Hand-assisted sternocostal triangle access² VATS provided the start to the era of nontrans thoracic approach to thoracic surgery. Subsequently, other alternate access approaches, including uniportal subxiphoid VATS for thymectomy and anatomic lung resections, were reported.^{3,4}

In this issue, Santiago-Andrade and colleagues⁵ describe their early experience of laparoscopic trans-diaphragmatic (LTD) thoracic surgery. The novel technique has similarity and may be regarded as the multi-port form of the approaches described. However, the proposed method requires intraperitoneal endo-incisions of the diaphragm and continuous U-stitch traction, which is not needed for subxiphoid route. They found less postoperative opioid use compared with VATS; however, the lack of pain score measurement for the groups in a small retrospective study makes interpretation difficult. In terms of limitations, even advocates of the subxiphoid approach have expressed difficulties with lower lobe resections and N2 lymph node dissection, particularly on the left side. Of note, lower lobe procedures consisted most of the anatomical resection in the current report on LTD surgery, although the data on lymph nodes harvested are not well reported, with some cases receiving trans-cervical extended mediastinal lymphadenectomy. The more prolonged path the LTD endoscopic instruments have to advance may partly explain the favor for lower lobe resections.

A number of other issues need to be evaluated before the LTD approach can be considered for adoption. First, with multiple diaphragmatic incisions, the possibility and consequence of a tumor being introduced

into another body cavity for oncologic surgery are present. Furthermore, postoperative ileus, formation of intra-abdominal adhesions, and the consequence of multiple diaphragmatic incisions on postoperative pulmonary function, pain, and morbidity will all need to be carefully studied. Long-term influence on the diaphragm is also a concern, just as the authors suggested avoiding LTD in young patients who require heavy lifting.

From a technical standpoint, the LTD approach in the future will benefit from fewer incisions on the abdomen and diaphragm. More advanced camera systems, such

FIGURE 1. Tiny, magnetic, anchoring, actuated endoscope allows it to be placed within the chest cavity.

as magnetic anchoring and actuated endoscopes⁶⁻⁸ (Figure 1), allow omission of the rigid-shaft endoscope and its port. In addition, rapid development of single-incision robots platforms and natural orifice transluminal endoscopic surgery technology may further reduce the incisions needed.^{6,8,9} Another problem inherent in all “remote” access surgery is the lack of digital palpation for lung lesion localization. Emerging localizing techniques by hookwire placement or dye marking in the hybrid operating room¹⁰ could provide a reliable 1-stop solution. Caution needs to be exercised for LTD surgery until more clinical data emerge. Although Leonardo da Vinci once said “Simplicity is the ultimate sophistication,” we should not easily dismiss innovative surgical approaches that often drive technologic and technical advances in surgery.¹¹⁻¹³

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