



PLATFORM OF LABORATORIES FOR ADVANCES IN CARDIAC EXPERIENCE

**ROMA**

Centro Congressi  
di Confindustria

Auditorium  
della Tecnica

**9<sup>a</sup> Edizione**

**30 Settembre**

**1 Ottobre  
2022**



## PACING NEWS: CORE PROBLEMS

## AICD E PM BICAMERALE: RUOLO DELLA MEDICINA NUCLEARE

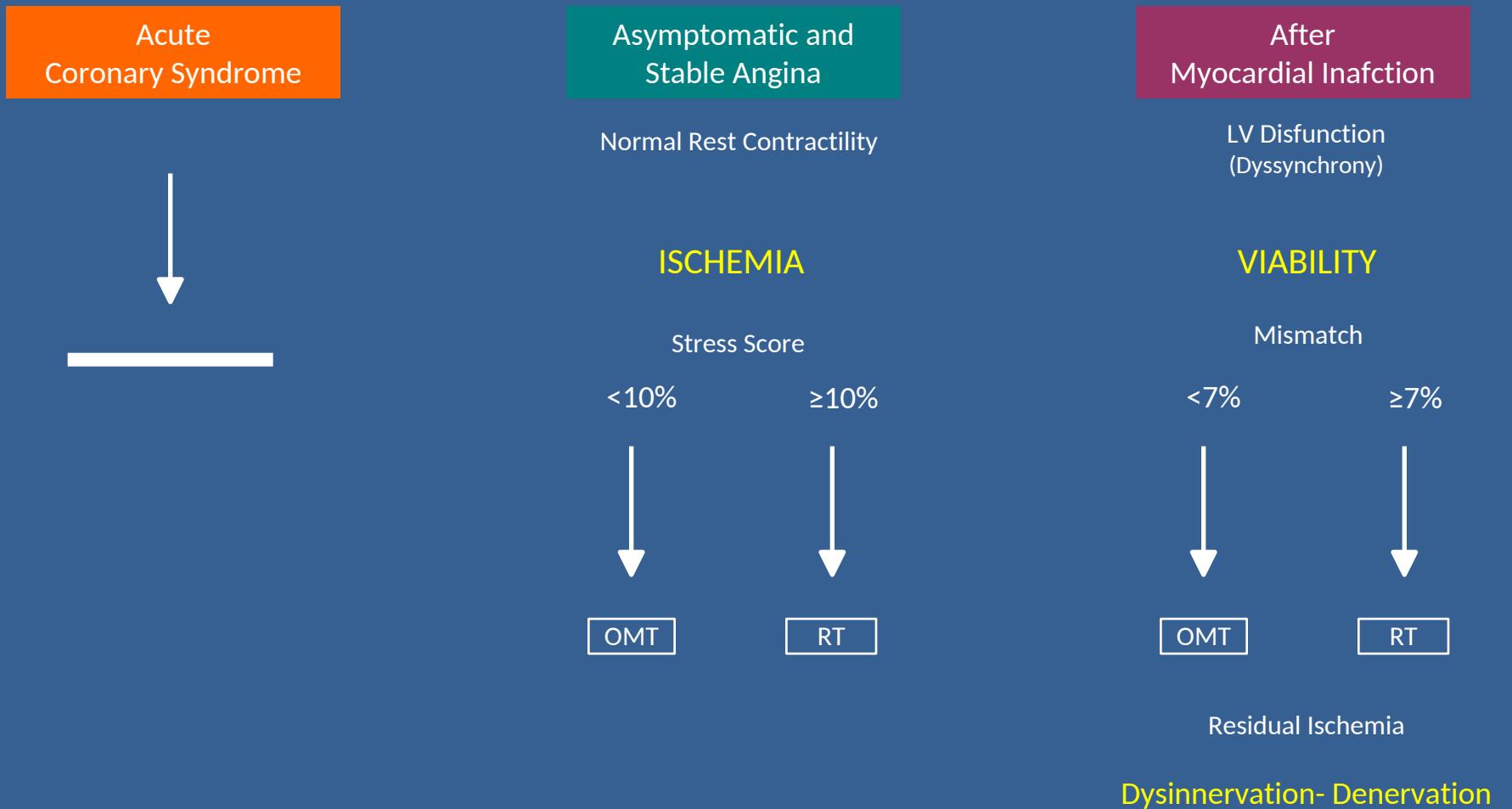
**Enrica Procaccini, MD**

Clinica Madonna Della Fiducia, Roma

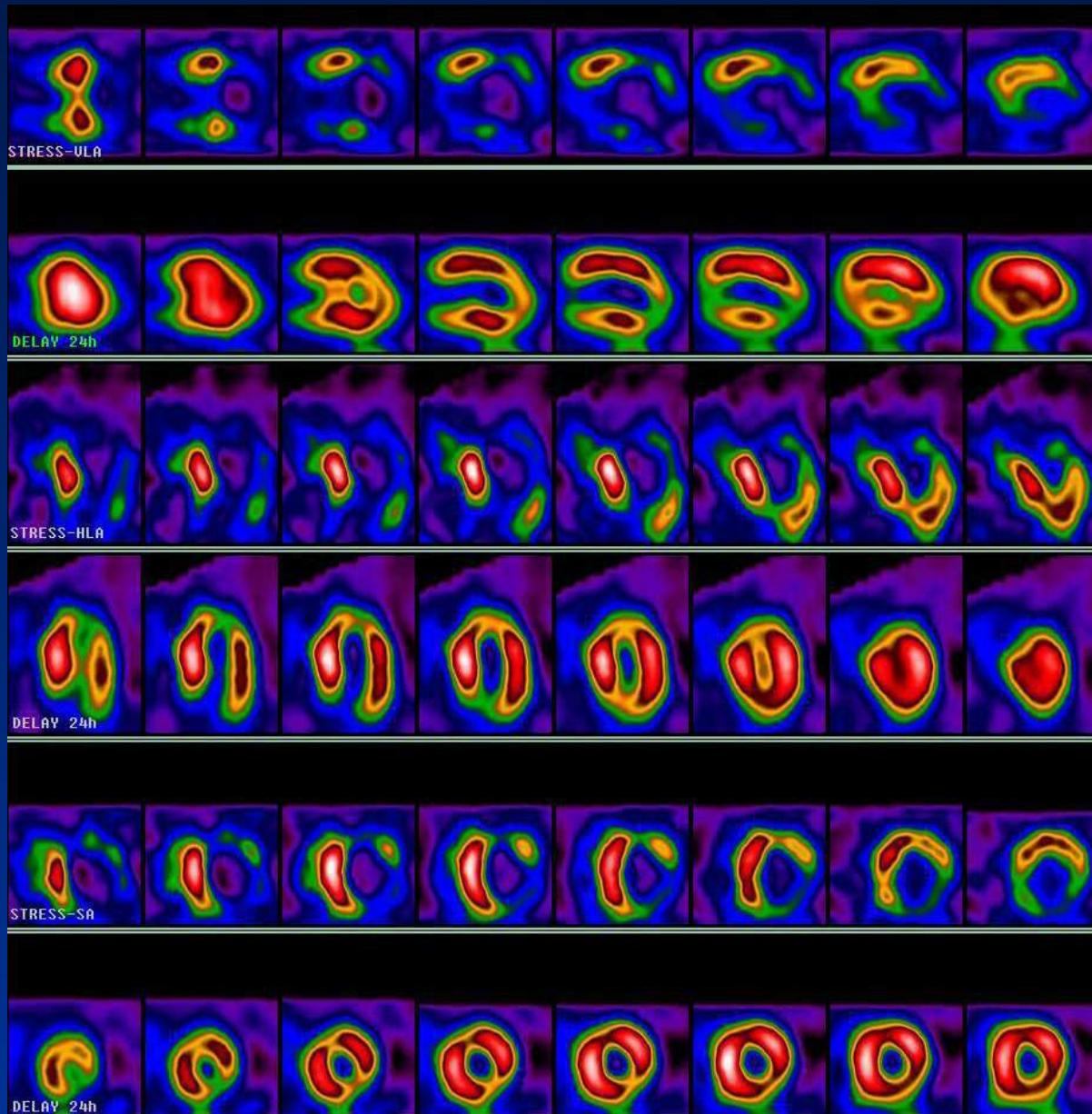
Ostia Radiologica, Ostia

Replaycare, Roma

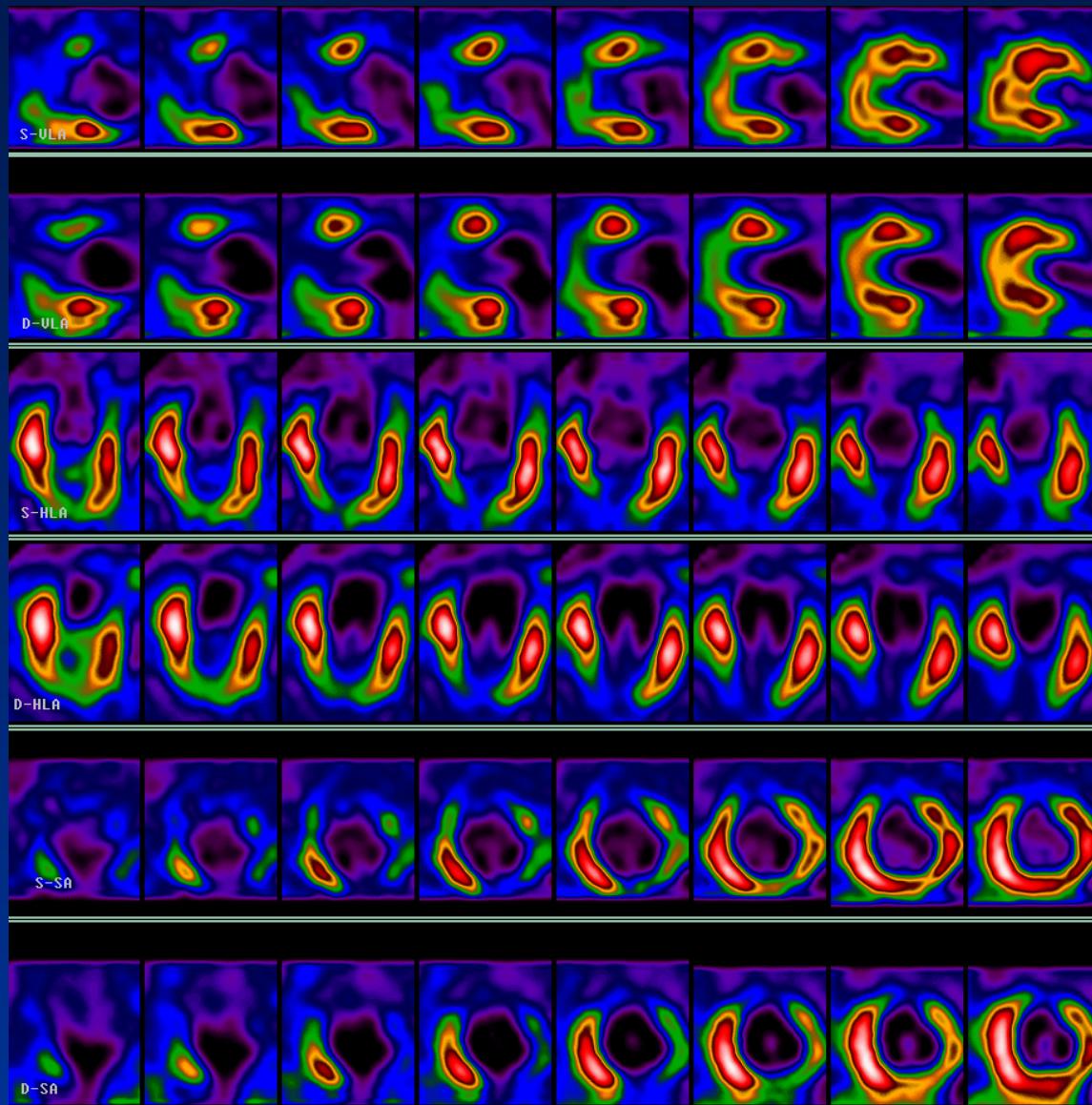
# Risk Stratification



# SPECT Imaging

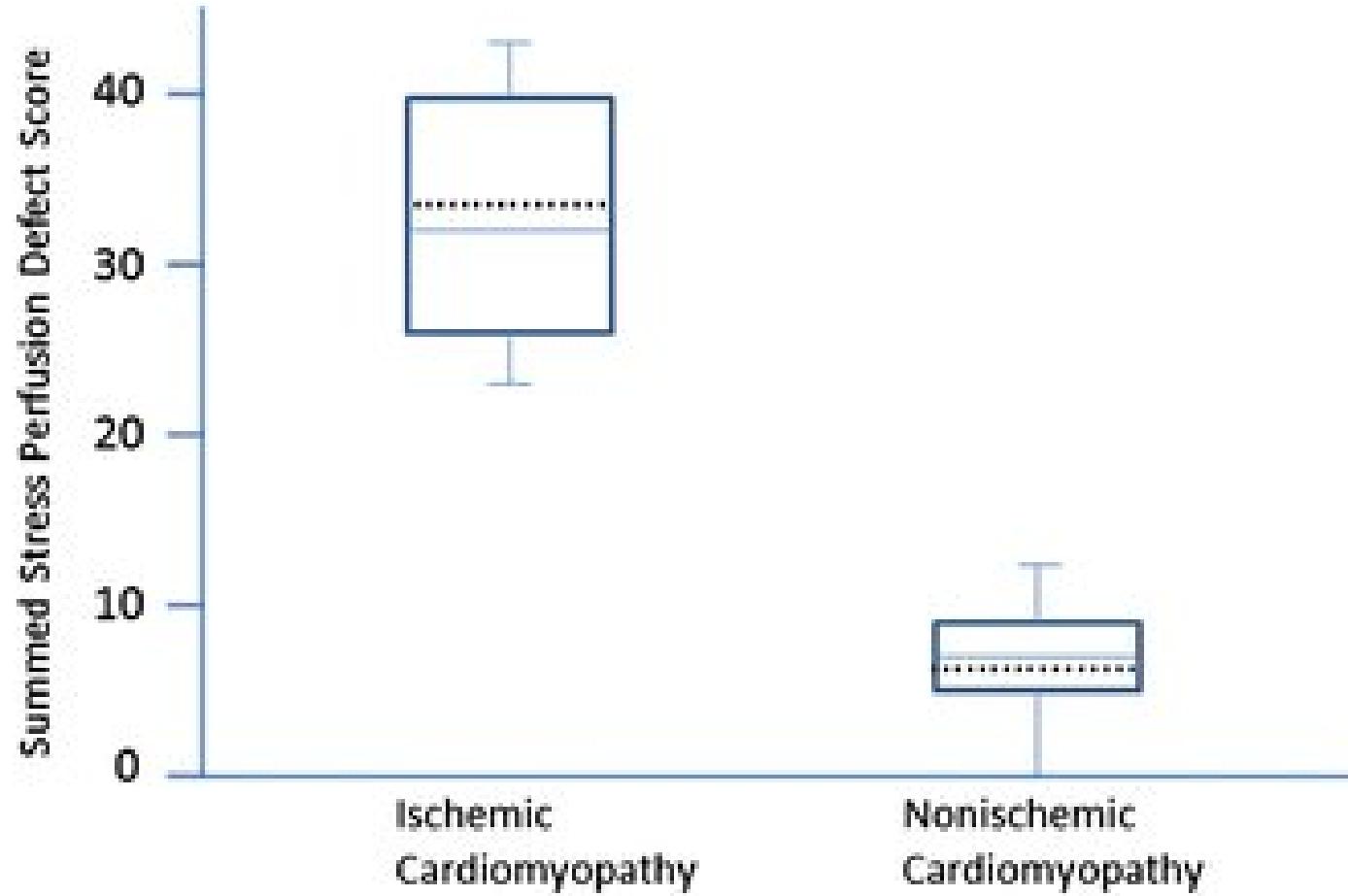


# SPECT Imaging



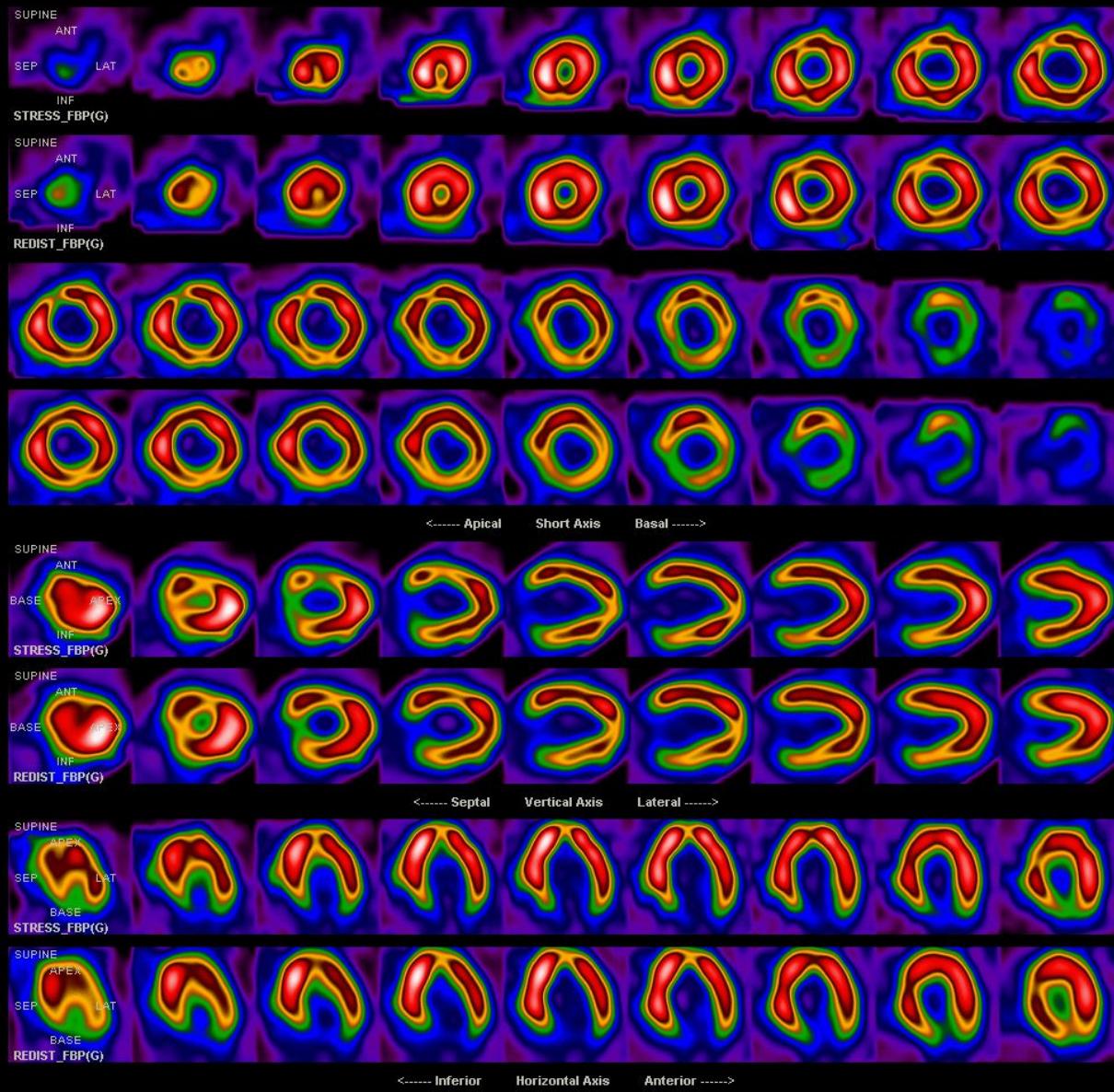


## THE ROLE OF RADIONUCLIDE IMAGING IN HEART FAILURE



Gulati V et al. (JNC 2013)

# SPECT Imaging

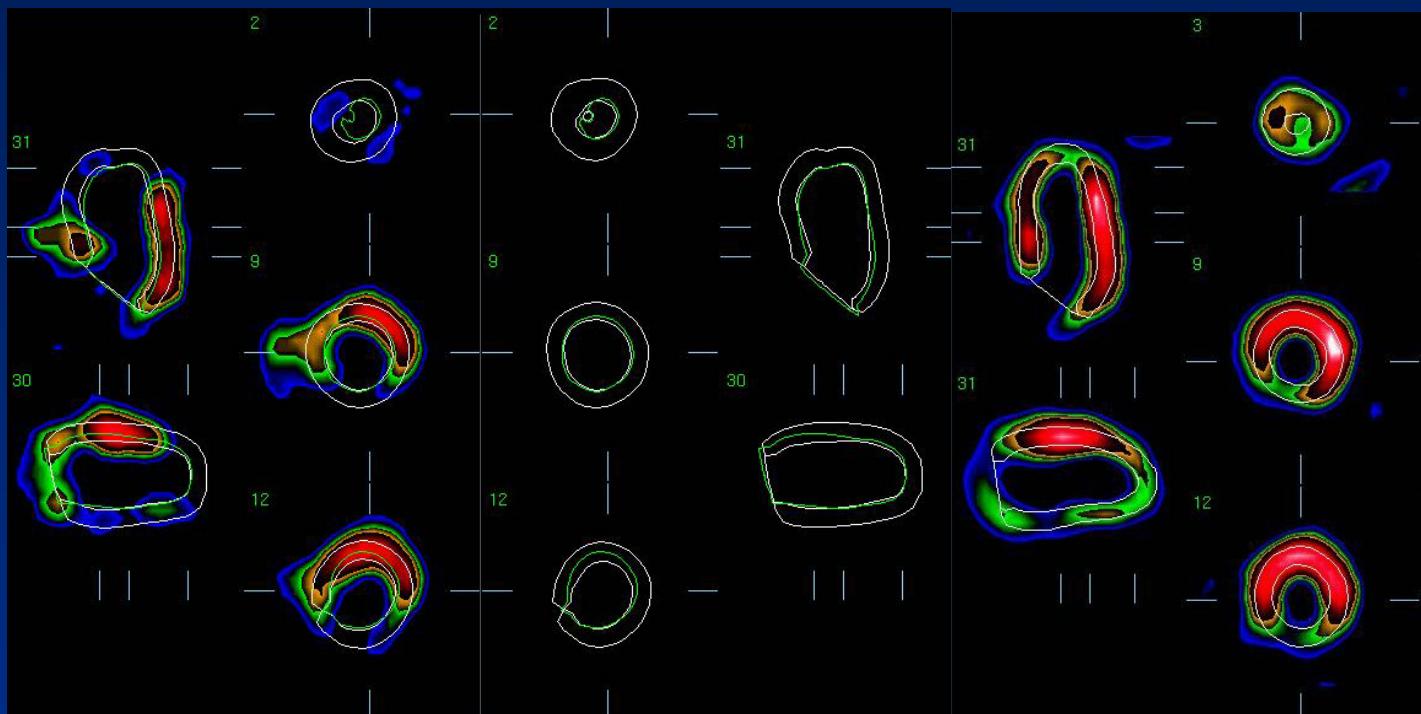


# Metabolism-Perfusion Mismatch

Perfusion

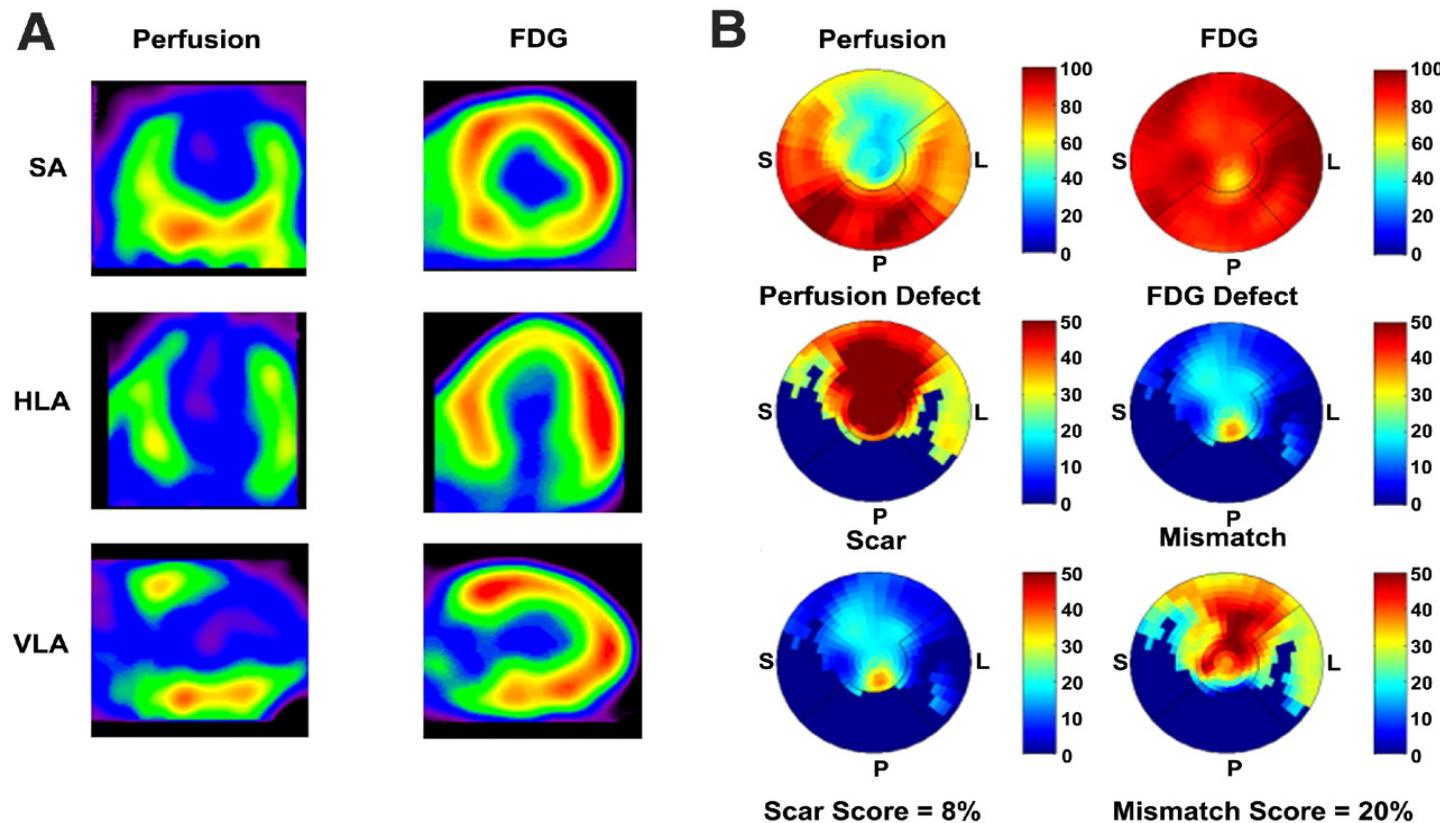
Contractility

Viability

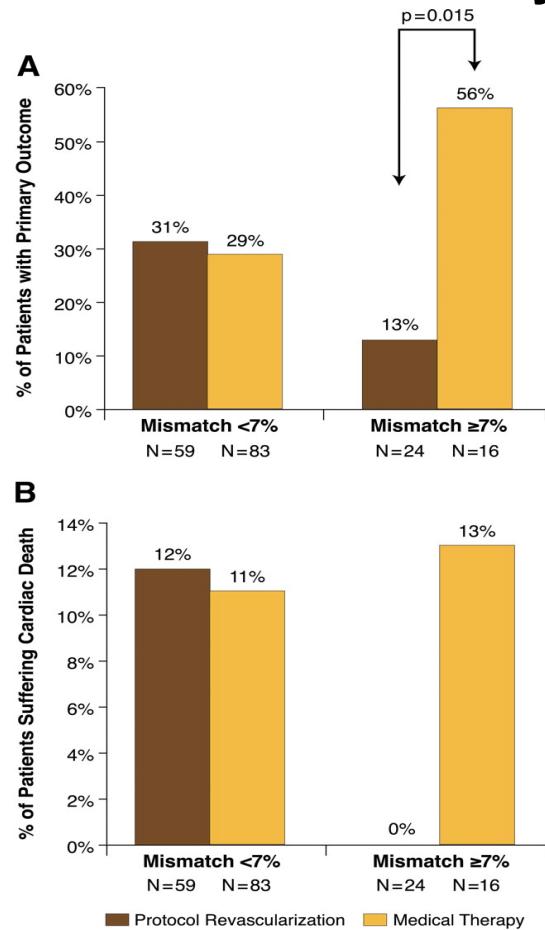




# Increasing Benefit From Is Associated With Increasing Amounts of Myocardial HibernationRevascularization - A Substudy of the PARR-2 Trial

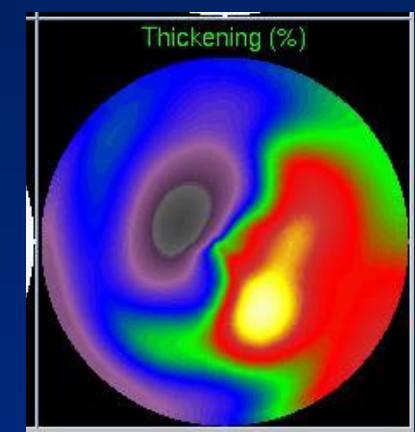
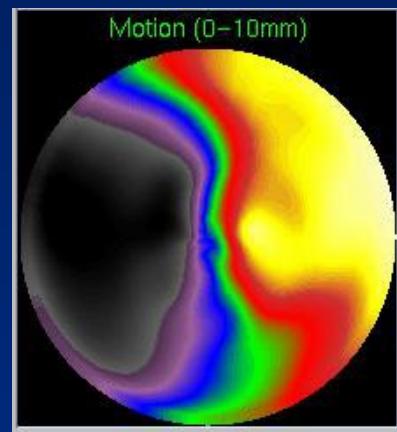
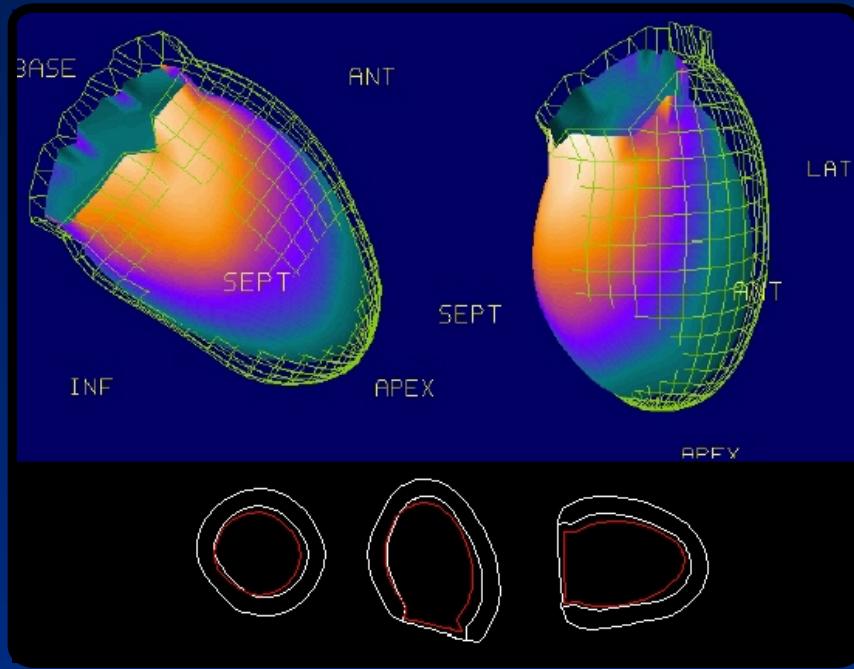


# Increasing Benefit From Revascularization Is Associated With Increasing Amounts of Myocardial Hibernation - A Substudy of the PARR-2 Trial



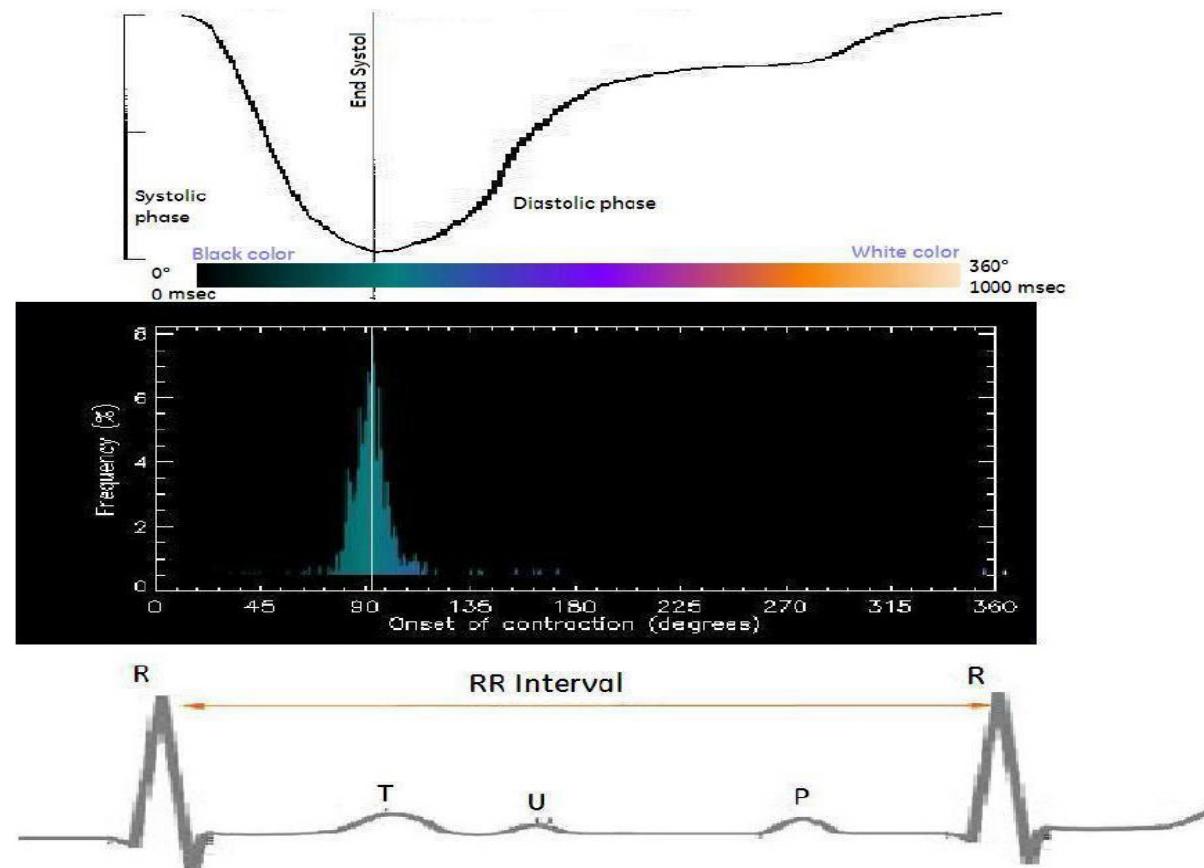
PARR-2 Investigators (J Am Coll Cardiol Img 2009;2:1060–8)

# SPECT Imaging





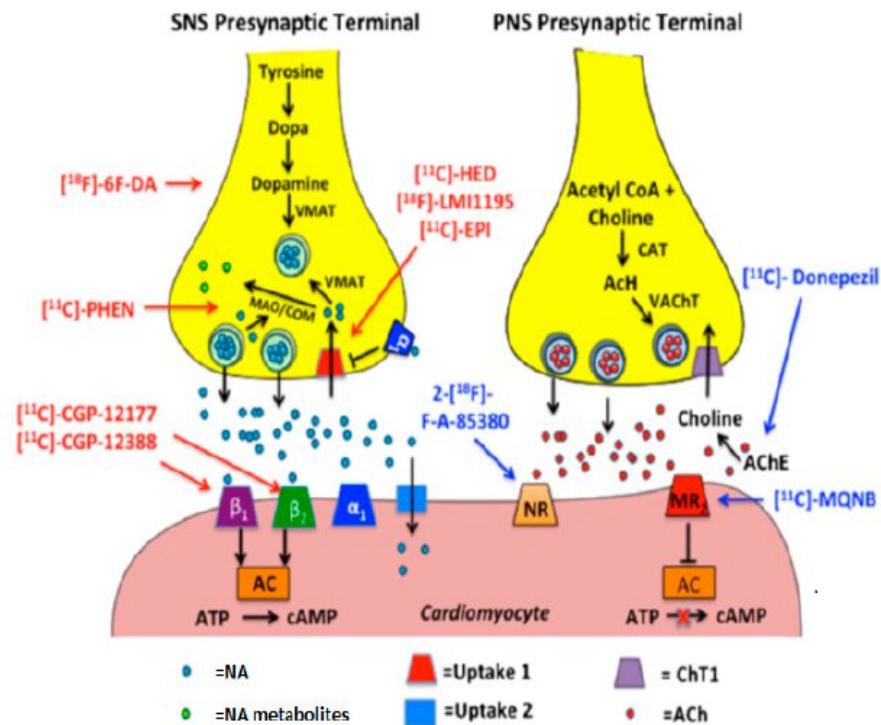
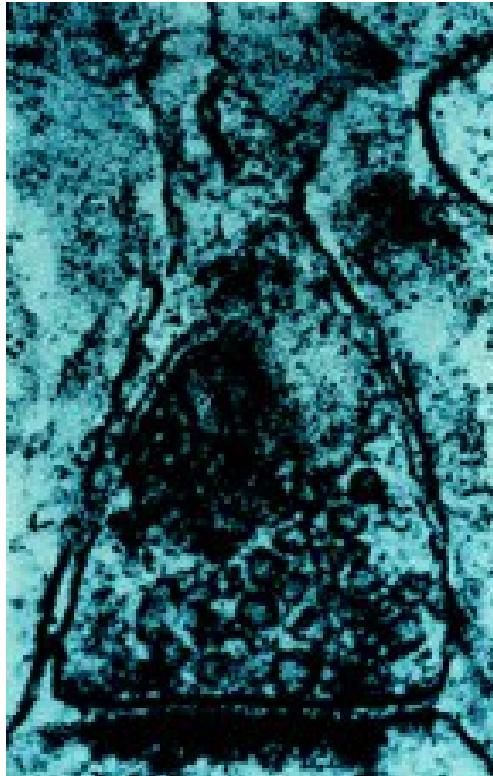
## Nuclear Imaging in Cardiac Resynchronization Therapy



Henneman M M et al (J Nucl Med 2007; 48:2001-2010)



# CARDIAC NEURONAL IMAGING AT THE EDGE OF CLINICAL APPLICATION

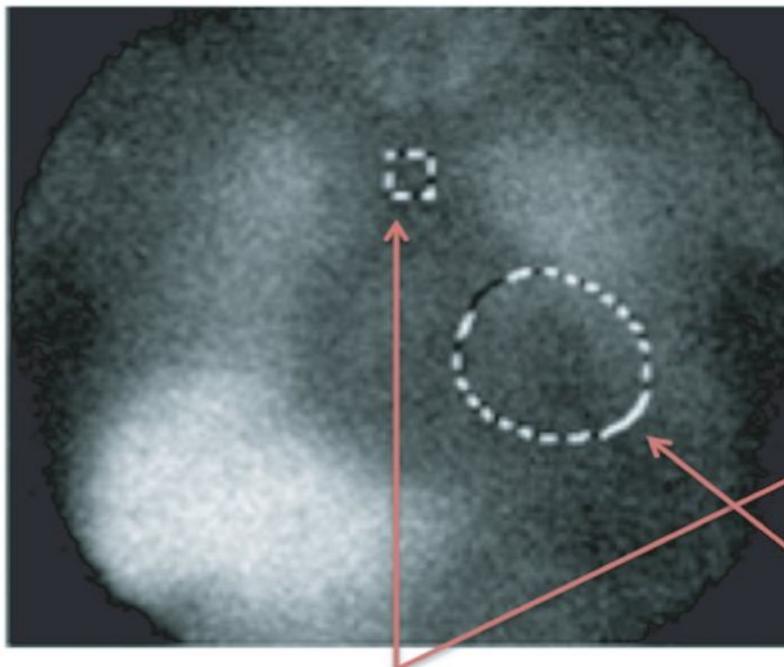


Travin, Cardiol Clin 2009  
 Kiuchi et al, Int J Mol Sci 2019

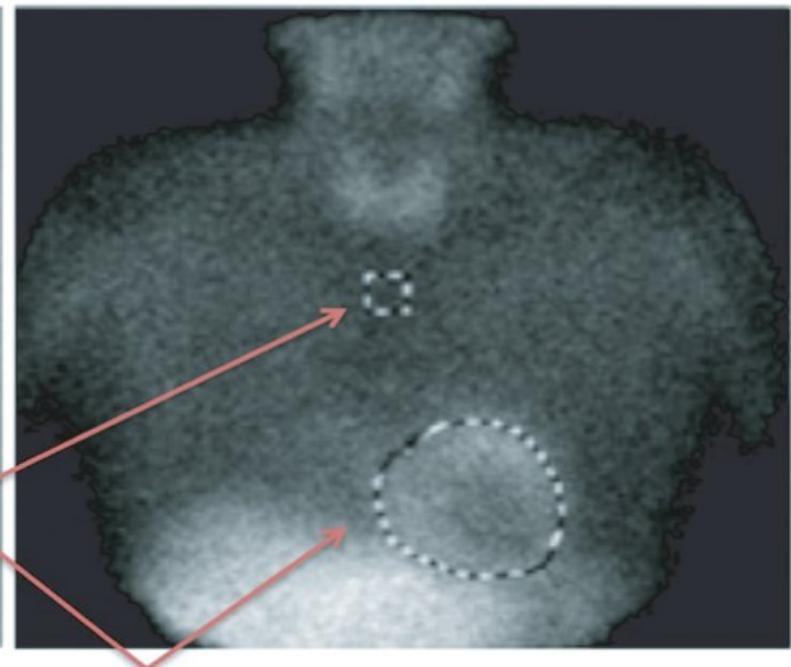


## TYPICAL EXAMPLES OF MIBG

Heart Failure Patient



Normal Subject

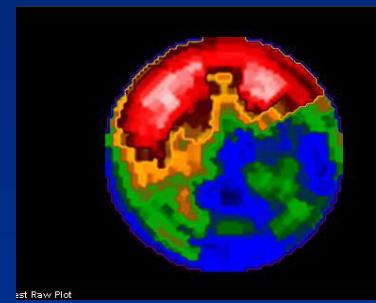
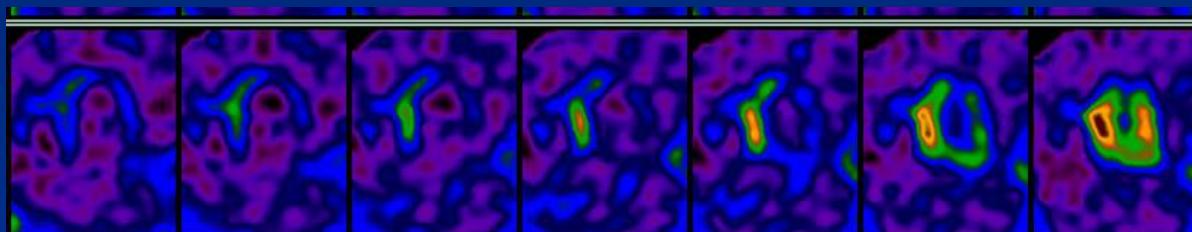
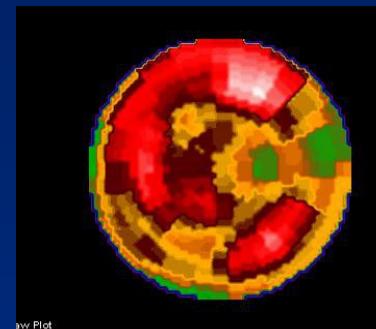
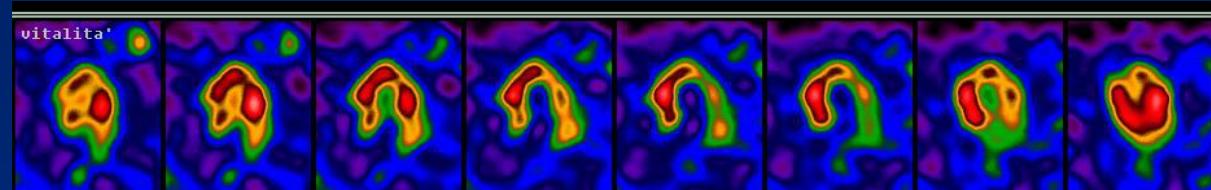
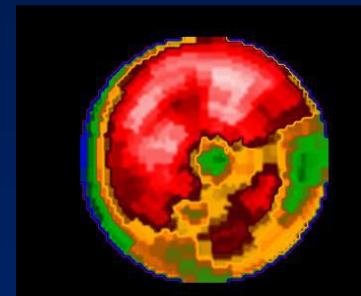
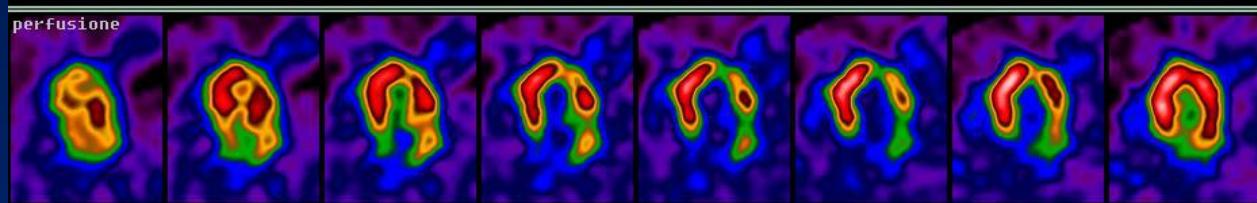


Mediastinum ROI

Heart ROI

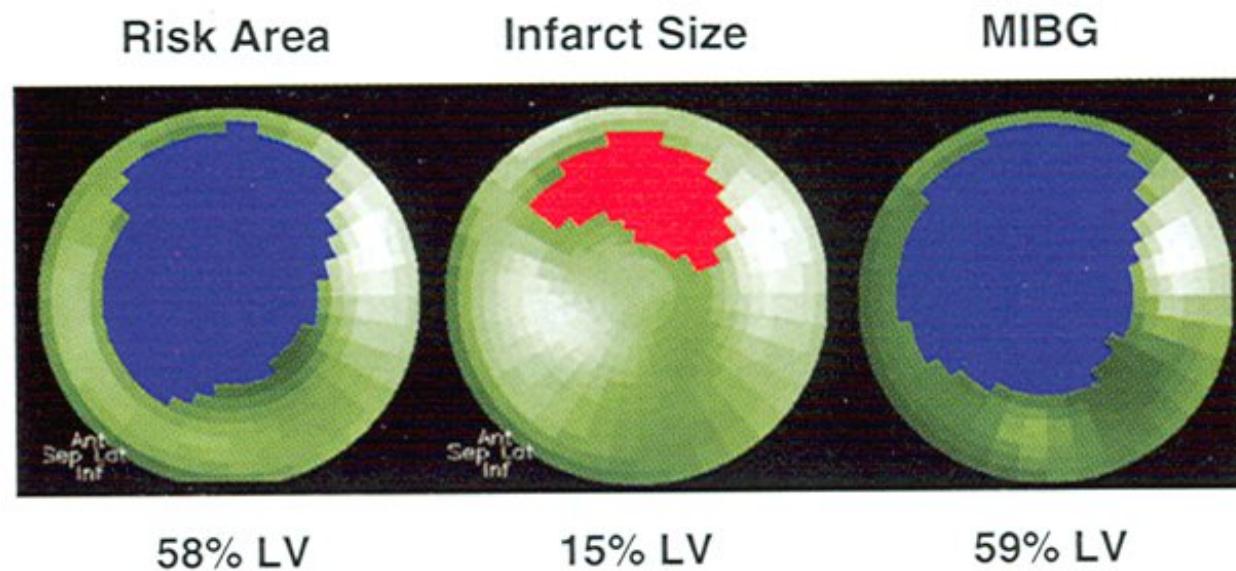
Zhou W, Chen J (J Biomed Res 2013;27:460-6)

## Viable – Innervation Mismatch





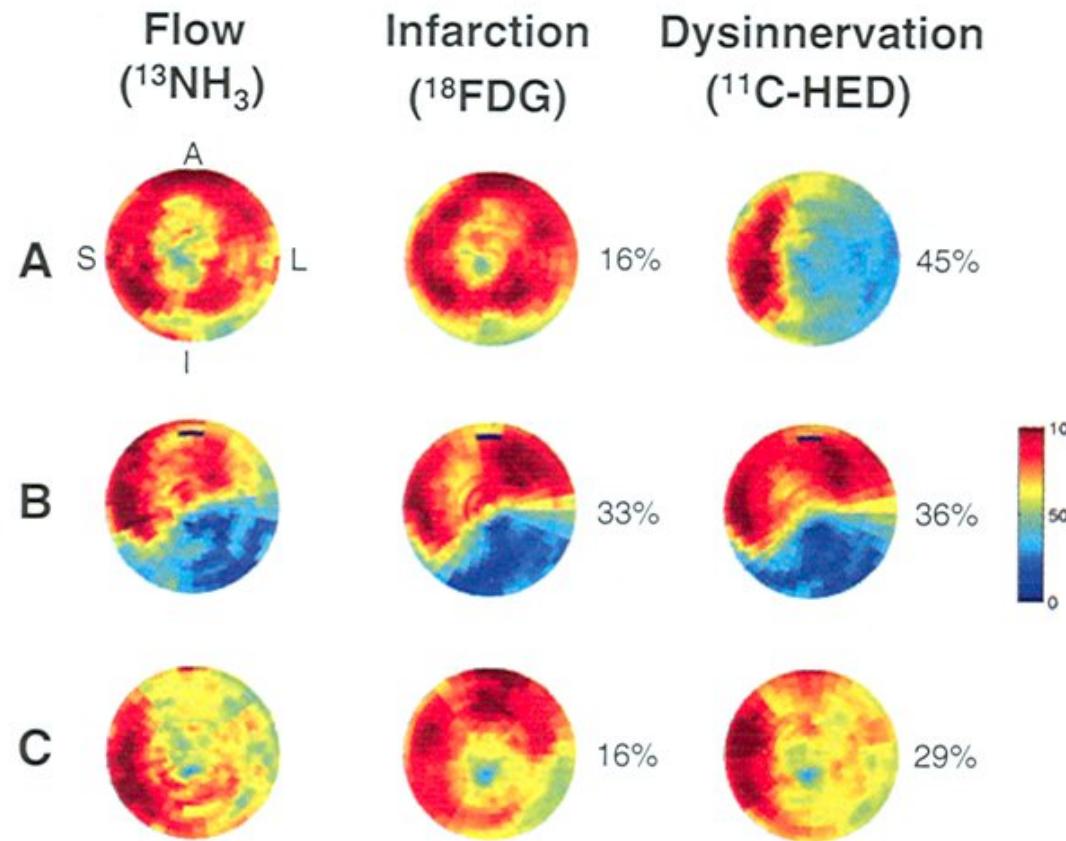
## Extent of cardiac sympathetic neuronal damage is determined by the area of ischemia in patients with acute coronary syndromes



Matsunari I et al. (Circulation 2000;101:2579-85)



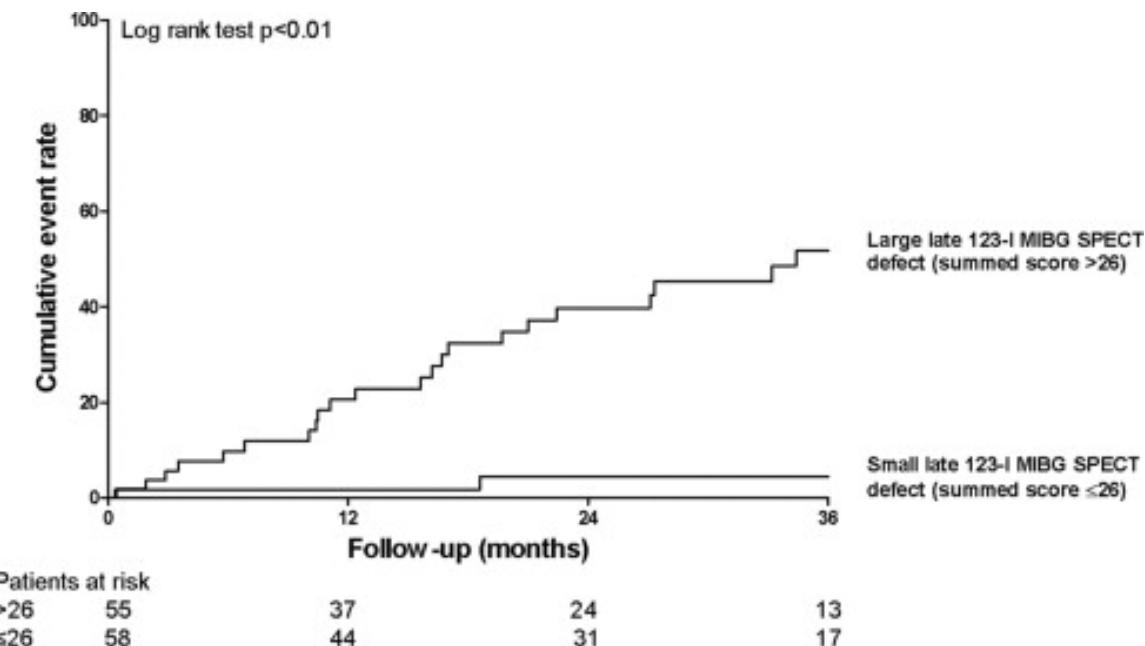
## Prediction of Atrial fibrillation events with positron emission tomography PAREPET study design and methods



Fallavolita J A et al. (Contemp Clin Trials 2006;27:374-88)



## CARDIAC SYMPATHETIC DENERVATION ASSESSED WITH 123-IODINE METAIODOBENZYLGUANIDINE IMAGING PREDICTS VENTRICULAR ARRHYTHMIAS IN IMPLANTABLE CARDIOVERTER-DEFIBRILLATOR PATIENTS

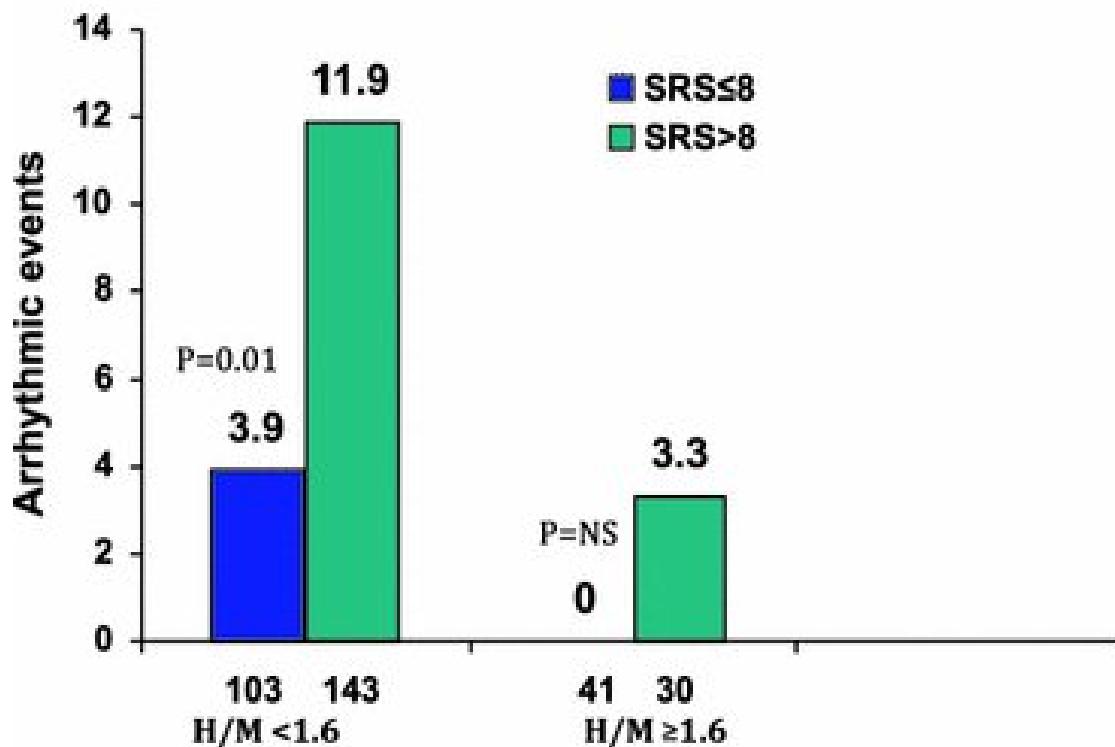


Mark J. Boogers et al. (J Am Coll Cardiol. 2010;55(24):2769-2777)

**RESTING PERFUSION MPI-SPECT COMBINED WITH CARDIAC  $^{123}\text{I}$ -MIBG  
SYMPATHETIC INNERVATION IMAGING IMPROVES PREDICTION OF ARRHYTHMIC  
EVENTS IN NON-ISCHEMIC CARDIOMYOPATHY PATIENTS**

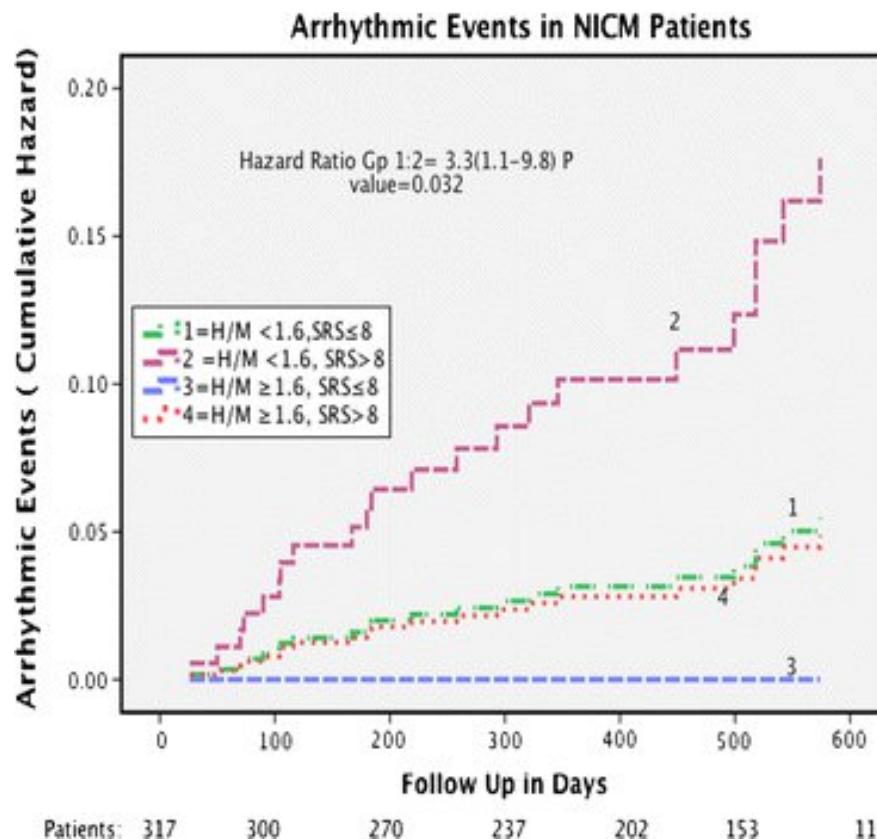
**Sub-study from the ADMIRE-HF trial**

**Non-Ischemic Cardiomyopathy patients**



Nitesh Sood MD et al. (Journal of Nuclear Cardiology 2013, Vol. 20, Issue 5, pp 813-820)

**RESTING PERFUSION MPI-SPECT COMBINED WITH CARDIAC 123I-MIBG  
SYMPATHETIC INNERVATION IMAGING IMPROVES PREDICTION OF ARRHYTHMIC  
EVENTS IN NON-ISCHEMIC CARDIOMYOPATHY PATIENTS**  
**Sub-study from the ADMIRE-HF trial**

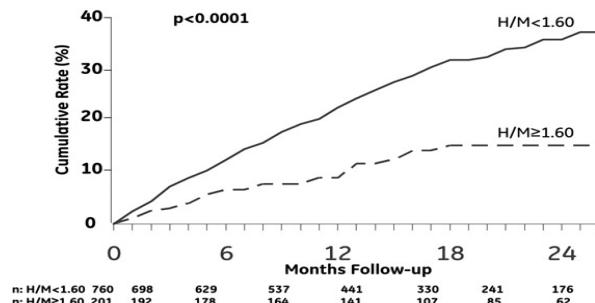
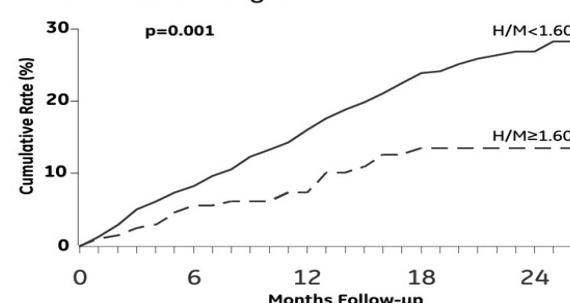
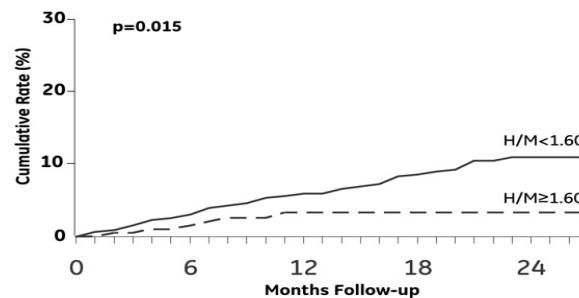
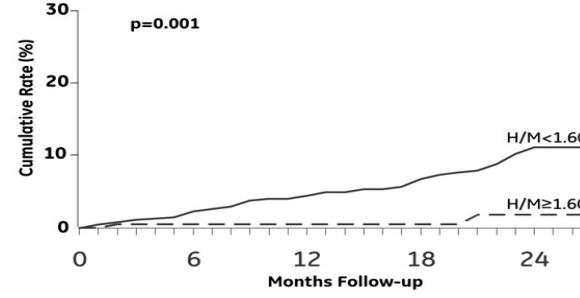
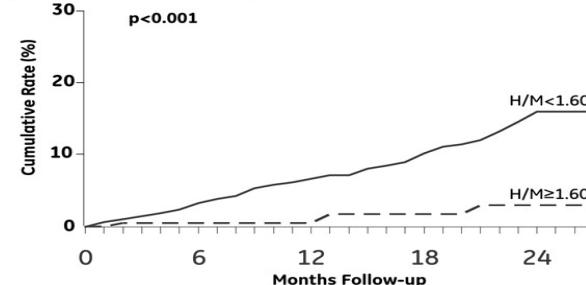


Nitesh Sood MD et al. (Journal of Nuclear Cardiology 2013, Vol. 20, Issue 5, pp 813-820)



## ADMIRE-HF Study

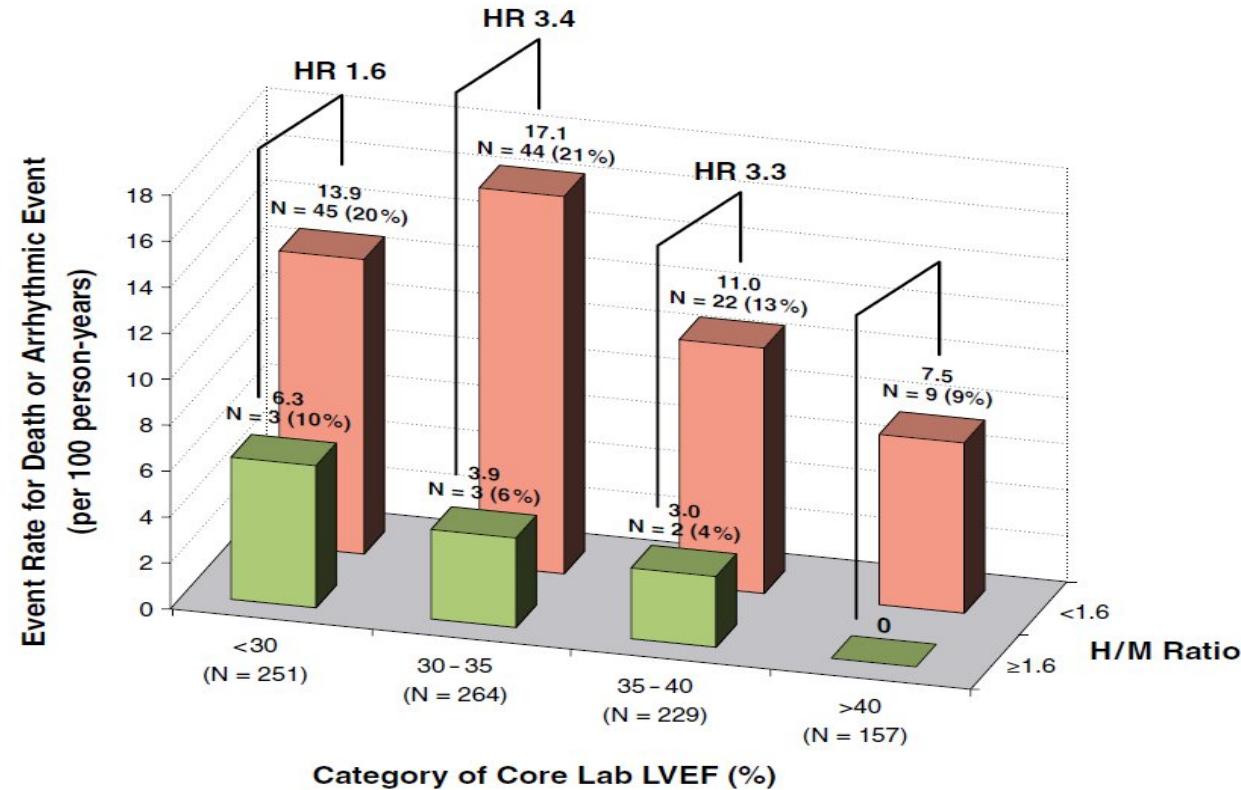
### AdreView Myocardial Imaging for Risk Evaluation in Heart Failure

**A Composite Primary Endpoint****B Heart Failure Progression****C Arrhythmic Event****D Cardiac Death****E All-cause Mortality**

Jacobson A F et al. (JACC 2010;55:2212-21)



## Death and arrhythmic events according to LVEF & H/M ratio



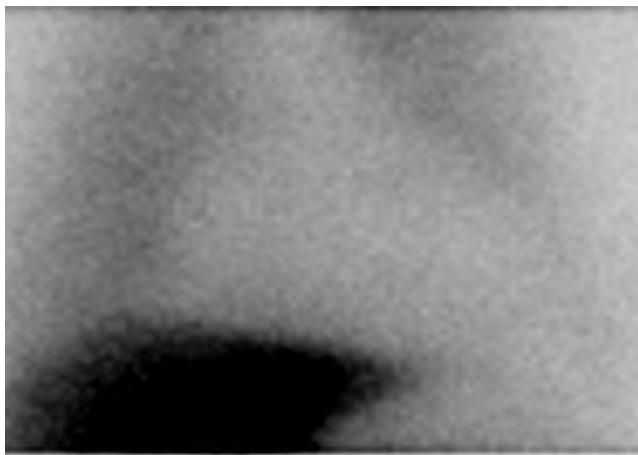
Shah et al, J Am Coll Cardiol Img 2012



## Representative ADMIRE-HF Patients

Based upon the H/M ratios, 2-year cardiac mortality risk for patient 1 is 10 times that of patient 3

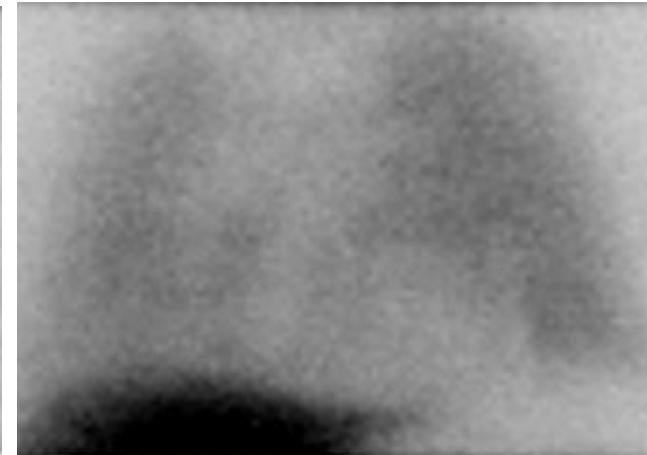
1



65 y/o M  
NYHA 2 DCM  
LVEF=25%  
**H/M=0.96**

Died at 8 mo  
HF Progression

2



51 y/o M  
NYHA 2 ICM  
LVEF=33%  
**H/M=1.38**

Died at 8 mo, SCD  
(No ICD)

3

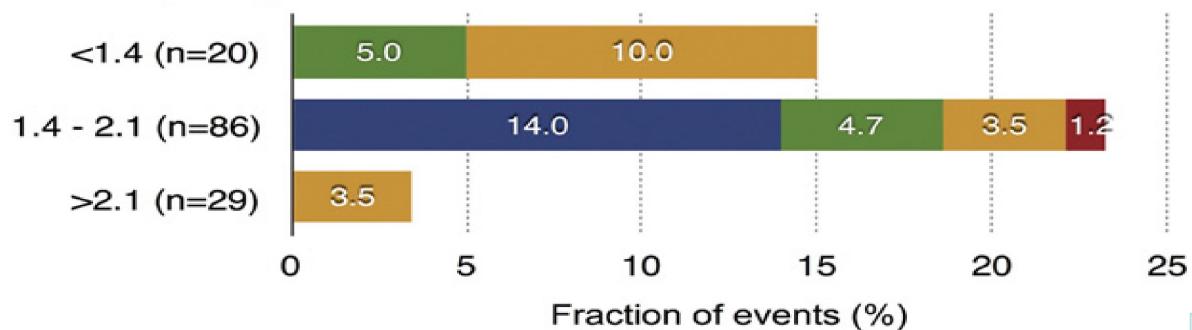


64 y/o M  
NYHA 2 ICM  
LVEF=30%  
**H/M=1.67**

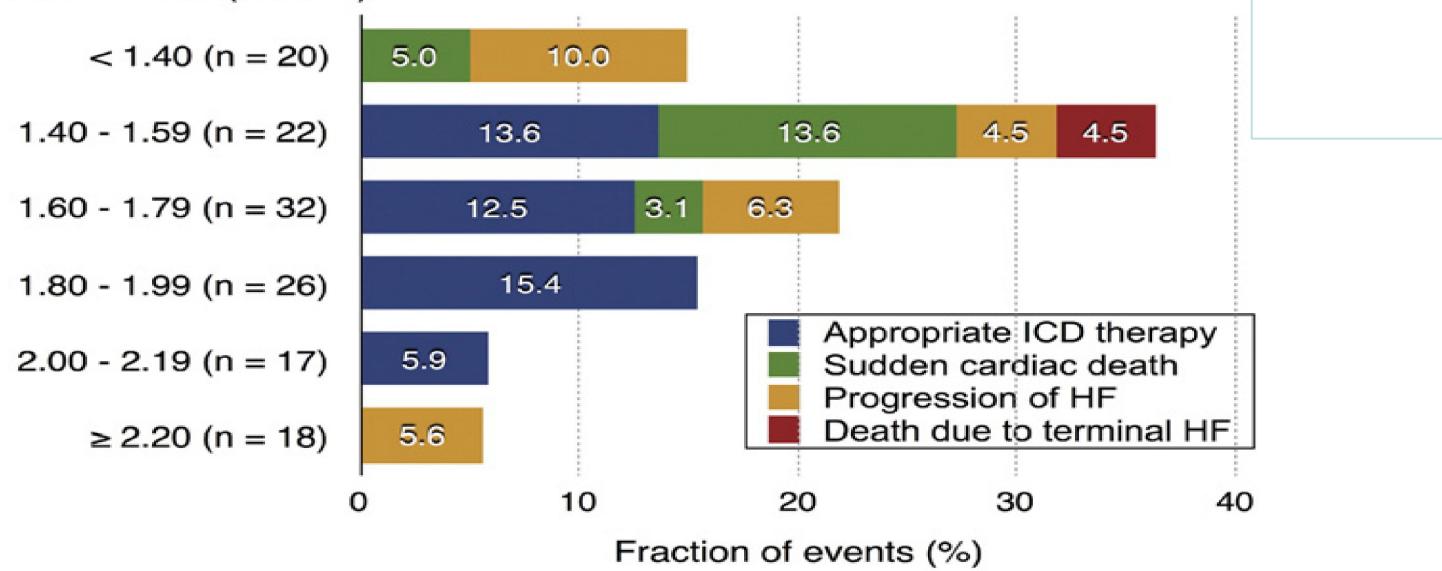
No event

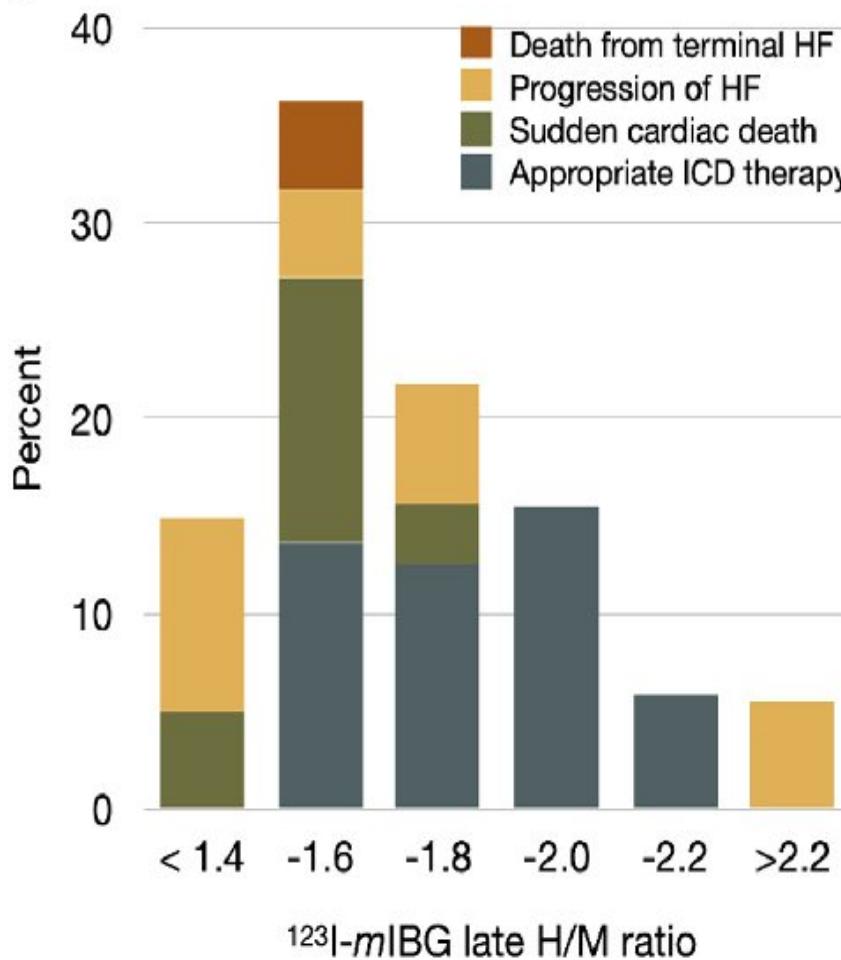
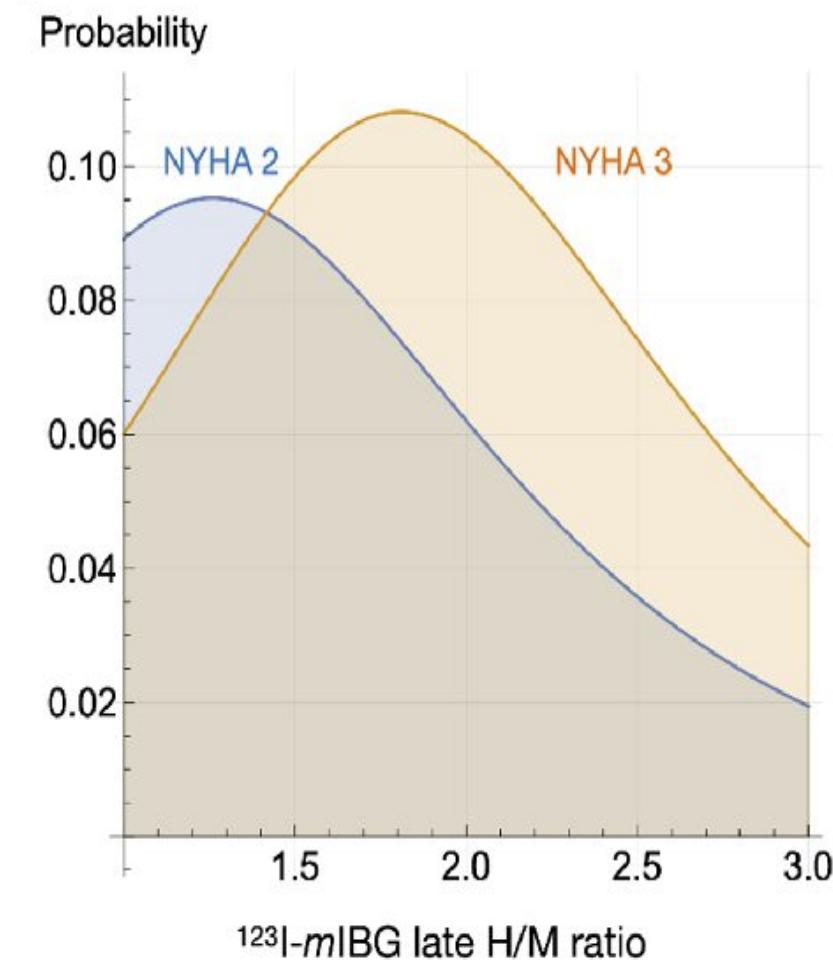
Jacobson A F et al. (JACC 2010;55:2212-21)

A. Late H/M ratio (tertile)



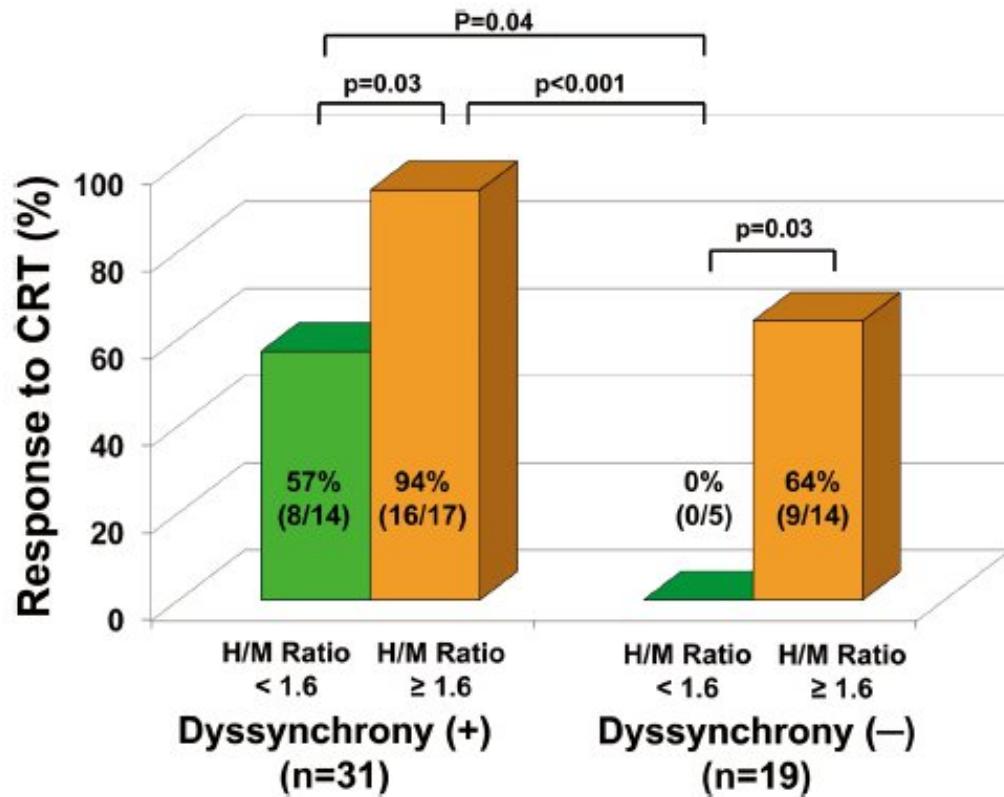
B. Late H/M ratio (0.2 unit)



**A****B**



## MIBG and CRT response

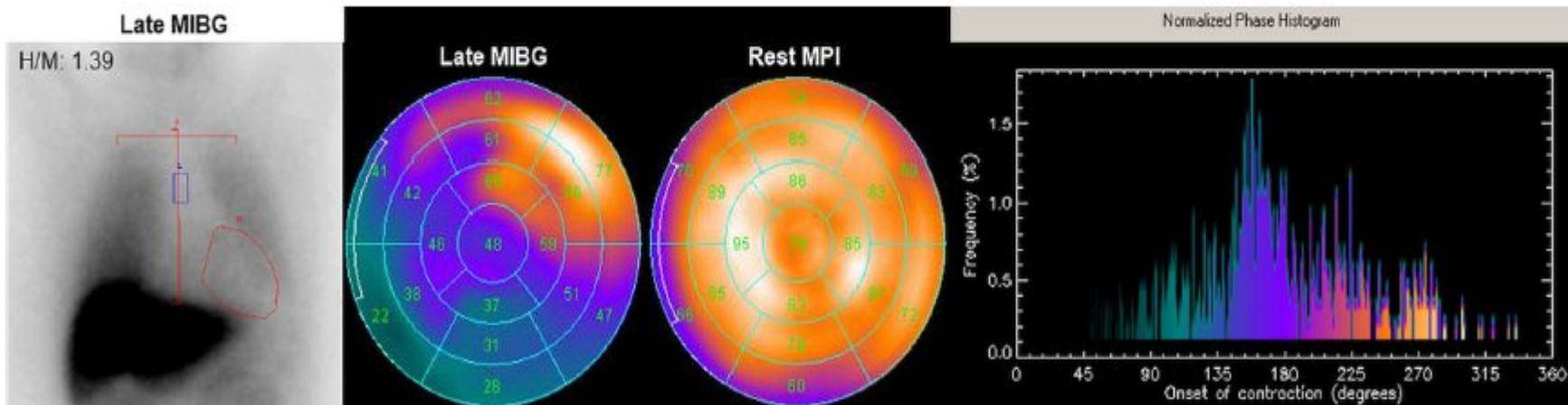


**Figure 5.** Bar graphs showing relationship between response rate to cardiac resynchronization therapy (CRT) and combined assessment of left ventricular (LV) mechanical dyssynchrony and delayed heart-to-mediastinum (H/M) ratio. The patients with dyssynchrony and H/M ratio  $\geq 1.6$  had a high frequency of LV functional improvement of a response rate of 94%. Patients without dyssynchrony and H/M ratio  $< 1.6$ , on the other hand, were more likely to show a lower frequency of LV functional improvement than the other patient sub-groups.

Tanaka et al, Circ J 2012



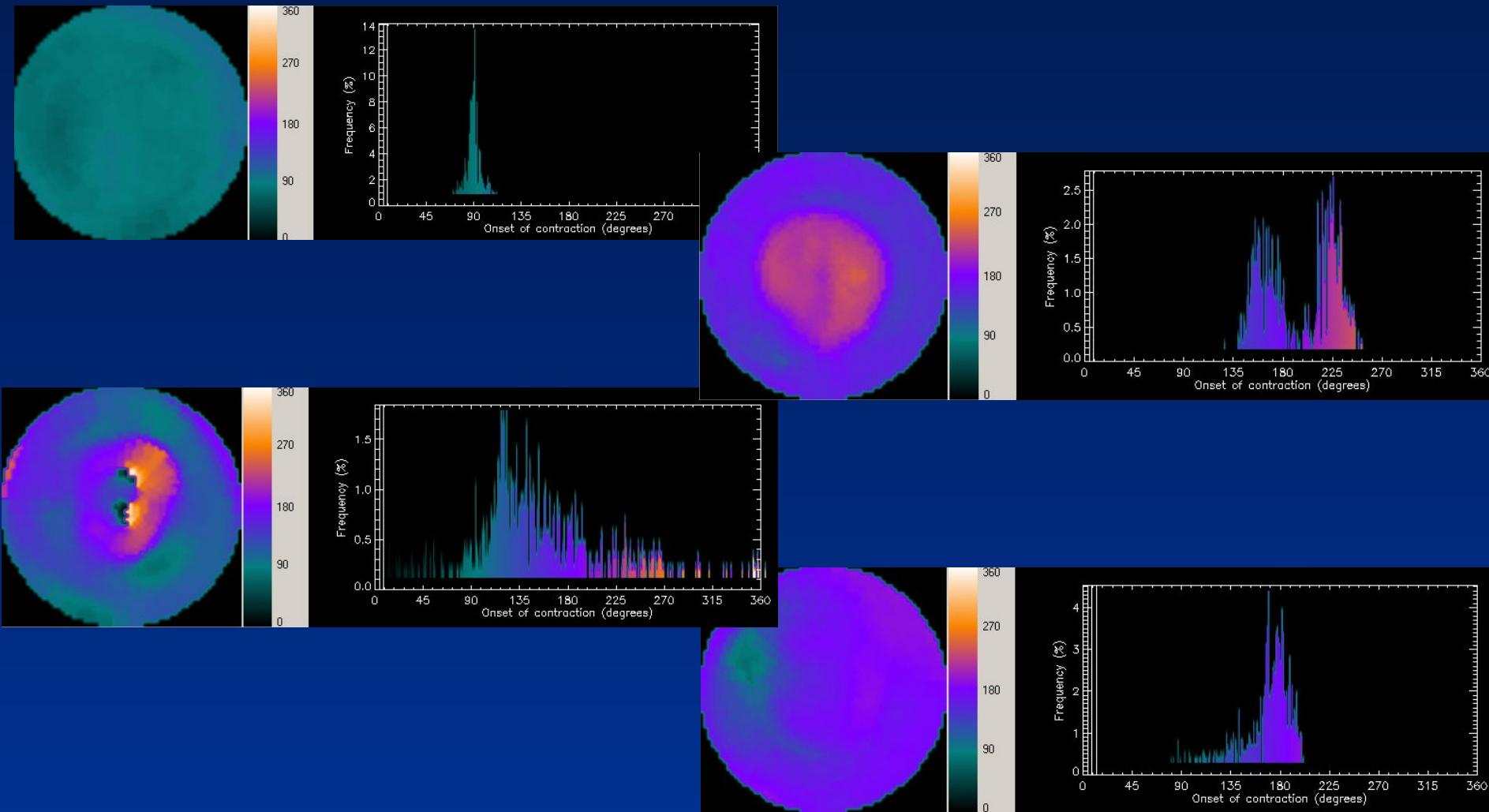
## Combined assessment of cardiac autonomic denervation and dyssynchrony

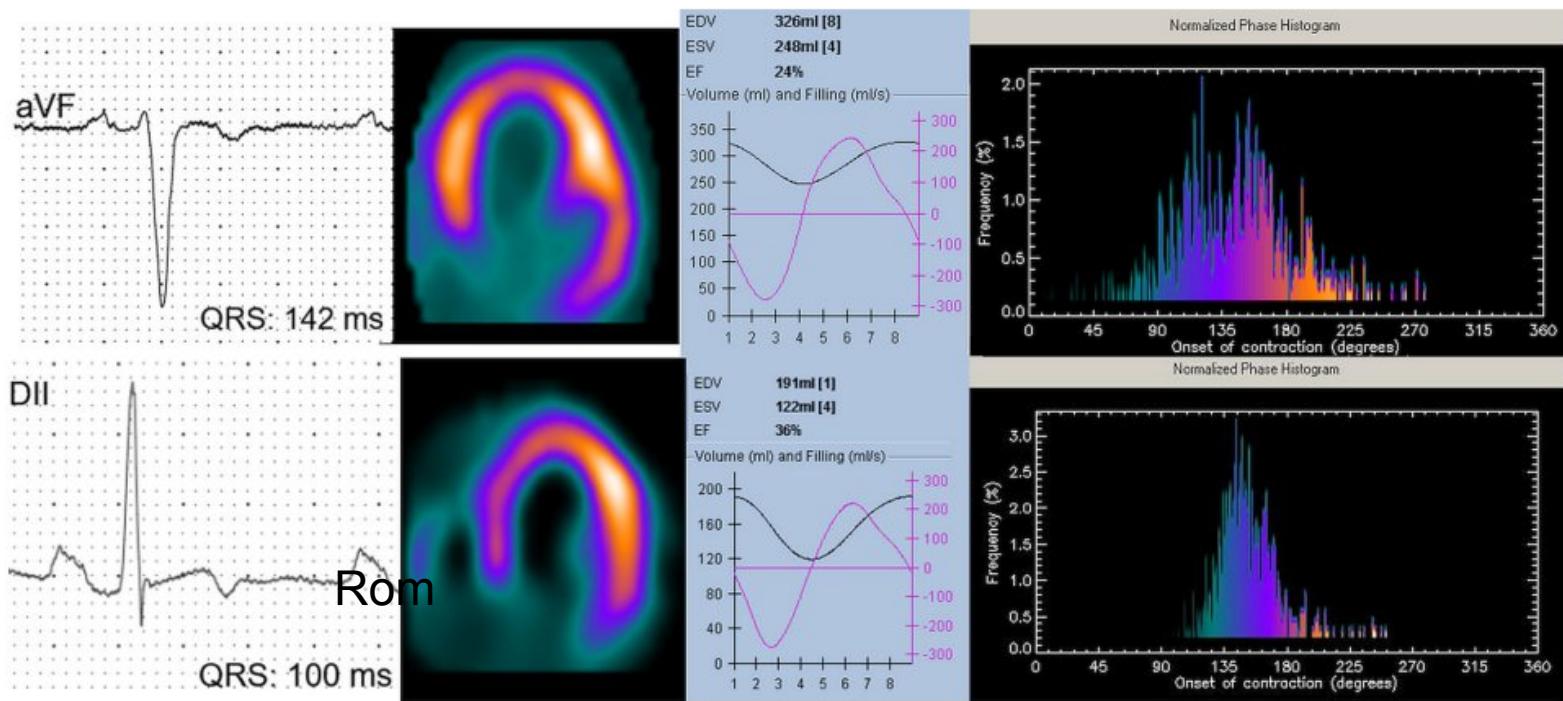


**Figure 4.** In this case, a relationship between regional sympathetic denervation with H/M (heart/mediastinum) ratio 1.39, mismatch innervation/perfusion, and left ventricular dyssynchrony is observed (Histogram Bandwidth HB 191, Standard Deviation SD 53.5). *MIBG*,  $^{123}\text{I}$ -metaiodobenzylguanidine.

Romero-Farina et al, J Nucl Cardiol 2019

# Phase Analysis of Gated Myocardial Perfusion SPECT for the Assessment of Left Ventricular Dyssynchrony





**Figure 2.** The above case corresponds to a patient with heart failure, with wide QRS and ventricular dyssynchrony (Histogram Bandwidth HB:126, Standard Deviation SD: 39.9), and the case below corresponds to a patient with heart failure, with normal QRS, and ventricular dyssynchrony (HB: 67, SD: 21.4). *EDV*, end-diastolic volume; *EF*, ejection fraction; *ESV*, end-systolic volume.

Romero-Farina et al, J Nucl Cardiol 2019



**GRAZIE PER LA  
CORTESE  
ATTENZIONE**

