staging, lymph node involvement, computed tomography anatomy and presence of adhesions. The groups were statistically similar in baseline characteristics with no differences in comorbidities (\( P = 0.48 \)). Although not statistically significant, the operating time was longer for Group B (133 ± 26 vs 125 ± 30 min, \( P = 0.18 \)); intraoperative blood loss was greater in Group B (250 ± 60 vs 200 ± 50 ml, \( P = 0.2 \)); Group B had a shorter hospital stay [5 days (3–20) vs 5.5 days (2–96), \( P = 0.5 \)]. Postoperative complication rates were similar (Group A: 36.3% vs Group B: 32.3% \( P = 0.4 \)).

Konge et al. [5] compared 29 VATS lobectomies by a junior trainee and 185 by two senior surgeons. The trainee had limited prior experience in open lobectomy (14 procedures). However, he performed 100 minor VATS procedures and observed 100 VATS lobectomies in preparation. Operating time for the trainee was significantly longer [median: 120 min (74–160) vs 100 min (42–255), \( P = 0.04 \)]. There was no significant difference in perioperative bleeding [median 100 ml (10–500) vs 50 ml (5–2500), \( P = 0.79 \)]. The chest tubes of trainee’s patients were removed earlier (median: 1 vs 2 days, \( P < 0.001 \)) and hospital stay was shorter (median: 3 days vs 4 days, \( P < 0.001 \)). Although the Spearman’s Rho value for the operative time and blood loss show a decline, there was no significant change in perioperative blood loss or procedure time as the trainee performed more operations (\( P = 0.42 \) and \( P = 0.64 \), respectively). None of the trainees’ procedures had to be converted to thoracotomy. Without much prior experience in open lobectomy, the trainee was able to produce results comparable with two VATS experts.

Zhao et al. [6] investigated the VATS learning curve of a surgeon who was experienced in VATS and open lobectomy. Ninety lobectomies were performed. The patients were divided into three chronological groups of 30 (Groups A, B and C). There were no demographic or clinicopathological differences between the groups. The operative time for Group A (214.2 min ± 62.2) was significantly longer than Groups B and C, which had similar operating times (153.8 min ± 30.1 and 148.3 min ± 31.8, \( P < 0.001 \) respectively). Patients in Group A (285 ml ± 152.1) also lost significantly more blood compared with patients in Groups B and C (150 ml ± 76.6 and 138.3 ml ± 79.5, \( P < 0.001 \)). The percentage of conversions to open lobectomy increased from the first to the last group (3.3–6.7%, \( P = 0.781 \)). There was no significant change in the length of hospital stay, chest tube duration, lymph node dissection or the rate of complications. According to the author, the learning curve plateau was achieved after 30 cases.

Wan et al. [7] compared 51/111 (46%) VATS lung resections performed by a senior surgeon vs 60/111 (54%) performed by trainees. Patient characteristics and risk factors were comparable between the groups. Conversion to thoracotomy for control of pulmonary artery bleeding occurred in 3 (5%) patients in the trainee group and 1 (2%) in the consultant (\( P = 0.39 \)). Trainees’ mean operating time was significantly longer (162 min vs 136 min, \( P = 0.01 \)). There was no significant difference in mean blood loss (\( P = 0.4 \)), length of hospital stay (\( P = 0.4 \)), duration of chest tube drainage (\( P = 0.9 \)) or complications (\( P = 0.95 \)). Overall mortality was 0%. The authors concluded that VATS major lung resection could be safely taught to trainees in a stepwise approach.

Reed et al. [8] compared outcomes in 97 open, 105 VATS lobectomies. There were no apparent differences in mortality, prolonged airleak, atrial fibrillation or other complications between the two groups. Stepwise approach to the incorporation of VATS lobectomies increased the operative competencies of the attending surgeon and enabled training of the residents and new attendings.

**CLINICAL BOTTOM LINE**

The learning curve for VATS lobectomy is not eliminated by prior experience in open lobectomy. Junior surgeons with less experience in open lobectomy are able to demonstrate similar outcomes and similar learning curves to their more experienced counterparts.

**Conflict of interest:** none declared.

**REFERENCES**

[5] Konge L, Petersen RH, Hansen HJ, Ringsted C. No extensive experience in baseline characteristics with no differences in comorbidities and presence of adhesions. The groups were statistically similar (Group A: 36.3% vs Group B: 32.3% \( P = 0.4 \)).
VATS. According to Ferguson et al. [5], skills required for thoracoscopic and robotic operations likely differ, and the needs and abilities of trainees learning these approaches require assessment. Therefore, the actual learning curve of robotic lobectomy has yet to be defined. Further investigation is needed in order to compare learning curves for VATS and robotic lobectomy when performed by open surgery experts and less experienced surgeons.

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References


