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DISPARITY IN RIGHT VENTRICULAR PUMP FUNCTION FOLLOWING CONVENTIONAL OR MINIMALLY INVASIVE PNEUMONECTOMY IN SWINE

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Recent clinical data indicate that following lung resection in high-risk patients, right ventricular (RV) ejection fraction (EF) is better maintained when the procedure is performed via a minimally invasive approach (1). Given that other data suggest that reductions in RV EF following conventional lung resection evolve over the first 1-2 days postoperatively and are independent of pulmonary vascular resistance (2), the present study was performed to determine whether identical anatomic lung resection via open thoracotomy or video assisted thoracoscopy (VATS) produces different effects on RV inotropy and afterload.

Methods. 8 swine underwent left pneumonectomy via thoracotomy (n=4) or VATS (n=4) and were allowed to recover for 3 days before open-chest measurement of RV pressure (RVP) and volume along with pulmonary arterial (PA) root pressure and flow. From these data, RV inotropy was indexed as end-systolic elastance (E_{es}), small and large vessel contributions to RV afterload as characteristic resistance (Z_R) and impedance (Z_C), respectively, and global RV pump function as EF. Data from pneumonectomy animals were compared to each other and 4 non-operated controls by ANOVA with a p value ≤ 0.5 considered significant.

Results. Data are shown in table. Although both open and VATS pneumonectomy produced similar increases in mean PA and peak RV pressures, only after thoracotomy was there a demonstrable reduction in RVEF. This response appears to be primarily the result

of a decline in RV E_{es} following open thoracotomy since there were no differential changes in either the small or large vessel contributions to RV afterload.

Conclusions. These preliminary data suggest that despite resection of the same lung mass, left pneumonectomy via open thoracotomy elicits a different pattern of reactive changes within the RV that result in a postoperative decline in contractility. Whether this response reflects inherent alterations within myocytes or other processes such as a change in the synchrony of free wall shortening remains to be determined. Nonetheless, the data appear to support the possibility that minimally invasive lung resection may improve the RV capacity to compensate for postoperative challenges such as pneumonia, embolism or acute lung injury.

References

1. Mikami I, Koizumi K, Tanaka S. Changes in right ventricular performance in elderly patients who underwent lobectomy using video-assisted thoracic surgery for primary lung cancer. *Jpn J Thorac Cardiovasc Surg* 2001;49:153-159.
2. Reed CE, Dorman BH, Spinale FG. Mechanisms of right ventricular dysfunction after pulmonary resection. *Ann Thorac Surg* 1996;62:225-231.

	control (n=4)	Thoracotomy (n=4)	VATS (n=4)
mean PAP (mmHg)	16 ± 0.5	18 ± 1	18 ± 2
RVEF (%)	49 ± 2	41 ± 3♦	46 ± 2
CO (L/min)	3.6 ± 0.4	3.1 ± 0.3	2.9 ± 0.1♦
Z _R (dyn-s-cm ⁻⁵)	352 ± 33	473 ± 56♦	455 ± 96♦
Z _C (dyn-s-cm ⁻⁵)	41 ± 5	64 ± 6♦	69 ± 10♦
RV peak pressure (mmHg)	27 ± 2	31 ± 2	32 ± 1
RVEDP (mmHg)	4 ± 1	5 ± 2	3 ± 3
RV E _{es} (mmHg/mL)	0.35 ± 0.02	0.24 ± 0.01♦❖	0.36 ± 0.02

♦ = difference from control; ❖ = difference thoracotomy vs VATS