Editorial

Adopting the robotic platform for anatomic lung resections: real life lessons for the tech enthusiast

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Robotic surgery unquestionably revolutionized the surgical approach to many diseases, and lung cancer is no exception. The added dexterity, tremor filtration, wristed motion and 3-dimensional magnification are undeniable attributes that helped many surgeons around the world cross the bridge from open to minimally invasive lung surgery (1-3). Like any new technology, the initial legitimate concerns were focused on safety, as the operating surgeon is physically away from the patient, and achieving oncological outcomes that are comparable to the traditional approaches. The scientific literature over the last 2 decades clearly refuted both concerns, as robotic lung surgery was demonstrated to be safe and to achieve at least similar survival to the open and thoracoscopic [video-assisted thoracoscopic surgery (VATS)] approaches (4,5). Furthermore, the robotic platform allowed many to push the boundaries of minimally invasive surgery and tackle complex lung and chest wall procedures, as well advance stage disease after neoadjuvant treatment (6).

In their manuscript, Takase et al share their experience in adopting the robotic platform in anatomic lung resections, focusing on the incidence and management of various intraoperative complications (7). While their rate of injuries may seem high when compared with prior publications, we acknowledge that many of them were either minor or considered inconsequential by many surgeons, and therefore may have very well been underrepresented in previous literature. Nevertheless, the authors must be commended for their honesty in reporting, the details they provide in examining the cause of each injury and how they treated it. In fact, their analysis and management can be used as a blueprint for surgeons who are interested in adopting the robotic platform for lung cancer surgery. The videos are also quite complimentary and a great guide for trainees in robotic lung surgery.

The authors rightfully point to the lack of tactile feedback as one of the causes of these injuries. While the excellent visualization and the 3-dimensional depth perception provided by the camera reduce this limitation, retracting or grasping lung tissue during robotic surgery can result in unintended trauma of fragile structures such as pulmonary artery branches or the airway wall, in addition to the lung parenchyma itself. In fact, a recent study by Su et al showed a correlation between prolonged post-operative air leak and the accrued experience of robotic surgeons (8). It is common in our current practice to hold the sponge with robotic forceps to push or pull on the lung parenchyma, and to minimize grasping of tissue that will not eventually be

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resected.

Another point to stress is the importance of prompt communication with the bedside assistant, and to have a plan for managing intra-operative catastrophes. Noticeably, all the injuries in this series were managed without any conversion to open thoracotomy, and without the need for blood transfusions. However, this cannot be assumed to be the expectation. A surgeon must always be ready to convert to thoracotomy when the need arises. A recent review of the Society of Thoracic Surgeons General Thoracic Surgery Database showed a lower rate of conversion from robotic to open surgery when compared with VATS (9). The dexterity of the robotic platform likely played a key role in allowing prompt repair of these injuries. More importantly though, the author's prior extensive experience in anatomic lung resections was crucial in managing the intra-operative complications. As noted earlier, this should serve as a caution to new trainees embarking on robotic lung surgery, without prior sufficient open or thoracoscopic experience. Interestingly though, some of the encountered injuries seem to have been caused by the difference in surgical views and anatomic angles between the conventional open or VATS approach and the robotic one. It is unclear if this can be considered a detriment for the seasoned eye as opposed to the less experienced surgeon or graduate who may have been more exposed to robotic views than any other in their training. Nevertheless, prior experience and pre-operative planning for a disaster scenario are paramount to adequately deal with acute robotic injuries, as demonstrated by other authors (10,11).

When an intraoperative vascular injury occurs during lung surgery, the likelihood of a safe outcome is vastly increased when the entire team in the operating room is well-prepared. A brief discussion before the procedure run by the primary surgeon is extremely helpful and will allay much of the inevitable anxiety when the situation arises. Informing the different members of the team of their specific individual roles will help make the need for conversion much smoother and more expeditious. In robotic surgery, the primary surgeon is not even sterile. It is therefore important to perform regular drills of emergency scenarios with the entire team (6).

In essence, the series by Takase and colleagues highlights a real-life learning curve for adopting robotic surgery in experienced hands (7). Surgeon's judgment, case selection, pre-operative planning, intra-procedural communication and post-operative debriefing cannot be over emphasized as essential pillars for building a successful robotic thoracic program. While most of the intra-operative injuries can be safely repaired robotically without the need for conversion, it is still paramount to avoid them as they are not all inconsequential. Hopefully pre-operative simulation of robotic anatomic lung resections can be developed in the future to help mitigate these risks. Such models would be most helpful for training the next generations of minimally invasive thoracic surgeons.

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