

Robotic[-assisted] lobectomy has the greatest* benefit in patients with marginal pulmonary function

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Patients with limited pulmonary function have a high risk for pulmonary complications following lobectomy. The aim of this study was to determine whether robotic-assisted lobectomy may be of particular benefit in high-risk patients with marginal baseline pulmonary function.

This retrospective study was conducted at The Ohio State University Wexner Medical Center. The institute's Society of Thoracic Surgery (STS) general thoracic database was queried for patients who underwent lobectomy between January 1, 2012 and August 31, 2017. Included were all patients who underwent lobectomy by either a robotic-assisted or an open approach. Patients who underwent bronchoplasty, sleeve resection, bi-lobectomy, resection of Pancoast tumors, or concomitant chest wall resection were excluded.

High-risk patients were defined by preoperative forced expiratory volume in one second (FEV1) or diffusing capacity of the lung for carbon monoxide (DLCO) score less than 60% predicted.¹ Low-risk patients were defined by FEV1 and DLCO > 80%,² and intermediate-risk patients as those with FEV1 or DLCO between 60 and 80%.

The primary endpoint was pulmonary complication, as defined by the presence of any perioperative pulmonary complications.

Univariate and multivariate binary logistic regression analyses were performed to test the association of clinical factors with pulmonary complications. Variables with $p < 0.01$ on univariate analysis were included in the multivariate model.

Data

Comparison of high-risk patients undergoing robotic-assisted or open lobectomy

Characteristic	Robotic-assisted Lobectomy (n = 82)	Open Lobectomy (n = 107)	p value
Age > 75 years	18 (22%)	12 (11%)	0.05
Male	38 (46%)	55 (51%)	0.44
Pack years, median (IQR)	50 (25–67)	40 (30–66)	0.035
Active smoker	38 (46%)	33 (31%)	0.035
COPD	67 (81%)	58 (54%)	< 0.001
Outcome			
Pulmonary complication	23 (28%)	48 (45%)	0.015
Air leak (> 5 days)	4 (5%)	16 (15%)	0.024
Atelectasis (req. bronchoscopy)	6 (7%)	24 (22%)	0.005
Tracheostomy	0	6 (6%)	0.028
Length of hospitalization, median days (IQR)	4 (4–7)	8 (5–12)	< 0.001
Major complications	16 (19%)	26 (24%)	0.41
Mortality	1 (1%)	2 (2%)	0.73

IQR: Interquartile range. Statistical significance was set at $p < 0.05$.

*Greatest is with respect to the data presented in this study.

PUBLICATION SUMMARY

Results

At The Ohio State University Wexner Medical Center, a total of 599 patients underwent lobectomy by robotic-assisted (n = 287) or open approach (n = 312) between January 1, 2012 and August 31, 2017. A subgroup analysis of 191 (32%) high-risk patients included 82 robotic and 107 open lobectomies.

Compared to the open lobectomy group, patients who underwent robotic-assisted lobectomy were slightly older, had better pulmonary function, and had less frequent prior cardiothoracic surgery. In addition, fewer of these patients underwent preoperative chemotherapy for clinical stage IIIa lung cancer.

The overall rate of pulmonary complication was lower following robotic-assisted lobectomy as compared to the open approach (21% vs. 32%, p = 0.002).

The overall median length of stay was two days shorter following robotic-assisted lobectomy (4 days vs 6 days, p = 0.001).

On multivariate analysis, robotic-assisted lobectomy was independently associated with a decreased risk for pulmonary complications (odds ratio [OR] 0.54, 95% confidence interval [CI] 0.34–0.85).

High-risk patients undergoing robotic-assisted lobectomy were less likely to have any pulmonary complication than high-risk patients who underwent open lobectomy (28% vs. 45%, p = 0.02).

Robotic-assisted lobectomy in high-risk patients was associated with decreased rates of prolonged air leak, atelectasis and pneumonia, when compared to open lobectomy in high-risk patients.

Median length of stay following robotic-assisted lobectomy in high-risk patients was 4 days, significantly shorter compared to 8 days following open lobectomy (p < 0.001).

Among high-risk patients, there were no significant differences in major complication and mortality rates.

Key takeaways

Robotic-assisted lobectomy is associated with fewer pulmonary complications when compared to a traditional open approach in a high-risk population.

In addition, the median length of stay for high-risk patients is 4 days shorter for those who underwent robotic-assisted lobectomy, as compared to those who underwent an open approach.

While the risk of pulmonary complication increases in patients with worse pulmonary function regardless of approach, the robotic-assisted technique may serve to attenuate this risk independent of baseline pulmonary function.

Study limitations

Given the retrospective nature of this study, the results may be biased by selection and confounding of unmeasured factors including surgeon experience and preference of technique.

High-risk patients in the robotic-assisted group actually included older and sicker patients, as this series reflects a liberal application of robotics for higher risk patients beyond the initial learning curve.

This study is limited to the comparison of perioperative outcomes, and does not examine differences in pain, dyspnea, and health related quality of life. Postoperative pain may be a significant factor in reducing postoperative pulmonary morbidity and shorten recovery.

References

1. Ceppa DP, Kosinski AS, Berry MF, et al. Thoracoscopic lobectomy has increasing benefit in patients with poor pulmonary function: a society of thoracic surgeons database analysis. *Ann Surg.* 2012;256(3):487-93.
2. Brunelli A, Kim AW, Berger KI, Addrizzo-Harris DJ. Physiologic evaluation of the patient with lung cancer being considered for resectional surgery: diagnosis and management of lung cancer, 3rd ed: American college of chest physicians evidence-based clinical practice guidelines. *Chest.* 2013;143(5 Suppl):e166S-90S.

Financial disclosure

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