

# 17. MRI & CT Imaging in Cardiology

## TWO DIFFERENT TECHNOLOGIES CT MACHINES

1. Single and MSCT-Multiple slice Spiral Scanner (300 msec rotation)(GE, Siemens, Phillips)
  - a. Newest MSCT 16 Slice, 32- to 64-detector-row MSCT is under developing
  - b. EKG Gating Retrospective and Prospective (Excellent Z axis).
  - c. 3D reconstructions, dynamic and static views 2D, 3D, 4D. Types of 3D: 1) MIP, 2) VRP, 3) MPR
2. EBCT Electron beam (GE Imatron)
  - a. Single Slice mode
  - b. Electron Beam Angiography
  - c. ECG triggering to provide a volume acquisition
  - d. Multislice Mode
  - e. Evaluating ventricular function, blood flow analysis.

## New MRI MACHINES

- 3-D Reconstructions up to 860 images per second
- Phillips 3.00 Tesla
- High Resolution 3D-TFE\_Coronary artery imaging using SENSE, MotionTrak, and Free breathing VectorCardiogram. Scan time 2:42 minutes.

## SPECIFIC DISEASES:

1. Calcium screening (CaS) for Coronary Artery Disease (CAD)
  - Approaching conventional coronary angiography
  - Characterization of Vulnerable Plaque
2. Myocardial Function Analysis
  - EF and Wall motion
3. Pulmonary Emboli (single contrast injection breath hold 25 s)
  - 90% for up to 5<sup>th</sup> order branches of the pulmonary artery
4. Thoracic Aorta Dissections
5. Congenital Heart Disease
6. Neoplastic Diseases
7. Pericardial Disease
  - Thick> 4 mm (Normal 2.2 mm)
  - Congenitally absent I pericardium
8. Thoracic Aorta
  - Aortic aneurysms
  - Marfan's
  - Occult dissections.
9. Hypertrophic Cardiomyopathies
  - For unusuat distribution of hypertrophy.
10. Right Ventricular Dysplasia & infarct

	MR-T1	MR-T2	xray-CT
dense bone	dark	dark	bright
air	dark	dark	dark
fat	bright	bright	dark
water	dark	bright	dark

## Coronary Artery Calcium Scoring [CACS]

(Modified Agatston)

0 and 10	low risk
10 and 99	moderate risk
100 and 399	high risk
> 400	highest risk

## MRI

**T1 Recovery** = Longitudinal relaxation

**T2 Decay** = Transverse relaxation

**T1 Recovery**-Short-fat/White, Long for water

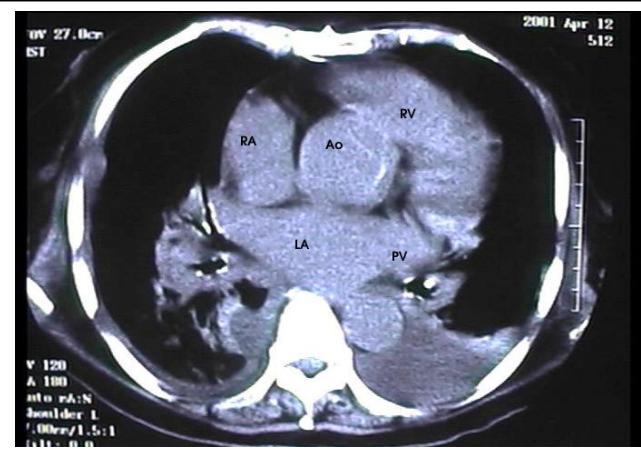
**T2 Decay**-Short-fat/Black, Long for water

**TR** repetition time, or time between RF excitation pulses. (T1)

**TE** echo delay time, or time interval between the RF pulse and the measurement of the first echo (T2)

**Proton density** quantitative summary of the number of protons per unit tissue.

GRASS (fast low flip angle gradient-recalled echo) pulse sequence.



## Abnormal tissue

	MR-T1	MR-T2	xray-CT	enhancement1
infarct	dark	bright	dark	subacute
bleed	bright	bright	bright	no
tumor	dark	bright	dark	yes