



29º Congresso de Cardiologia do Estado da Bahia  
Mesa Redonda: Novos Métodos de Imagem Cardiovascular

**Strain**  
**Speckel Tracking Echocardiography**  
**Quando e pra quem?**

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*Escola Bahiana de Medicina e Saúde Pública*

Salvador, 2017



# Conflito de interesse

- ▶ Declaro não ter nenhum conflito de interesse para essa apresentação
- 



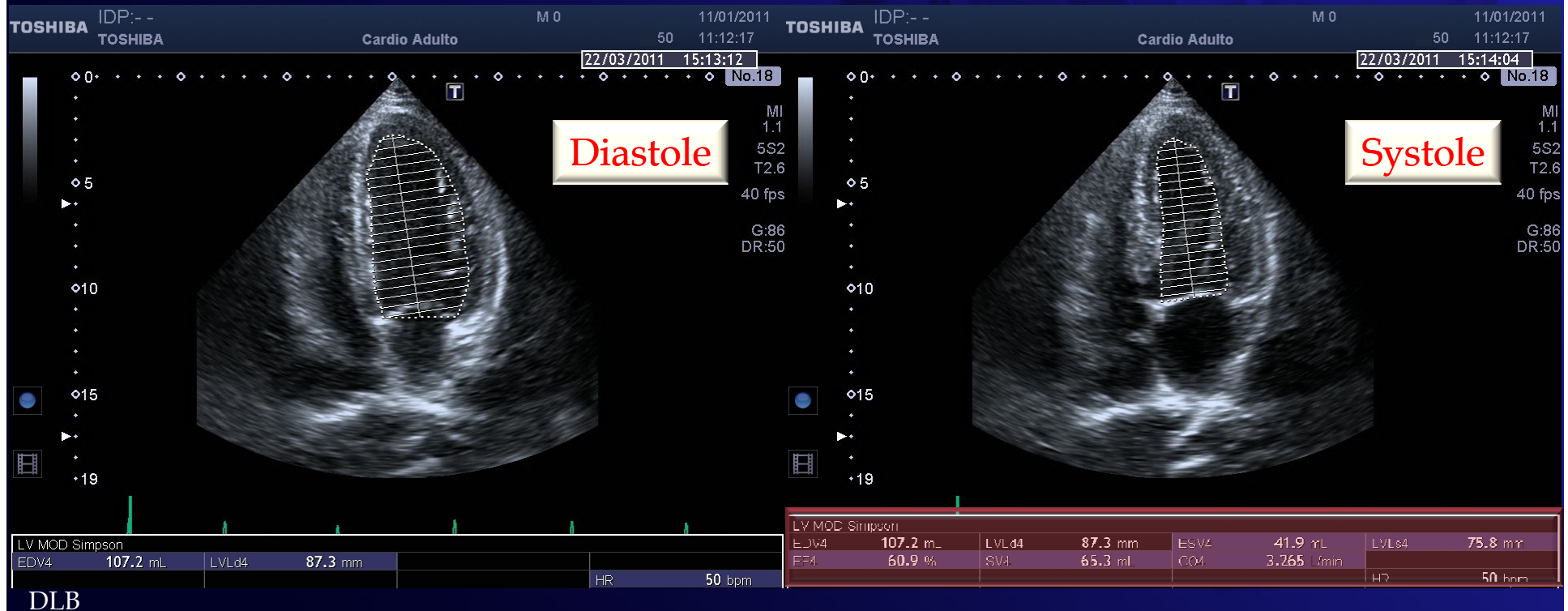
# Objetivos

- ▶ *Strain* – o que é? Como é calculado?
- ▶ Contextos clínicos
  - ▶ Cardiotoxicidade
  - ▶ Hipertrofia ventricular esquerda
  - ▶ Estenose aórtica assintomática
  - ▶ Síndrome coronariana aguda
  - ▶ Outras câmaras (*strain* ventricular direito, *strain* atrial esquerdo)

# Avaliação da função sistólica do ventrículo esquerdo

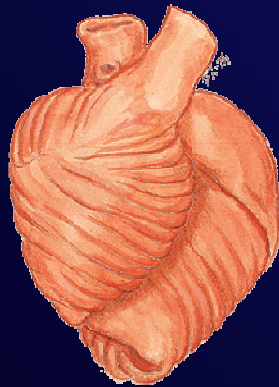
Por décadas...

## Fração de Ejeção

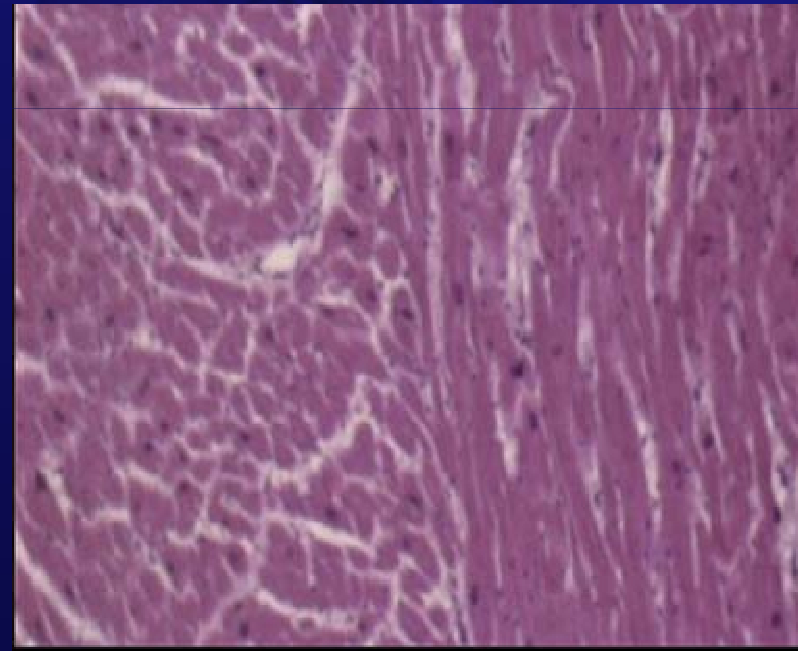


# Disposição das fibras miocárdicas

- ▶ **Coração helicoidal: um contínuo de duas camadas de fibras helicoidais**



endocárdio



epicárdio

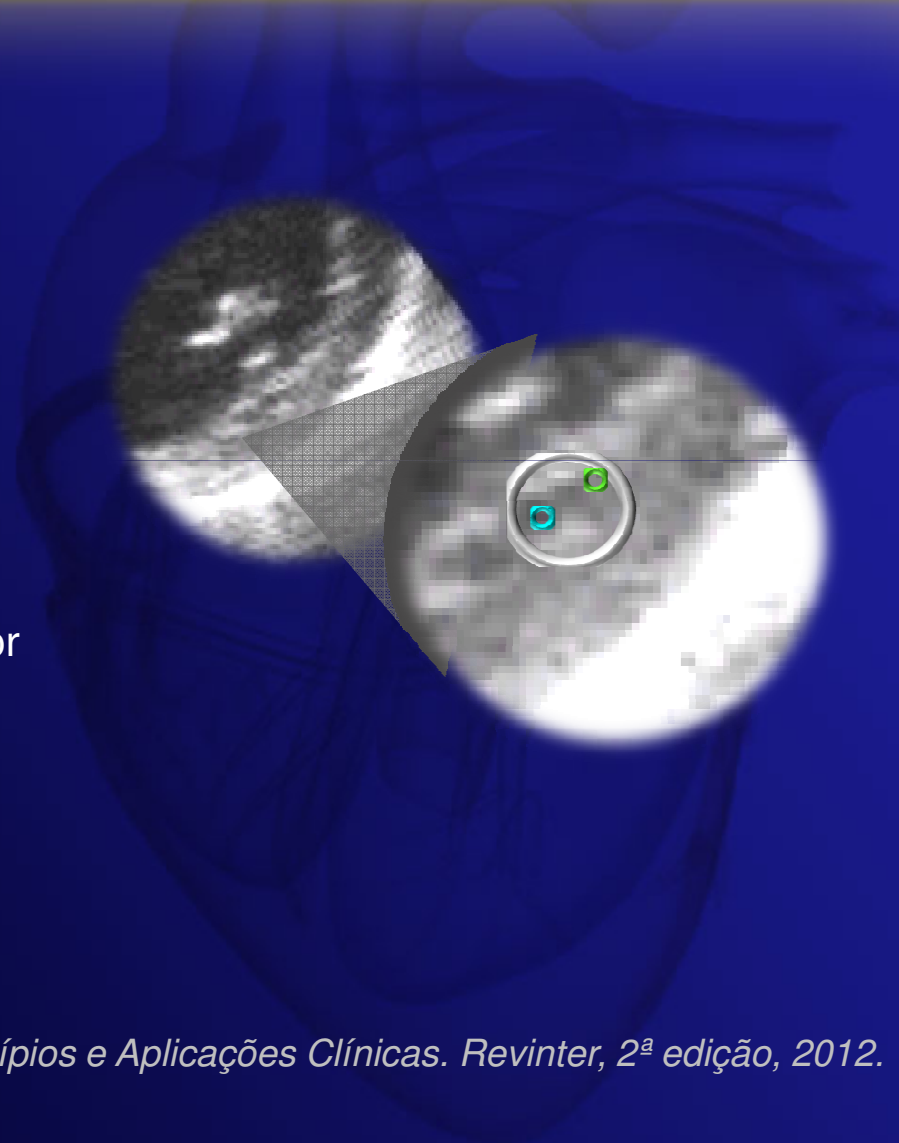
# Princípio do *strain*

O volume muscular permanece o mesmo durante o ciclo cardíaco, deformando-se, portanto, em três dimensões



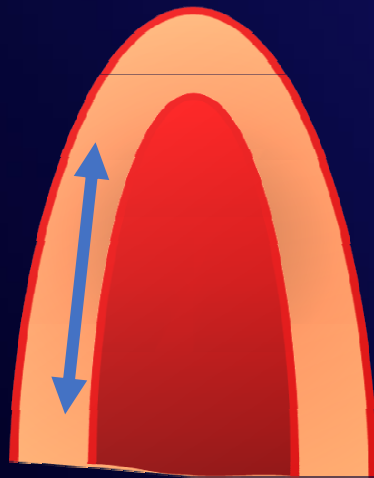
# Speckle Tracking Echocardiography

- ▶ O *STE* mede a deformação miocárdica baseada na identificação e acompanhamento de *speckles*
- ▶ Vantagens
  - ▶ Não depende do ângulo
  - ▶ Pequena variabilidade inter e intra-observador
  - ▶ Capacidade de mensurar qualquer vetor de contração

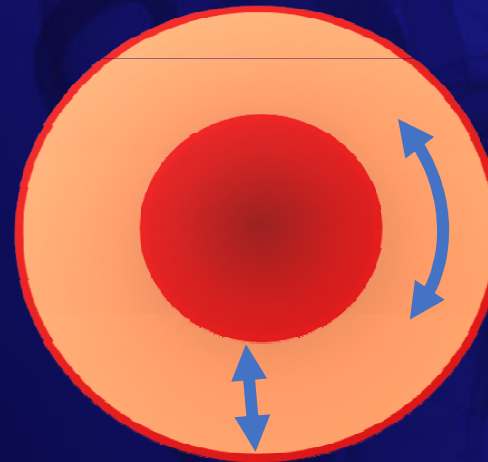


# Speckle Tracking Echocardiography

- ▶ Pode ser medido em três vetores: longitudinal, radial e circunferencial



Longitudinal

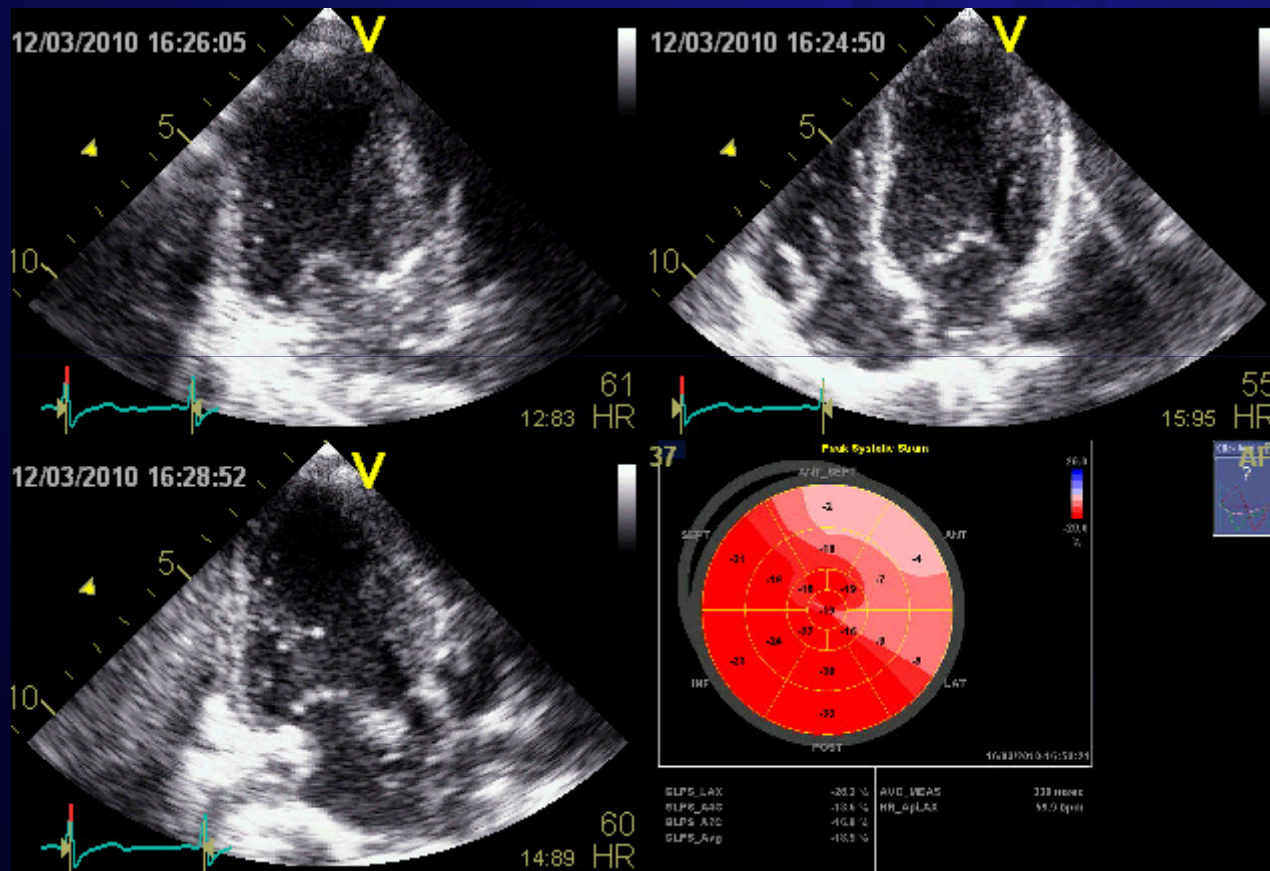


Radial

Circunferencial

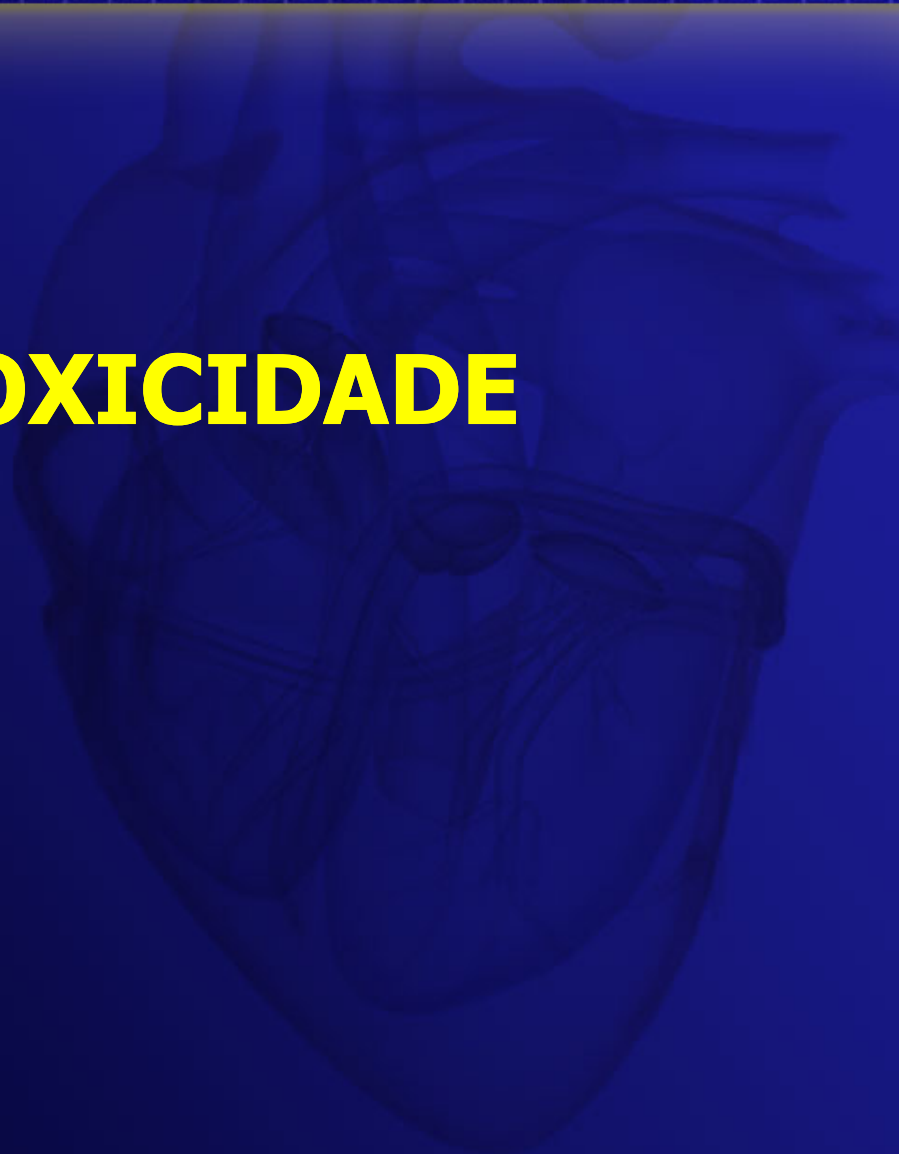


# Strain longitudinal global (GLS) do VE



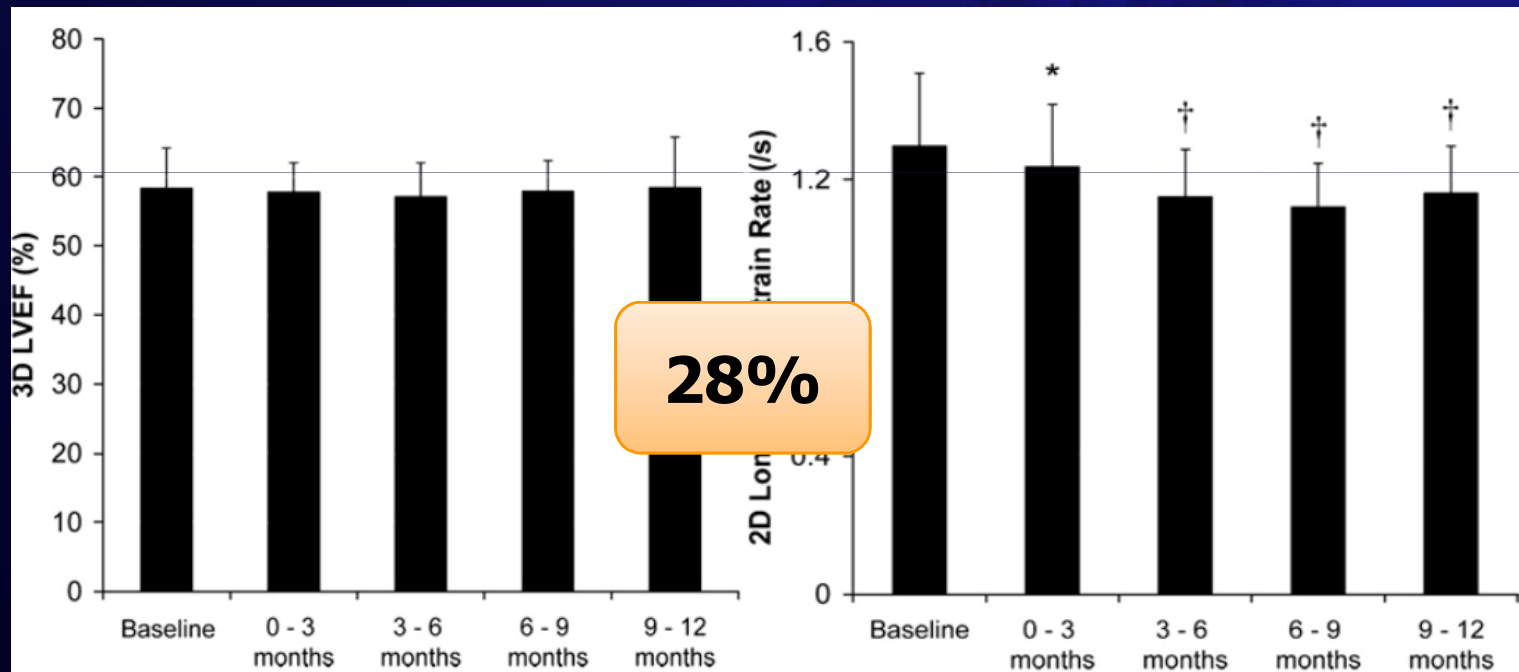


# **1. CARDIOTOXICIDADE**



# Use of myocardial deformation imaging to detect preclinical myocardial dysfunction before conventional measures in patients undergoing breast cancer treatment with trastuzumab

James L. Hare, MBBS,<sup>a</sup> Joseph K. Brown, BSc,<sup>a</sup> Rodol Leano, BSc,<sup>a</sup> Carly Jenkins, MSc,<sup>a</sup> Natasha Woodward, MBBS,<sup>b</sup> and Thomas H. Marwick, MBBS, PhD<sup>a</sup> *Brisbane, Australia*



Hare et al. *Am Heart J* 2009;158:294-301.

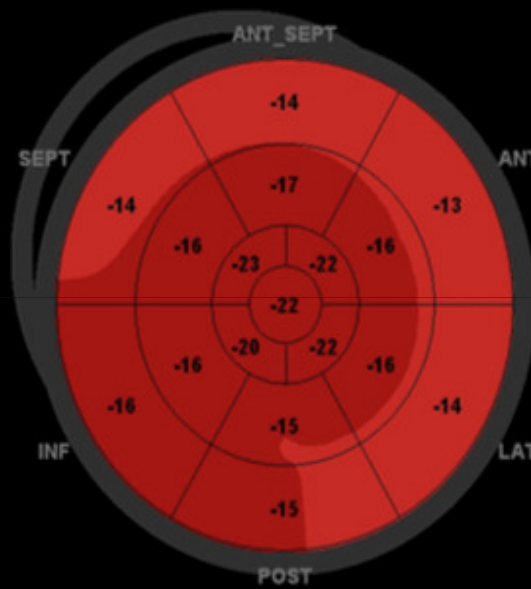
# Cardiotoxicidade

GLS -20.1%



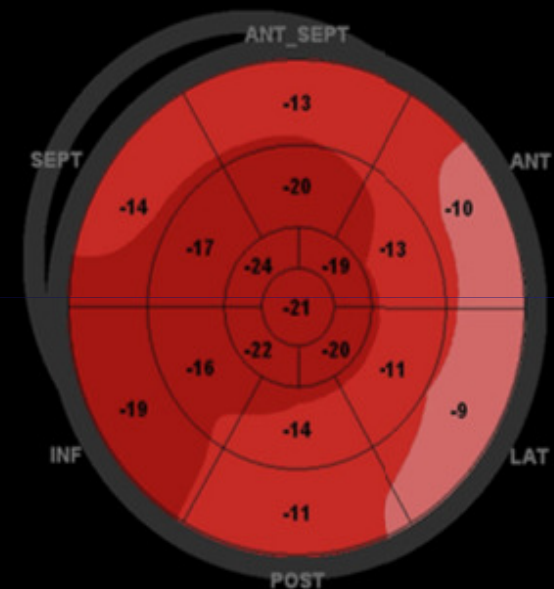
Pre-therapy EF 61%

GLS -17.0%



6M EF 55%

GLS -16.1%

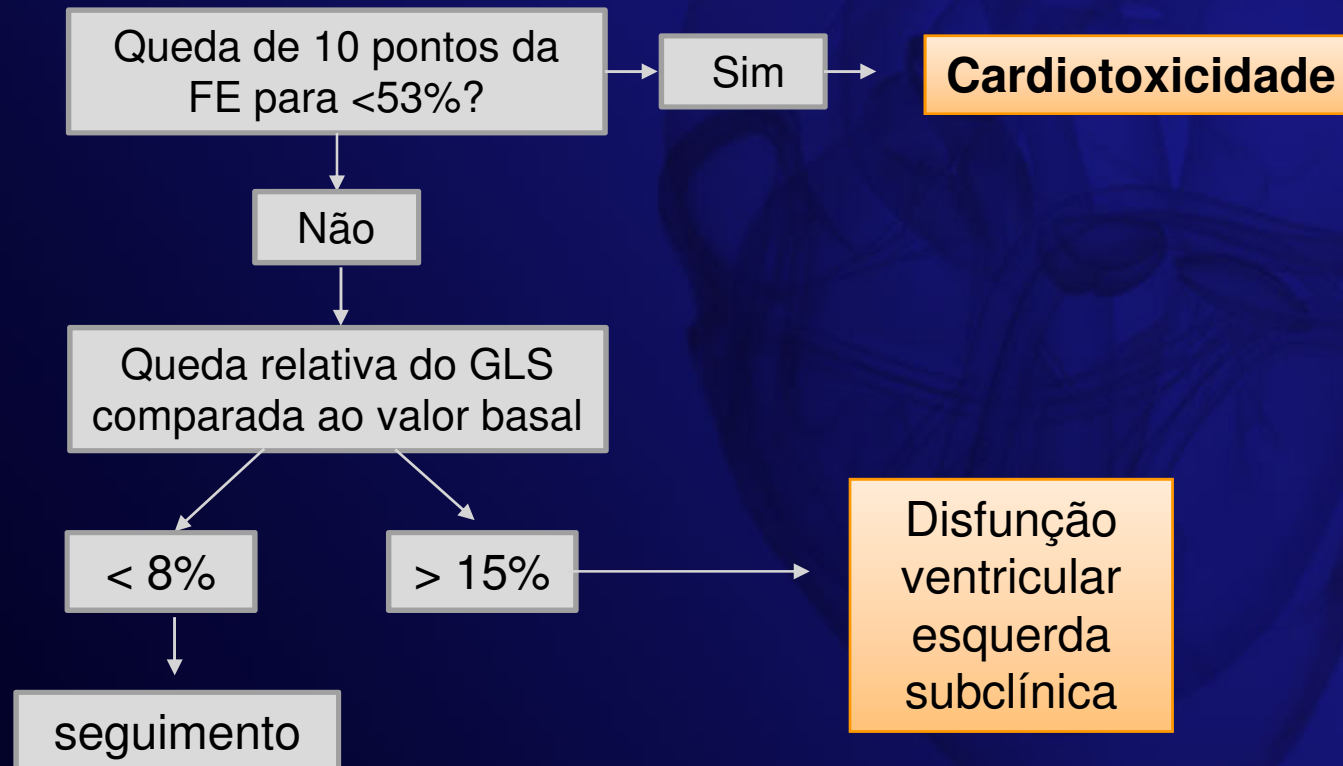


12M EF 49%

## EXPERT CONSENSUS STATEMENT

# Expert Consensus for Multimodality Imaging Evaluation of Adult Patients during and after Cancer Therapy: A Report from the American Society of Echocardiography and the European Association of Cardiovascular Imaging

(J Am Soc Echocardiogr 2014;27:911-39.)



# Cardiotoxicidade

## Ecocardiograma com strain

- ▶ Idealmente para todos os pacientes que serão submetidos a quimioterapia
- ▶ Pacientes de **alto risco**

DCV conhecida  
Fatores de risco para DCV (HAS, DM)  
> 65 anos  
Altas doses acumuladas de agentes tipo I (> 350mg/m<sup>2</sup>)  
Combinação de agentes tipo I e II

- ▶ Periodicidade conforme o agente utilizado

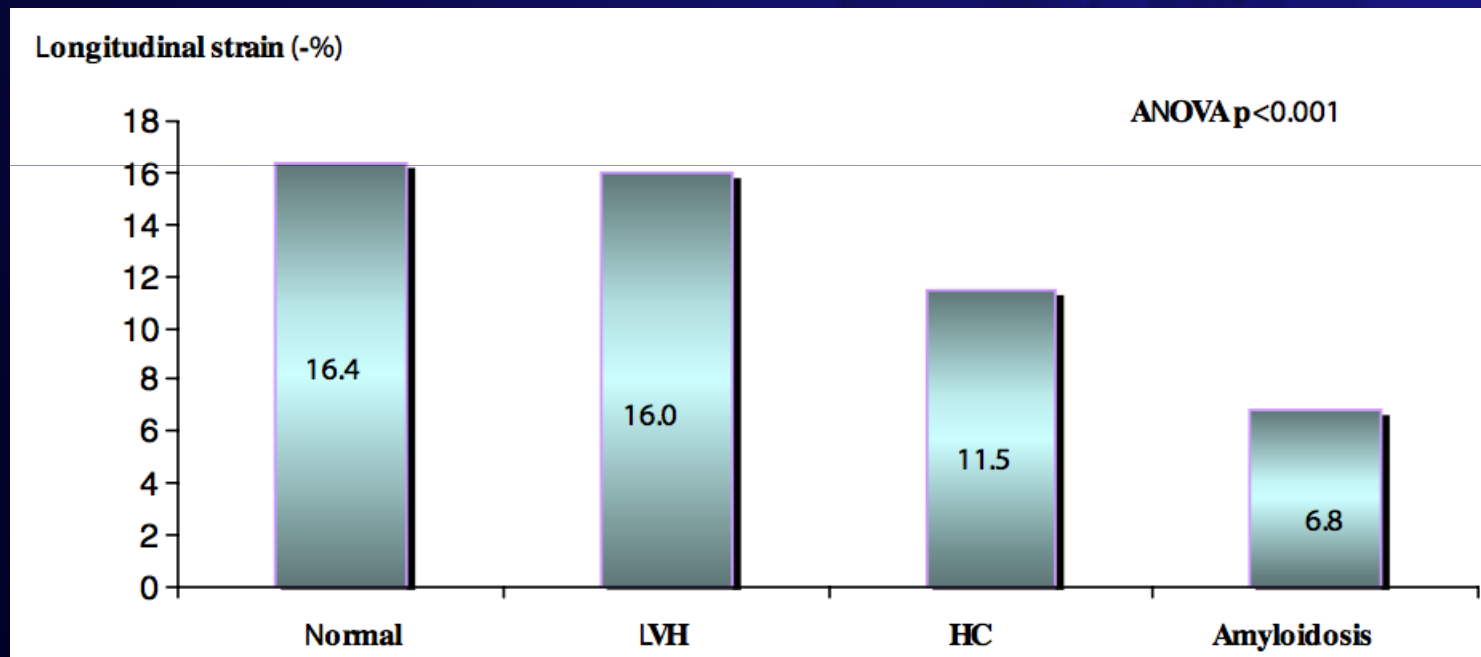
The background of the slide is dark blue. At the top, there is a horizontal band with a grid pattern, overlaid with a white ECG (heart rate) line. On the left side of this band, there is a stylized illustration of a heart with blue and yellow highlights. The main body of the slide is a solid dark blue color. In the center, the text '2. HIPERTROFIA VENTRICULAR ESQUERDA' is written in a bold, yellow, sans-serif font. On the right side, there is a faint, semi-transparent illustration of a human heart, showing its anatomical structure.

## **2. HIPERTROFIA VENTRICULAR ESQUERDA**

# Hipertrofia ventricular esquerda

## Diferenciação etiológica

- ▶ A causa da hipertrofia ventricular esquerda muitas vezes é de difícil diferenciação etiológica somente utilizando parâmetros convencionais

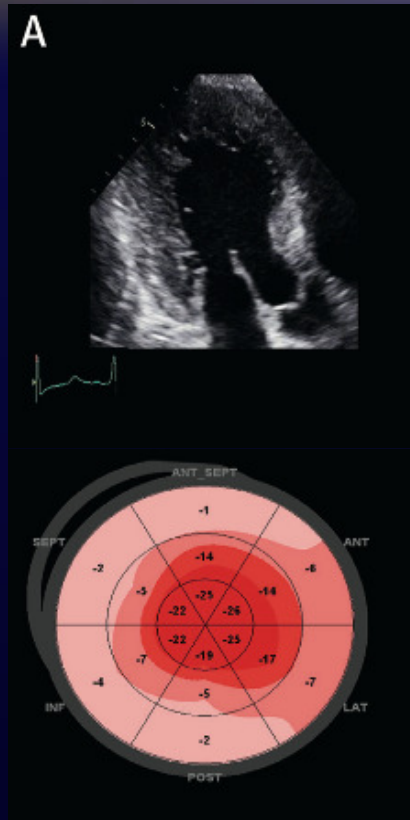


*Sun et al. Am J Cardiol 2009; 103:411– 415*

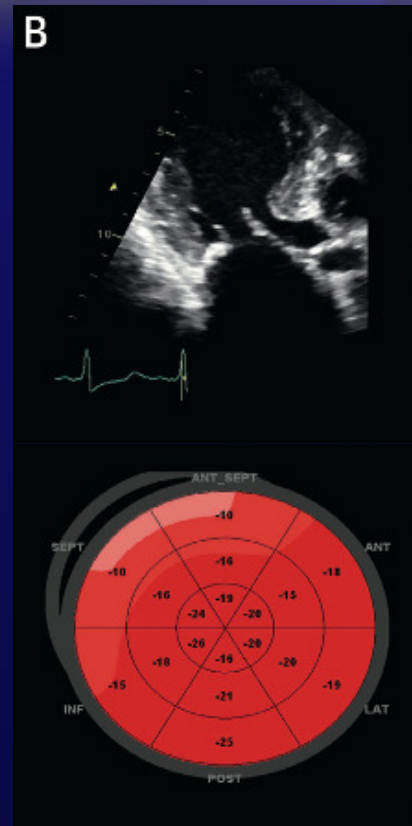


# Hipertrofia ventricular esquerda

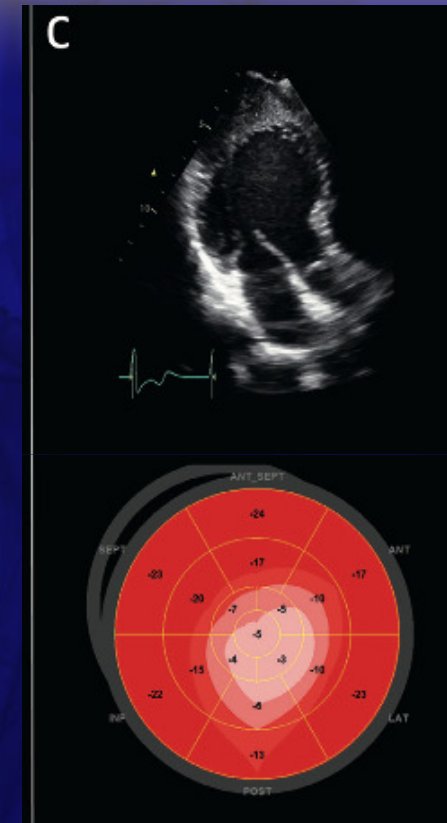
## Diferenciação etiológica



**Amiloidose**



**Hipertrófica  
septal**



**Hipertrófica  
forma apical**

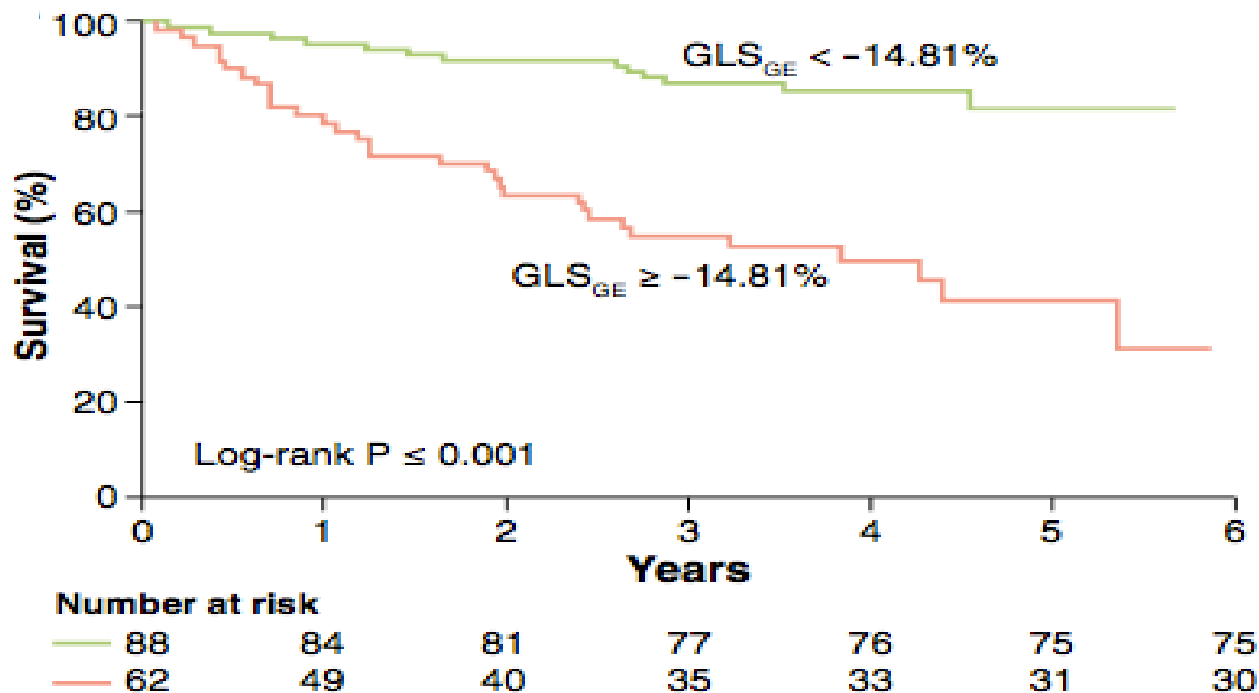
# Prognosis of Light Chain Amyloidosis With Preserved LVEF

## Added Value of 2D Speckle-Tracking Echocardiography to the Current Prognostic Staging System

Sergio Barros-Gomes, MD,<sup>a</sup> Brittney Williams, BS,<sup>a</sup> Lara F. Nhola, MD,<sup>a</sup> Martha Grogan, MD,<sup>a</sup> Joseph F. Maalo Angela Dispenzieri, MD,<sup>b</sup> Patricia A. Pellikka, MD,<sup>a</sup> Hector R. Villarraga, MD<sup>a</sup>



Mortalidade por todas as causas (*follow-up 3,3 anos*)  
 $HR = 4,72 (2,53 - 9,32)$





### **3. ESTENOSE AÓRTICA GRAVE ASSINTOMÁTICA**



# Estenose aórtica assintomática

- ▶ Indicação cirúrgica com FE <50% (Classe I)
- ▶ Porém, esses pacientes apresentam pior prognóstico e maior mortalidade pré-operatória
- ▶ 50% não recuperam a FE após a cirurgia

AVR is recommended for symptomatic patients with severe high-gradient AS who have symptoms by history or on exercise testing (stage D1)

AVR is recommended for asymptomatic patients with severe AS (stage C2) and LVEF <50%

AVR is indicated for patients with severe AS (stage C or D) when undergoing other cardiac surgery

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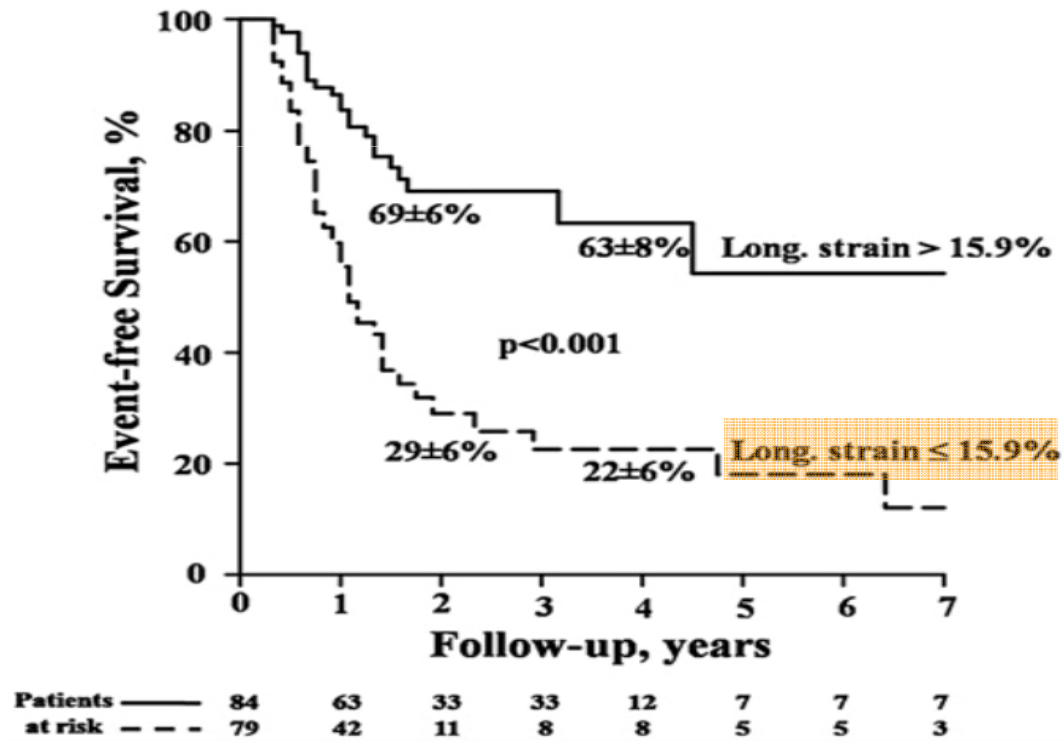
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# Risk stratification in asymptomatic moderate to severe aortic stenosis: the importance of the valvular, arterial and ventricular interplay

Patrizio Lancellotti,<sup>1</sup> Erwan Donal,<sup>2</sup> Julien Magne,<sup>1</sup> Marie Moonen,<sup>1</sup> Kim O'Connor,<sup>1</sup> Jean-Claude Daubert,<sup>2</sup> Luc A Pierard<sup>1</sup>

Sintomas, Cirurgia de Troca Valvar ou Óbito  
*HR = 1,1 (1,05 – 1,20)*





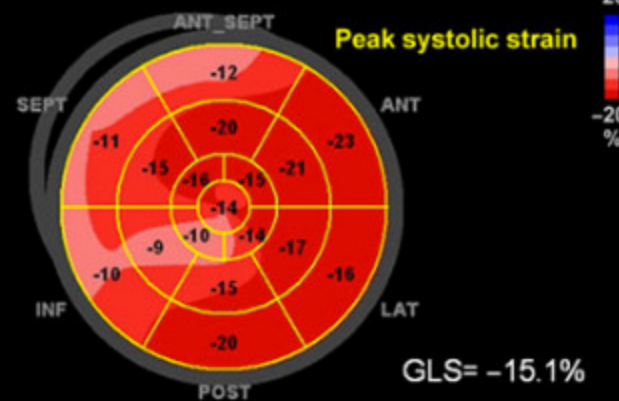
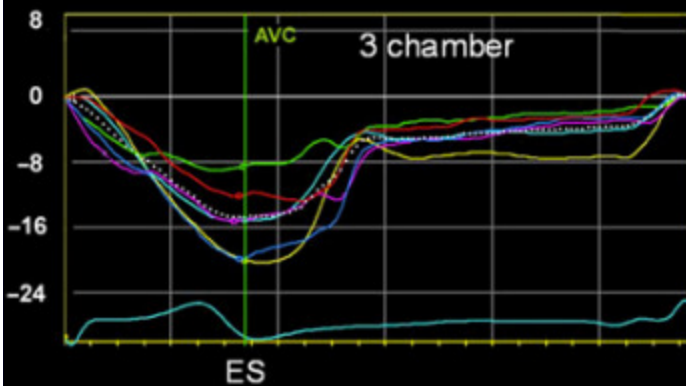
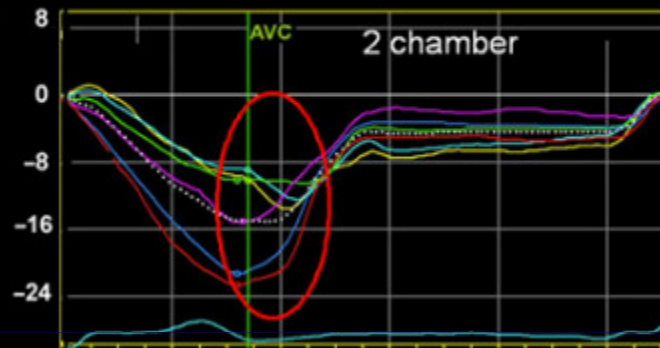
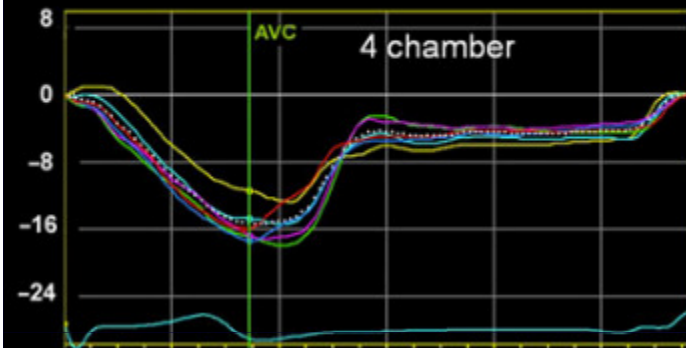
# **4. SÍNDROME CORONARIANA AGUDA**



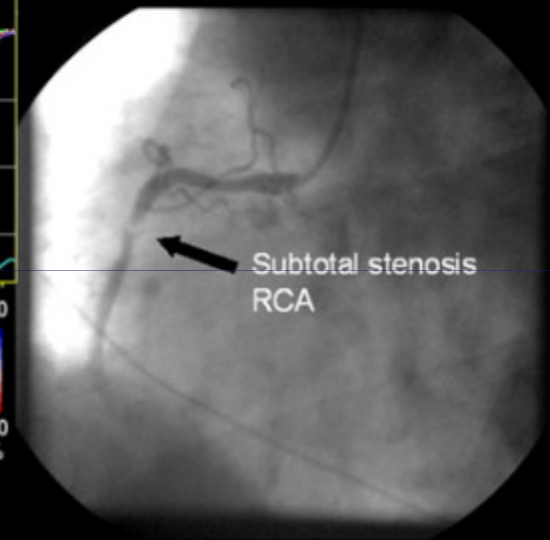
# Strain longitudinal do VE na SCA

Strain (%)

2D strain and bull's eye plot



Coronary angiogram

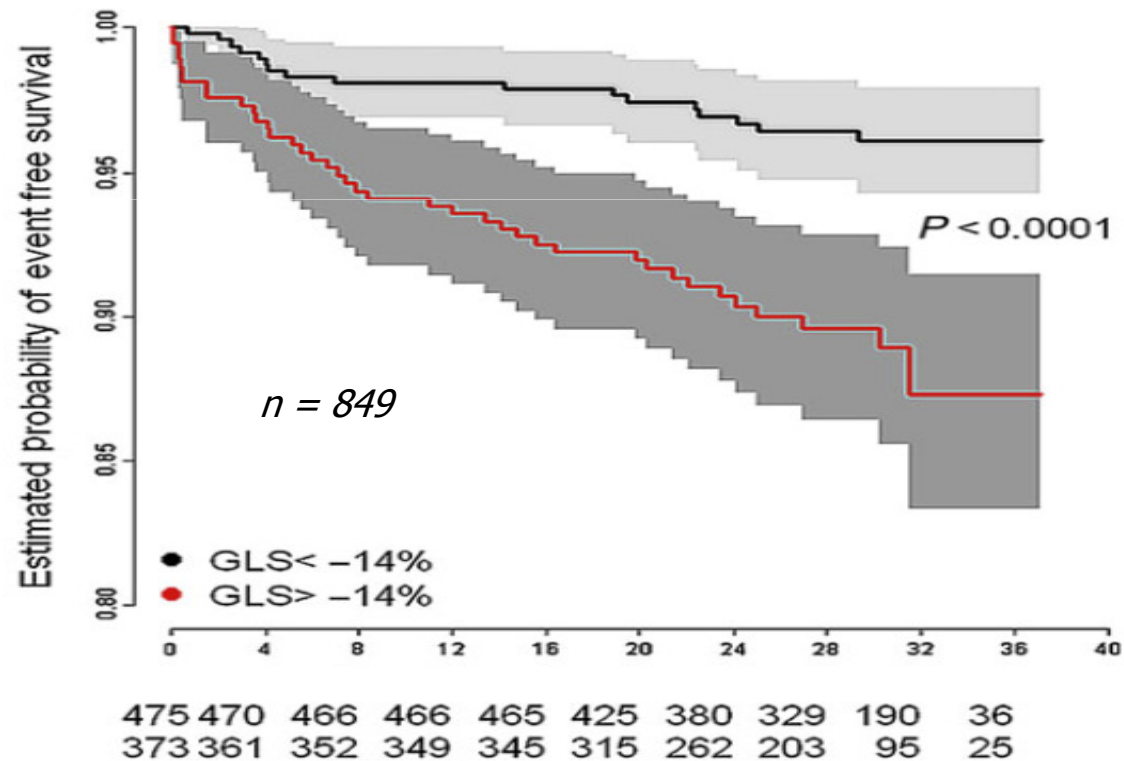


# Prediction of All-Cause Mortality and Heart Failure Admissions From Global Left Ventricular Longitudinal Strain in Patients With Acute Myocardial Infarction and Preserved Left Ventricular Ejection Fraction



JACC

Morte ou Re-hospitalização por ICC  
(HR = 3,21 IC 95%: 1,83 – 5,67)







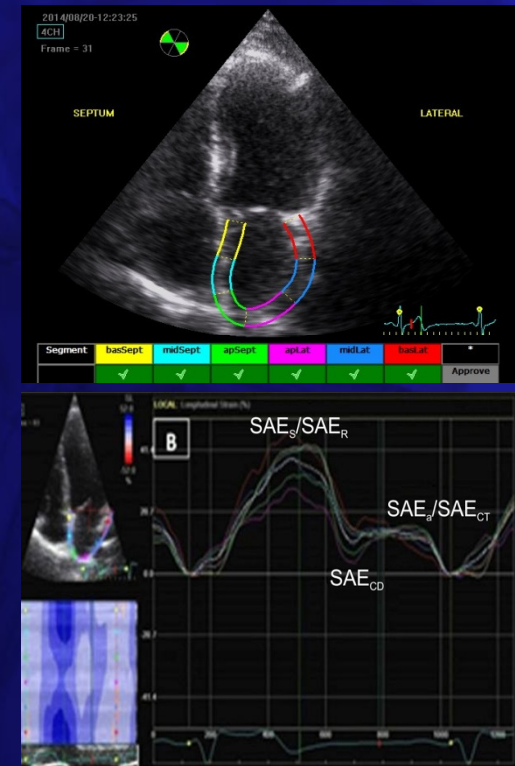
## **5. *STRAIN* EM OUTRAS CÂMARAS CARDÍACAS**



# Left Atrial Mechanics: Echocardiographic Assessment and Clinical Implications

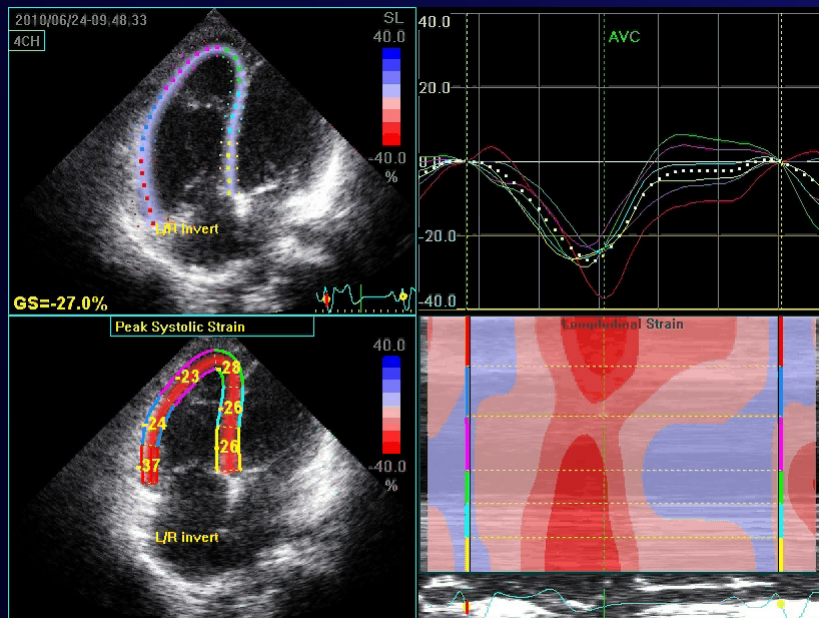
Maria J. Vieira, MD, PhD, Rogério Teixeira, MD, Lino Gonçalves, MD, PhD, and Bernard J. Gersh, MB, ChB, DPhil, FRCP, *Coimbra and Loures, Portugal; Rochester, Minnesota*

- ▶ **FIBRILAÇÃO ATRIAL**
  - ▶ RISCO DE TROMBOEMBOLISMO
  - ▶ RESPOSTA A CARDIOVERSÃO / ABLAÇÃO
- ▶ **INSUFICIÊNCIA CARDÍACA COM FE PRESERVADA**
- ▶ **VALVOPATIAS MITRAL E AÓRTICA**
- ▶ **CARDIOMIOPATIAS**
- ▶ **SÍNDROME CORONARIANA AGUDA**



# Strain do Ventrículo Direito

- ▶ Doenças congênitas (T4F, CIA, EP)
- ▶ Doenças pulmonares (HP, Embolia pulmonar)
- ▶ Miocardiopatias (Chagas, DAVD)
- ▶ Insuficiência tricúspide grave assintomática



*Collier et al. JACC VOL. 69, n. 8, 2017*

**Nem tudo é mil maravilhas...**



# Pontos a serem considerados...

- ▶ Necessita de **boa qualidade** das imagens
- ▶ Avaliação prejudicada em pacientes com **FC elevada**
- ▶ Não uniformização dos **valores de referência**
- ▶ Variabilidade dos valores a depender do **software** utilizado



**Obrigado!**  
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