

# 16. Nuclear Cardiology

## Myocardial Perfusion Imaging

### 1. Thallium-201

- Half life 74 hours, cyclotron-produced
- 69-83 keV (88%)
- Potassium analog, 85% first pass uptake
- Dynamic equilibrium
- Radiation 25 mSv (Cardiac cath 6 mSv)

### 2. Technetium-99M Label Compounds

- Bound with Sestamibi (MIBI), Tetrofosmin, Furifosmin, Teboroxime
- Half life 6 hours, generator produced (Eluded from Molybdenum generator)
- 140 keV
- Lipid soluble and binds to intracellular membranes, 65% first pass uptake
- Frozen images at time of injection  
MIBI Images last several hours
- Radiation 12 mSv

### 3. PET-Positron Emission Tomography

- Two 511 keV photon at 180°. Provides better localization
- When a Positron meets with an electron-Annihilation occurs, within mm of source
- Radiopharmaceuticals: Hydrogen, Nitrogen, Oxygen, Fluorine, Carbon (cyclotron)  
<sup>68</sup>Ga and <sup>82</sup>Rb (generator produced)
- Most common fluorine-18 labelled fluorodeoxyglucose, also called FDG (1/2 life 112 minutes)
- Radiation 7 mSv

**Pharmacologic Vasodilation** : Information on exercise duration and capacity cannot be obtained.

"LAST RESORT"

#### Adenosine

- Increases coronary blood flow 3 to 5 times, usually does not provoke ischemia
- Diseased arteries are relatively hypoperfused
- Side effects: Rare AV conduction abnormalities, Headache, nausea and flushing (75%)  
60% have chest pain and 12% EKG changes

#### Dipyridamole

- blocks cellular reabsorption of endogenous adenosine
- reversed with IV Aminophylline,
- Scan does not work if caffeine ingested
- Side effects: Increased HR, mild hypotension  
Headache, nausea and flushing (20%)  
20% have chest pain and 8% EKG changes

#### Dobutamine (Often used with Atropine) (Mostly used for Pharmacologic Stress Echo)

- increases myocardial demand by increasing myocardial contractility, heart rate, and BP
- increases blood flow 2 to 3 times
- Side effects: 43% Ventricular ectopy 30% have chest pain and 50% EKG changes

## Cardiac Performance Imaging/ MUGA Scans

- In vitro labeling of patient own RBC with stannous chloride and Technetium
- Cardiac cycle is often divided into 28 equal segments.
- MUGA is an eponym from the word multigated "**MU**"-- LTI "**GA**"-- TED
- EF is less reliable with irregular rhythms like atrial fibrillation
- Radiation 8 mSv

