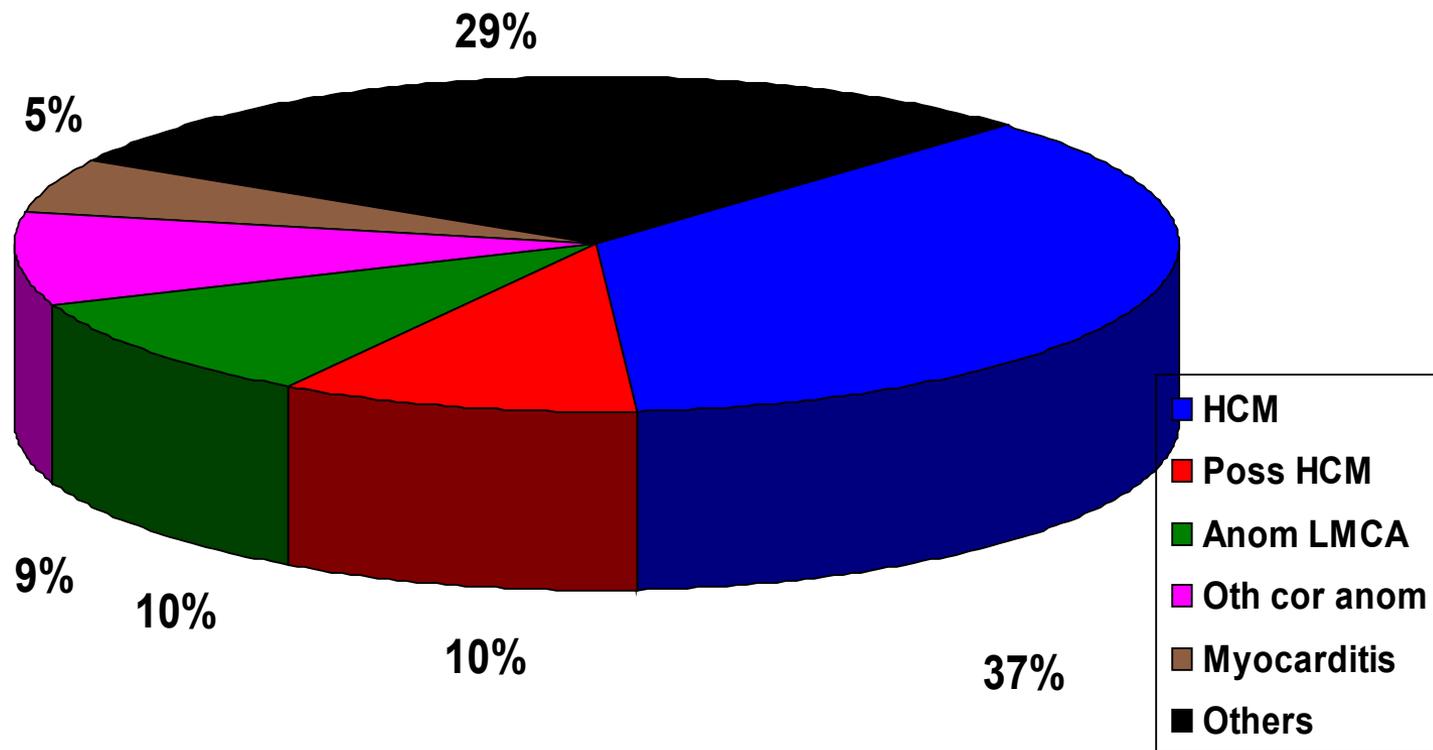


diagnostic imaging of Cardiovascular causes of sudden cardiac death

Ass.Prof. Vesela Stoyanova MD PhD

Cardiovascular causes of sudden cardiac deaths in young competitive athletes



Cardiac Imaging



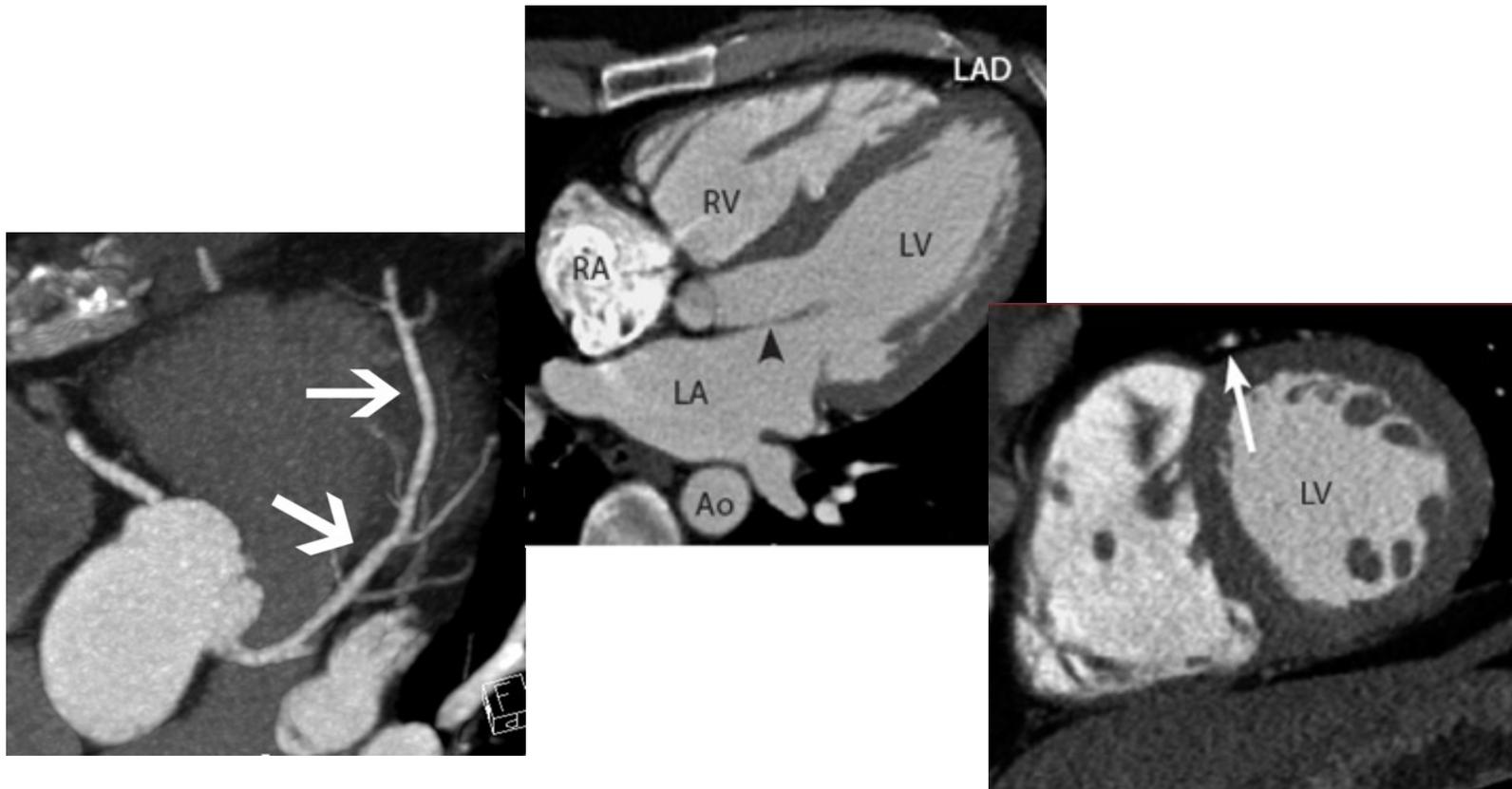
ACG gated MDCT and MRC

...excellent spatial resolution in delineation of cardiac anatomy and pathology and are therefore assuming an expanding role in the diagnosis of disease processes associated with structural abnormalities of the heart.

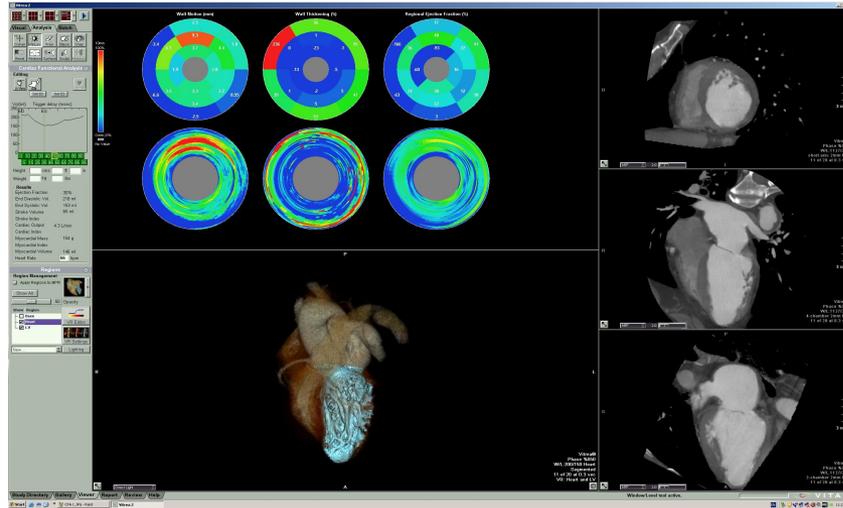
- × Sparrow P, Eur Radiol. 2009 Feb;19(2)

Cardiac mdct with ECG gating

- × ... is assessing both the coronary arteries and myocardial morphological abnormalities.



Left ventricular function



Cardiac mdct

✖ The incidence of congenital anomalies of the aortic and
*“Coronary anomalies were observed in the 18% of the
population” /Filippo Cademartiri European Radiology 2007/*
The population

✖ Angelini P, (2002) Coronary anomalies: incidence, pathophysiology, and clinical relevance. *Circulation* 105:2449–2454

✖ ... 1.2% of sudden deaths in the general population

✖ Burke AP, et al (1991) Sports-related and non-sports-related sudden cardiac death in young adults. *Am Heart J* 121:568–575

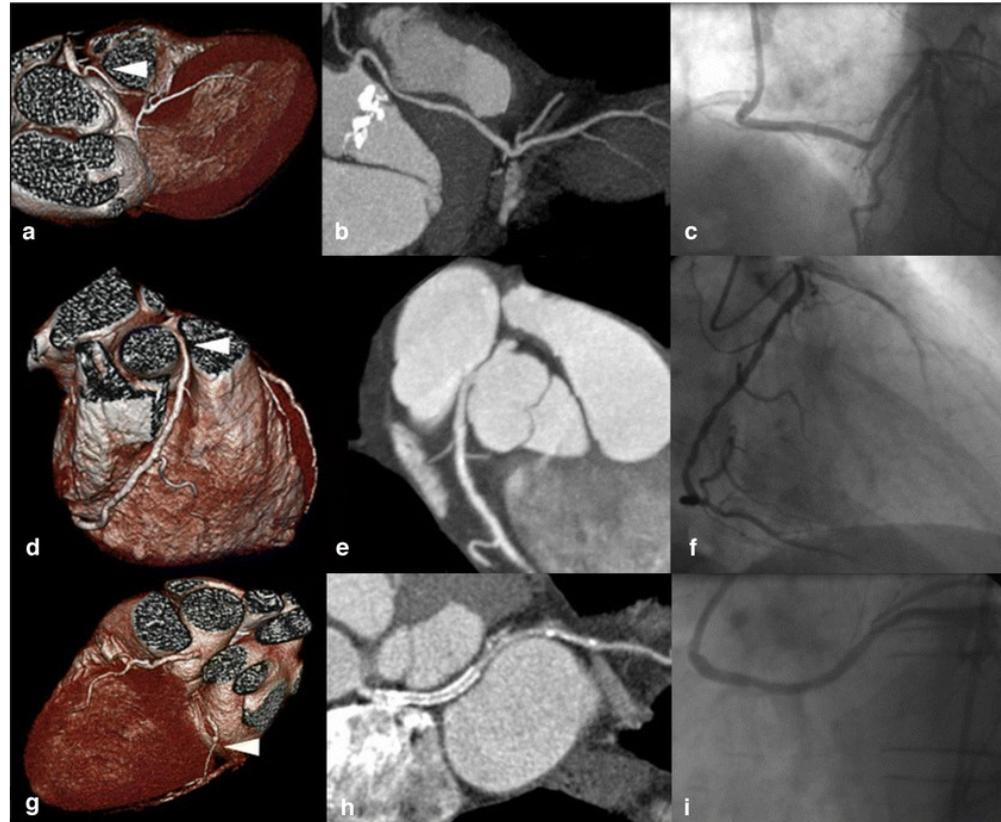
✖ ... but between 12 and 19% of sports-related cases

✖ Maron BJ, (1996) Cardiovascular preparticipation screening of competitive athletes: a statement for health professionals from the Sudden Death Committee (Clinical Cardiology) and Congenital Cardiac Defects Committee (Cardiovascular Disease in the Young), American Heart Association. *Circulation* 94:850–856

coronary Anomalies

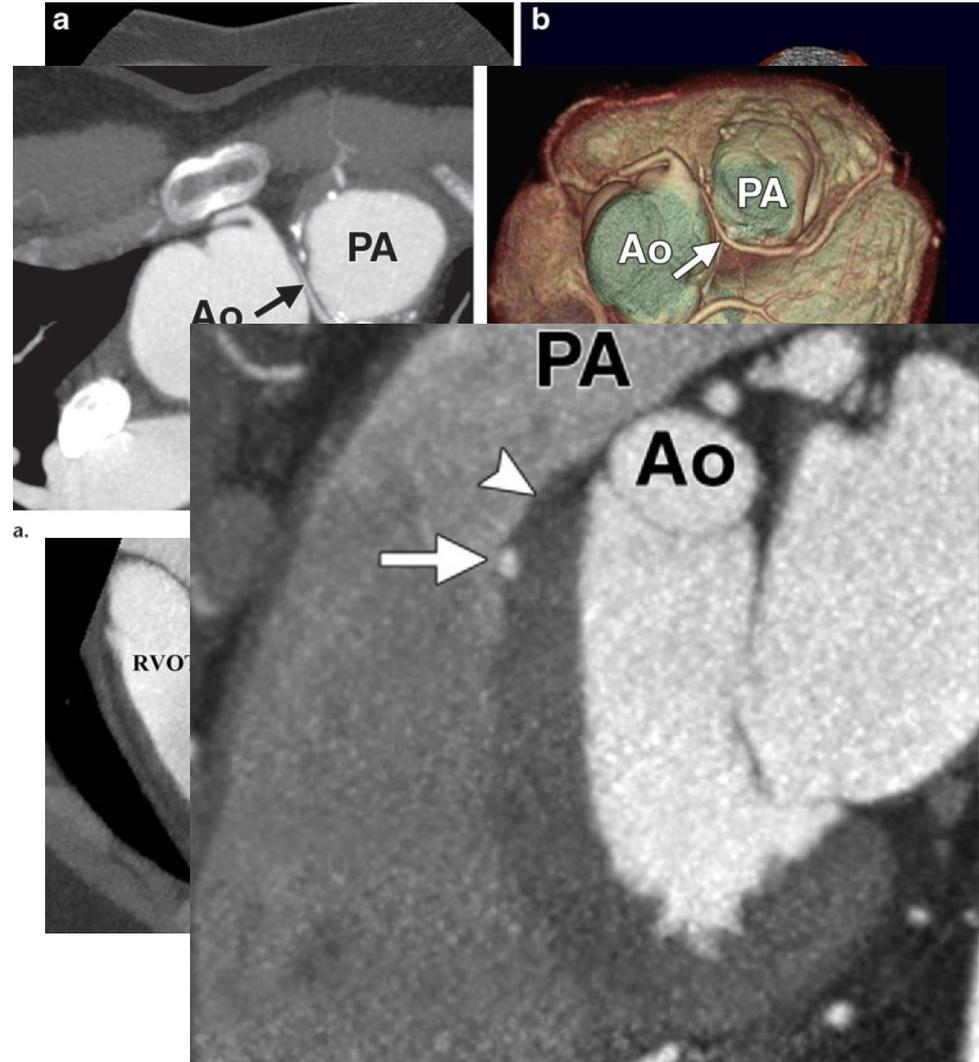
The three commonest anomalies are :

- × left coronary artery - from the right anterior sinus
- × right coronary artery from the left anterior sinus of Valsalva
- × left circumflex from the right anterior sinus



indicators of risk of sudden death

- × Acute angle of take off of the anomalous vessel from the aortic sinus
- × a slit like orifice
- × an interarterial course
- × an intra-mural aortic segment.



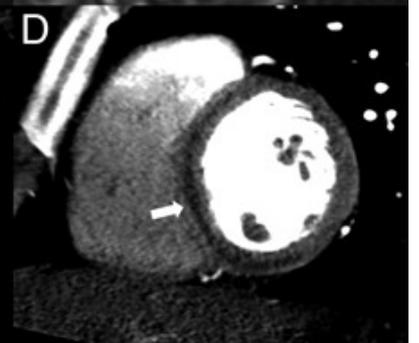
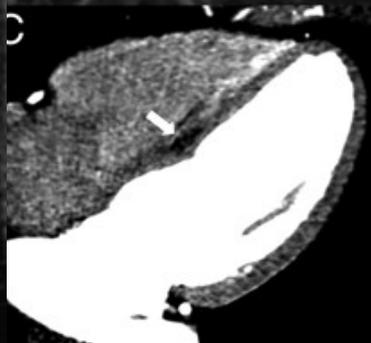
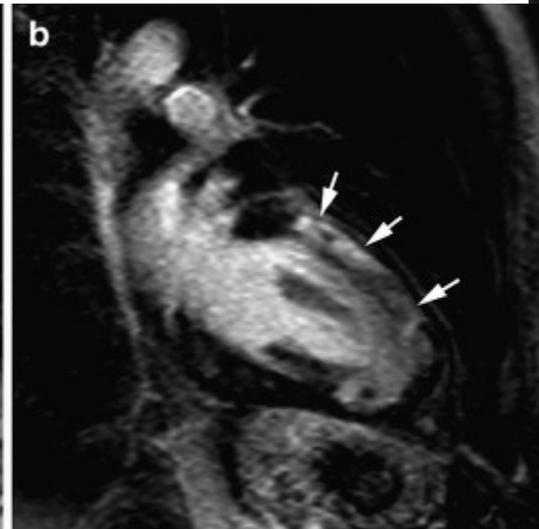
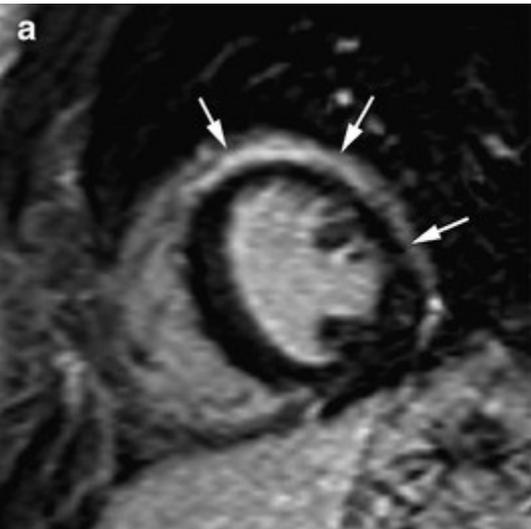
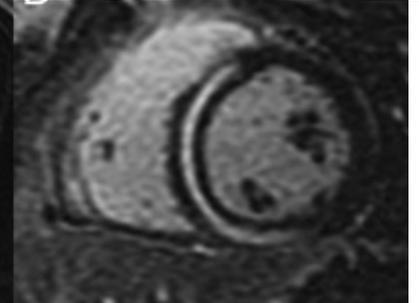
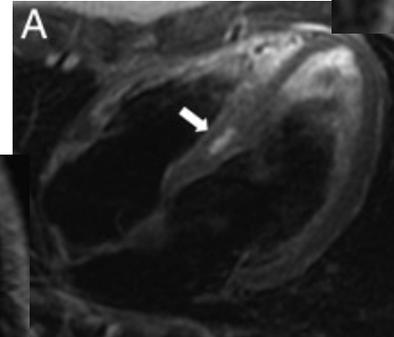
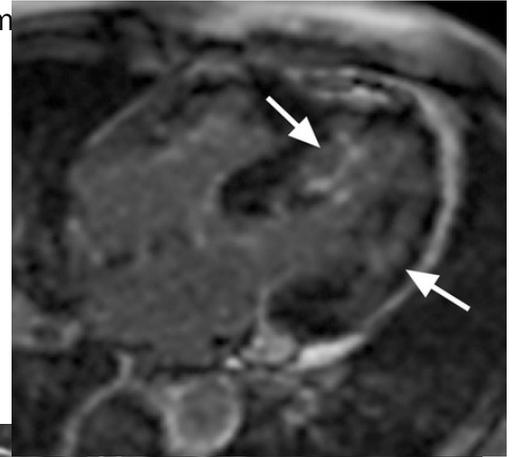
The imaging investigation of choice for anomalous coronary arteries is ECG-gated MDCT !!!

- × CMR noninvasively visualizes ventricular morphology and function with a very high degree of accuracy and reproducibility

- × Pattynama PM, Lamb HJ, Van der Velde EA, et al. Reproducibility of MRI-derived measurement of ventricular volumes and myocardial mass. Magn Reson Imaging 1995;13(1):53-63

Ventricular mass and volumes

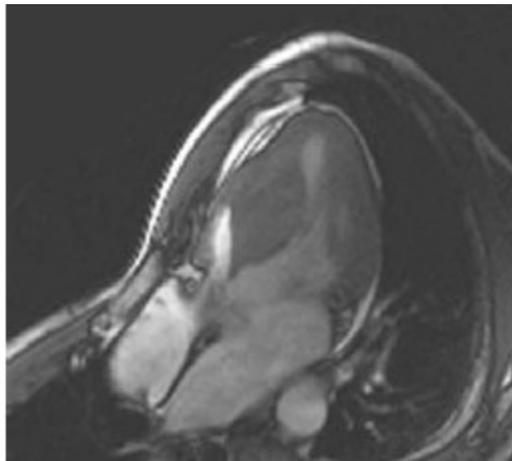
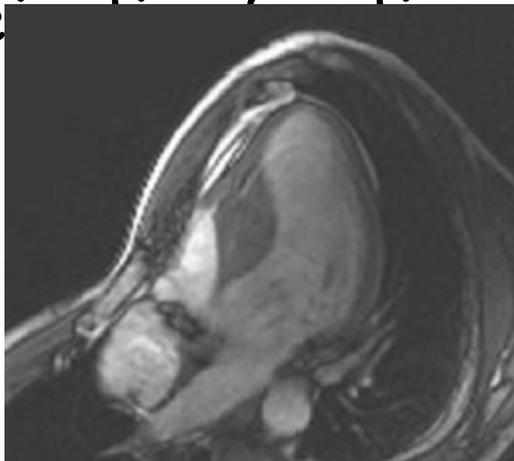
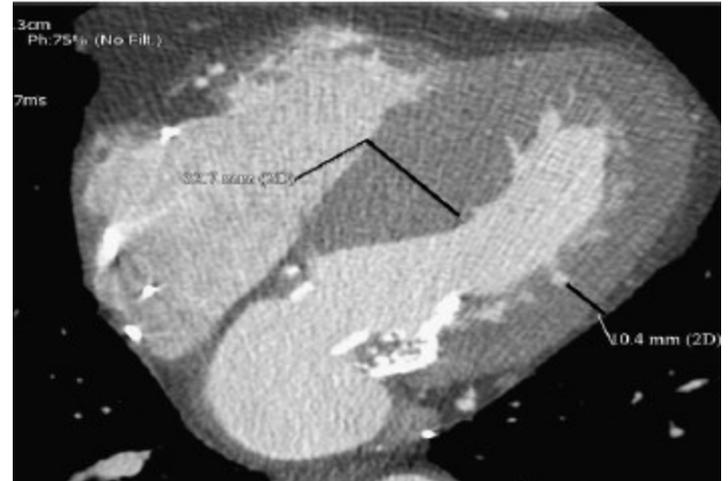
- × Tissue analysis
- × - edema
- × - fibrous tissue



Hypertrophic cardiomyopathy

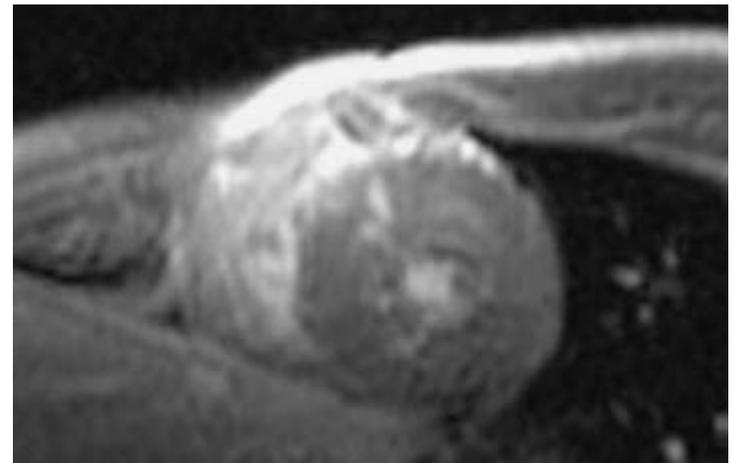
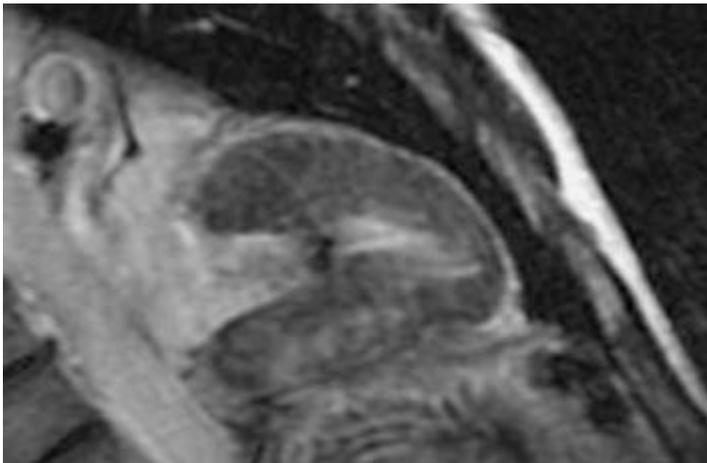
MRI = MDCT = precise measure of wall thickening,

- × end-diastolic
- × end-systolic volumes of the left ventricle
- × ejection fraction



Mri advantage

- × tissue characterization of the myocardium with great prognostic relevance
- × delayed enhancement can be used to identify the eventual presence of fibrous areas in patients with HCM

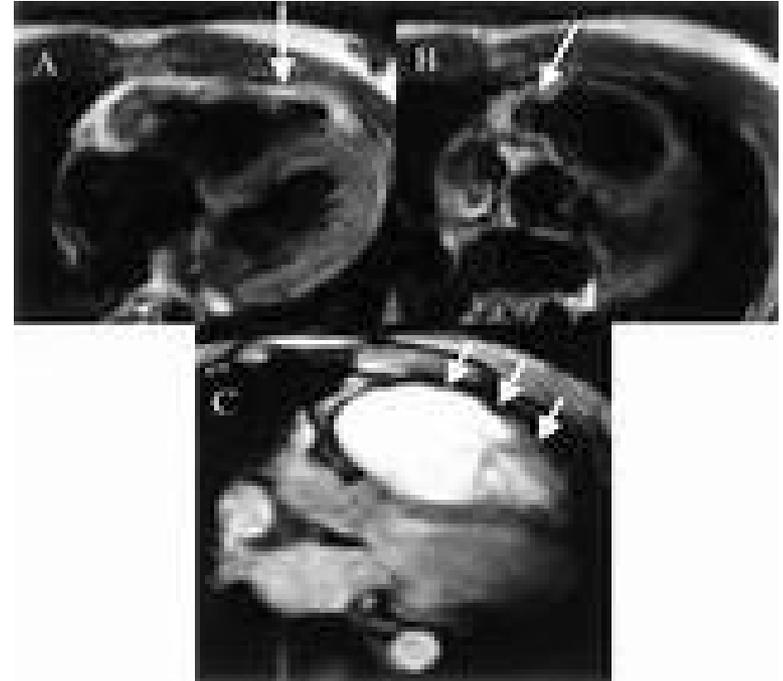


The presence of fibrous areas alone is not indicative of an unfavorable prognosis, but an extended fibrous area is !

Arrhythmogenic right ventricular cardiomyopathy (ARVC)

Morphological findings:

- × volumetric measurements of the right ventricle
- × measuring the thickness of the free wall
- × **Assessment of function.**
- × global function = right ventricle Ejection Fraction (EF),
- × regional function of the free wall with the demonstration of asynergic areas.



MRI >> MDCT

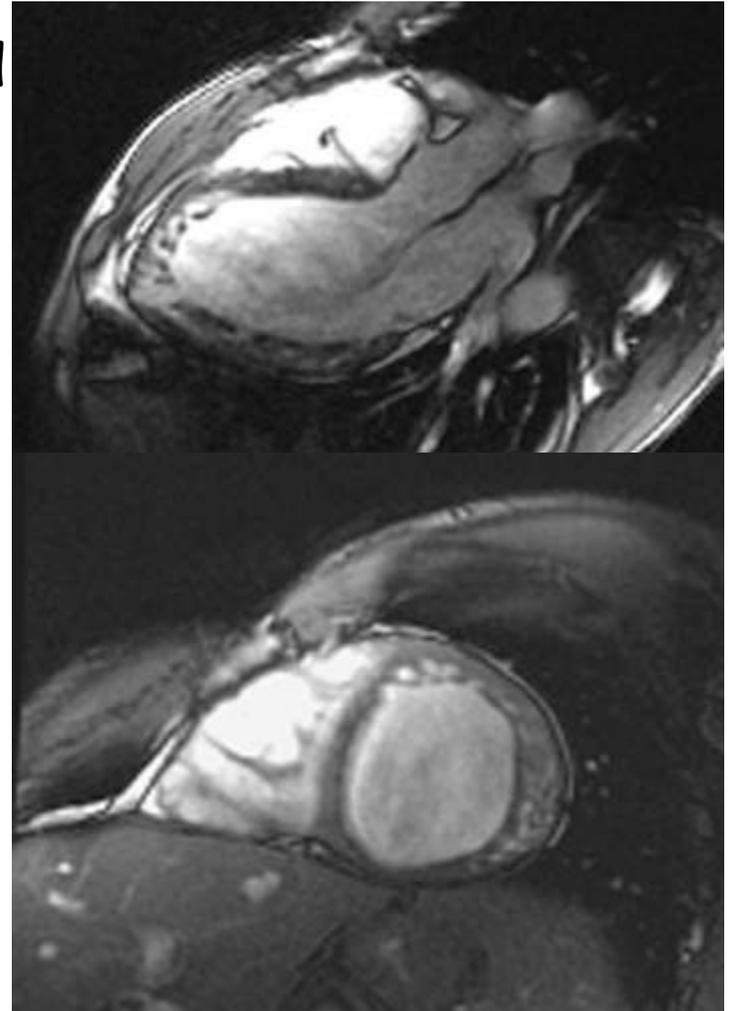
Tissue characterization -

non-compaction of the myocardium

- × Ratio noncompacted to compacted myocardium > 2.3 in diastole with
- × Ss 86% sp 99% ppv 75% npv 99%
- × Petersen SE. J Am Coll Cardiol 2005

- × **Tissue characterization**
- × subendocardial fibrosis

MRI >> CT



Dilated cardiomyopathy - DCM

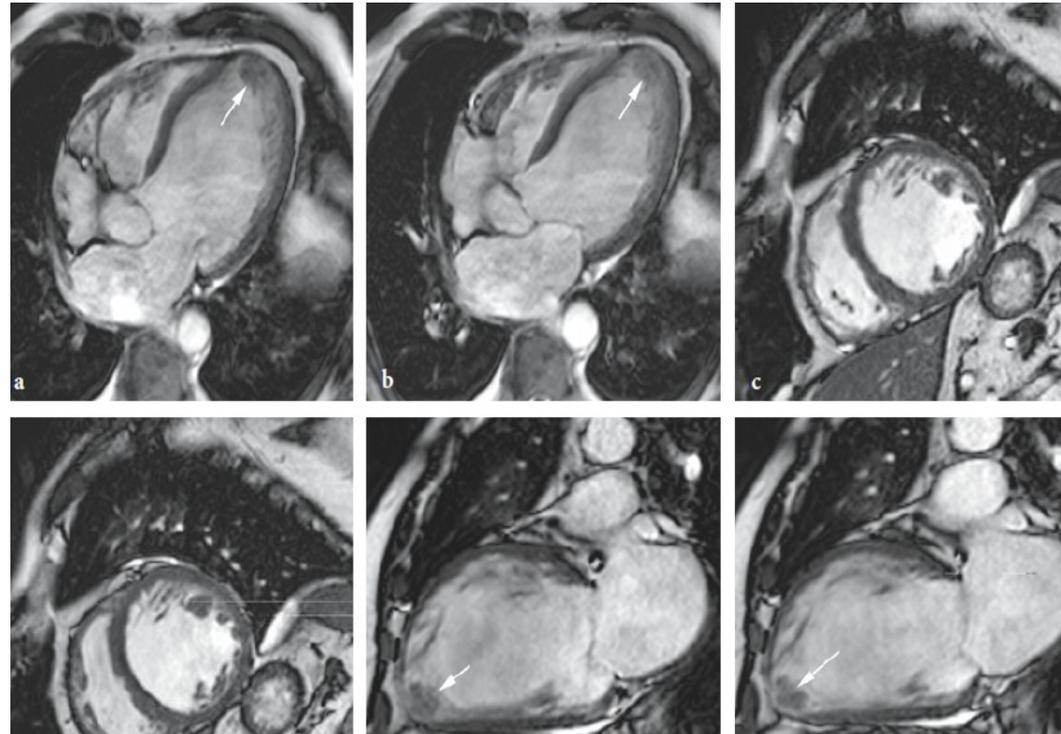
× Morphological changes :

- wall thickness
- ventricular mass
- ventricular enlargement
- CE MRI - mid or subendocardial enhancement- fibrosis.

× - diffuse

× - segmental

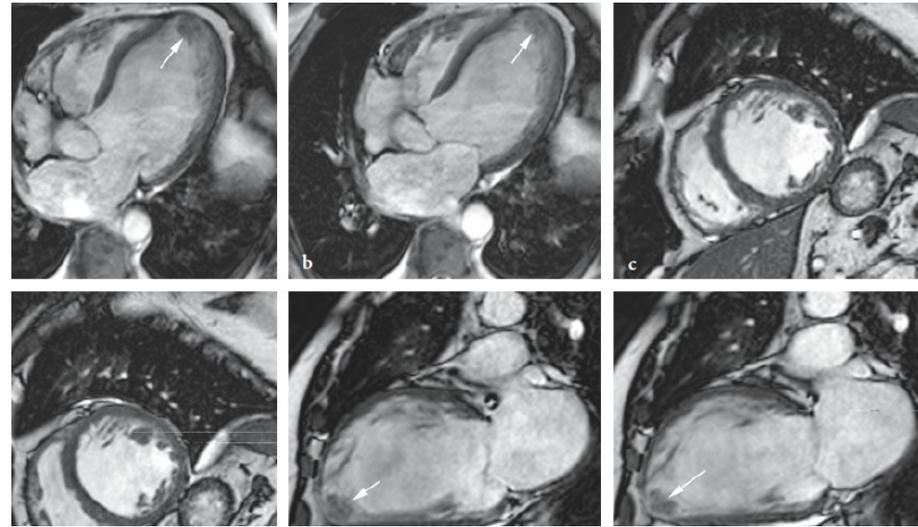
× MRI > MDCT



Imaging

to exclude concomitant :

- × valvular disease
- × pericardial disease
- × to detect the repercussion of the LV dilatation on valvular function
- × to detect LV thrombi,



- × Functional abnormalities.
- × increased end-diastolic and endsystolic LV volumes,
- × reduced ejection fractions in
- × one or both ventricles
- × wall motion abnormalities.

- × Global dysfunction is more typical of DCM

Take home point



Efficacy of imaging techniques to assess structural heart diseases

SHD	echo	CMR	Nuclear	MDCT
LV function	++	+++	++	++
Valvular	+++	+++		++
Cardiomyopatie				
- dilated	+++	+++	+	++
- infiltrative	++	+++		
- HCM	+++	+++	+	++
- ARVD	++	+++		++
Myocardites	++	+++	++	
Isolated noncompaction ventricular myocardium	+++	+++		+
Coronary anomalous origin	+	++		+++

× Thank you !