Letter to the Editor

Lobectomy for patients with marginal pulmonary function: an indication for robotics

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We thank Drs. Casiraghi and Spaggiari (1) for their insightful editorial remarks in the March 2019 issue of this Journal concerning our original report on the outcomes of robotic lobectomy in patients with marginal pulmonary function as compared to the traditional open thoracotomy approach (2). The authors provide an excellent summary on our work in the context of the literature. We agree with their conclusion that robotic-assisted thoracoscopic anatomic lung resections should not be avoided, but embraced for patients with compromised pulmonary function.

In today's healthcare landscape, surgical outcomes are becoming increasingly transparent, and will be eventually linked to reimbursements. The National Quality Forum has endorsed pulmonary lobectomy morbidity and mortality for lung cancer as a surgical quality outcome measure, which will be publically reported (3). The measure adopted the Society of Thoracic Surgery (STS) risk prediction model, which was developed according to outcomes in the national general thoracic database. Naturally, the model factors pulmonary function amongst multiple other patient risk factors, showing an increase of the composite measure of morbidity and mortality by 6% (95% confidence interval: 3–10%) for every 10% decrease of baseline forced expiratory volume in one second (FEV1) (4). This model also showed that video-assisted thoracoscopic surgery is associated with a 40% decrease in the odds ratio of developing a major postoperative complication, making this a powerful tool in the hands of proficient thoracoscopic surgeons. As thoracic surgeons, we train arduously to become not only technical experts, but also masters in the appropriate selection of patients for lung resections. With growing experience, we learn that patient selection directly affects surgical risk and outcomes in a predictable fashion. The problem at hand is a common one, which is the patient with severe chronic obstructive pulmonary disease by borderline pulmonary function tests, who is diagnosed with a surgically resectable early stage lung cancer. This is a patient in need of a pulmonary lobectomy, who would be traditionally considered "high risk" with a real possibility of postoperative respiratory failure, and need for tracheostomy. The potential adverse outcome may lead some surgeons to recommend an oncologically inferior sublobar resection or stereotactic body radiation therapy (SBRT). In our experience, these patients may be ideally approached using a robotic-assisted thoracoscopic technique, to accomplish an anatomic lung resection while minimizing the risk of perioperative morbidity. A close look at the existing data on the differential risk for thoracoscopic versus open lung resection will help us make that point.

Several previous studies suggest that the perioperative risk of lobectomy is relative to the surgical approach. In an analysis of the national STS database, Ceppa and colleagues examined the risk of pulmonary complications based on postoperative predicted FEV1, and found that the risk of pulmonary complications increased with

decreasing pulmonary function (5). In contrast to the linear increase in pulmonary morbidity that is seen with open lobectomy, they observed that complication rates with VATS plateaued around 15% for patients with a predicted FEV1 less than 60%. In a separate analysis of 340 patients with a FEV1 or diffusing capacity of the lung for carbon monoxide (DLCO) of <60%, Berry and colleagues found FEV1 and DLCO were significant predictors of pulmonary morbidity for patients undergoing thoracotomy but not for those undergoing thoracoscopic lobectomy (6). Preoperative pulmonary function has also been used to allocate so called "high risk" patients into clinical trials, such as the currently accruing JoLT Stable-Mates trial, which is comparing sublobar resection with SBRT for early stage lung cancer. According to the American College of Surgeons Oncology Group (ACOSOG) criteria, preoperative pulmonary function tests (predicted FEV1 or DLCO <50%) are considered major criteria and age and cardiovascular comorbidities are minor criteria (7). Donahoe and colleagues examined the pulmonary risk in a selected group of 72 patients considered high risk based on the ACOSOG criteria who were subjected to lobectomy (8). This study demonstrated a higher rate of pulmonary complications for high risk patients as compared to standard risk patients (44% *vs.* 15%), but this was not the case for patients who underwent lobectomy by VATS. Our experience with robotic-assisted lobectomy mirrors those findings, and confirms the benefit of the thoracoscopic approach in patients with decreased pulmonary function. We observed an overall reduction in the risk of pulmonary complications by 11%, which increased to 17% for high risk patients a baseline FEV1<60% (2). Notably, we found no ARDS, need for tracheostomy, or initial vent support >48 h in any of the 82 high risk patients selected for robotic lobectomy. Although no direct comparison exists between robotic and VATS lobectomy specifically in high risk patients, these results are at least comparable to those reported by VATS (5,9). The existing risk stratifications based on postoperative predicted pulmonary function may therefore not apply in in the same way to minimally invasive thoracoscopic resections, and the operative approach should be carefully considered when selecting patients with marginal pulmonary function for lobectomy.

Acknowledgments

None.

Footnote

Conflicts of Interest: RE Merritt is a speaker for Surgical Intuitive Inc. PJ Kneuertz has no conflicts of interest to declare.

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