

Right ventricular strain and cardiac axis deviation following lung resection

I. Slessor¹, P. McCall¹⁺², J. Kinsella¹ and B. Shelley¹⁺².

¹Academic Unit of Anaesthesia, University of Glasgow, UK

²Golden Jubilee National Hospital, Clydebank, UK

Lung resection has been associated with significant post-operative right ventricular (RV) dysfunction, but the mechanism is poorly understood [1]. The primary aim of this study was to assess whether RV strain could be demonstrated using an electrocardiographic (ECG) scoring system. Secondly we investigated whether cardiac axis deviation was associated with RV strain and whether changes in the electrical axis observed post-operatively reflect anatomical rotation of the heart.

Methods

With ethical approval two parallel studies were performed; an ECG study and a cardiovascular magnetic resonance (CMR) study. Pre- and post-operative ECGs were analysed to determine changes in electrical axis and RV strain (quantified using Daniel's score [2]). Cardiovascular variables and length of high dependency and hospital stay were recorded. CMR images were obtained pre-operatively and on post-operative day two.

Results

Seventy three and 14 patients predominantly undergoing lobectomy were included in the ECG and CMR studies respectively. Daniel's scores increased post-operatively ($p < 0.001$) and patients with an increased score had longer high dependency (43 vs. 48.5) hours; $p = 0.046$ and hospital (6 vs. 7) days; $p = 0.024$ stay. There was no association between Daniel's score and cardiovascular variables. Electrical cardiac axis deviated left following lung resection ($8.49^0 \pm 21.4^0$; $p = 0.001$), but was not related to Daniel's score. On CMR, minimal leftward rotation was observed in the HLA plane ($3.8^0 \pm 3.3^0$; $p = 0.001$). No rotation was observed in the VLA plane.

Discussion

RV strain is identifiable following lung resection using a non-invasive ECG based score and appeared to be clinically significant. RV strain does not appear to be associated with electrical axis deviation nor rotation of the heart in the HLA or VLA planes. This ECG score may have a clinical role in detection of RV dysfunction.

References

1. Reed CE, Dorman H, Spinale FG. Mechanisms of right ventricular dysfunction after pulmonary resection. *Annals of Thoracic Surgery* 1996; 62: 225-32.
2. Daniel KR, Courtney DM, Kline JA. Assessment of cardiac stress from massive pulmonary embolism with 12-lead ECG. *Chest* 2001; 120: 474-81.