Editorial

Robotic sleeve lobectomy-recent advances

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We read with great interest the recent report by Huang and colleagues of their experience with robot assisted thoracoscopic right upper lobe sleeve resection. The cornerstone of surgical management of non-small cell lung cancer (NSCLC) is complete resection, and sleeve resection has developed as an alternative to pneumonectomy in frail patients with diminished lung function. Recent data from the French Epithor database suggest that sleeve resection confers a benefit in early overall and disease free survival in matched cohorts, when compared to pneumonectomy (1). As mentioned by Huang and colleagues the limitations in manoeuvrability and depth perception with video-assisted thoracoscopic surgery (VATS) has previously mandated that sleeve lobectomy be performed as an open procedure in all but a few high-volume specialized centres. The two main technical obstructions to minimally invasive sleeve resection via a VATS approach include the steep learning curve necessary to develop the procedure, and the fact that the increased distance between the two ends of the bronchial anastomosis may necessitate certain approximation techniques impossible via VATS (2).

The benefits of minimally invasive thoracic surgery compared to the open approach have been well described, and include smaller incisions, reduced postoperative pain, decreased hospitalisation and earlier return to work. Perhaps even more importantly the minimally invasive approach may offer earlier and better exposure to adjuvant therapy (2). Minimally invasive thoracic surgery was limited to VATS until 2002, when Melfi and colleagues described the first robotic lobectomy for primary lung cancer (3). Robotic lobectomy is now widely accepted as feasible and safe, with proponents citing improved instrument control, ergonomics and intra-operative view, and decreased blood loss and length of stay (4).

A meta-analysis recently published by our group evaluates Robotic lobectomy compared to the VATS and open approaches. We found RATS to be superior VATS/open surgery with respect to transfusions, complications, length of inpatient stay and 30-day mortality (5).

A technique for robotic bronchoplasty in a human cadaver was first described by Ishikawa and colleagues in 2006 (6). There are several aspects of the robotic platform which facilitate bronchoplasty in sleeve resection. Principal among them are the 3D optics and seven degrees of freedom that the robotic instruments possess, allowing for precise intrathoracic suturing and knot tying (2). Schmid and colleagues described their experience with a hybrid VATS/RATS robotic sleeve lobectomy in 2011; the resection and lymph node dissection was performed via VATS, and then the robot was used to perform the bronchoplasty via the same ports (with the addition of a fourth port for the assistant) (2). Subsequently there have been several reported cases of totally robotic sleeve lobectomies, with most reported as single cases or small case series (7-10).

Cerfolio and his group described their experience with 8 sleeve lobectomy cases in 2016, with encouraging results. They report no 30- or 90-day mortality and no major morbidity. All patients bar one were radiologically free of tumour at 6 months, and on postoperative surveillance bronchoscopy there was no significant stricture of any of the anastomoses. Interestingly they favour the use of a 0-degree camera over the more traditional 30-degree, citing reduced torque on the intercostal bundle (leading to less postoperative pain), and more room for the bedside assistant. They also advocate performing the

mediastinoscopy simultaneous to the sleeve resection (with the use of frozen section) or just before (within two days), in order to free up tension on the anastomosis by mobilizing the left and mainstem bronchus (7).

The principal drawback to RATS remains the significantly increased capital and running costs when compared to VATS. Schmid and colleagues estimated that the additional cost of robotic sleeve lobectomy when compared to VATS is 1,800 dollars per case (2). However, there is a lack of robust literature around this issue, and as we believe that any decisions around allocation of resources in healthcare should be based on rigorous economic analysis, our group is currently completing an economic analysis of RATS *vs.* VATS *vs.* open lobectomy, due for publication soon. Huang and colleagues correctly point out that the other drawback of the robotic platform is the lack of tactile feedback to the operator (although visual compensation may address this issue once the surgeon is proficient).

In conclusion this report is a valuable addition to the growing body of literature on robotic sleeve lobectomy, a technique that confers all the proven advantages of minimally invasive thoracic surgery on this frail patient population. As case numbers grow in coming years, we anticipate that more high-quality evidence will become available to further evaluate and refine this procedure.

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Footnote

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