

Should Robotic Thoracic Surgery Be Pursued? A case-control analysis of selected robotic versus laparoscopic/VATS procedures

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Objectives: There has been a push to integrate robotics into thoracic surgery despite limited evidence beyond safety and feasibility studies. In the thoracic literature, very few studies have compared outcomes of robotics with laparoscopic/VATS (MIS) cases. Since few thoracic surgeons have surpassed the robotic learning curve, we compared our initial robotic experience with MIS to determine which procedures warrant continued development and study.

Methods: A case-control analysis was performed comparing a prospective database of consecutive robotic procedures (lung resection, thymectomy, mediastinal tumor resection, esophageal myotomy with partial fundoplication and Nissen) with matched historic MIS procedures.

Results: In 18 months, 61 robotic cases were attempted with 3 conversions. The 8 thymectomies, 21 anatomic lung resections, 11 mediastinal lesions resected, 7 myotomies and 9 Nissens were compared to a similar MIS group. One mortality occurred in the robotic group unrelated to the approach. Four major and 1 minor morbidity occurred in the robotic group compared with 3 major and 5 minor in the MIS group. Operative time, blood loss and length of stay were similar except for operative time in the esophageal group (Table 1). Significantly less narcotics were used by patients after robotic lung and esophageal surgery. During robotic lung surgery 4.1 N1 lymph nodes were harvested compared to 2.6 in the MIS group ($p=0.45$). No difference in N2 nodes harvested or duration of air leak (3.6 days vs 1.7 (MIS), $p=0.1$) was observed. We successfully transitioned from bilateral VATS thymectomy to a unilateral robotic approach and also observed that access to superior/anterior mediastinal lesions and visualization of esophageal layers for myotomy were enhanced by robotics. Subjectively, dexterity, ergonomics and optics were superior with the robot.

Conclusions: Early experiences with robotics resulted in similar operative outcomes and morbidity when compared to matched MIS procedures. Benefits of robotics exist for lung resection in postoperative pain reduction and hilar nodal dissection. Dexterity, optics and access to the mediastinum favor robotic mediastinal and myotomy surgery. Robotic fundoplication confers no obvious benefit, but does facilitate skill acquisition for esophagectomy. Robotics should be pursued and studied in randomized fashion to define its role in thoracic surgery.

Table 1: Comparative Outcomes

Procedure (N)	OR Time (min)	Blood Loss (ml)	Length of stay (d)	# off narcotic pains meds at 7 days
Thymectomy				
Robot (8)	264	55	2.2	4
VATS (5)	213	72	2.4	4
Anatomic Lung				
Robot (21)	219	163	5	8
VATS (21)	207	157	6	0***
Mediastinal				
Robot (11)	105	20	1.7	4
VATS (11)	157	35	2.1	2
Esophageal				
Robot (16)	182	1	1.8	9
MIS (16)	147*	14	1.5	3**

* p = 0.03, ** p = 0.002, *** P = 0.058