Editorial

Any ports in a storm

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As minimally invasive surgery evolves, patient and physician expectations will also evolve in parallel. The minimally invasive oncologic surgeon must balance the short-term advantages of minimally invasive techniques such as less pain and decreased perioperative complications with the need to equal or outperform traditional open oncologic resections. Robotic-assisted lung resection provides excellent visualization and dexterity but has a learning curve. The ideal surgical access would include ease of use, excellent visualization, ease of adoption, and flexibility as a hedge against the unpredictable nature of surgery while minimizing patient morbidity.

The transition from open surgery to video-assisted thoracic surgery (VATS) or robotic-assisted thoracic surgery (RATS) or from VATS to RATS requires several adjustments from the surgical team. The most salient differences are the loss of tactile feedback in robotics and different viewing angles. Current robotic technologies have not been able to replicate haptic feedback; however, robotic techniques provide improved intra-corporeal dexterity and ×10 magnification at high resolution. While many surgeons in North America use a bottom-up view, where the endoscope is placed caudal to the target anatomy, this is different from the typical view afforded by a posterolateral thoracotomy. In the early era of VATS, many thought leaders recommended transitioning to an axillary thoracotomy approach as an intermediate step and initially using the thoracoscope as a light source to allow surgeons to become oriented to this more anterior and inferior view of the hilum. Kohno and Mun reported "confronting upside-down monitor setting strategy to ease this transition by preserving the traditional view" or "cranial view" (1,2). Other groups have reported a view analogous to the view afforded by thoracotomy using robotic techniques (3).

Funai *et al.* previously reported the Hamamatsu Method for RATS which preserves the more cranial perspective (4). In the current issue of the journal, the authors present a modification of the technique that eliminates one port while preserving the full five port functionality they termed the Hamamatsu Method KAI (5). Many groups have reported an ever diminishing number of ports to perform more complex pulmonary surgery (6-8). Pulmonary resection using the robotic single port platform is currently in trials to seek and Food and Drug Administration (FDA) approved indication for the single port robot. In the current study, authors combined the camera port with the assistant port using a single incision laparoscopic device (Alnote® lapsingle, Alfresa Pharma Corporation, Oskaka, Japan). This 30 mm in is placed in the fifth interspace in the posterior axillary line and is later used for specimen extraction.

New surgical approaches whether paradigm shifting such as eliminating the thoracotomy for lung surgery or subtle modifications of technique need must be able to offer equivalent or better patient outcomes, have a reasonable margin for safety and adaptability. Additionally, the new technique should have an approachable learning curve that can be traversed by a wide population of surgeons. The greater the patient benefit, the better tolerated the learning curve. If the technique is too hard to learn, then it will be relegated to only a few proponents and not disseminated widely.

The authors' impetus for developing this technique was the greater number of ports needed for RATS compared to their VATS technique. Is this argument grounded in data supporting fewer incisions leads to less pain or greater satisfaction or is it an emotional argument. Perhaps the answer is yes to both. Han *et al.* reported decreased early post-operative pain using a two-port technique compared to a three-port technique. Analogous to method described by Funai *et al.*, these authors used a single port device (Lapsingle®, Sejong Medical, Paju, South Korea) in both arms of the study to allow multiple access points from one incision (6). A study of a large database comparing RATS to VATS and to open lung resection reported less opioid use in the RATS group. This study did not report port number for either minimally invasive arm (9).

As the number of surgeons performing RATS increases, the number of port strategies will undoubtedly increase as well. Newer robotic platforms with additional capabilities may become available soon. Single port RATS has been reported for pulmonary resection (10,11). The authors have shown that Hammanstsu KAI method is safe in their hands, preserves the functionality of their original technique including all four robotic arms and allows for an assistant. The decreased operative time and conversion rate implies that the transition from five ports to four ports was straightforward. Although prospective randomized trial including pain scores, morphine equivalents and patient satisfaction scores would provide the strongest validation of this concept, it is unlikely that such a trial would take place. The multi-use port strategy described by several authors that combines the camera, assistant, extraction and potential damage control site remains a clever way to minimize port site numbers while preserving the full functionality, operative prospective and safety.

Single port, transdiaphragmatic and subxiphoid approaches are being actively investigated. What is the optimum balance between the degree of access (port number and size) and minimizing the morbidity of that access? A corollary to this balancing act is: can these optimized techniques such as single port, three port, etc., be broadly applied to surgeons with less experience or to more complex procedures such as bronchoplasty or complex segmentectomy? Funai and colleagues have demonstrated that their modification is the next steppingstone on the path of minimizing the access for robotic surgery.

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