

Cardiac MRI



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Overview

- Clinical indications
- Clinical objectives
- Advantages of Cardiac MRI (CMRI)
- Contraindications
- Ventricular function
- Ventricular myocardium viability
- Cardiac tumours
- Vascular imaging

Clinical indications for CMR

- Acute & chronic heart disease
- Coronary artery disease
- Congenital heart disease
- Valvular heart disease
- Cardiomyopathy
- Review of cardiac transplant
- Pericardial diseases
- Cardiac tumours
- Aortic & pulmonary vessel abnormalities
- Other systemic and vascular diseases

Clinical objectives of CMR

- Define cardiac and vascular anatomy
- Assess pericardial pathology
- Quantify ventricular function
- Assess myocardial viability / scarring
- Myocardial perfusion
- Quantifying blood flow
- Aorta and coronary artery MR angiography

Advantages of MRI

- No ionising radiation
- Less dose for serial studies
- Non-invasive
- Free choice of imaging planes
- Visualise anatomy that is difficult on echo
- Provides a comprehensive test and avoids multiple tests

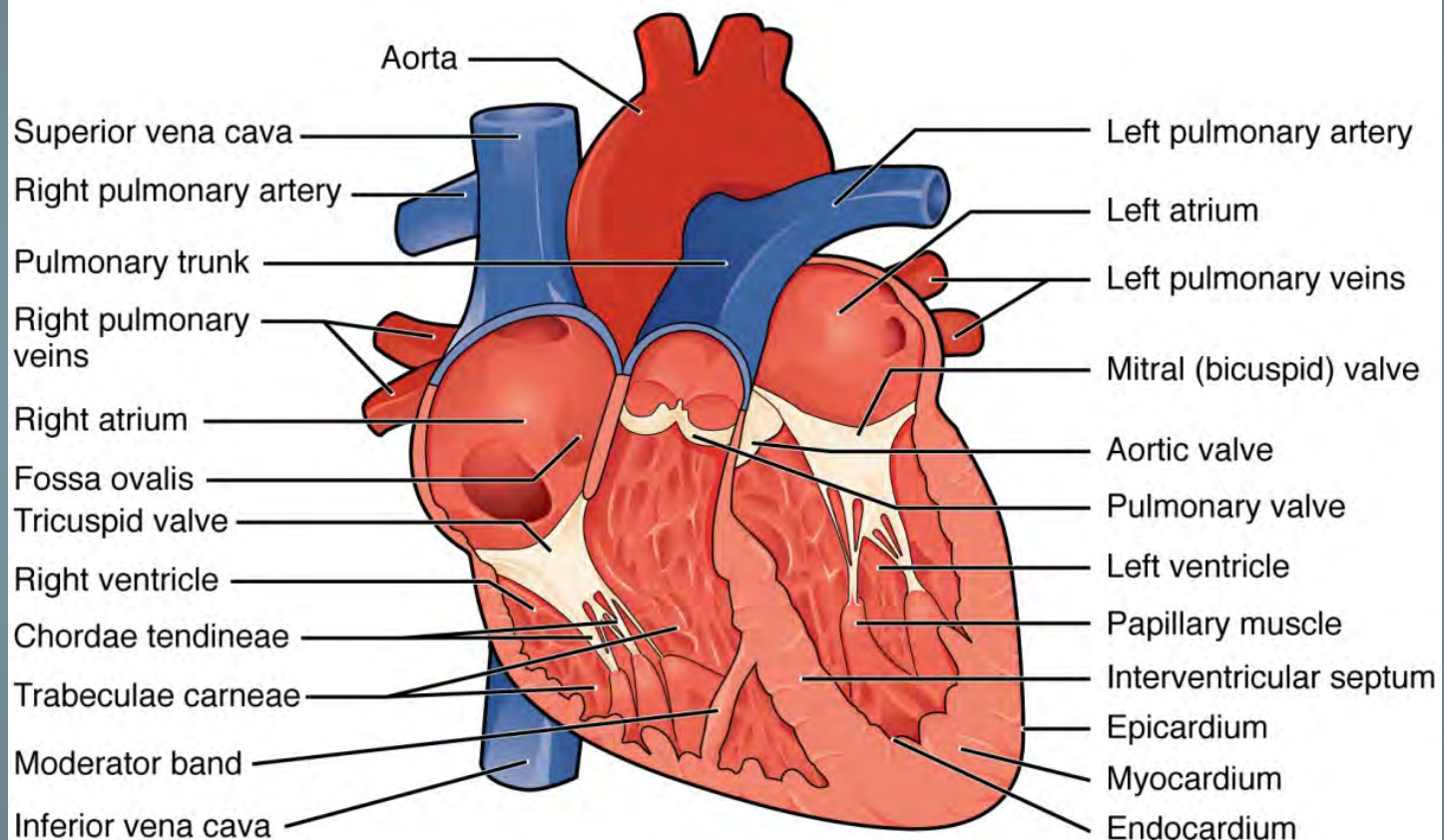
Advantages of MRI

- Varied imaging techniques
 - Anatomical
 - Cine (physiological)
 - Non-contrast vascular
 - Quantitative measurements including flow
 - Contrast enhanced studies
 - Myocardial perfusion

Contraindications and limitations

- Non-compatible metallic devices
- Metallic foreign body
- Severe claustrophobia
- Patient body habitus
- Poorly traced cardiac rhythm
- Uncooperative patients

Anatomy of the heart



Anterior view

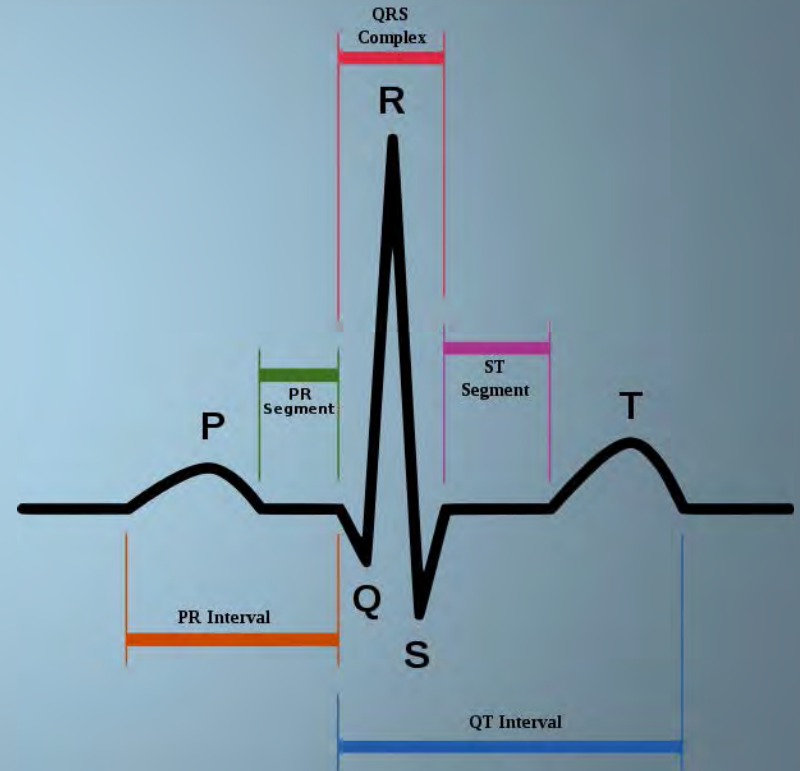
Cardiac synchronisation

Prospective gating

- MR acquisition after desired physiological event
- Used for static images

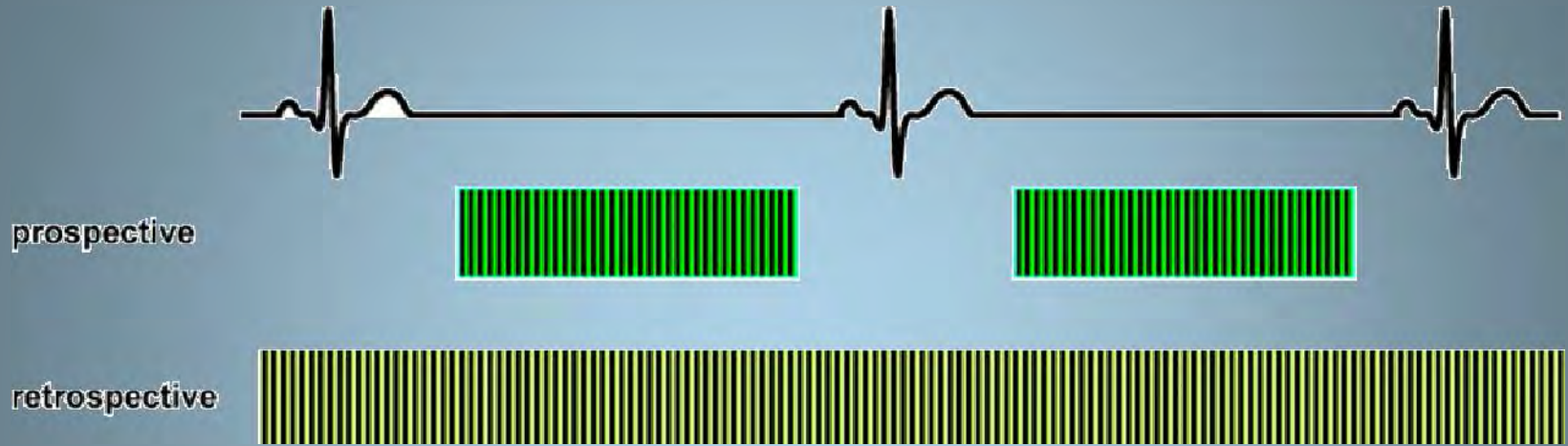
Retrospective gating

- MR acquisition is continuous
- VCG recorded simultaneously
- MR data correlated with cardiac cycle
- Used for cine imaging



[<http://en.wikipedia.org/wiki/Electrocardiography>]

Cardiac synchronisation



Arrhythmia rejection to account for variations in the patient's heart rate

Ventricular function

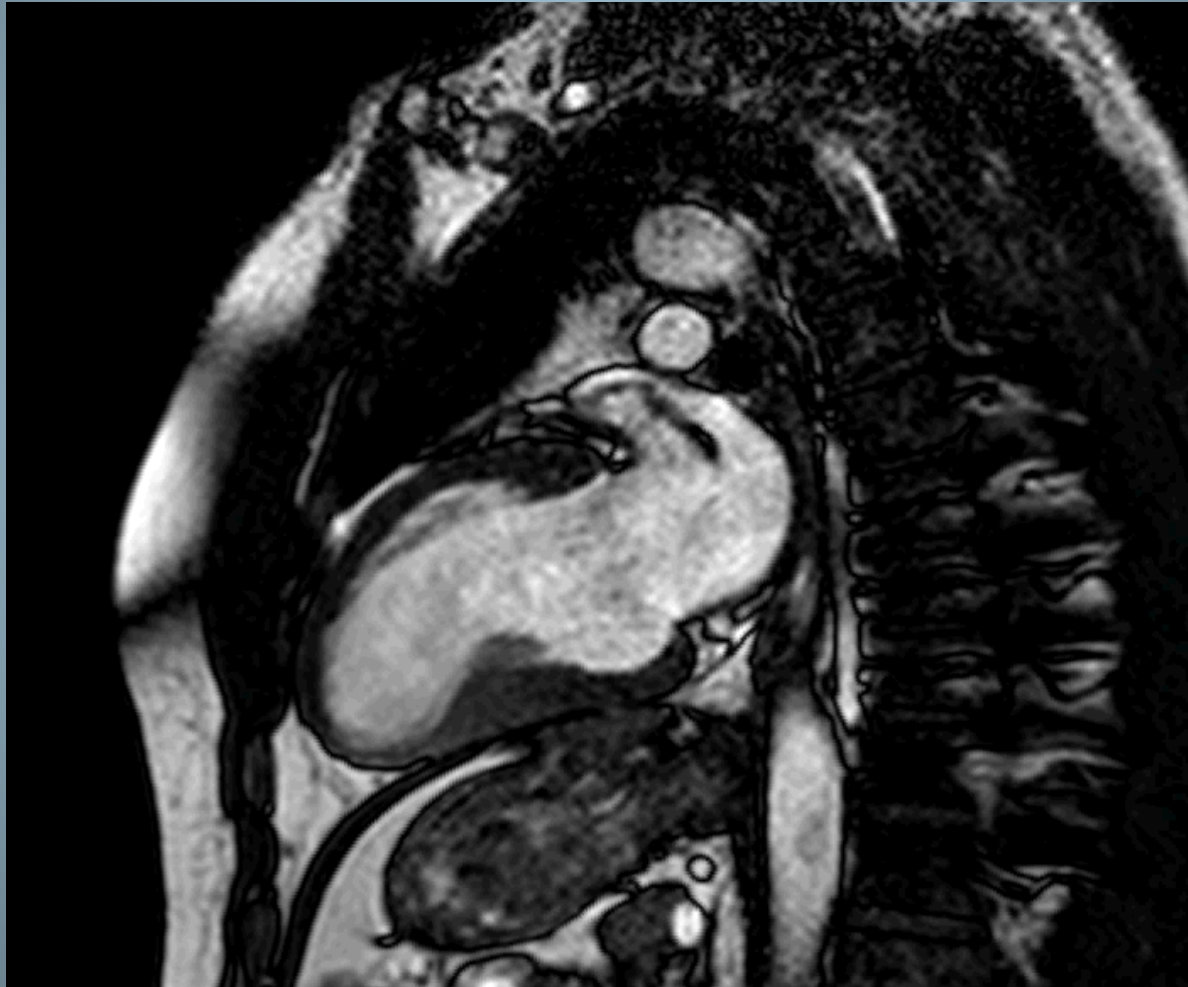
Clinical indications

- Heart failure
- Cardiomyopathy
- Arrhythmogenic right ventricular dysplasia (ARVD)
- Pulmonary hypertension
- Valve disease

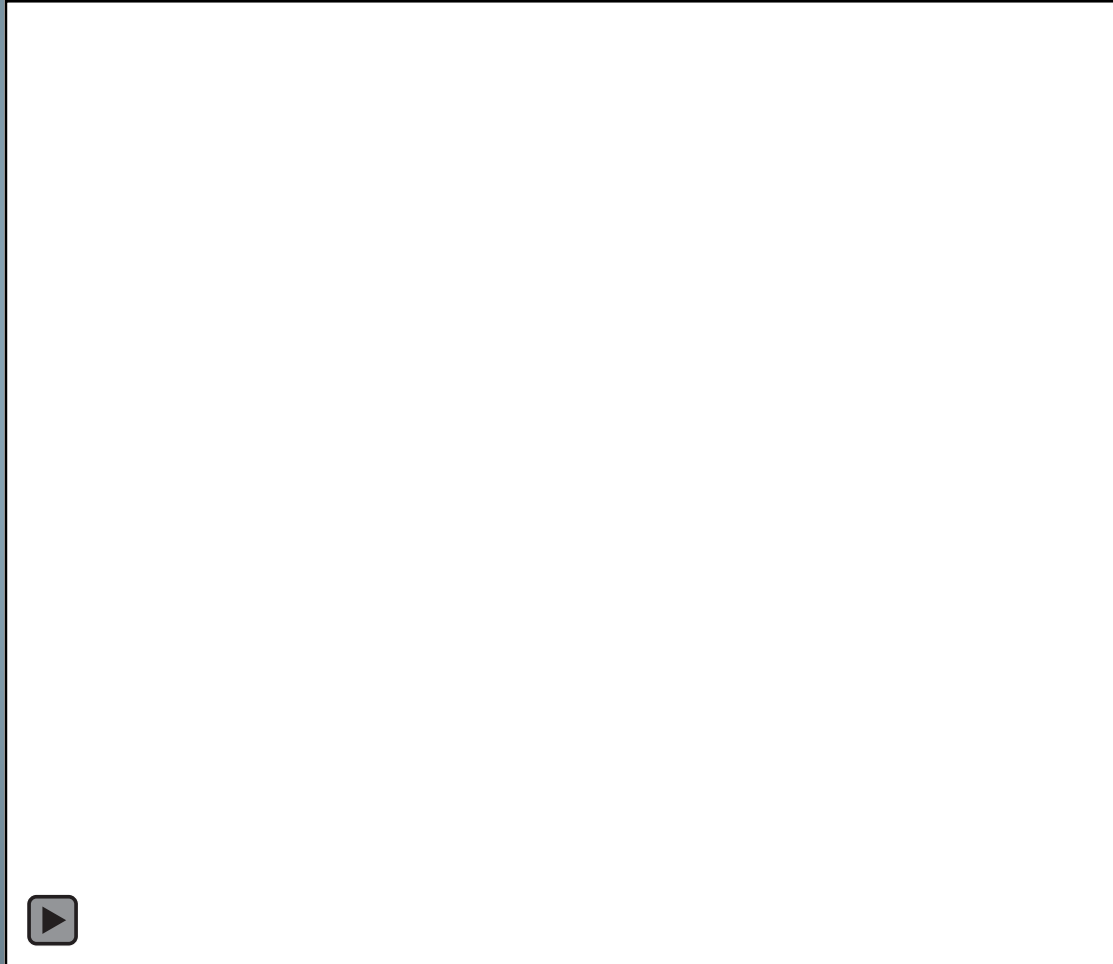
Ventricular function

- Cine imaging – same slice repeatedly
- Gated using VCG
- Appearance of real-time imaging
- Demonstrates myocardium thickness, constriction and relaxation
- Movement of blood through valves, chambers and outflow tracts
- Quantitative analysis of ventricular volumes

Left 2 chamber (2ch) cine



4 chamber cine



3 chamber or Left ventricular outflow tract (LVOT1) cine

