

RCoA Research, Education & Travel Grants 2016

Award: The Ernest Leach Research Fund

Applicant: Dr Adam Glass, University of Glasgow

Project Title: *Assessment of RV contractile reserve on exercise following lung resection – a pilot study*

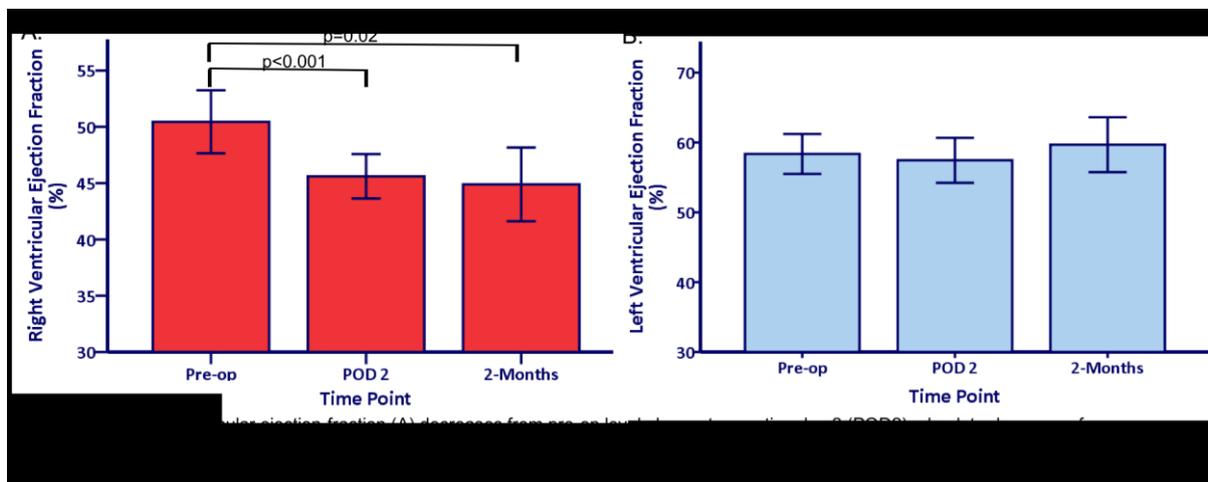
Project Description:

Introduction

Lung cancer is the leading cause of cancer death in the UK. Surgical resection offers the best chance of cure; rates are increasing with older and sicker patients now undergoing resection. Unfortunately, morbidity following lung resection remains high. Many patients experience long term dyspnoea and decreased functional capacity, this is poorly associated with the change in lung function [1] and may be influenced by cardiac limitation [2].

Background

Our group has previously investigated changes in cardiac function at rest following lobectomy with echocardiography and cardiac magnetic resonance (CMR) imaging, demonstrating decreased right ventricular ejection fraction (RVEF) but unchanged left ventricular ejection fraction following surgery [3] (Figure 1). Delta RVEF (POD2 from pre-op) was associated with potential cardiac inflammation (delta BNP, $r=0.47$, $p=0.03$).



Although long recognised as a potential cause of decreased exercise capacity following lung resection, RV function on exercise has undergone very little investigation. Using volumetric pulmonary artery catheters to measure RVEF (a technique the accuracy of which has since been challenged[4]), Okada et al showed that three weeks following lobectomy RVEF was decreased at rest and further decreased on exercise in parallel with a marked increase in pulmonary artery pressure and pulmonary vascular resistance. Echocardiographic assessment of RV

function is challenging due to its complex shape and retrosternal position but surrogate markers of tricuspid annular plane systolic excursion (TAPSE), tricuspid S wave velocity and RV longitudinal strain (RVLS) have all been shown to associate with RVEF measured by CMR[6]. In our previous study TAPSE correlated best with RVEF ($r=0.35$, $p<0.01$) but showed no significant change between time points.

In pulmonary hypertension, the concept of RV contractile reserve is increasingly recognised as an important determinant of exercise capacity and outcome[6]. We hypothesise that following lung resection patients may exhibit similar physiology. The subtle changes in RVEF we have previously observed at rest may manifest as reduced RV contractile reserve on exercise in the face of well documented afterload increase.

Methodology

Aims

Primary endpoint

- RV contractile reserve measured as the change in RV function (delta TAPSE) on exercise relative to rest determined pre and 2-months post-operatively.

Secondary endpoints

- Change in contractility (delta RVLS) on exercise
- Change in afterload (est. pulmonary artery pressure and acceleration time) on exercise
- Change in markers of cardiac inflammation (BNP, CK-MB, troponin and myoglobin)

Study design

Pilot observational cohort study of patients undergoing video-assisted thoracoscopic lobectomy. With informed patient consent and ethical approval, five patients will undergo exercise echocardiography pre-operatively and two months post-operatively. The echocardiography protocol will assess RV and LV function, afterload and contractility at rest and on a fixed workload at submaximal exercise.

Timescale and funding justification

Grant funds will cover the echocardiography scanning and blood samples analysis costs. A draft protocol has been prepared and we aim to complete the study in nine months from funding decision.

This study will help inform a larger clinical study examining the functional impact of post-operative RV dysfunction. Ameliorating perioperative RV injury may be a novel therapeutic target and lead to improved patient outcomes following lung resection.

References

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