

## Magnetic Resonance Guided Cardiac Catheterisation in Children and Adults with Congenital Heart Disease

V. Muthurangu<sup>1</sup>, A. Taylor<sup>2</sup>, S. Hegde<sup>3</sup>, M. Miquel<sup>3</sup>, D. Hill<sup>3</sup>, R. Razavi<sup>3</sup>

<sup>1</sup>Imaging Sciences, Kings College London, London, United Kingdom, <sup>2</sup>Cardiology, Institute of Child Health, London, London, United Kingdom, <sup>3</sup>Imaging Sciences, Kings College London, London, London, United Kingdom

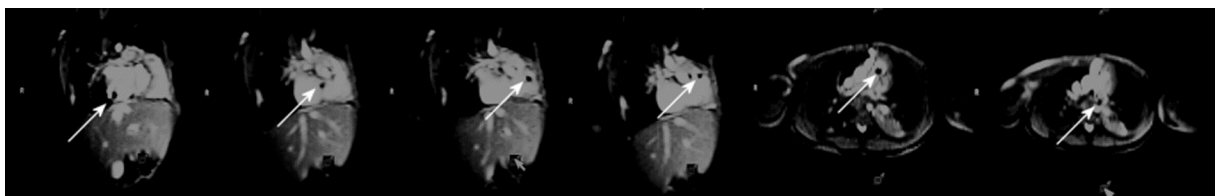
**Introduction:** X-ray guided cardiac catheterisation is limited by poor soft tissue visualisation and exposure to x-ray radiation. We have developed a novel method of magnetic resonance (MR) guided cardiac catheterisation with x-ray support.

**Methods:** Our cardiac catheterisation laboratory has both MR and X-ray imaging facilities; an XMR suite. Real-time steady state free precession sequences were used to visualise balloon angiographic catheters. 33 patients underwent diagnostic cardiac catheterisation under a combination of x-ray and MR guidance

**Results:** In 9 patients cardiac catheterisation was performed wholly under MR guidance. In the remaining patients catheter manipulation was carried out under a combination of x-ray and MR guidance. All the patients received lower x-ray doses compared to controls, with the mean (SD) dose for patients undergoing XMR guided cardiac catheterisation was 11.8 (12.6) and for the age and procedure matched contemporaneous controls was 42.6 (36.7). We were able to superimpose x-ray fluoroscopic images of electrophysiology electrode catheters on to the 3D rendered image of the cardiac anatomy obtained by MR.

**Conclusion:** We have shown MR guided cardiac catheterisation to be safe and practical in a clinical setting, with better soft tissue visualisation, more pertinent physiological information and a reduction in ionising radiation exposure. We feel MR guidance will become the method of choice for diagnostic cardiac catheterisation in congenital heart disease patients, and an important tool in interventional cardiac catheterisation and radiofrequency ablation of arrhythmias.

*Fig1. Balloon tip catheter, filled with carbon dioxide, being manipulated through the right heart and pulmonary arteries.*



*Fig 2. a) Registration of MR volume of the right heart and basket catheter. b) Registration of tagged MR images and basket catheter*

