

## **RCoA Research, Education & Travel Grants 2015**

**Award:** The Sargant Fund

**Applicant:** Dr Peter Alston

**Project Title:** Coronary sinus blood isoflurane concentration in patients undergoing heart surgery

### **Project Description:**

#### **1. Background**

There is evidence from the systematic review and meta-analysis of randomised controlled trials that compared to total intravenous anaesthesia, a volatile anaesthetic technique administered to patients undergoing cardiac surgery is associated with a lower mortality and a lower incidence of adverse myocardial outcome. However, it is unclear what dose of volatile anaesthetic agent is required to obtain the optimal outcome. Indeed, the concentration of volatile anaesthetic agents such as isoflurane, in the myocardium when it is administered into the oxygenator during cardiopulmonary bypass (CPB) has never been measured in humans. One way to estimate the myocardial concentration would be to measure the concentration of isoflurane in the coronary sinus blood by sampling from a catheter that is routinely placed for delivering cardioplegia.

#### **2. Methodology**

The primary aim of the study is to measure the isoflurane concentration in coronary sinus blood. The secondary aims are to assess whether:

- The myocardial concentration of isoflurane had equilibrated with its arterial concentration before the aortic cross-clamp had been applied by comparing the difference in concentrations between the coronary sinus and arterial blood.
- Oxygenator exhaust levels of isoflurane may be used to estimate coronary sinus venous blood concentrations

Ethical and R&D approval have been granted. In this pilot study, 30 patients scheduled to undergo elective heart surgery under volatile anaesthesia using a coronary sinus catheter, will be recruited. After the coronary sinus catheter has been inserted and before cross-clamping of the aorta, 10 ml blood samples will be taken from the coronary sinus and arterial line. Simultaneously, the concentration of isoflurane in the gases exhausting from the oxygenator will be recorded. The concentration of isoflurane in the blood samples will be measured using head space gas chromatography. Concentrations in the arterial and coronary sinus blood will be statistically compared to determine if they are different. If they are not different then this would indicate that levels in the myocardium have equilibrated and coronary sinus concentrations should represent myocardial concentrations of isoflurane. Bland and Altman's method comparison analysis will be used to determine whether oxygenator exhaust concentrations can be used to determine coronary sinus concentrations of isoflurane.

### **3. Timescale and justification of funding**

It planned to take three months to recruit the patients, analyse the blood samples, undertake statistical analysis and write a report as this is the time allocated to the medical student to undertake his Student Selected Component in year four. An estimated eight patients a week fulfil the entry criteria so it should be possible to recruit the nominated 30 patients in the first two months of this time period allowing a month for statistical analysis and report writing.

Gas chromatography analysis of blood isoflurane concentrations will cost £30 per sample. Travel, accommodation and meeting registration expenses will be required so that the study may be presented by the medical student at an international meeting. Following training, collection of blood samples and recording of patient and operative characteristics will be undertaken by the medical student.