CLINICAL RESEARCH

At the Centre of Excellence in CVMRI, we aim to progress the development of MRI as a diagnostic tool for congenital and acquired heart disease. Through vendor research collaborations, we explore the application of novel MRI technologies to determine new clinical applications, help improve image quality, acquisition speed and diagnostic accuracy to guide clinical management.

Our research has focused on areas such as establishing normal CMR values for the Australian population, improved techniques for measuring ventricular function; the role of CMR in the assessment of myocarditis and cardiomyopathies; in infants with complex congenital heart disease; and in patients with chronic embolic pulmonary hypertension.

Currently, our major focus is developing techniques and exploring the feasibility and utility of CMR assessment under exercise stress conditions. In collaboration with Siemens Healthcare, we are exploring the use of an ultra-fast imaging technique (ECG-triggered cine bBSSFP with compressed sensing) to measure cardiac function during exercise with a supine bicycle ergometer. Initial research focused on the effects of exercise on right ventricular contractile function and early detection of right ventricular maladaptation in patients with pulmonary arterial hypertension. Our research has shown that in this patient group, right ventricular dysfunction not evident at rest can be unmasked and measured during exercise. We are also exploring other applications of CMR during exercise.

OUR VISION ON CVMRI

There will be a significant and continuing improvement in image quality and imaging speed with a comprehensive cardiac imaging examination achievable in one acquisition without the need for breath holding. New reproducible techniques for tissue characterisation will remove the need for intravenous contrast administration. Improved accuracy and speed of flow imaging will deliver reproducible, quantitative, real-time imaging of flow dynamics in vessels, heart chambers and valves.

Exercise cardiac MRI will be a robust tool for assessing patients undergoing physical exercise and will play a major role in the management of patients with cardiac disorders, potentially leading to a significant reduction in the cost associated with healthcare provision to these patients.

Technical developments will improve ultra-high field CMR and provide novel insights into cardiac diseases.

COLLABORATIONS

Our centres collaborate with programs within the Prince Charles Hospital such as the Heart and Lung Institute; the Queensland Pulmonary Hypertension Unit; and the Critical Care Research Group.

We also collaborate on research projects with research institutes within Australia and globally, i.e. the Heart Foundation Research Centre and Menzies Health Centre, Griffith University, Queensland; the Baker Institute, Melbourne; the School of Information Technology and Electrical Engineering, University of Queensland; the Department of Physical and Chemical Sciences, Queensland University of Technology and the Max-Delbrück-Centre for Molecular Medicine, Berlin, Germany.

Our industrial collaboration partners include Siemens Healthcare, and MRI Tools, Berlin, Germany.

THE CENTRE FOR ADVANCED IMAGING

The University of Queensland, Brisbane, Australia

Founded in 2010, the Centre for Advanced Imaging (CAI) brings together the skills of a critical mass of researchers and state-of-the-art research imaging instruments. It is the only facility of its type in Australia, one of only a handful in the world. The centre contains over $50M of human imaging and spectroscopy equipment and hosts a 7 Tesla and a 3 Tesla human imaging system with CMR equipment.

Group Members: Daniel Stäb, Kieran O’Brien, Markus Barth, Aiman Al Najjar, Gregory Brown.

Website: http://www.cai.uq.edu.au

BASIC RESEARCH

At the Centre for Advanced Imaging, we explore the capabilities of ultra-high field CMR. Given the SNR advantage inherent to the higher field, we particularly expect improvements in spatial resolution and new opportunities for MR based myocardial tissue characterisation and microstructure imaging. In order to solve technical challenges such as cardiac triggering and field inhomogeneities, we closely collaborate with coil and system manufacturers.

Other research activities include the advancement of simultaneous multi-slice (SMS) CMR and its translation into clinical applications.

SCMR INVOLVEMENT AND FAVOURITES

Dr Richard Slaughter has served the SCMR as an invited speaker, session chair and member of the Congenital Heart Imaging Committee.

Publications:


Abstracts:

(i) A New Method for Cardiac MRI Analysis of Right Ventricular Function (2004).
(iii) The Role of Contrast Enhanced MR Angiography in Infants with Complex Congenital Heart Disease in the First Months of Life (2005).
(iv) MRI Features of Cardiac Manifestations of Fabry’s Disease (2005).
(vii) Late Gadolinium Enhancement does not occur in the Tako-Tsubo Cardiomyopathy—a Quantitative Cardiovascular Magnetic Resonance Study (2011).
(ix) CALIBRHEA accelerated 2D bSSFP Imaging with Improved Banding Behavior using Gradient Controlled Local Larmor Adjustment (GC-LOLA) (2016).
(x) ECG Triggering at Ultra-High Field Using a Conventional 3-Lead Trigger Device (2017).

THE RICHARD SLAUGHTER CENTRE OF EXCELLENCE IN CARDIOVASCULAR MRI

The Prince Charles Hospital, Brisbane, Australia

Founded in 2002, the Richard Slaughter Centre of Excellence in Cardiovascular (CV) MRI offers Australia’s largest cardiac MRI service, encompassing both clinical and research activities for acquired and congenital heart disease.

The centre has two 1.5 Tesla MRI scanners and is based at the Prince Charles Hospital which is the largest cardio-thoracic centre in Australia and one of the largest in the Southern Hemisphere.

Founding members: Richard Slaughter and Wendy Strugnell.

Radiologists: Richard Slaughter, Rachael O’Rourke, Allan J. Wesley, Anthony Litzow, Katrina Hopcraft.

Cardiologists: Christian Hamilton-Craig, Jolande Neill, Aaron Lin.

MRI Radiographers: Wendy Strugnell, Robyn Riley, Andrew Trotter, Anthony Fuller, Temeeka Parry, Tina Readdy, Michaela Macmahon, Matt Thomas, Mark Chapman, Damien Thomas, Erin Walker.

THE UNIVERSITY OF QUEENSLAND

A USTRALIA

Prince Charles Hospital & University of Queensland

Brisbane, Australia

CMR study at the 7 Tesla human MRI system

Tour de France cycling champion Cadel Evans participating in exercise CMR research

CLINICAL FOCUS

Informed by clinical evidence-based research, we provide a comprehensive clinical service covering the full range of clinical cardiovascular applications including congenital heart disease; ischemic heart disease and cardiomyopathies; pulmonary hypertension including chronic, embolic pulmonary hypertension; heart and lung transplantation; percutaneous valve therapies; heart failure and electrophysiology.

Richard Slaughter Centre of Excellence in Cardiovascular MRI & Centre for Advanced Imaging

Collaborations

CMA study at the 7 Tesla human MRI System

Founding members Richard Slaughter and Wendy Strugnell

Collaborations

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