

Image Acquisition Protocol & Interpretation I: SPECT or SPECT/CT

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Senario

65 year old man, 170 cm , 70 kg

CC: exertional chest tightness

ECG: nondiagnostic

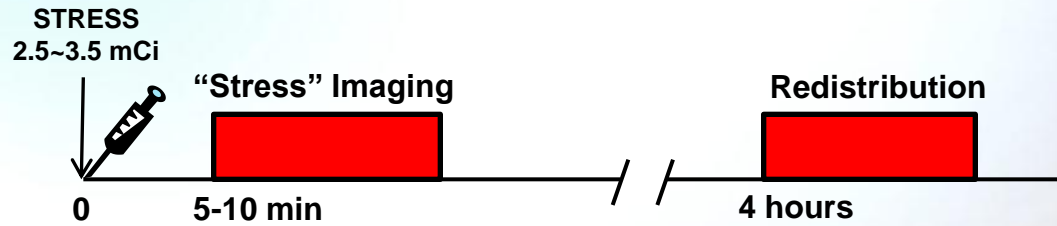
Consulted for MPS

Q. Which tracer do you use? Why?

- **Tl-201**

- **Tc-99m** **tetrofosmin**
 sestamibi

TI-201



Q. Which stress test you use?

STRESS TEST

Exercise stress test

Treadmill exercise

Bicycle exercise

Pharmacologic stress test

Dipyridamole, Adenosine, Regadenoson

Dobutamine

Adenosine Stress Testing

6-minute protocol (standard protocol)

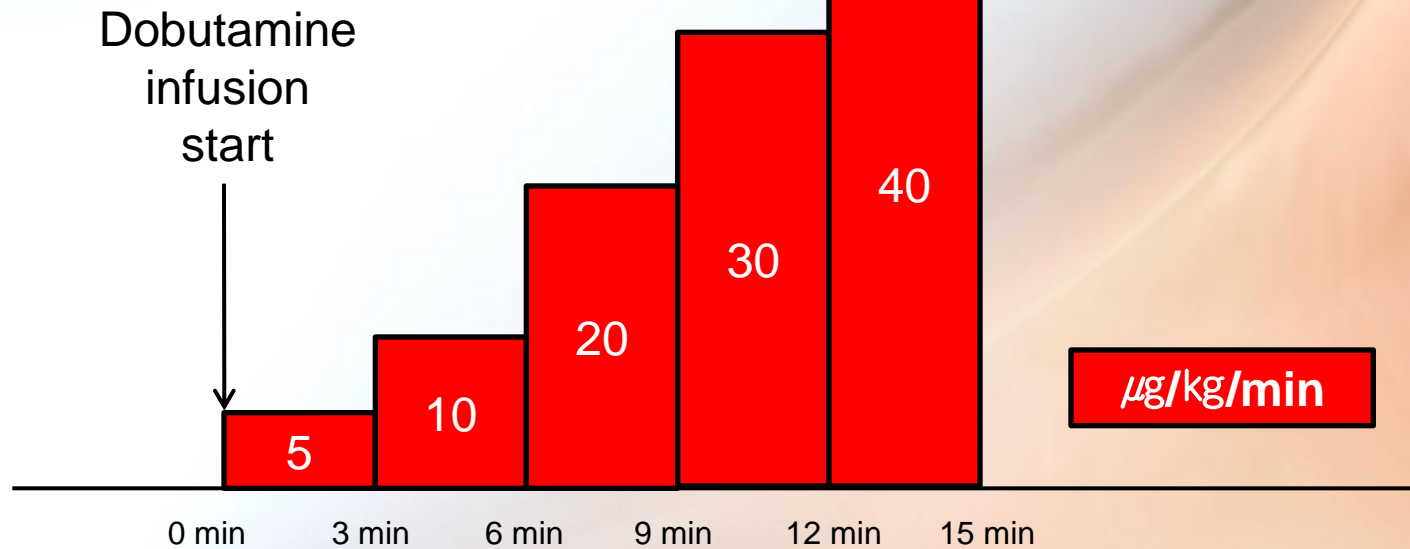
140 $\mu\text{g}/\text{kg}/\text{min}$ for 6 minutes by *iv* injection

Radiotracer injection at 3 minutes after injection start

4-minute protocol

3-minute protocol

Dobutamine Stress Testing



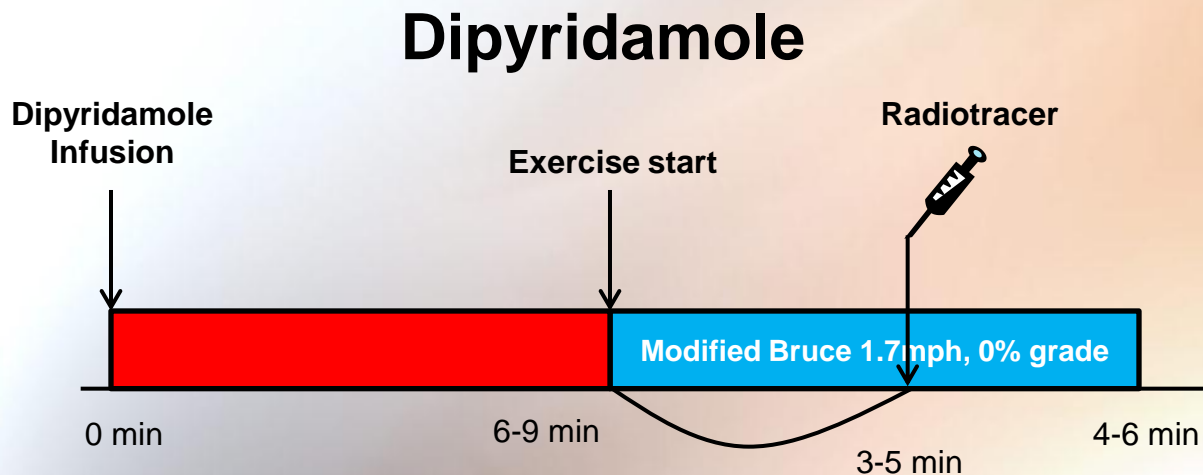
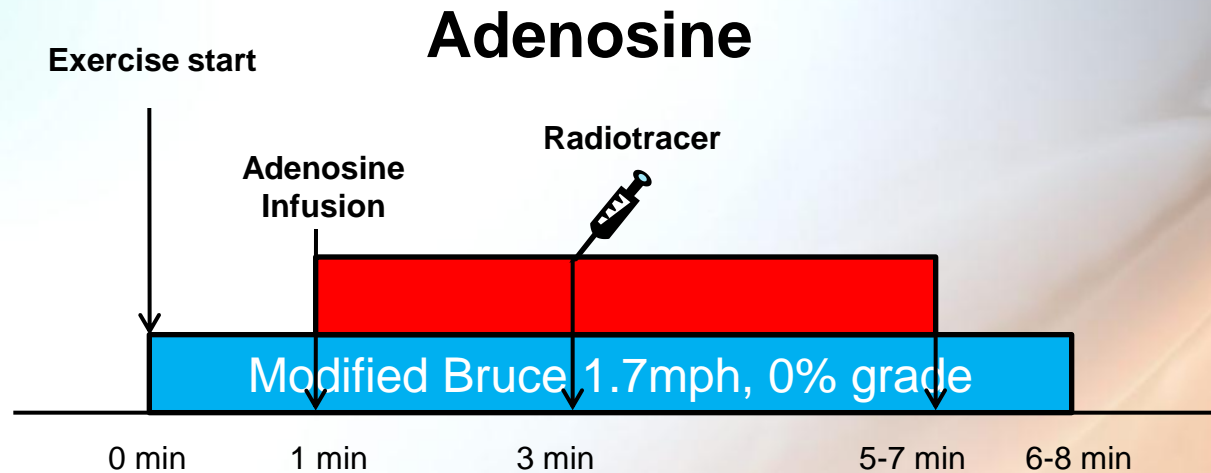
Goal : 85% of age-adjusted maximal predicted heart rate

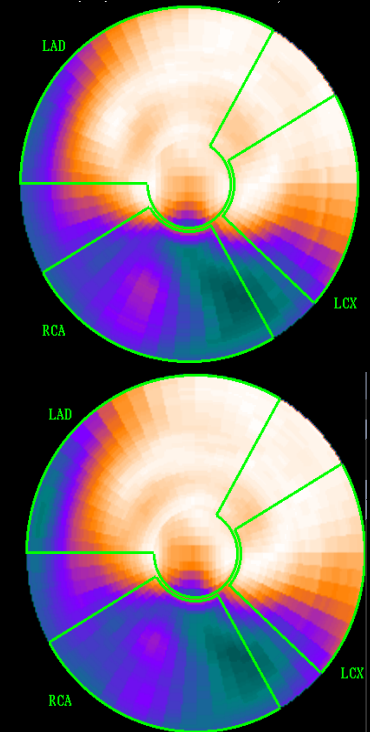
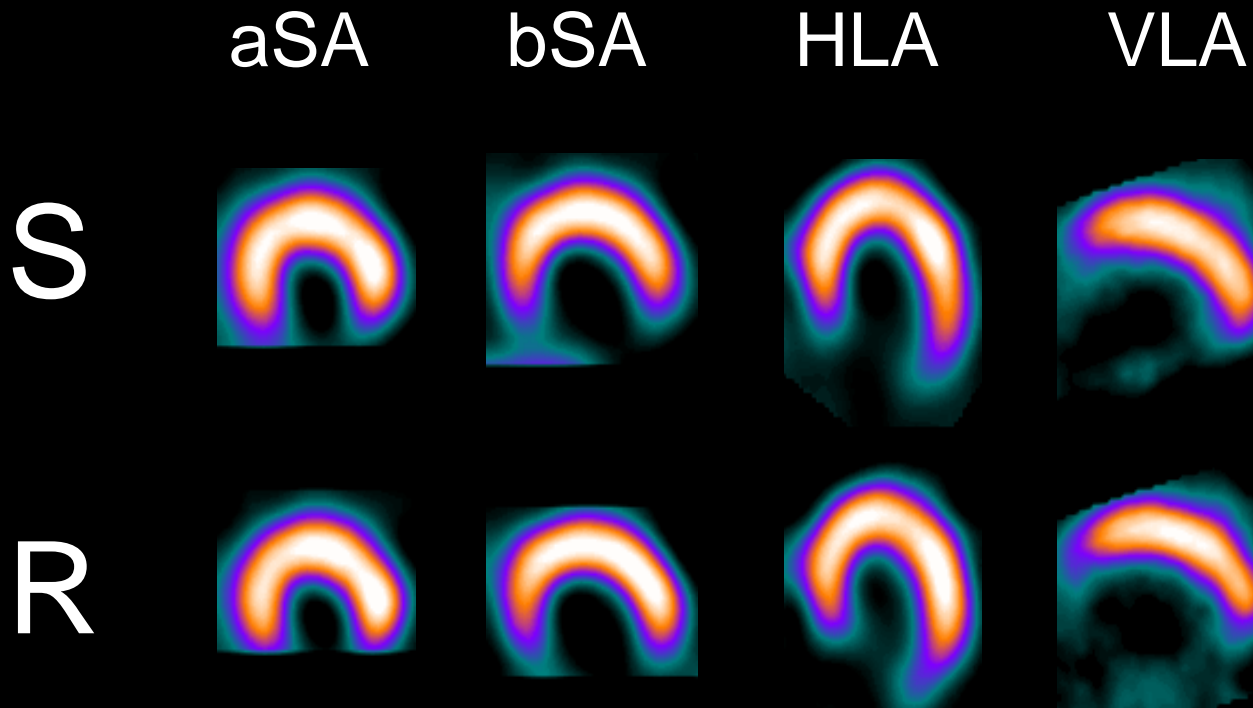
Men : $220 - \text{age}$

Women : $226 - \text{age}$

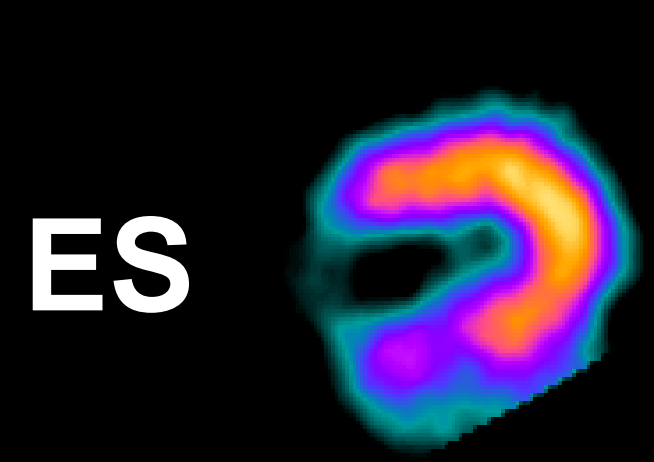
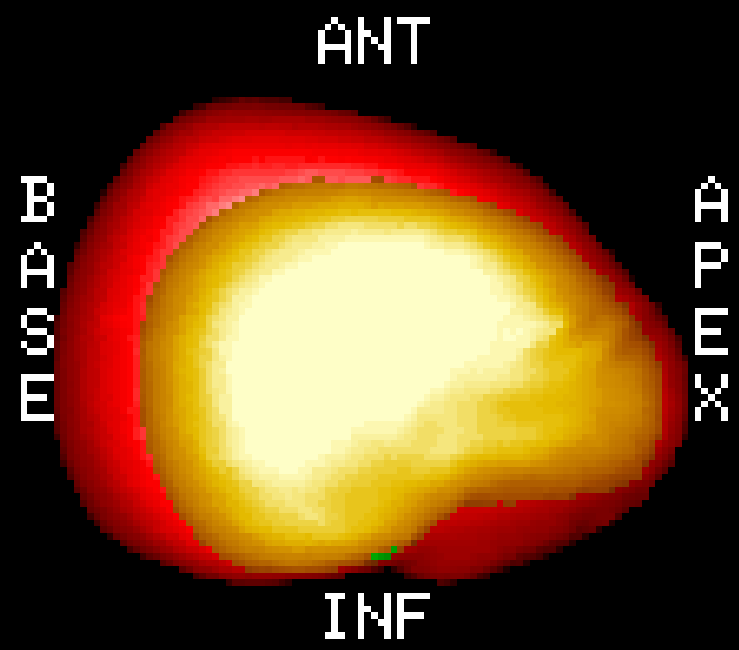
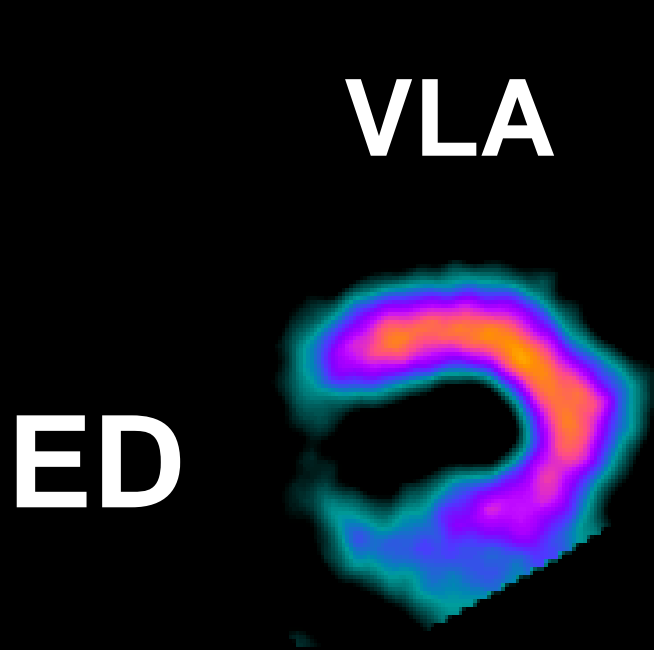
Atropine 1 mg

Combination of Low-level Exercise with Vasodilator Infusion





**Q. What is your interpretation ?
What are you going to do next ?**

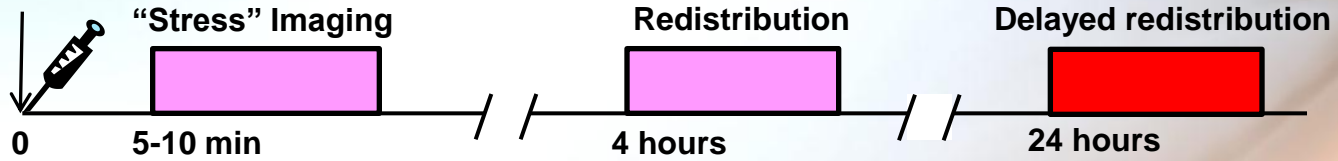


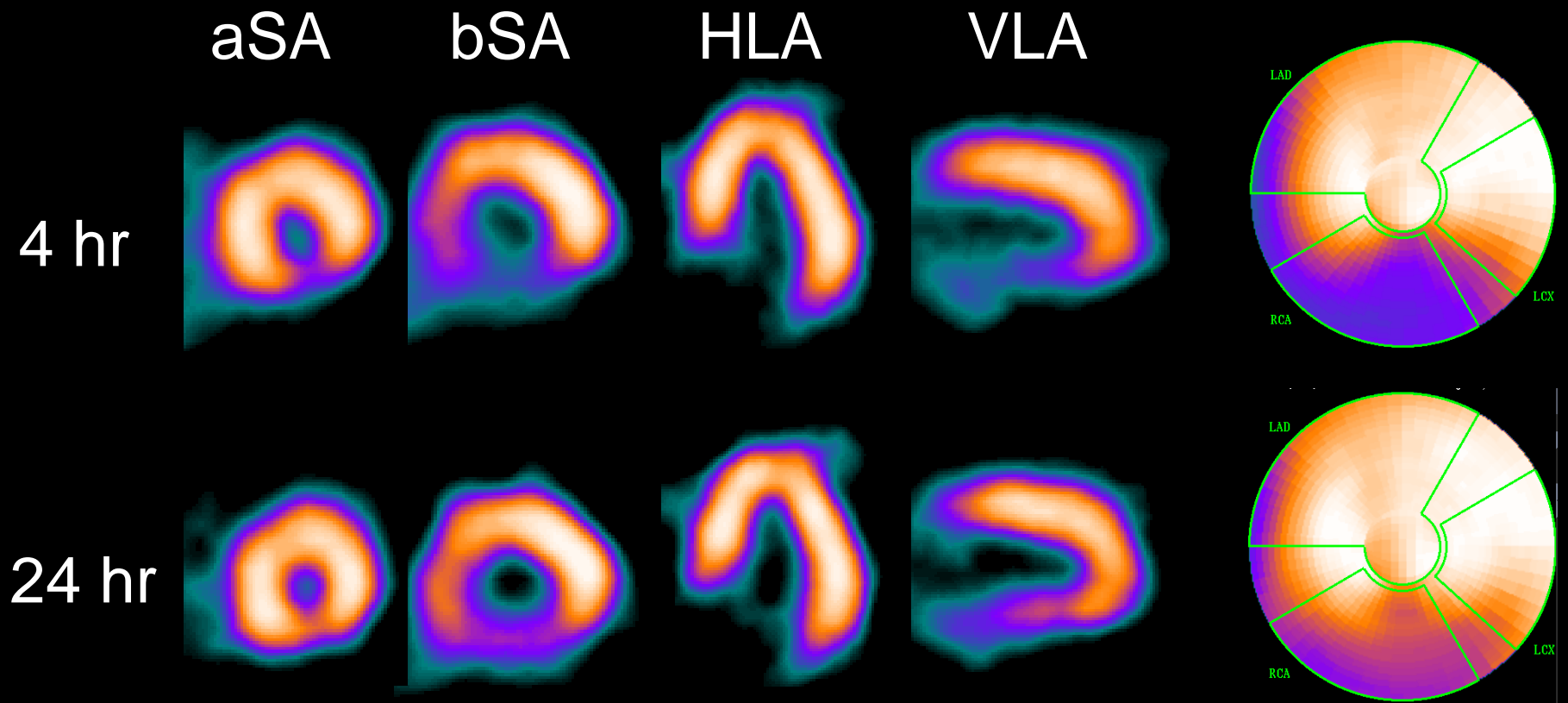
Septal

EDV ml/m²: 250
ESV ml/m²: 155
LVEF 38 %

LATE REDISTRIBUTION PROTOCOL

STRESS
2.5~3.5mCi



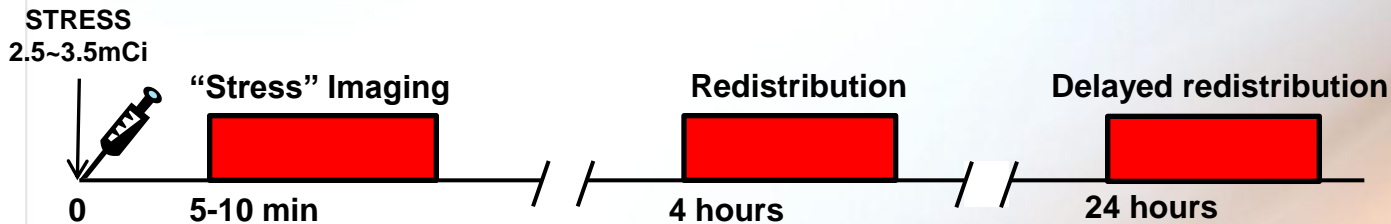


Q. What is your interpretation ?

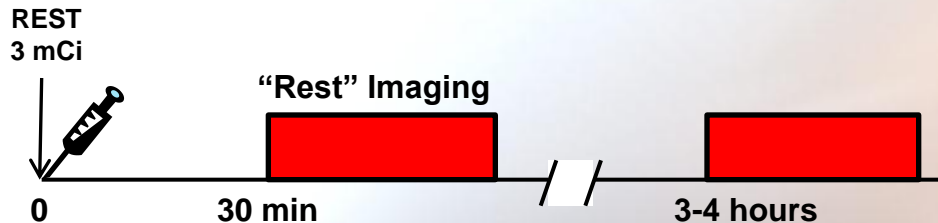
TI-201 Viability Tests (1)

- redistribution

1. 24hr REDISTRIBUTION PROTOCOL



2. REST-REDISTRIBUTION PROTOCOL



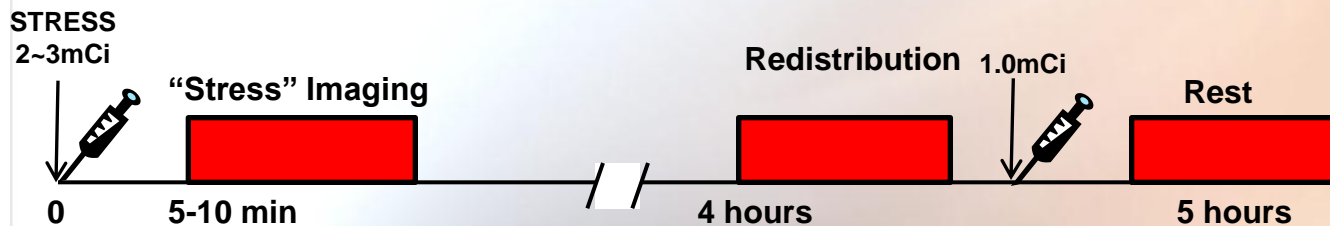
TI-201 Viability Tests (2)

- reinjection

1. STRESS-IMMEDIATE REINJECTION PROTOCOL



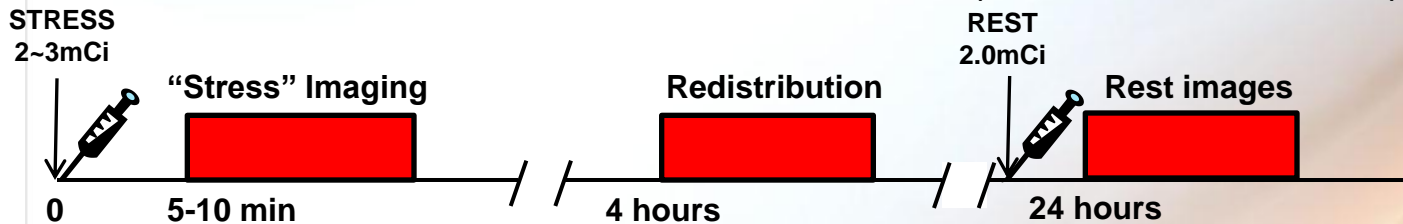
2. DELAY-REINJECTION PROTOCOL



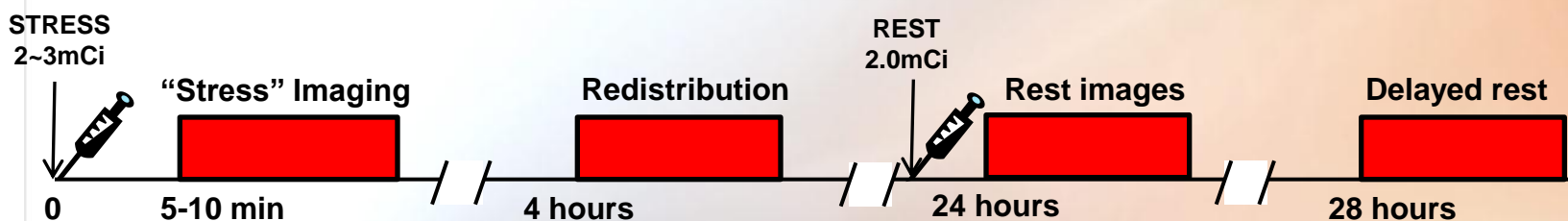
TI-201 Viability Tests (2)

- reinjection

3. LATE REST REINJECTION PROTOCOL (IMMEDIATE REST)



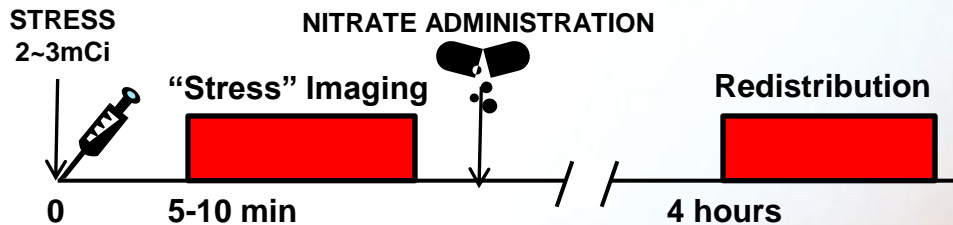
4. SEPARATE STRESS-REST REDISTRIBUTION PROTOCOL

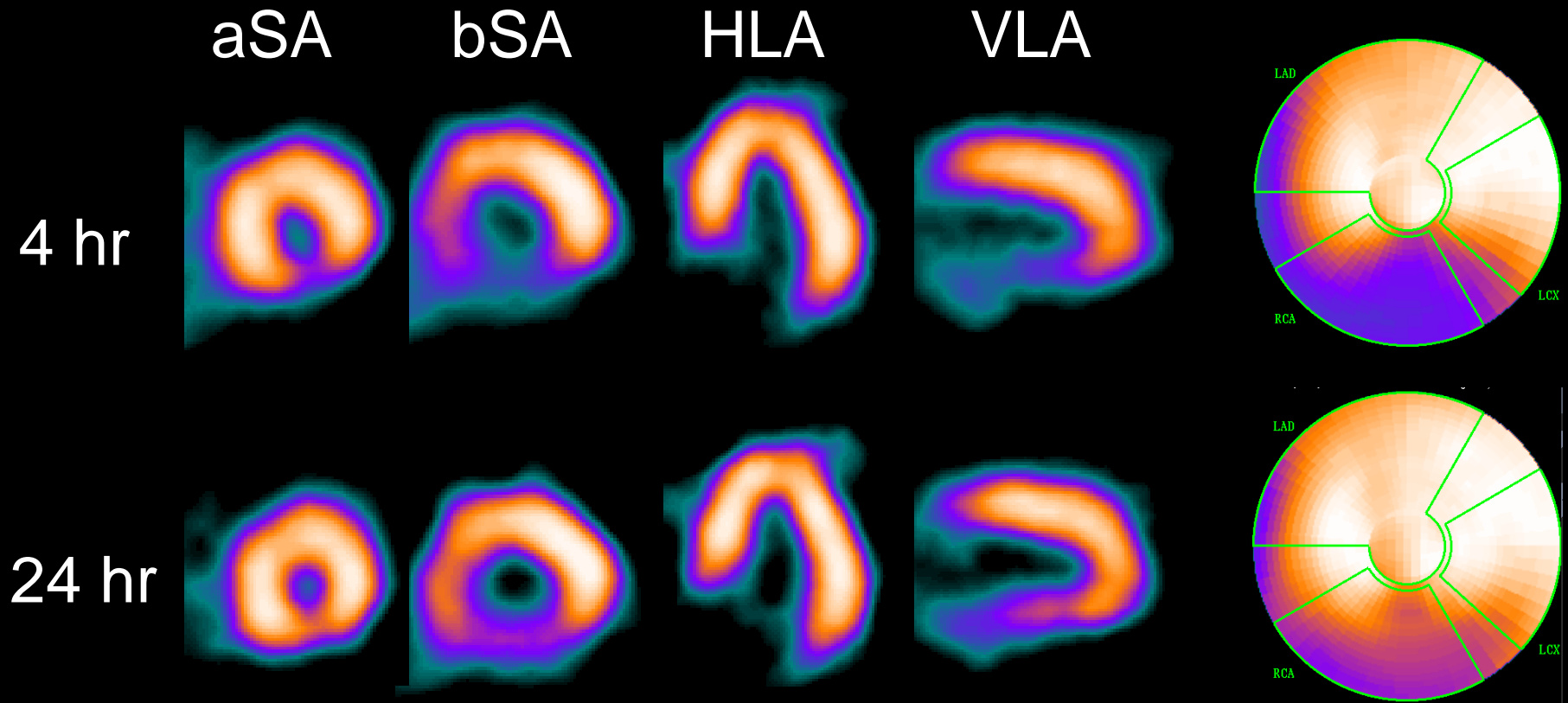


TI-201 Viability Tests (3)

- nitrate

STRESS/DELAY-NITRATE PROTOCOL

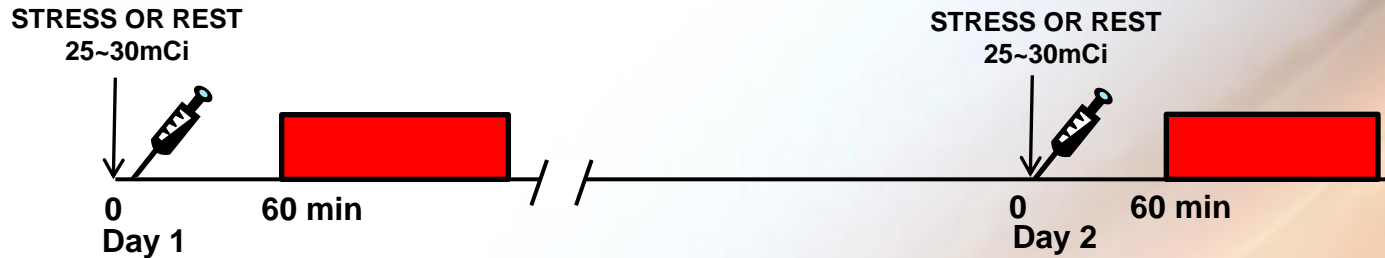




Q. What is probability of functional recovery after a successful revascularization ?

Tc-99m agents - two day protocols

1. CONVENTIONAL "TWO-DAY" PROTOCOL

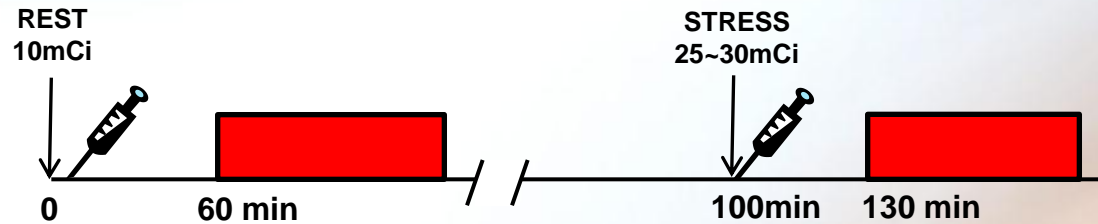


2. MODIFIED CONVENTIONAL "TWO-DAY" PROTOCOL

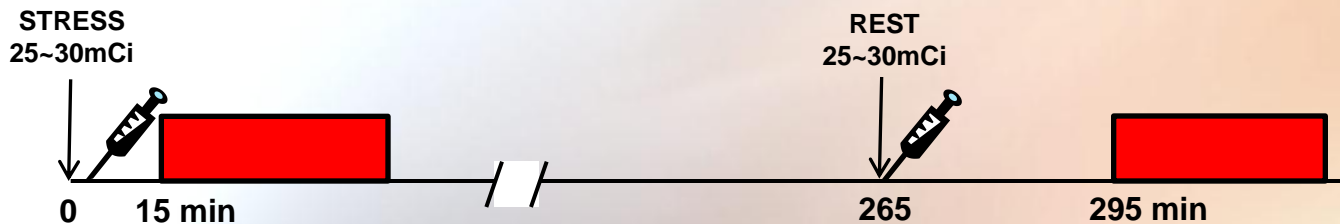


Tc-99m agents - same day protocols

1. SAME DAY "PROTOCOL: REST-STRESS"

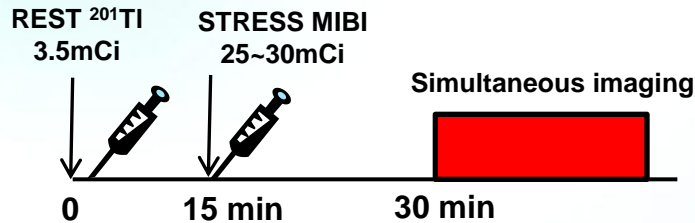


2. SAME DAY "PROTOCOL: STRESS-REST"

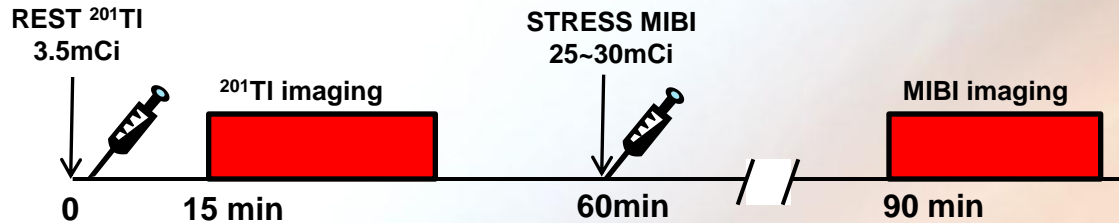


Dual Isotope Imaging Protocols

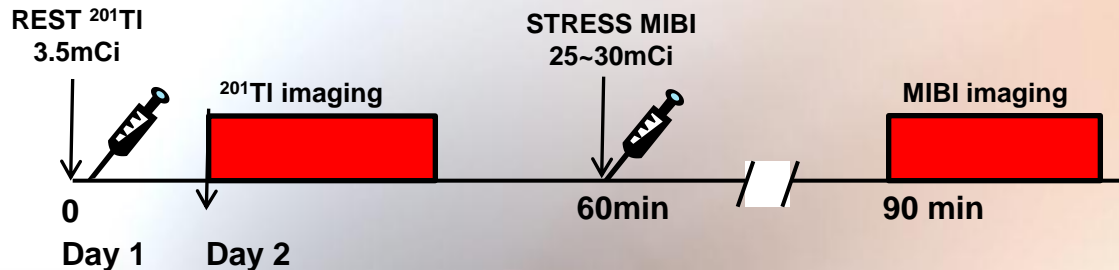
1. INITIAL PROTOCOL WITH SIMULTANEOUS ACQUISITION

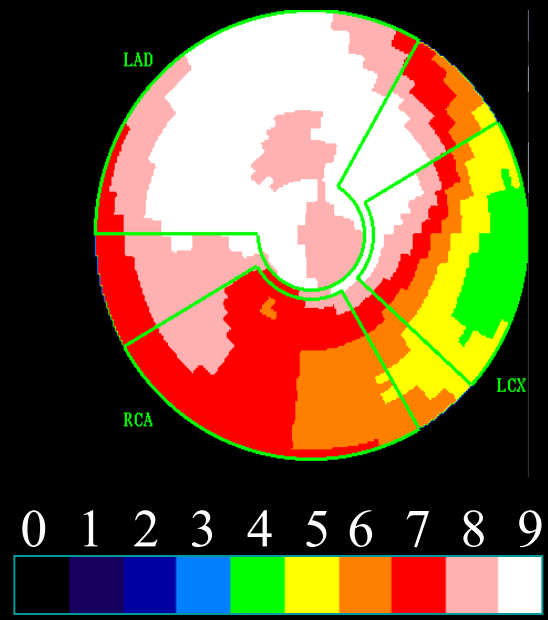
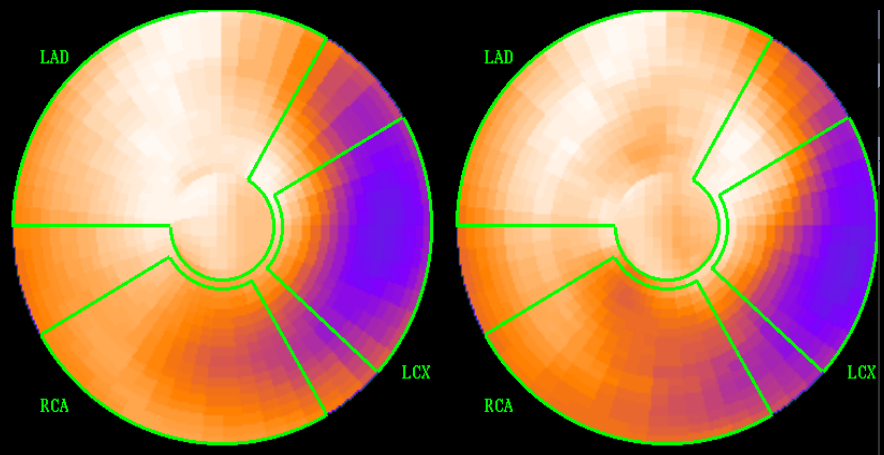
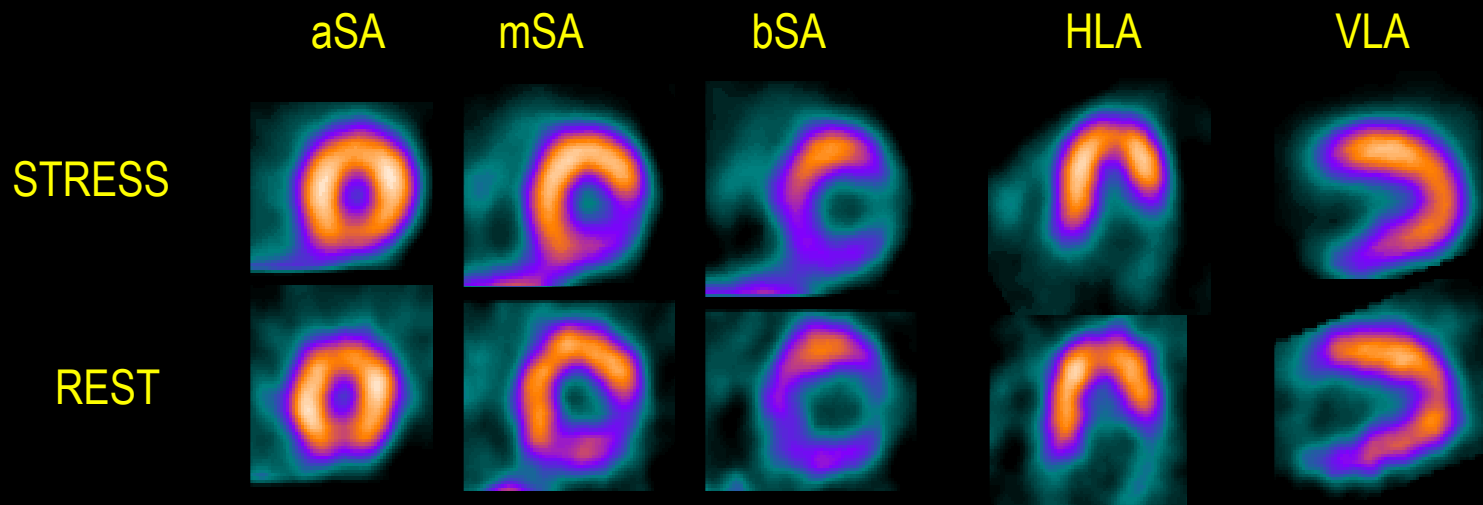


2. STANDARD DUAL RADIONUCLIDE PROTOCOL

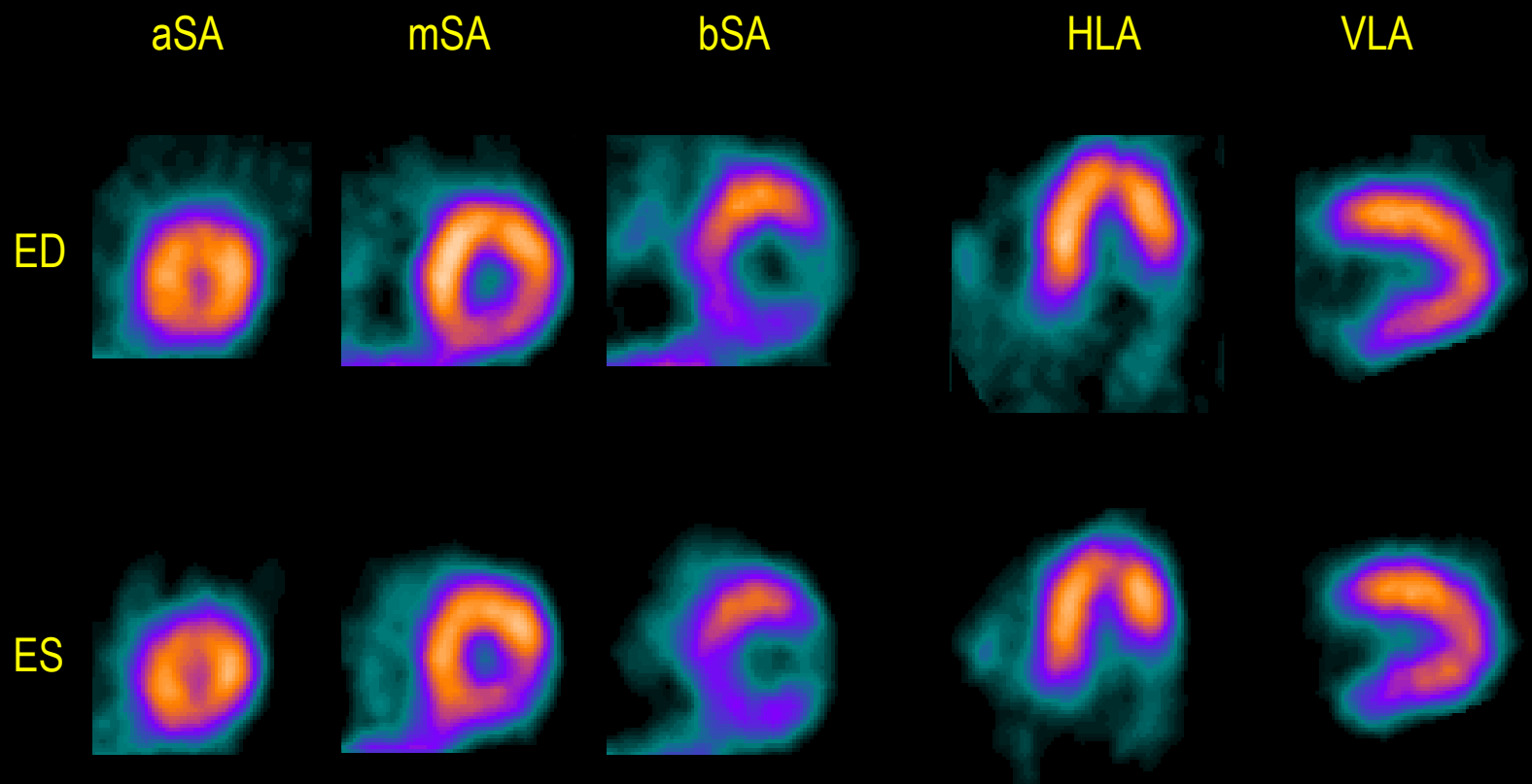


3. TWO-DAY INJECTION PROTOCOL

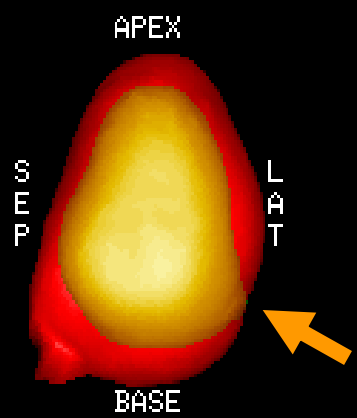




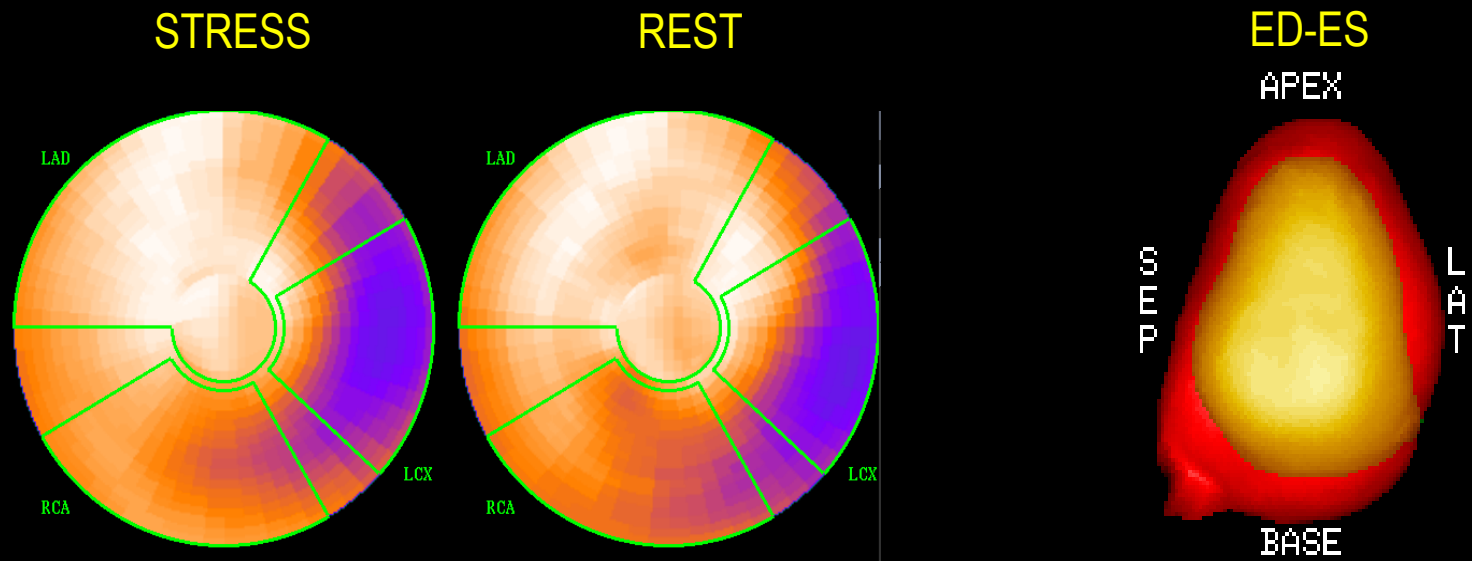
Rest ED-ES



LVEF= 52 %
EDV = 111 ml
ESV = 54 ml

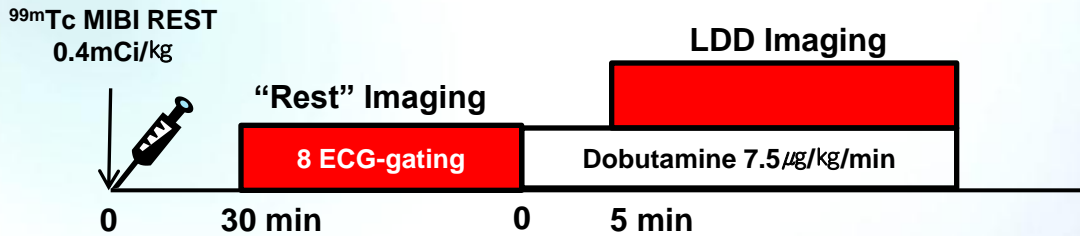


Q. Interpretation ?



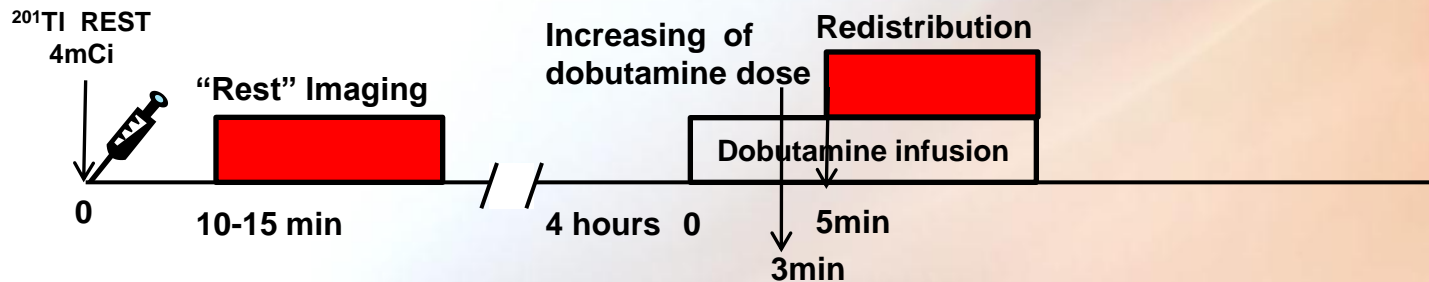
**Q. Fixed defect & akinesia
What do you do next ?**

REST AND **LOW DOSE DOBUTAMINE** PROTOCOL



J Nucl Cardiol 2009;16:597–604

REST REDISTRIBUTION AND **LOW DOSE DOBUTAMINE**



Dobutamine protocol

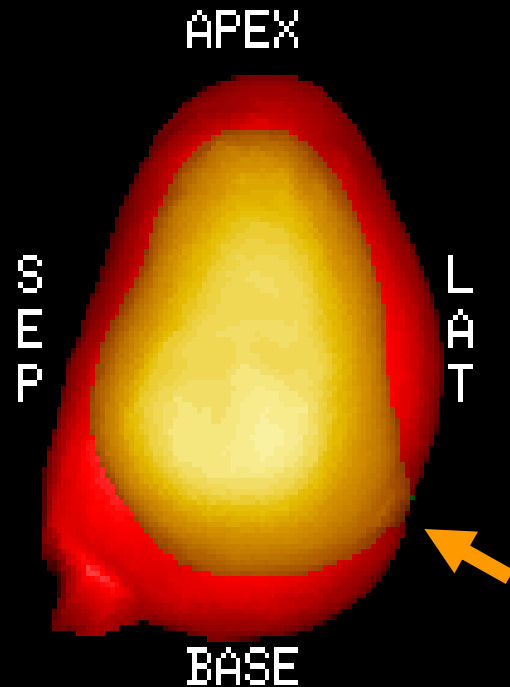
(0-3 min) : 5 µg/kg/min

(3 min to acquisition end) : 10 µg/kg/min

Ann Nucl Med 2009; 23:197–203

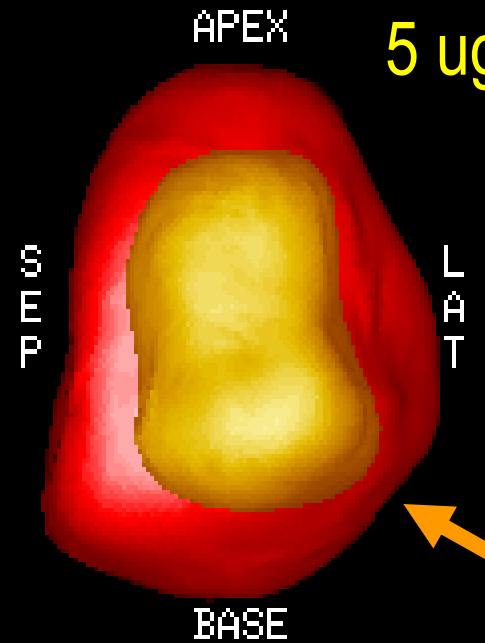
Wall Motion during Dobutamine Infusion

Rest



LVEF= 52 %
EDV = 111 ml
ESV = 54 ml

5 ug/kg/min



LVEF= 70 %
EDV = 93 ml
ESV = 28 ml

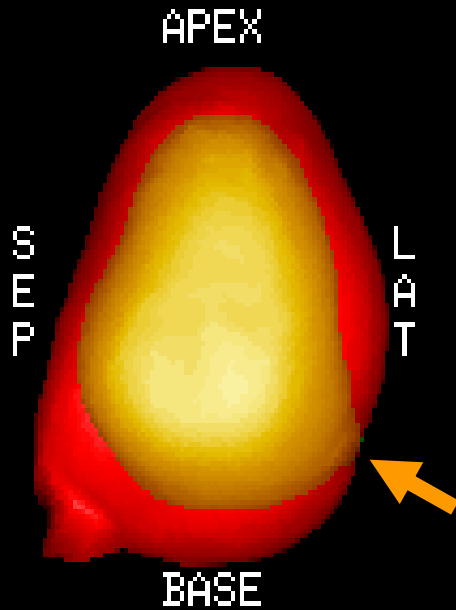
Pre-PTCA

Post-PTCA

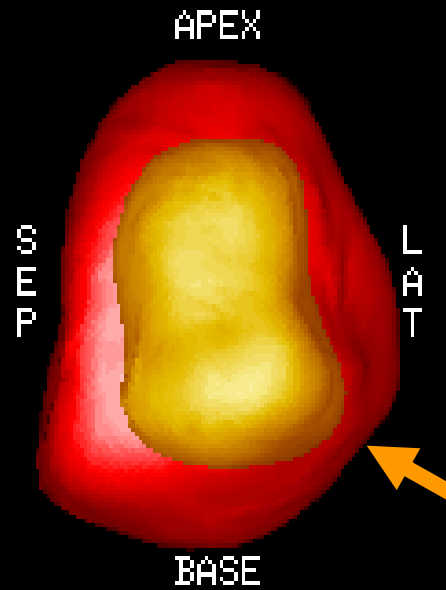
Rest

Low dose DB

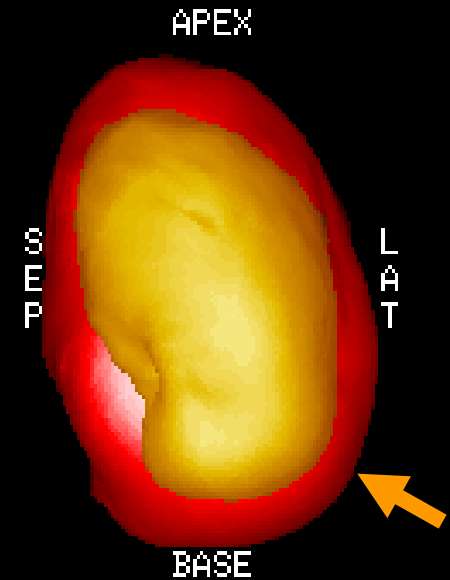
3 mo later



LVEF=52%
EDV=111ml
ESV=54ml



LVEF=70%
EDV=93ml
ESV=28ml



LVEF=56%
EDV=103ml
ESV=45ml

Dedicated Cardiac SPECT

Ventri (GE)

Pin hole collimators

CZT (Cadmium Zinc Telluride, Cd-Zn-Te) detectors

Discovery NM/CT 570 (GE)

CT imaging

C.Cam (Siemens)

Optimized angle of detectors(76°)

CardioMD (Philips)

X-ACT (Digirad)

D-SPECT (Spectrum Dynamics)

CZT detectors

- One half of the traditional technetium dose
- Six minutes of imaging

A **Cardius 3 camera**

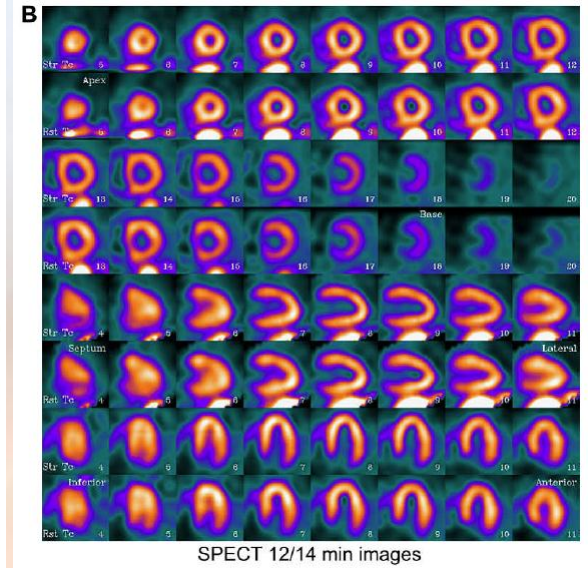
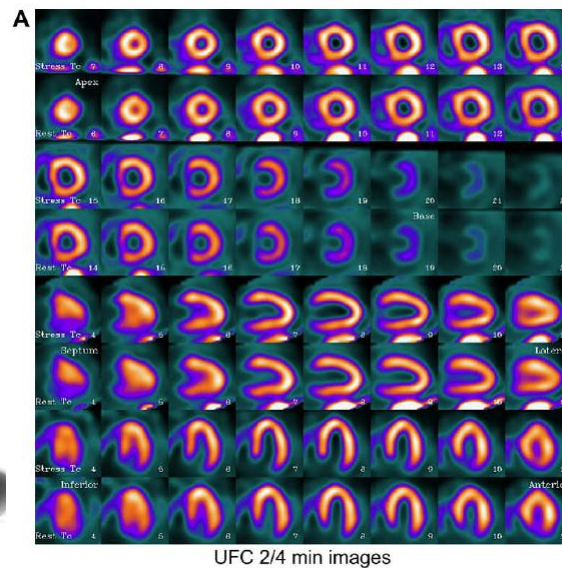
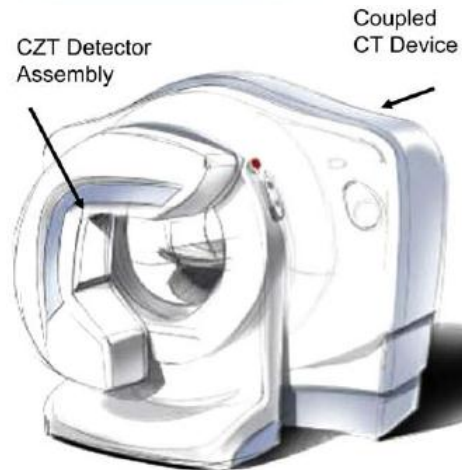


CardiArc system



Spectrum Dynamics system

Comparison of dedicated cardiac and conventional SPECT

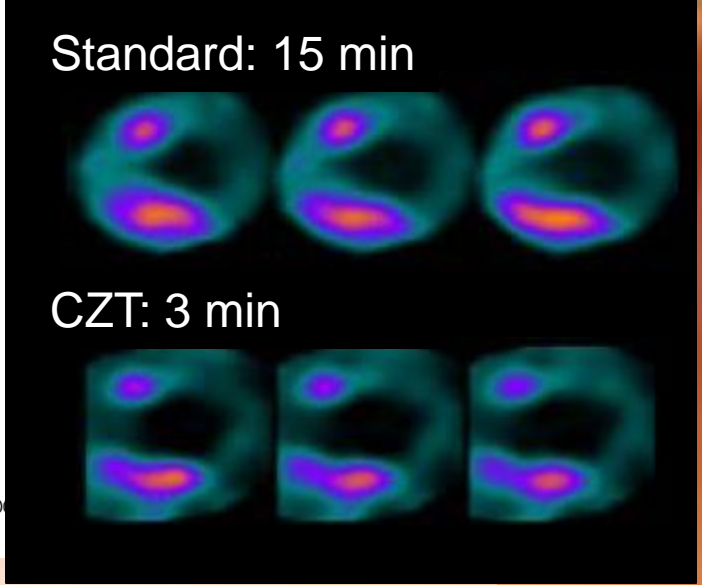
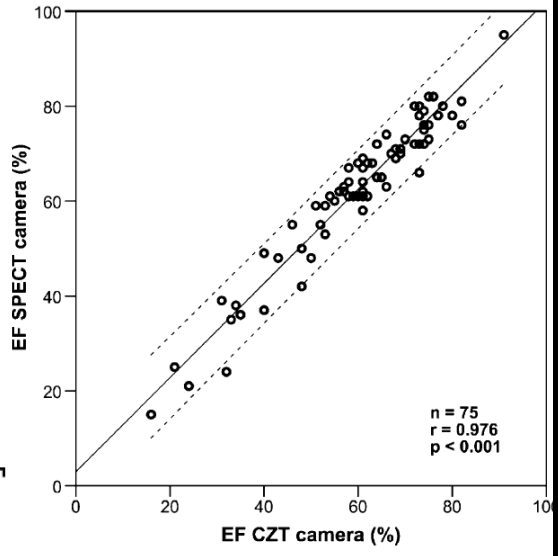
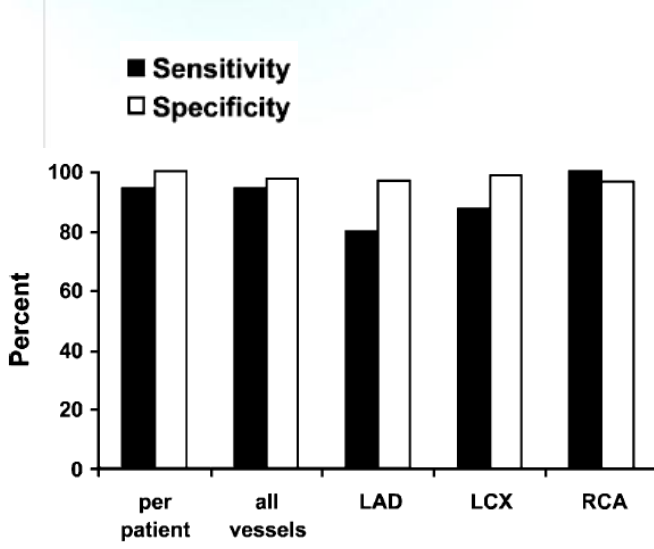


Scan Time	Rest	Stress
AT cardiac system	4min	2min
Conventional SPECT	14min	12min

Instruments Cardiac Dedicated SPECT

High Sensitivity

Lower-dose injection and faster scan



Buechel et al.
EJNMMI
2010



Thank you for your attention