

Joint Symposium

JS-I ACAR *Abbreviated MR*
(3 speakers, 90 min)

JS-II AOSR *MRI Safety Course*
(5 speakers, 90 min)

JS-III TRS *Cardiac MR -Practical Tutorial*
(8 speakers, 120 min)



Chun-Ku Chen, MD, PhD
陳俊谷 副教授

Time Table

Sunday, May 22, 2022
Room 203

Time	Topics	Speakers	Moderators
13:30-13:40 (10mins)	Effective shimming at 3T CMR	Randy Yang	Chun-Ku Chen
13:40-13:50 (10mins)	Techniques and Sequence for Arrhythmia Patients	Hsiu-Ning Chang	Chun-Ku Chen
13:50-14:00 (10mins)	Avoid Breathing Artifacts in CMR	Ming Hua Chang	Chun-Ku Chen
14:00-14:15 (15mins)	Late Gadolinium Enhancement	Chun-Ku Chen	Chun-Ku Chen
14:15-14:30 (15mins)	How to do flow 2D/ 4D flow, anti-aliasing and visualization	Hsu-Hsia Peng	Chun-Ku Chen
14:30-14:45 (15mins)	How to do stress perfusion on CMR	Wei-Ming Huang	Chun-Ku Chen
14:45-15:00 (15mins)	CMR imaging in patient with CIED	Ling, Kuo	Chun-Ku Chen
15:00-15:15 (15mins)	Repaired TOF CMR in 45 min	Mao-Yuan Su	Chun-Ku Chen
15:15-15:30 (15mins)	Non-ischemic Cardiomyopathy CMR in 45 min	Hsiu-Ning Chang	Chun-Ku Chen

CMR Practical Tutorial

Organizer: Chun-Ku Chen, MD, MHA, PhD

Overview:

In this session, the impact on CMR image by heart rhythm, breathing, magnetic field and the solutions regarding parameters and alternative sequences will be discussed. The major CMR evaluation, such as late gadolinium enhancement, flow quantification and visualization, the tips of how to perform a successful stress perfusion imaging, the safety measures and how to acquire diagnostic images in patients with cardiac implantable electrical devices. The practical tips for the whole workflow for CMR for repaired tetralogy of Fallot and non-ischemic cardiomyopathy will also be demonstrated. In summary, the practical aspects of the important components about acquiring diagnostic CMR images will be covered in this CMR Practical Tutorial session.

CMR Practical Tutorial

Organizer: Chun-Ku Chen 陳俊谷

在這兩個小時的研討會，我們將以中文講解技術層次的課題，已實用為導向，作為放射技師、放射科醫師、MR科學家的共同舞臺。希望能夠減少減少CMR執行時的困難，提升影像品質的可靠度，逐漸發展臨牀應用。

在這個系列課程中，將針對這些影響因子、如心律、呼吸、磁場均勻度對影像造成的影響，以及如何調整取像的條件、儀器的參數、替代性的序列說明講解，來減少這些影響因子對影像品質帶來的衝擊，維持品質，並對如何完成主要的心臟血管評估項目：心肌延遲增強、血流評估自取像的精要重點到判讀、量化分析，視覺化方法方式進行講解。課程亦針對如何從包含裝置準備設定做一套良好的壓力性心肌灌注影像流程進行重點說明，並對植入心律調節器以及去顫器這種重要困難情境下，須要特別注意病人安全的事項、為了處理影像中可能嚴重假影的特殊影像序列之解決方案，以及案例對照講解。最後針對修復後的法洛氏四重症以及非缺血性心肌病變的整套取像過程進行範例步驟說明。綜合來說，這個系列的課程，對如何完成心臟磁振造影的重要項目的過程將會有全面涵蓋說明。

Effective shimming at 3T CMR



- Assistant Professor, Biomedical Imaging Research Institute, Cedars-Sinai Medical Center
- Major interest / achievement: Cardiovascular imaging, Fast Imaging, Magnetic resonance engineering

Hsin-Jung Yang, PhD, USA

Effective shimming at 3T CMR

- **Synopsis:**
- Although 3-T MRI is well established in neurological and musculoskeletal applications, its usage in the cardiovascular environment has been more challenging. A major reason for the limited application of 3T CMR is due to the amplified B_0 field inhomogeneity and susceptibility artifacts in high field environments. In this talk we are going to introduce the potential difficulties in shimming 3T CMR and practical ways to obtain reliable CV images at 3T.
- **Key References:**
- Rajiah P, Bolen MA. Cardiovascular MR imaging at 3 T: opportunities, challenges, and solutions. Radiographics 2014;34:1612-1635.

Techniques and Sequence for Arrhythmia Patients



- Radiologic Technologist, Taipei Veterans General Hospital
- Major interest / achievement: Cardiovascular imaging

Hsiu-Ning Chang, B.S. Taiwan

Techniques and Sequence for Arrhythmia Patients

- **Synopsis:**
 - We will demonstrate how to do cardiac MR planning and show strategies to mitigate artifacts in performing cardiac MR for patients with arrhythmia.
- **Key References:**
 - Ferreira et al.: Cardiovascular magnetic resonance artefacts .Journal of Cardiovascular Magnetic Resonance 2013, 15:41
 - Alfudhili K, Masci PG, Delacoste J, Ledoux J-B, Berchier G, Dunet V, et al. Current artefacts in cardiac and chest magnetic resonance imaging: tips and tricks. Br J Radiol 2016; 89: 20150987.

Avoid Breathing Artifacts in CMR



- Radiologic technologist,
Department of Radiology,
Kaohsiung Veterans General
Hospital
- Major interest:

Cardiovascular imaging, abdominal
imaging

Ming Hua Chang, B.S., Taiwan

Avoid Breathing Artifacts in CMR

- **Synopsis:**
- Practical tutorial about avoiding breathing artifacts in CMR: 1. How to use abdominal banding to restricte the diphragmatic motion to reduce the scan time and improve the image quality. 2. How to use quiet breath to improve the non-breathhold with motion correction method. 3. How to reorder the k-space average order to improve the motion artifacts in the multi-NEX scan.
- **Key References:**
- Ferreira PF et al. Cardiovascular magnetic resonance artefacts. J Cardiovasc Magn Reson 2013;15:41

Late Gadolinium Enhancement



Chun-Ku Chen, MD, MHA, PhD, Taiwan

- Director, Division of Cardiopulmonary Radiology, Department of Radiology, Taipei Veterans General Hospital
- Adjunct Associate Professor, Faculty of Medicine, College of Medicine, National Yang Ming Chiao Tung University
- Major interest: Cardiovascular imaging
Thoracic imaging

Late Gadolinium Enhancement

- **Synopsis:**
- Late gadolinium enhancement (LGE) is an important sequence of CMR for detecting myocardial fibrosis and assessing myocardial viability for prognostication patient outcome. This talk will introduce general concept of LGE, the technique commonly used, the tips of obtaining diagnostic quality, and the general analysis of the images.
- **Key References:**
- Kim RJ et al. The use of contrast-enhanced magnetic resonance imaging to identify reversible myocardial dysfunction. *N Engl J Med* 2000;343:1445-1453
- Mrsic Z et al. The prognostic value of late gadolinium enhancement in Nonischemic heart disease. *Magn Reson Imaging Clin N Am* 2019;545-561
- Biglands et al. Cardiovascular magnetic resonance physics for clinicians: part II. *J Cardiovasc Magn Reson* 2012;14:66

How to do flow 2D/ 4D flow, anti-aliasing and visualization



Hsu-Hsia Peng, PhD, Taiwan

- Associate Professor, Department of Biomedical Engineering and Environmental Sciences, National Tsing Hua University
- Major interest:
Cardiovascular imaging,
Magnetic resonance imaging,
Biomedical imaging

How to do flow 2D/ 4D flow, anti-aliasing and visualization

- **Synopsis:**

- In this talk, we will introduce (1) How to analyze 2D/4D flow, (2) The theory of velocity aliasing and how to do anti-aliasing, and (3) the visualization of 4D flow.

- **Key References:**

- Stalder AF et al, Quantitative 2D and 3D Phase Contrast MRI: Optimized Analysis of Blood Flow and Vessel Wall Parameters. Magn Reson Med 2008;60:1218-31
- Wang HH et al, Does Altered Aortic Flow in Marfan Syndrome Relate to Aortic Root Dilatation? J Magn Reson Imaging 2016;44:500-508

How to do stress perfusion on CMR



- Radiologist, Mackay Memorial Hospital, Taipei, Taiwan
- Major interest:
Cardiovascular imaging, Thoracic imaging, Interventional radiology

Wei-Ming Huang, MD, Taiwan

How to do stress perfusion on CMR

- **Synopsis:**

- Stress CMR provides comprehensive information in regards to myocardial ischemia, myocardial viability, and cardiac function.
- First pass perfusion imaging is performed with stress and rest images to identify ischemia and infarct.
- A revascularization strategy guided by stress CMR has effectiveness comparable to invasive measurement of FFR, and can be particularly helpful in clinically stable patients with a moderate to high pretest probability of ischemic heart disease.

- **Key Reference:**

- Hamirani YS, Kramer CM. Cardiac MRI assessment of myocardial perfusion. *Future Cardiol.* 2014;10:349-358.
- Patel AR, Salerno M, Kwong RY, et al. Stress Cardiac Magnetic Resonance Myocardial Perfusion Imaging: JACC Review Topic of the Week. *J Am Coll Cardiol.* 2021;78:1655-1668.

CMR imaging in patient with CIED

(cardiac implantable electronic device)



- Cardiologist, Electrophysiologist,
Taipei Veterans General Hospital
- Major interest:
Cardiovascular imaging,
Electrophysiology, Cardiomyopathy

Ling, Kuo, MD, Taiwan

CMR imaging in patient with CIED

(cardiac implantable electronic device)

- **Synopsis:**
- The safety of magnetic resonance imaging (MRI) performed in patients with cardiac implantable electronic device (CIED) had been confirmed with the use of a prespecified safety protocol. However, the CIED-caused artifact interferes the accurate interpretation of the presence of cardiac arrhythmogenic substrates--which are evaluated by late gadolinium enhancement (LGE) images. The application of wideband technology in LGE images effectively shift the artifacts away from the heart in large portion compared to conventional LGE, which provides the useful information in clinical practice. This talk will introduce the feasibility of wideband LGE images to minimize the artifact and its clinical impact. Furthermore, the safety and concern of cardiac MRI acquisition will be briefly reviewed.
- **Key References:**
- Rashid S et al. Improved late gadolinium enhancement MR imaging for patients with implanted cardiac devices. *Radiology*. 2014;270:269-74.
- Nazarian S et al. Safety of Magnetic Resonance Imaging in Patients with Cardiac Devices. *N Engl J Med* 2017; 377:2555-2564
- Singh A et al. Feasibility of Cardiac Magnetic Resonance Wideband Protocol in Patients With Implantable Cardioverter Defibrillators and Its Utility for Defining Scar. *Am J Cardiol*. 2019;123:1329–1335.

Repaired TOF CMR in 45 min



Mao-Yuan Su, PhD, Taiwan

- Radiological technologist, Department of Medical Imaging, National Taiwan University Hospital
- Assistant Professor, Department of Medical Imaging and Radiological Technology, Yuan-Pei University of Medical Technology
- Major interest / achievement: Cardiovascular imaging/Excellent Radiographer Award Mr. Wu Zai-De at Peng-Lai X-ray Institute, Taiwan (2018)

Repaired TOF CMR in 45 min

- **Synopsis:**
- Cardiovascular magnetic resonance (CMR) has been considered as an essential diagnostic tool in patient with repaired tetralogy of Fallot (rTOF)¹. It has well documented accuracy and reproducibility for quantitative assessment of biventricular size and function, flow measurements, and myocardial viability² and has emerged as an important tool for risk stratification³ in this patient population. However, lengthy CMR protocols are time consuming, increase cost and resource utilization and render patient discomfort. In this talk, I will introduce how to perform rTOF CMR in 45 minutes.
- **Key Reference:**
- Tal Geva, J Cardiovasc Magn Reson [2011] 13(1):9
- Wald RM et al., Circulation [2009] 119:1370-1377
- Majeed A et al., Am Heart J [2022] 245:70-77

Non-ischemic Cardiomyopathy CMR in 45 min



- Radiologic Technologist, Taipei Veterans General Hospital
- Major interest / achievement: Cardiovascular imaging

Hsiu-Ning Chang, B.S. Taiwan

Non-ischemic Cardiomyopathy CMR in 45 min

- **Synopsis:**
- We will demonstrate the workflow for performing cardiac MR acquisition non-ischemic cardiomyopathy survey in 45 minutes, including tips for optimizing image quality and strategies for mitigating commonly encountered artifacts.

- **Key References:**
- Ferreira et al. Cardiovascular magnetic resonance artefacts .Journal of Cardiovascular Magnetic Resonance 2013, 15:41
- Alfudhili K, Masci PG, Delacoste J, Ledoux J-B, Berchier G, Dunet V, et al. Current artefacts in cardiac and chest magnetic resonance imaging: tips and tricks. Br J Radiol 2016; 89: 20150987.