

# Emerging Role of LGE CMR for Risk Stratification of Patients at Risk of Sudden Cardiac Death

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**Picture  
This**

Imaging & Beyond  
by Jankharia

# Cardiac MRI

## Technique

- 1.5T or 3.0T scanner
- Cardiac sequences
- ECG-gating
- Training

LGE

# Late Gadolinium Enhancement

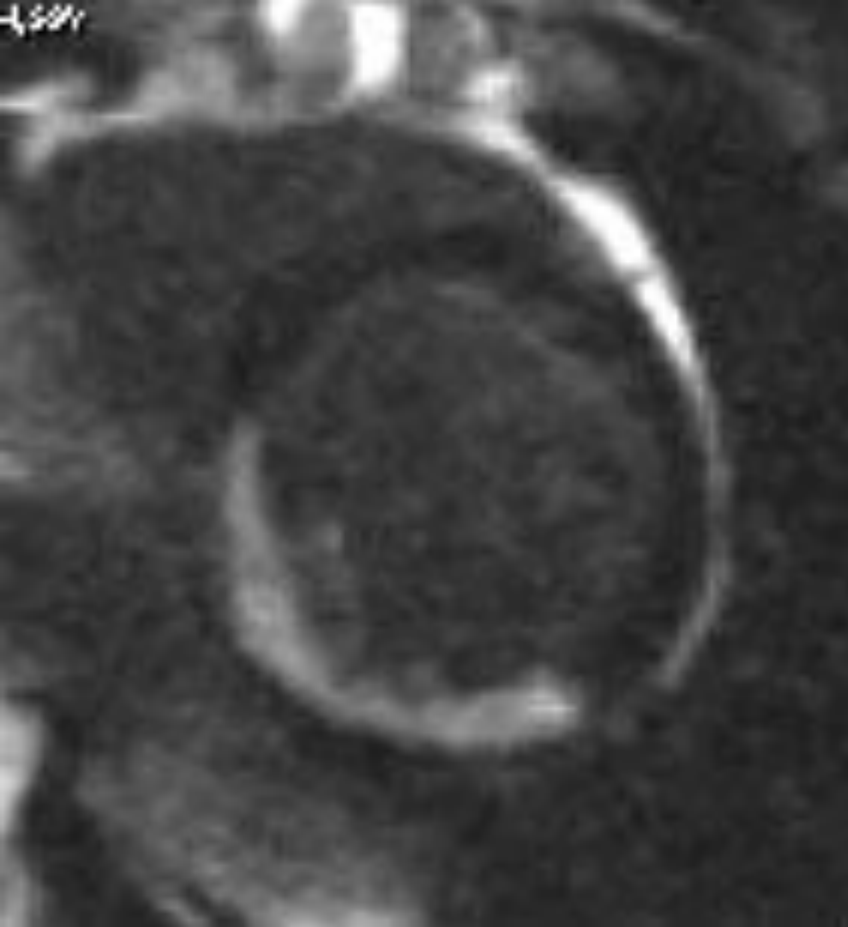
# Late Gd Enhancement

# Delayed Enhancement

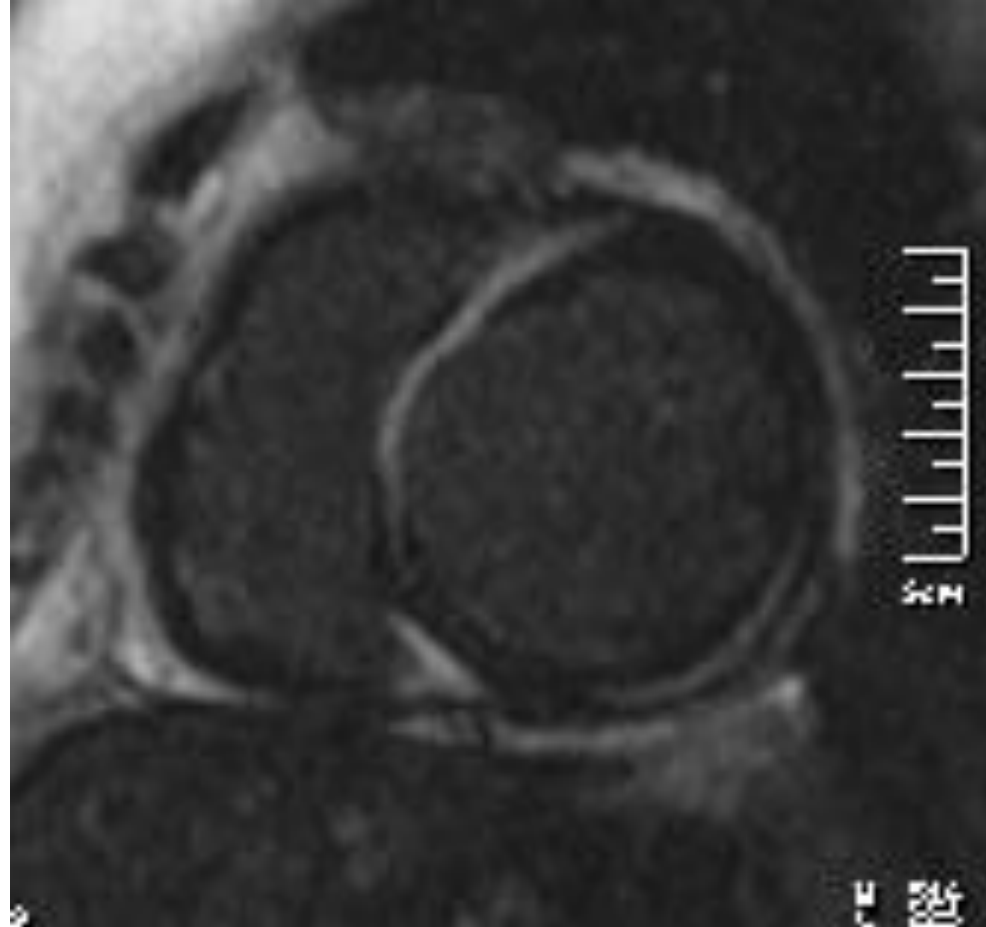
# Tissue Characterization

## Delayed Enhancement

- 5-7 minutes after injection of Gd
- Areas of infarction, infiltration and fibrosis enhance
- The pattern of enhancement can help differentiate a possible set of etiologies



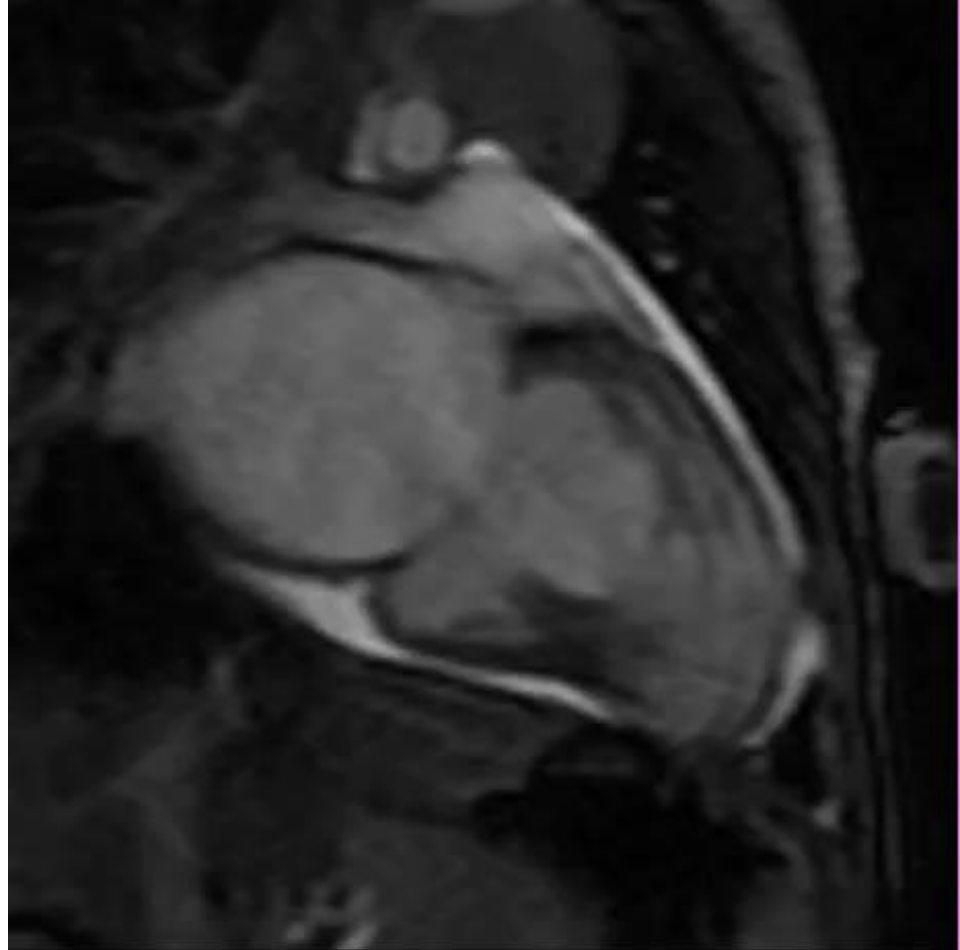
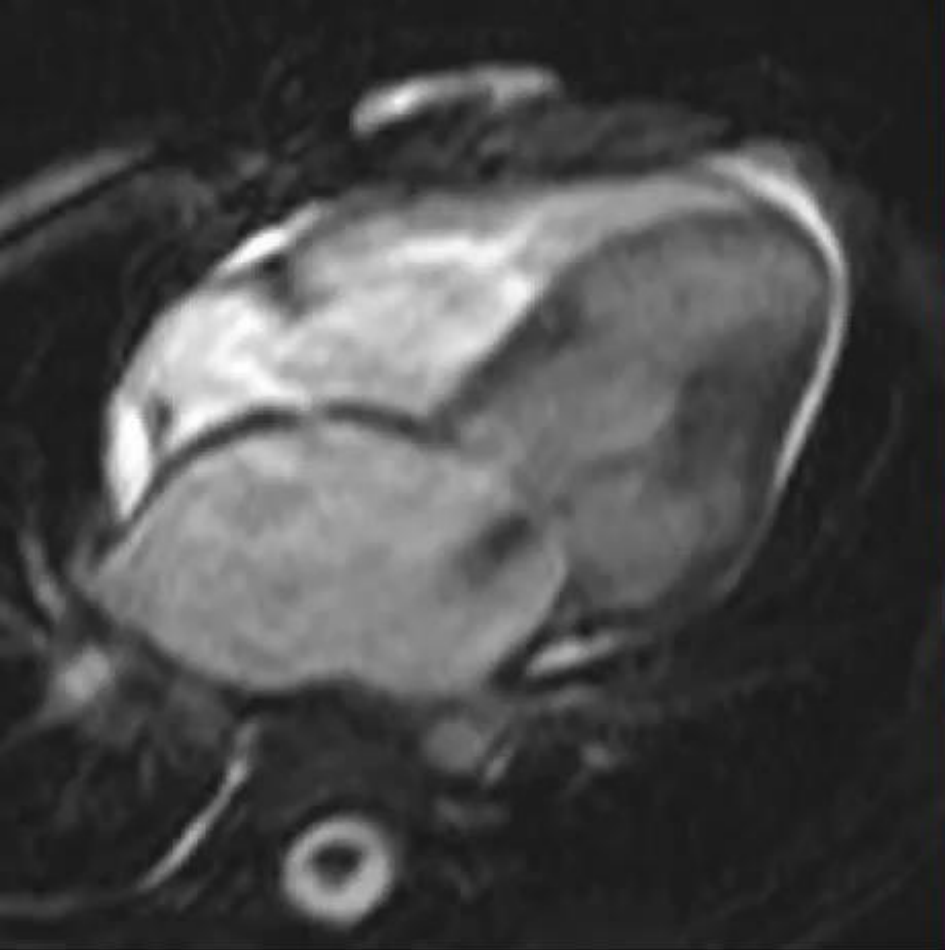
Infarct



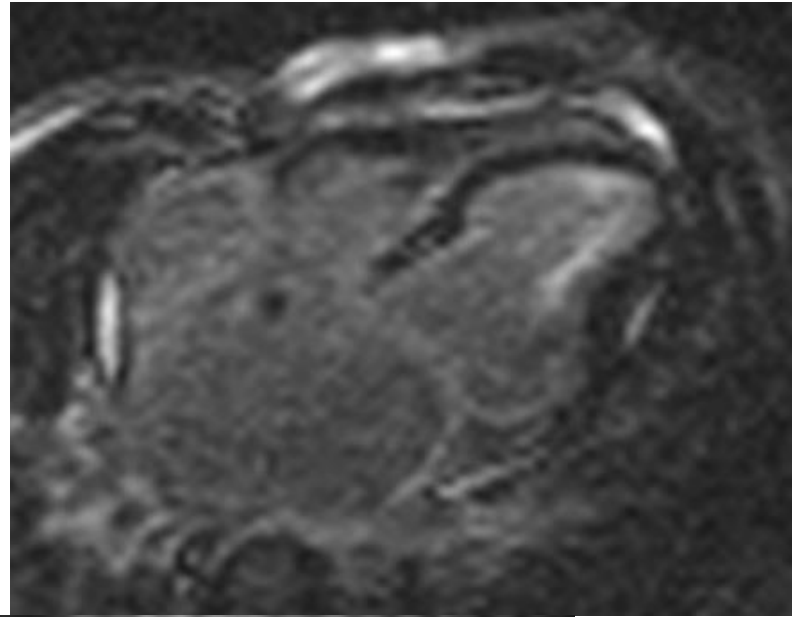
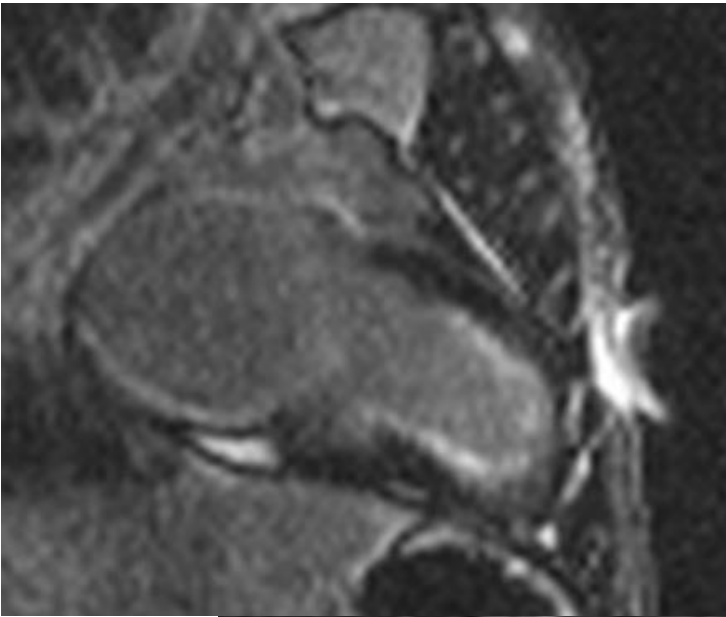
Infiltration / fibrosis

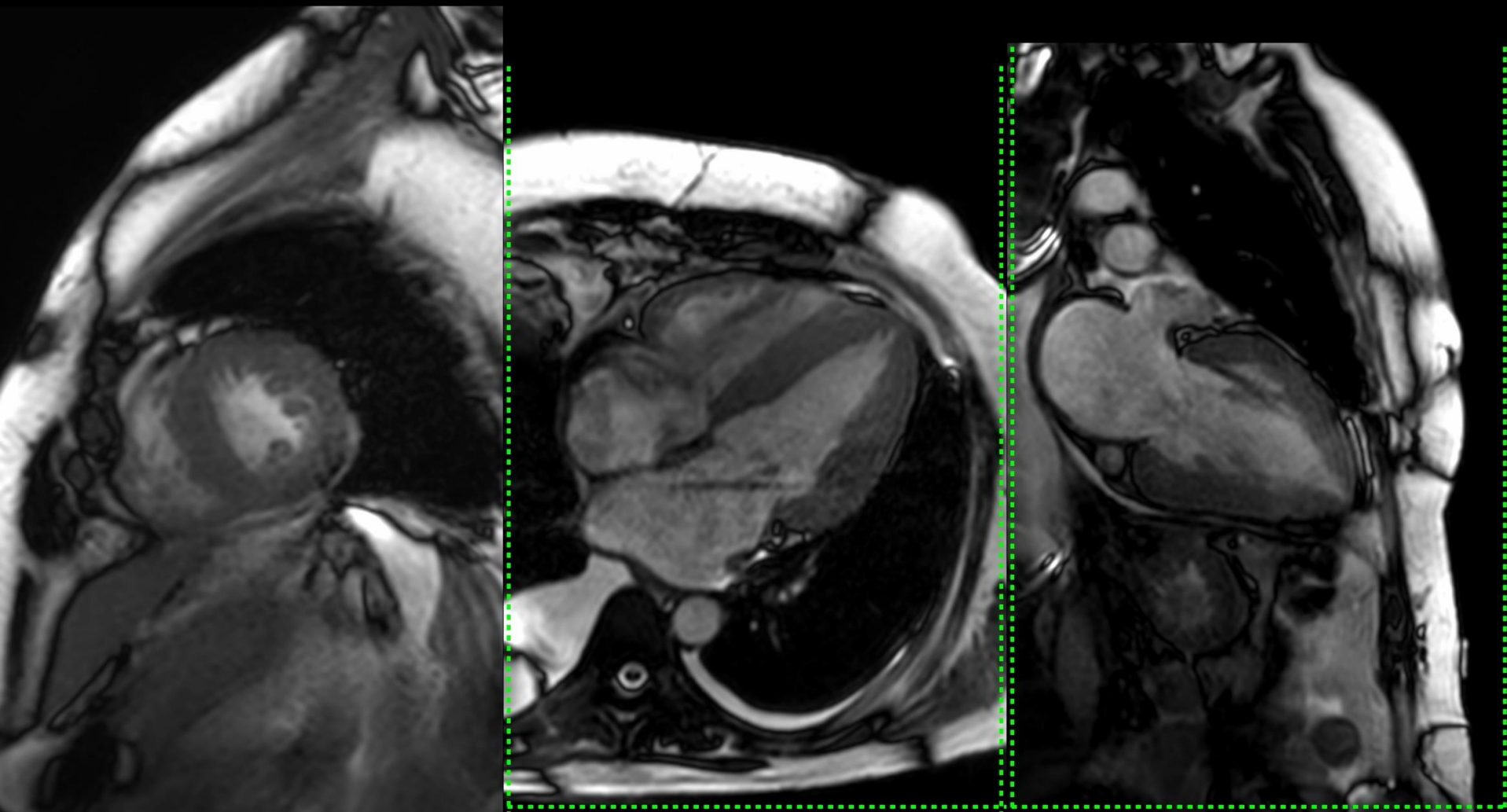


# Other types of enhancement



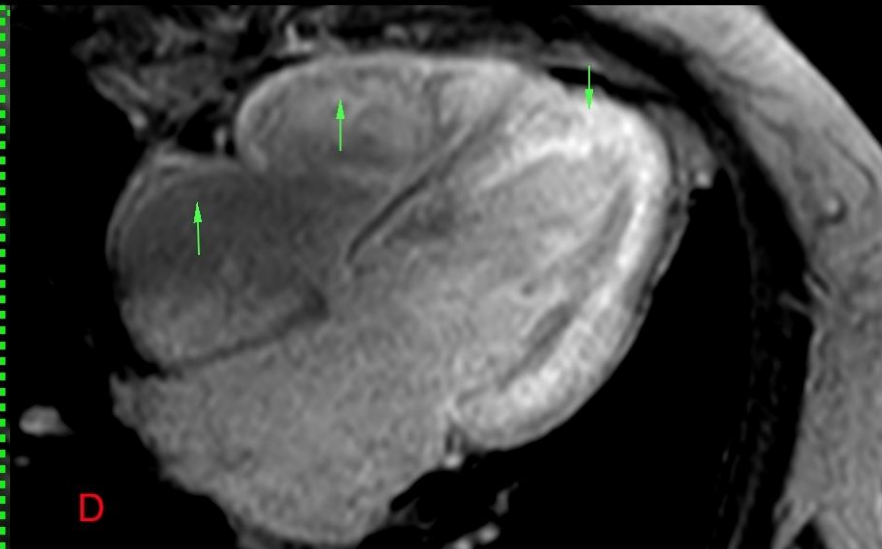
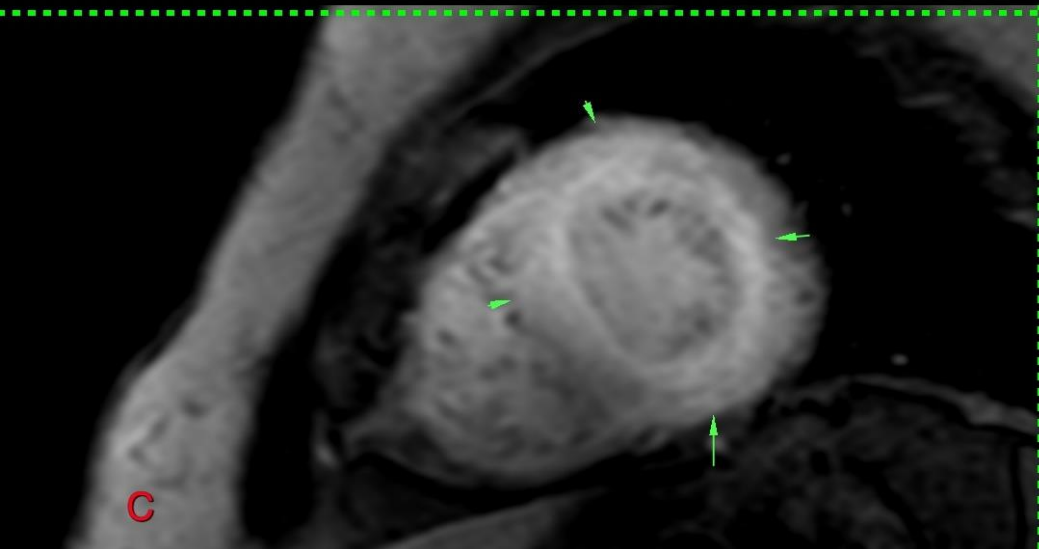
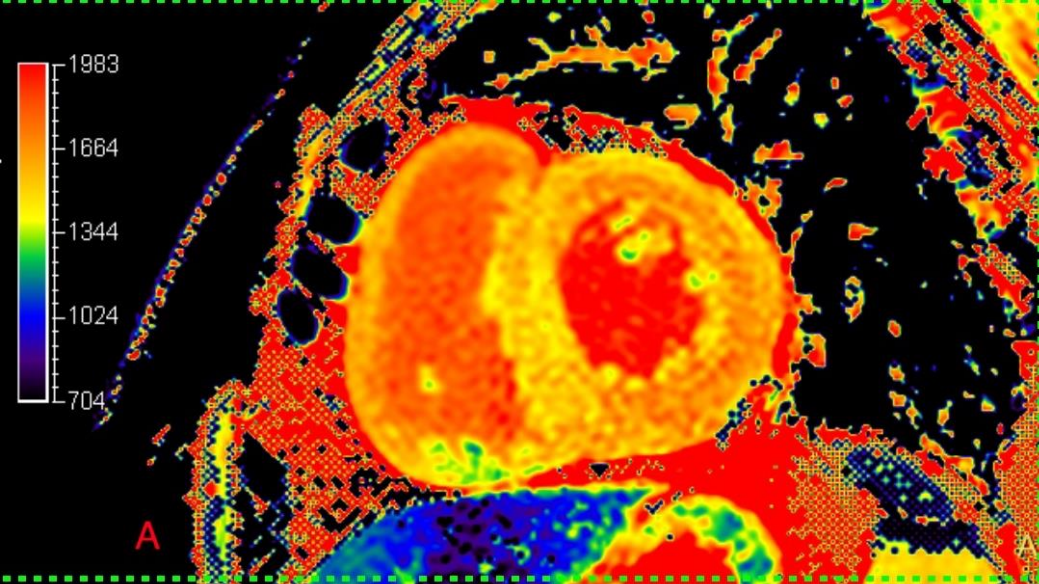
Restrictive physiology





53-years old man in failure





Amyloidosis

# Sudden Cardiac Death Risk Stratification

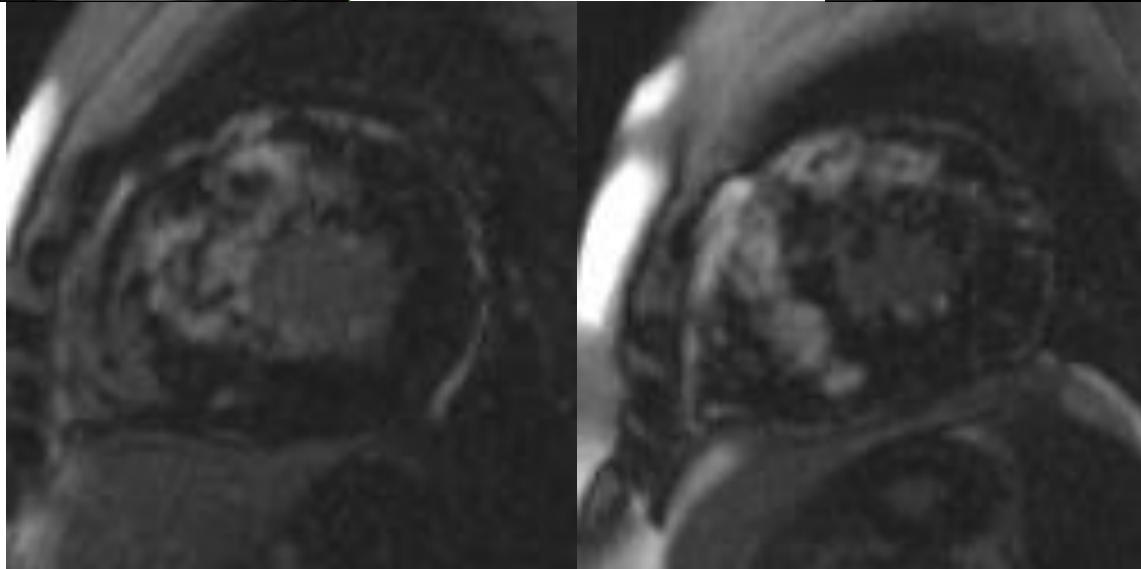
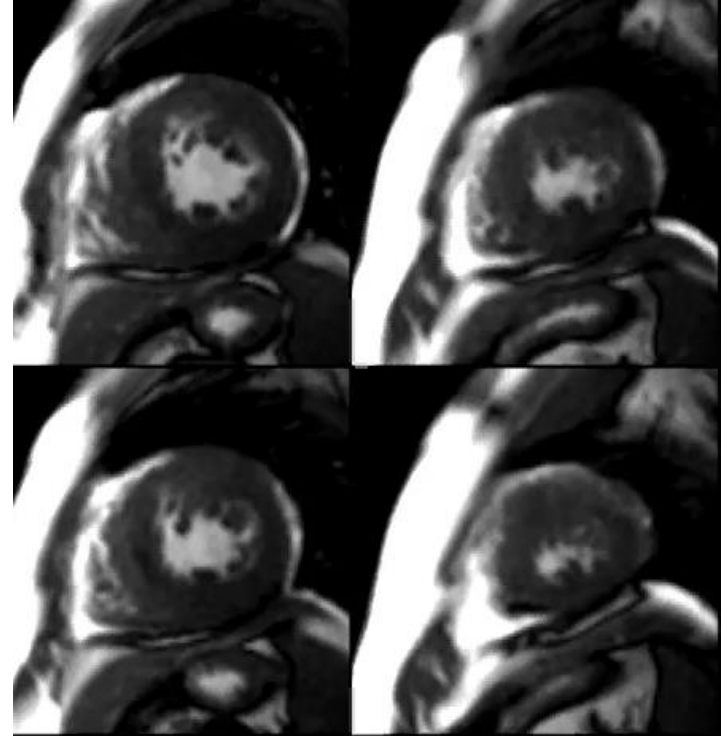
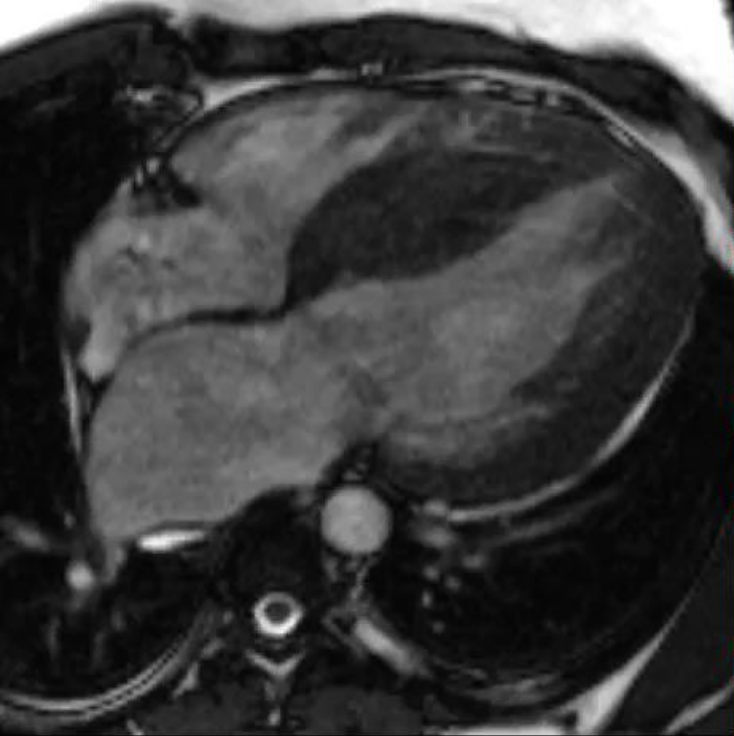
## LGE

- Hypertrophic cardiomyopathy
- Dilated cardiomyopathy
- Granulomatous cardiomyopathy - sarcoidosis

# Hypertrophic Cardiomyopathy

# Case

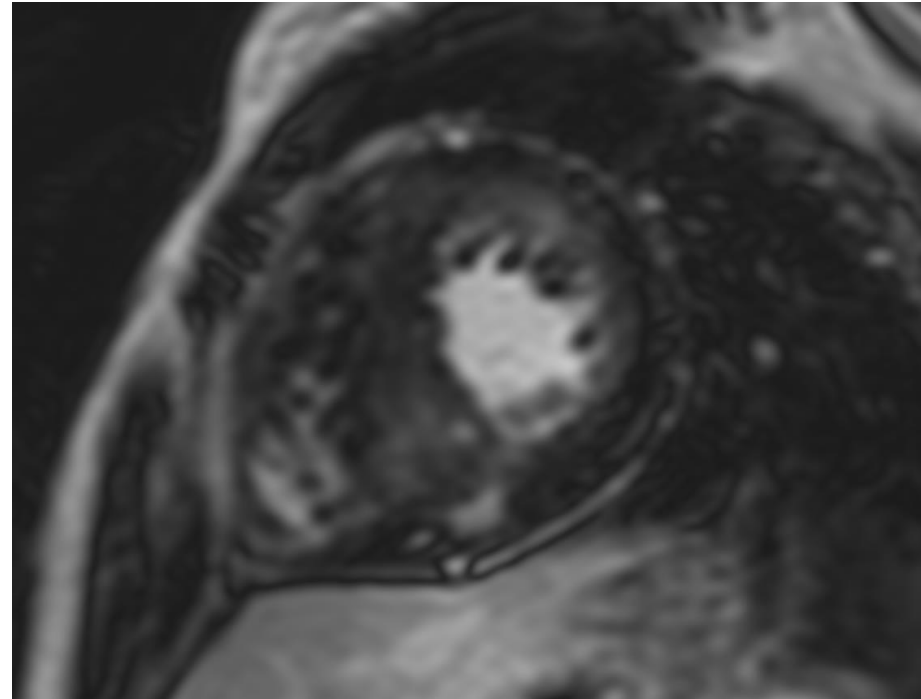
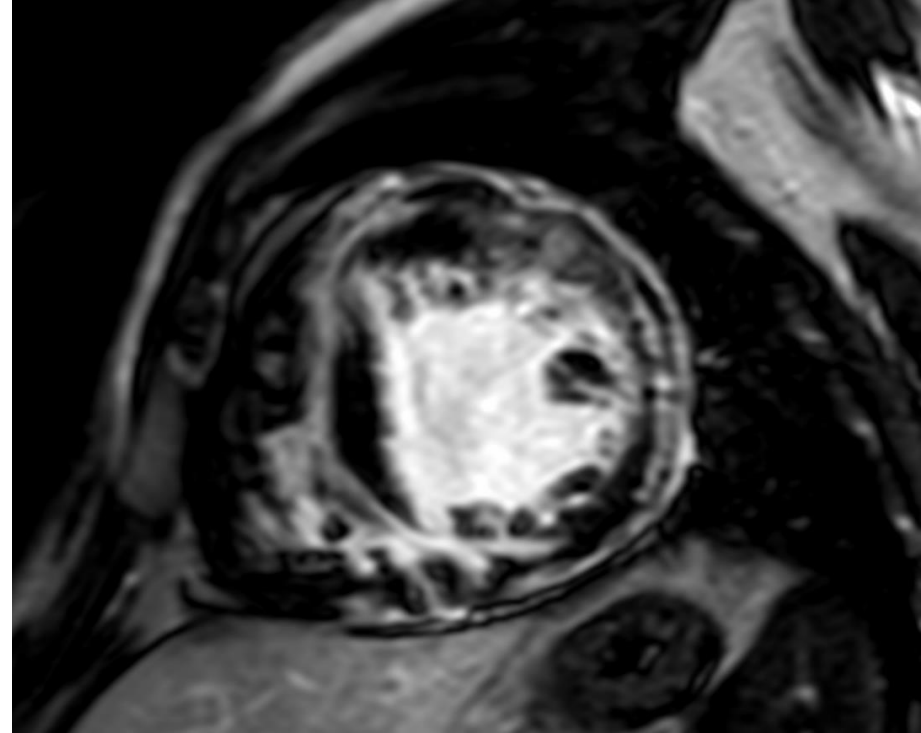




# Sudden Cardiac Death in HCM

## Risk Assessment

- Traditional criteria for assessment are not sensitive enough to capture all patients
- Addition of late gadolinium enhancement (LGE) identifies many more patients at risk for SCD, who would need ICDs

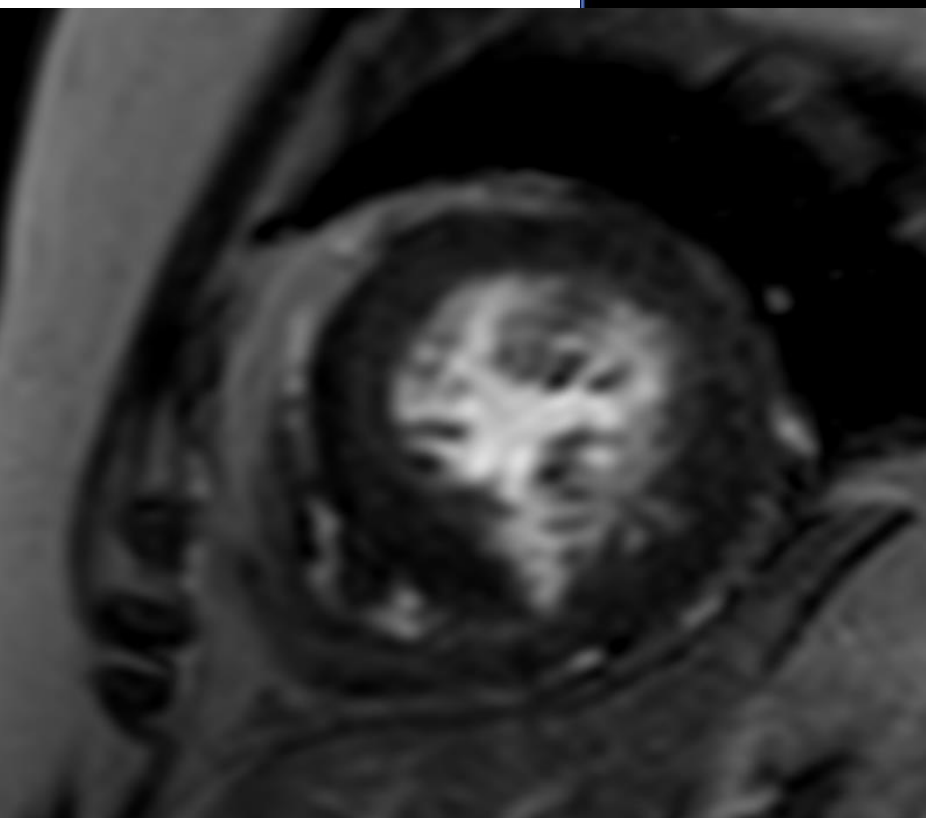


# LGE in HCM

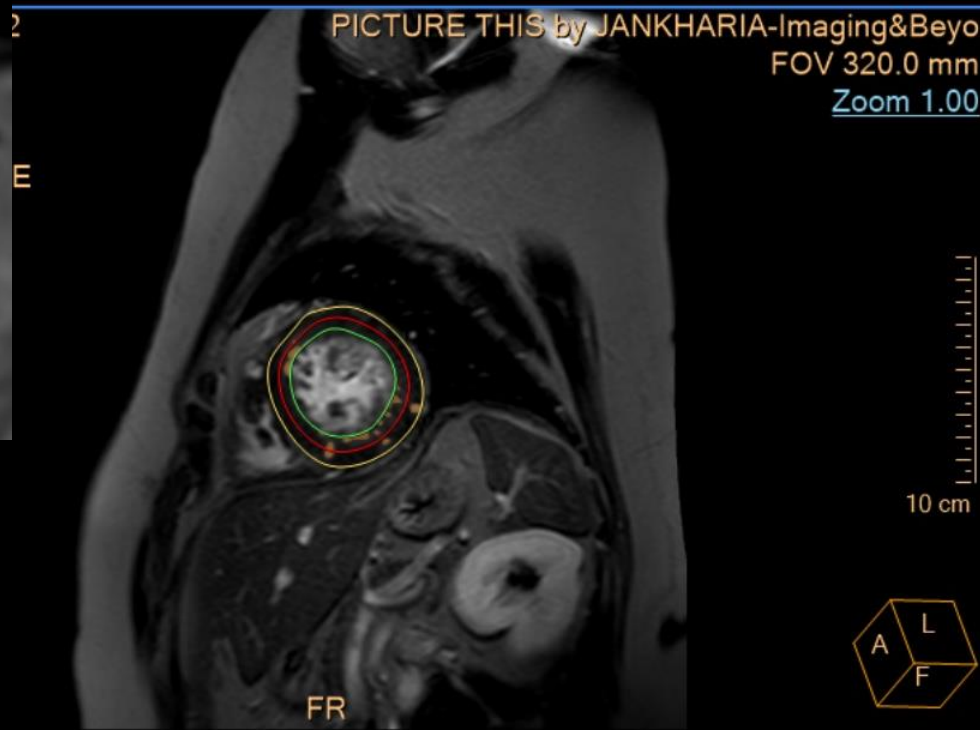
## PERFUSE study

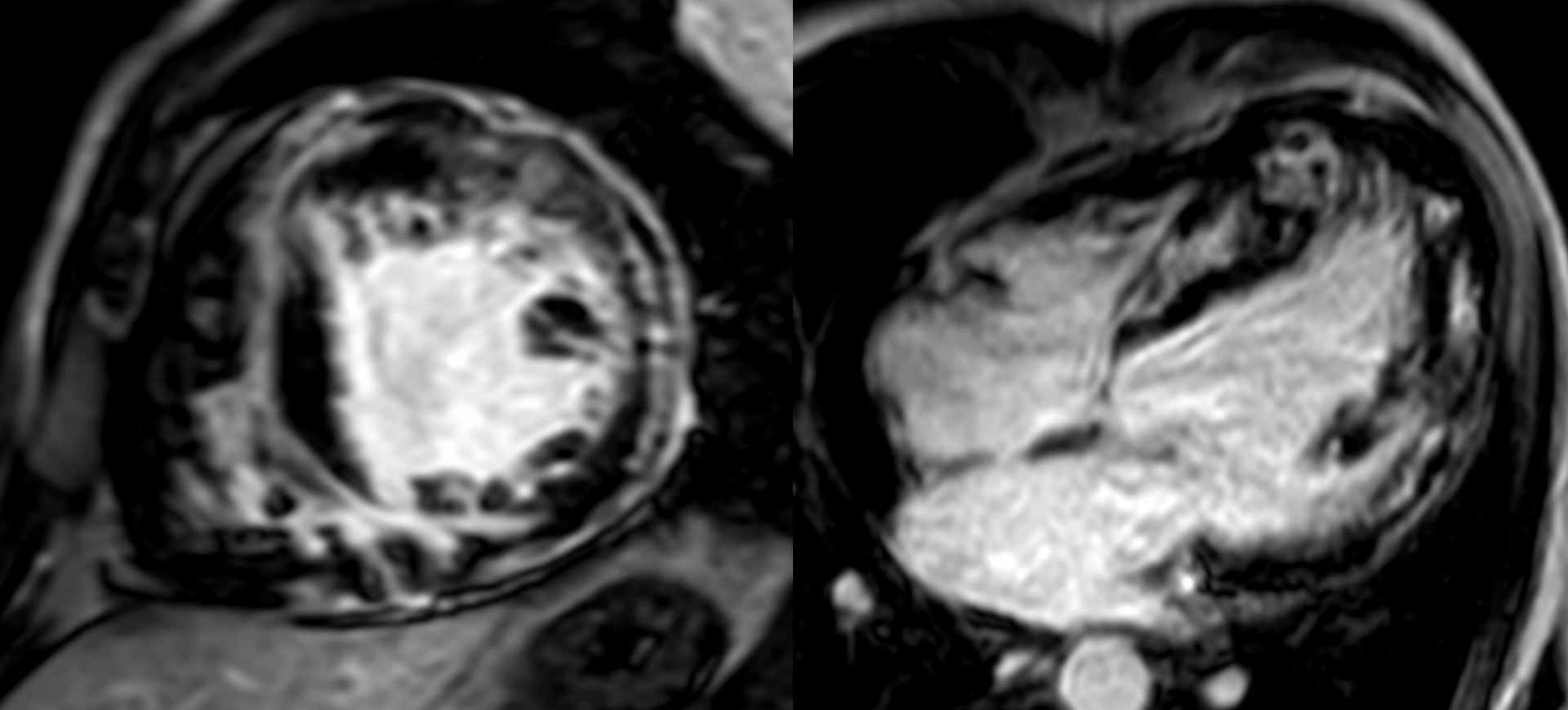
- 1293 patients over a median of 3.3 years
- Absence of LGE is associated with low risk (but not zero risk)
- The mere presence of LGE is not a risk factor
- LGE of >15% is associated with a 2-fold risk of SCD even in the presence of 1 additional risk factor
- The relationship is linear

	Results Summary
	Values
Enhanced volume	10257 mm <sup>3</sup>
Enhanced mass	10.77 gr
Myocardial volume	148458 mm <sup>3</sup>
Myocardial mass	155.88 gr
Percentage enhanced volume	7 %
Image type used	M_FFE

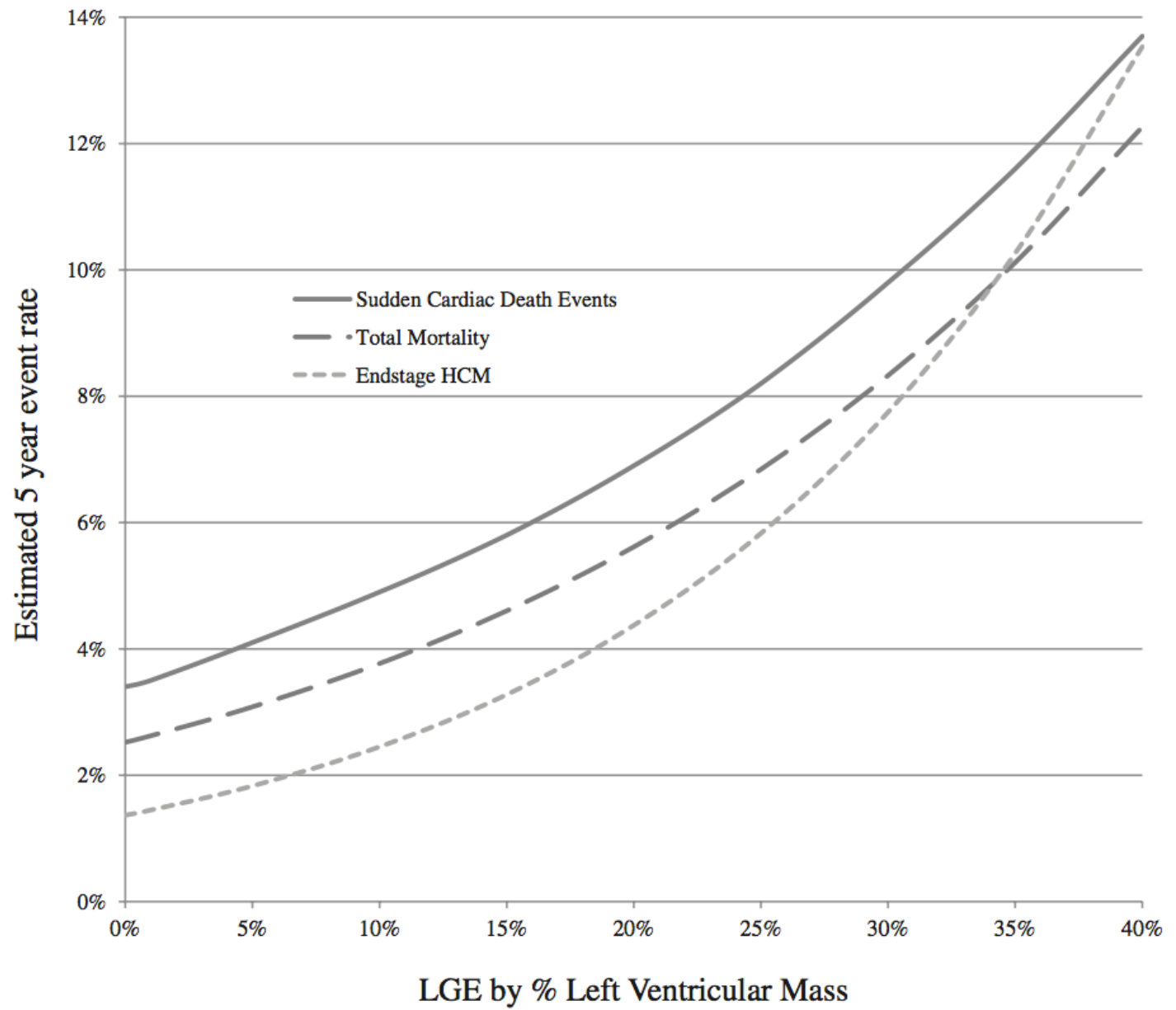


PICTURE THIS by JANKHARIA-Imaging&Beyo  
FOV 320.0 mm  
Zoom 1.00





43%



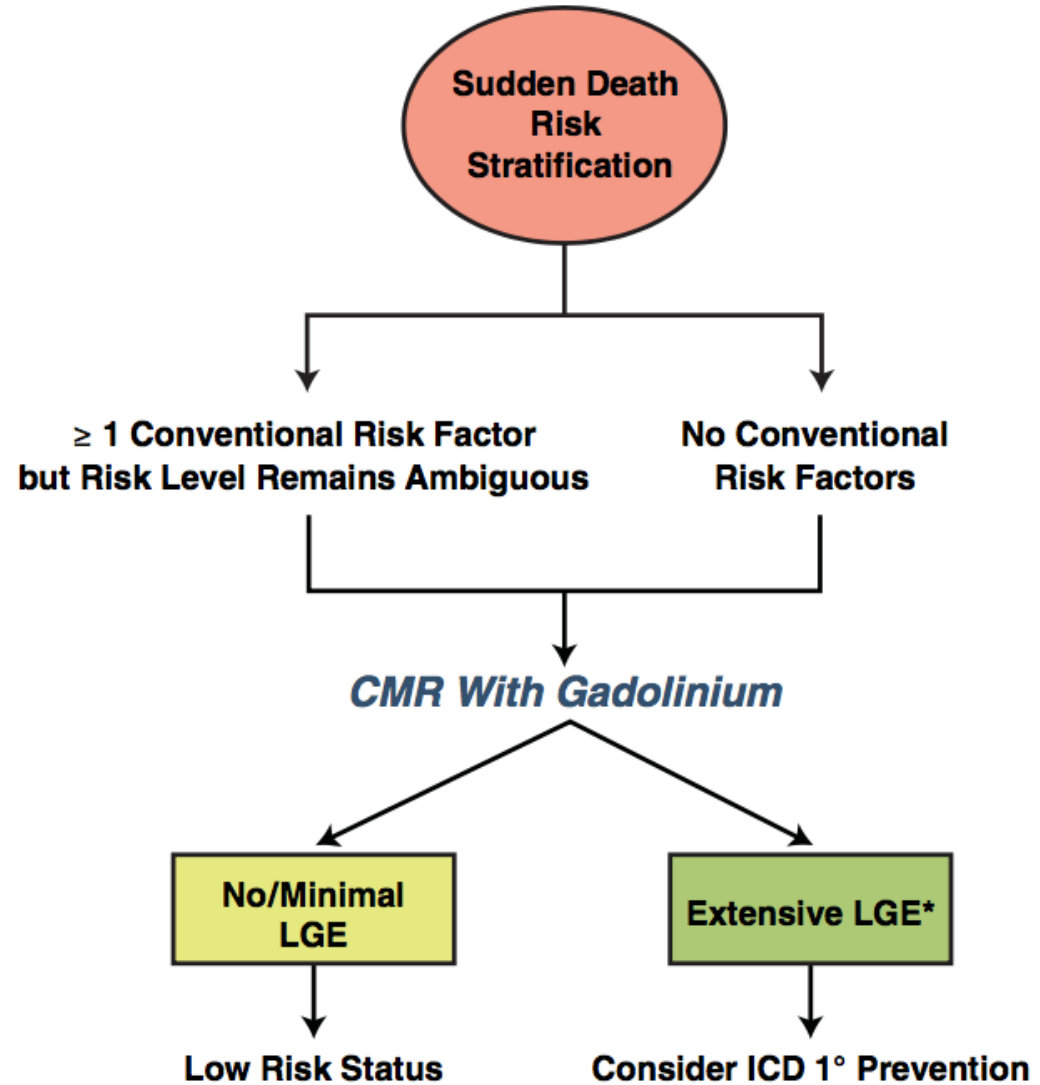
# LGE in HCM

## Meta-Analysis

- 2993 patients in 5 studies
- The mere presence of LGE is not a risk factor
- LGE of >20% is associated with a 2-fold risk of SCD
- The relationship is linear
- Each 10% increase results in a 36% increase in relative SCD



**FIGURE 2** Flow Diagram Outlining Role of Contrast CMR With LGE for Sudden Death Risk Stratification in HCM





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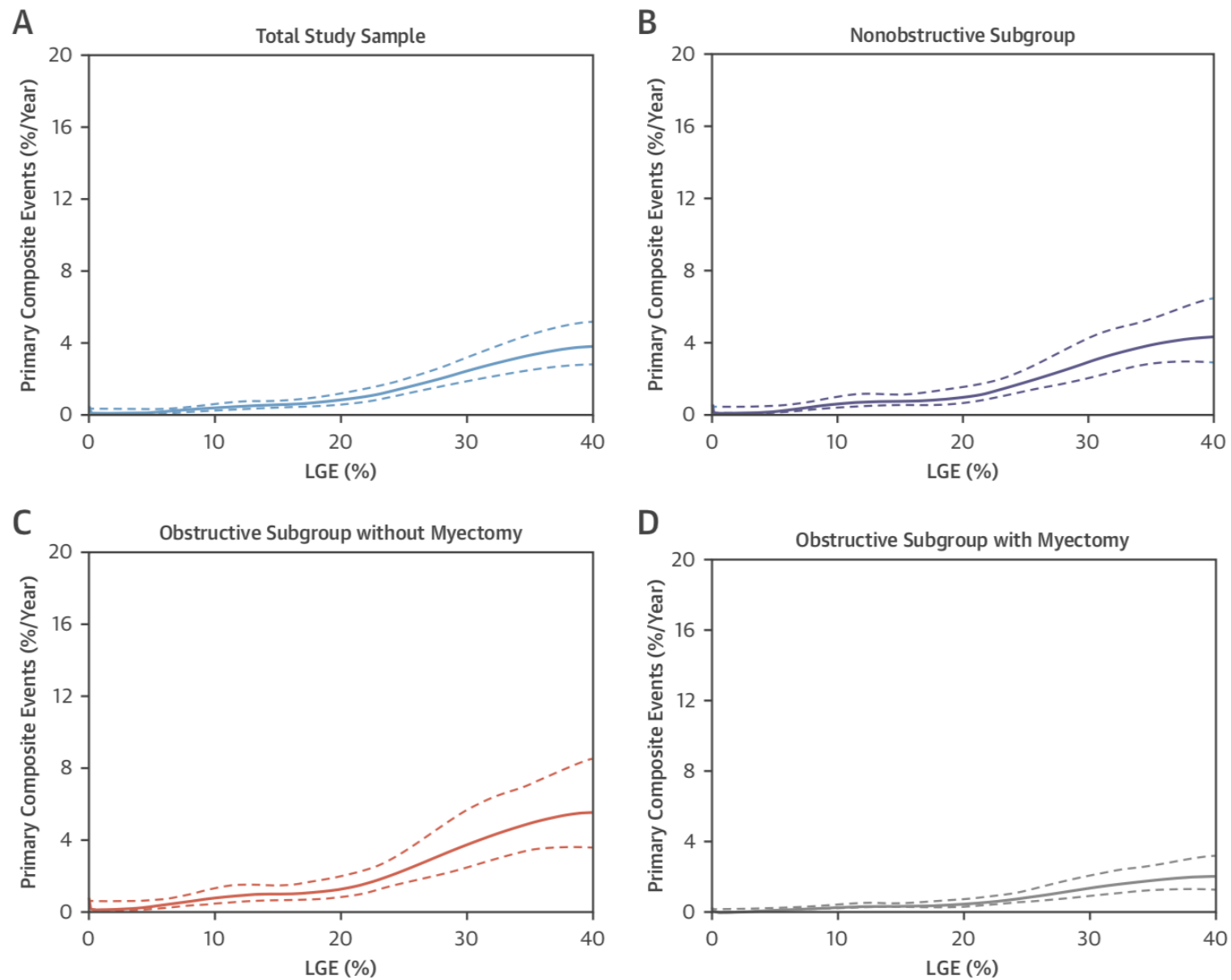
Original Investigation

## Late Gadolinium Enhancement in Patients With Hypertrophic Cardiomyopathy and Preserved Systolic Function

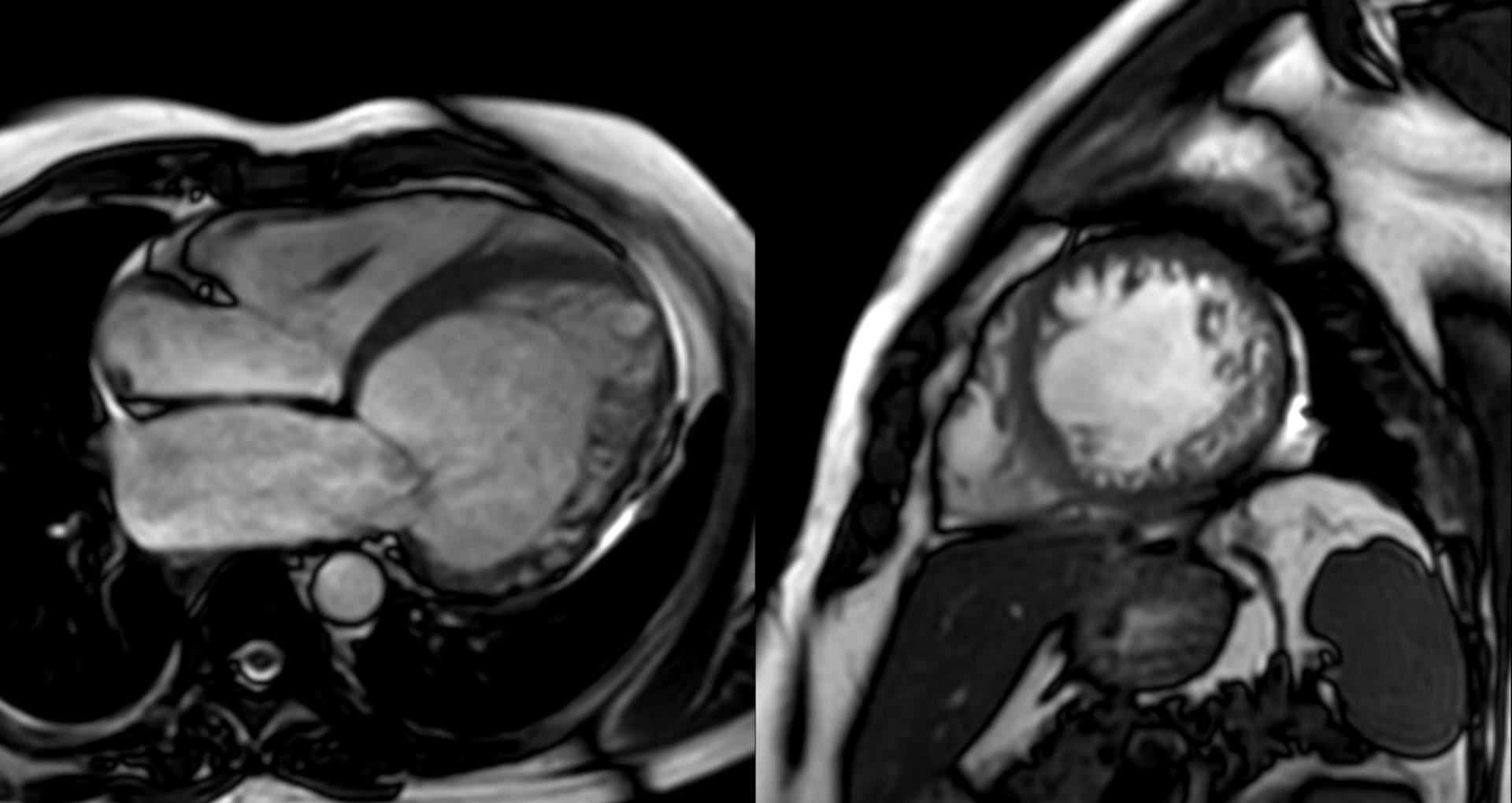
Amgad Mentias MD, Pejman Raeisi-Giglou MD, Nicholas G. Smedira MD, Ke Feng MD, [Kimi Sato MD, PhD](#), Oussama Wazni MD, Mohamad Kanj MD, Scott D. Flamm MD, Maran Thamilarsan MD, Zoran B. Popovic MD, PhD, Harry M. Lever MD, Milind Y. Desai MD   

Mentias A, Raeisi-Giglou P, Smedira NG, Feng K, Sato K, Wazni O, et al. Late Gadolinium Enhancement in Patients With Hypertrophic Cardiomyopathy and Preserved Systolic Function. Journal of the American College of Cardiology. 2018 Aug;72(8):857–70.

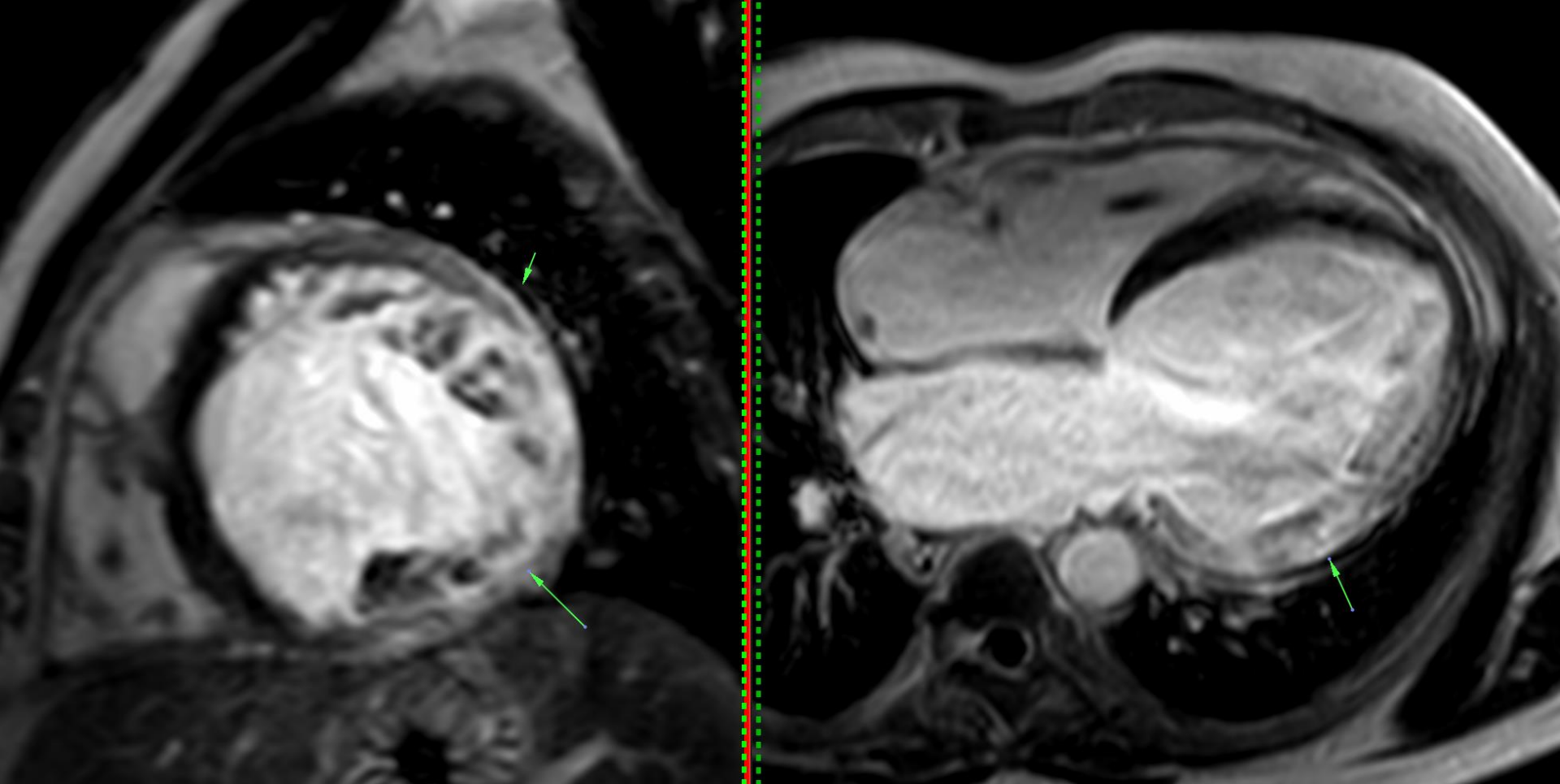
**FIGURE 2** Quadratic Spline Analysis Demonstrating Estimated Risk of Primary Composite Event at 5 Years for %LGE



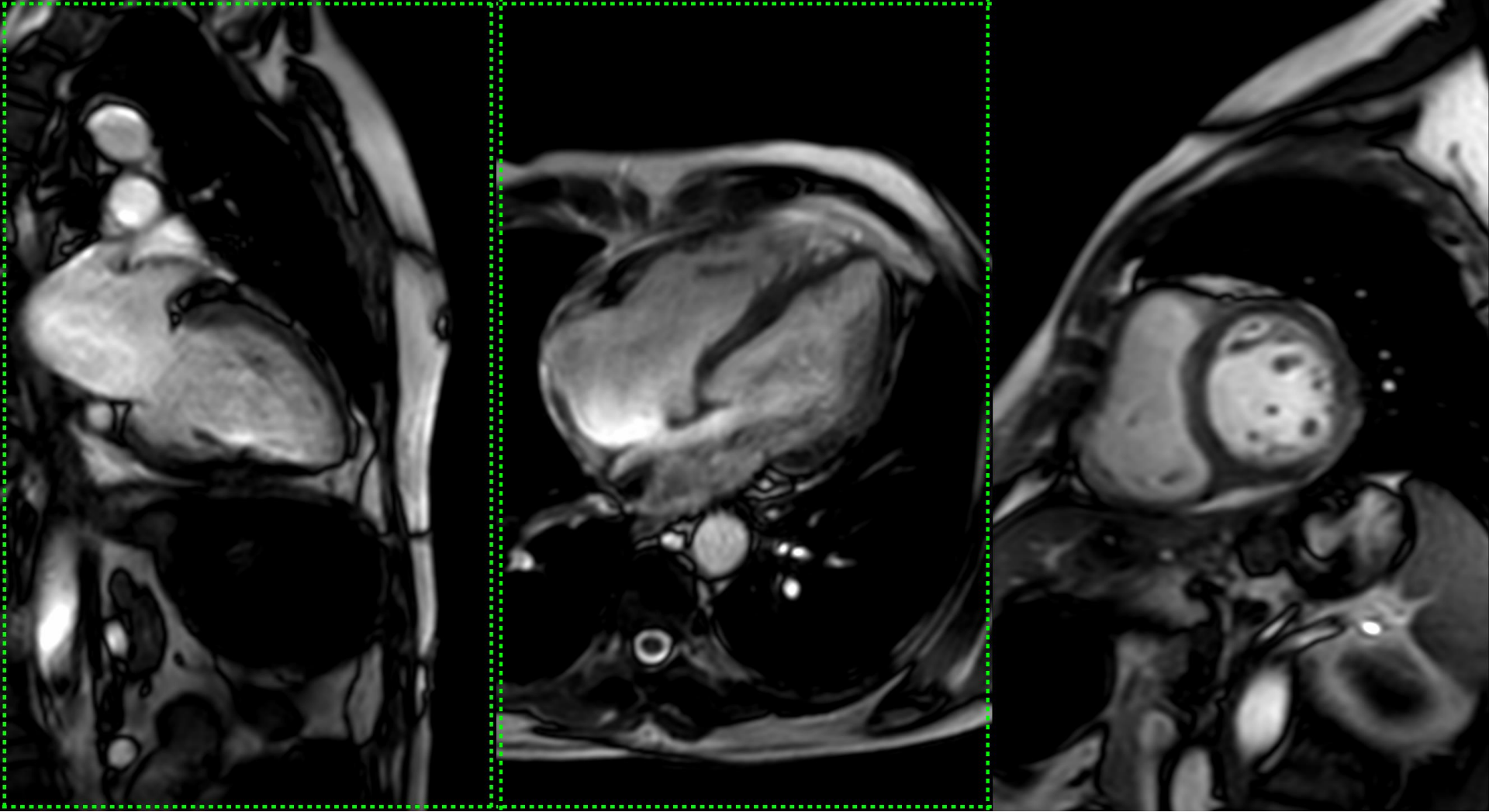
# Dilated Cardiomyopathy



49-years old man with an EF of 18% - DCM

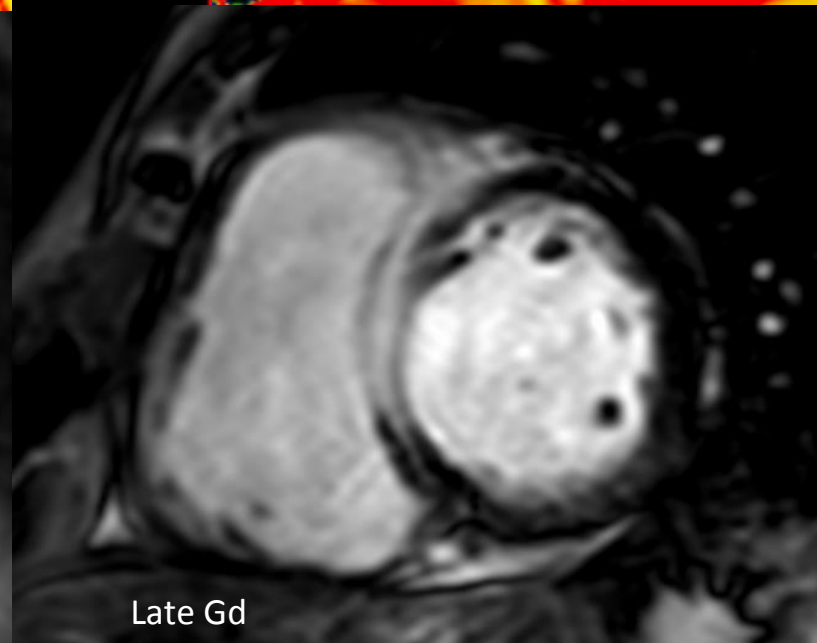
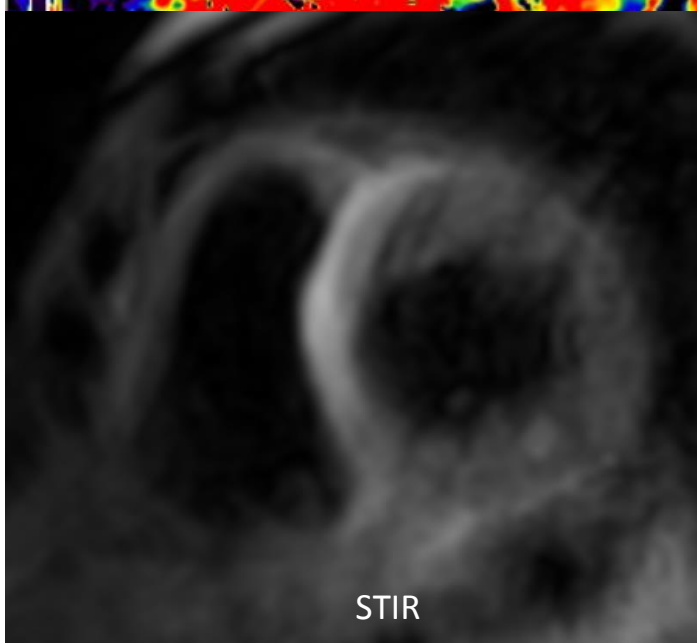
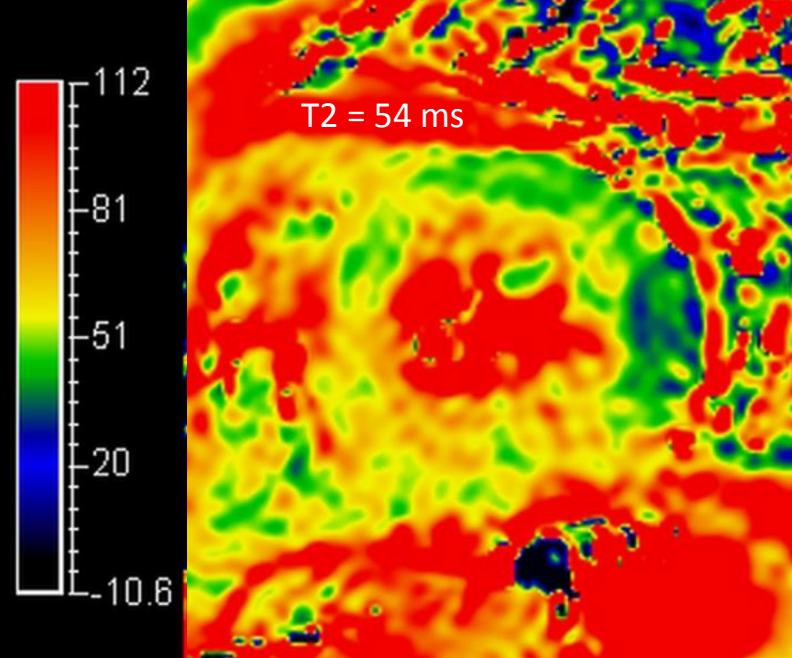
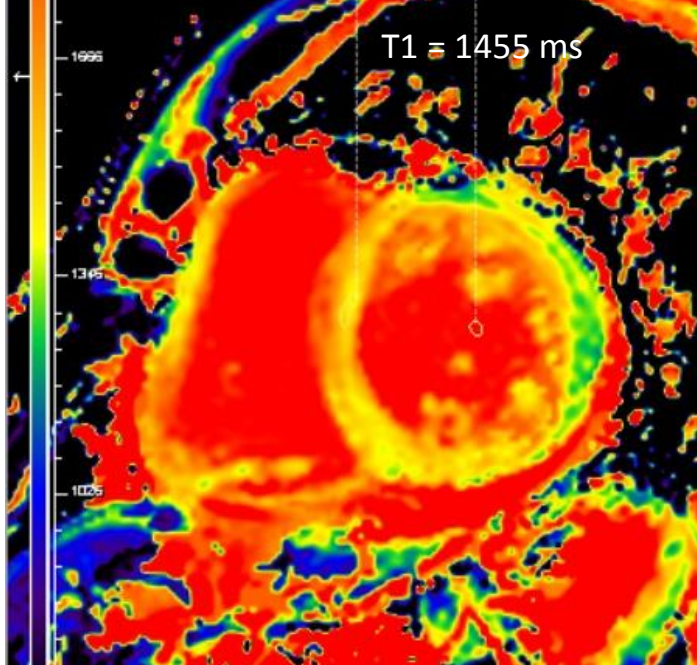


Fibrosis



43-years old man





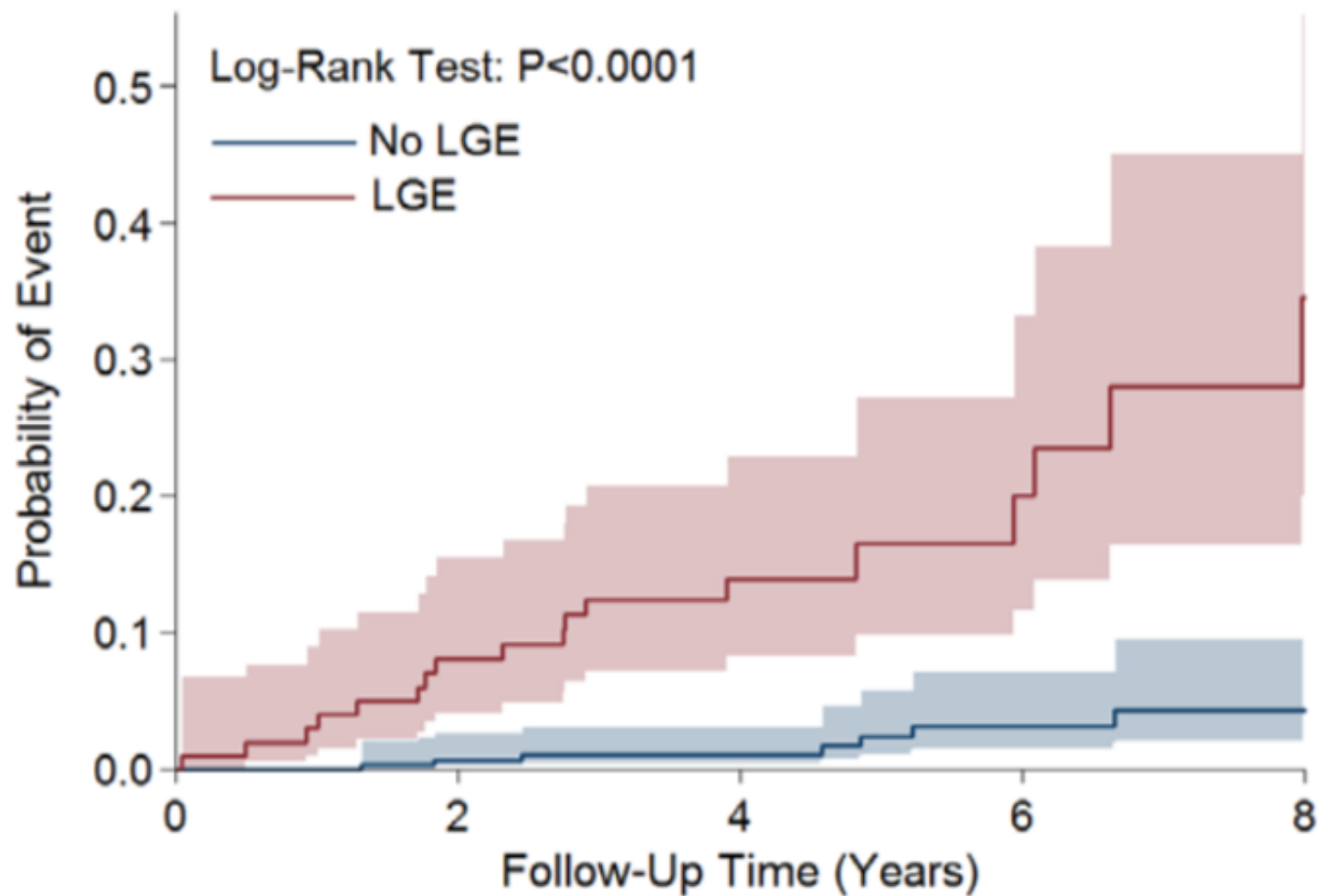
Fibrosis



# LGE in DCM

Patients with mild to moderate systolic dysfunction – EF > 40%

- If there is LGE, there is increased risk of sudden cardiac death



No LGE 298  
LGE 101

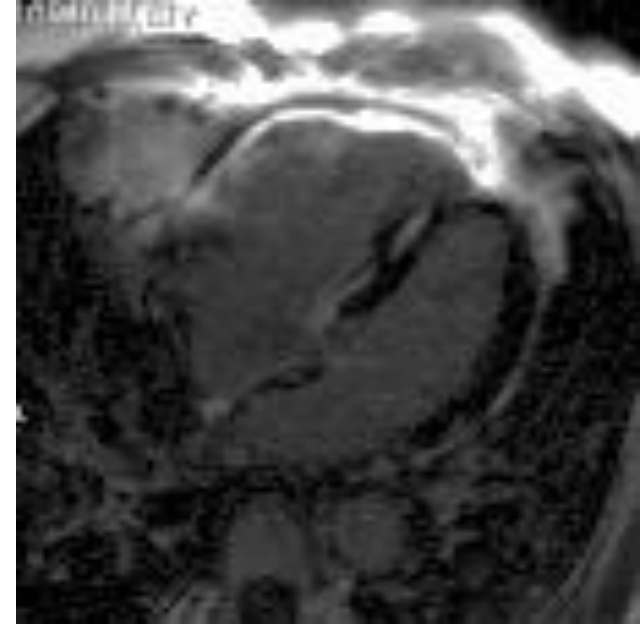
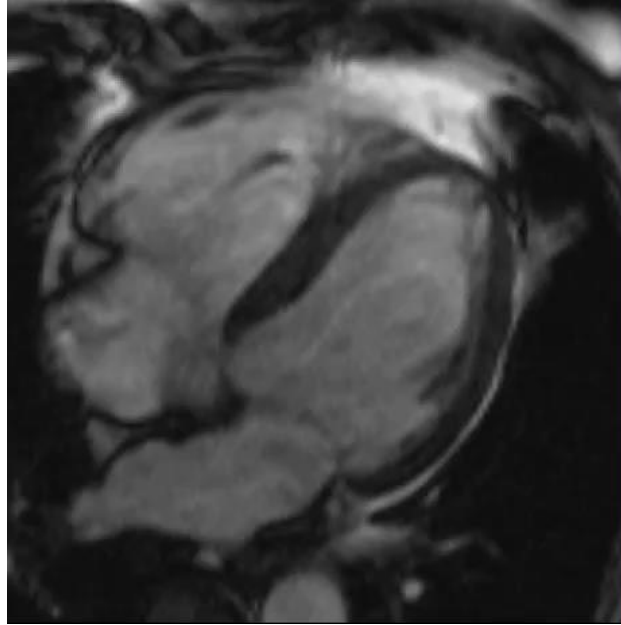
289  
89

182  
53

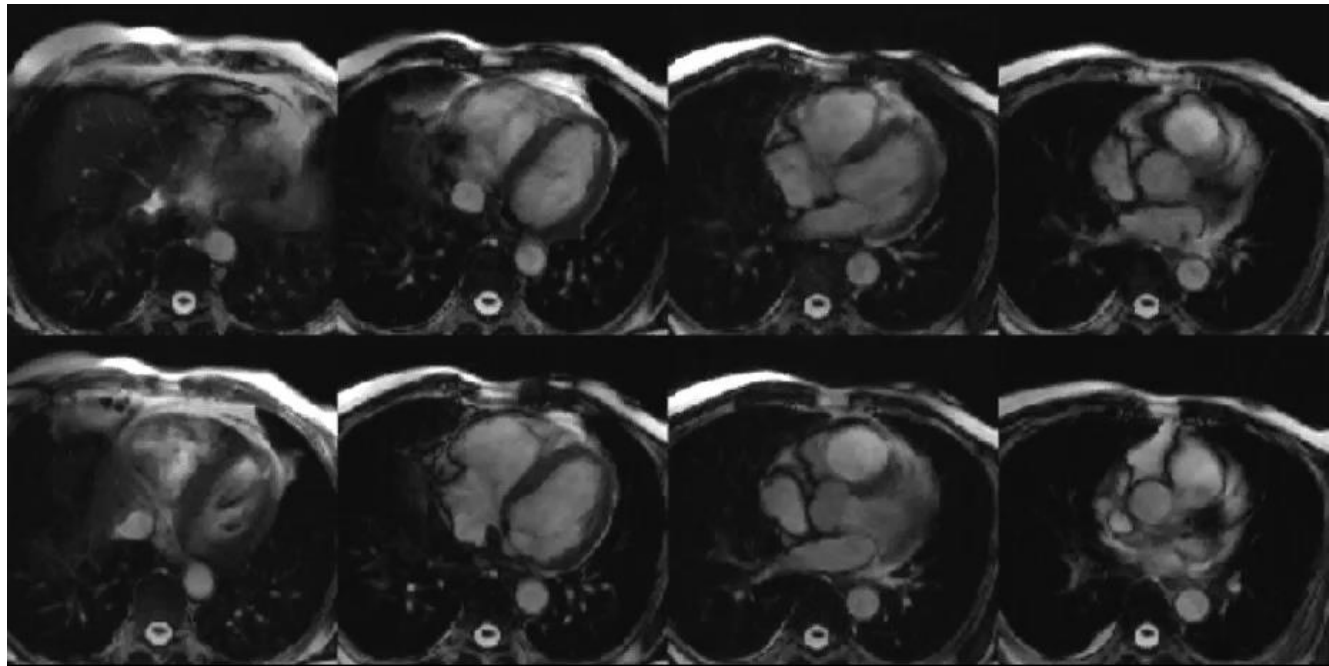
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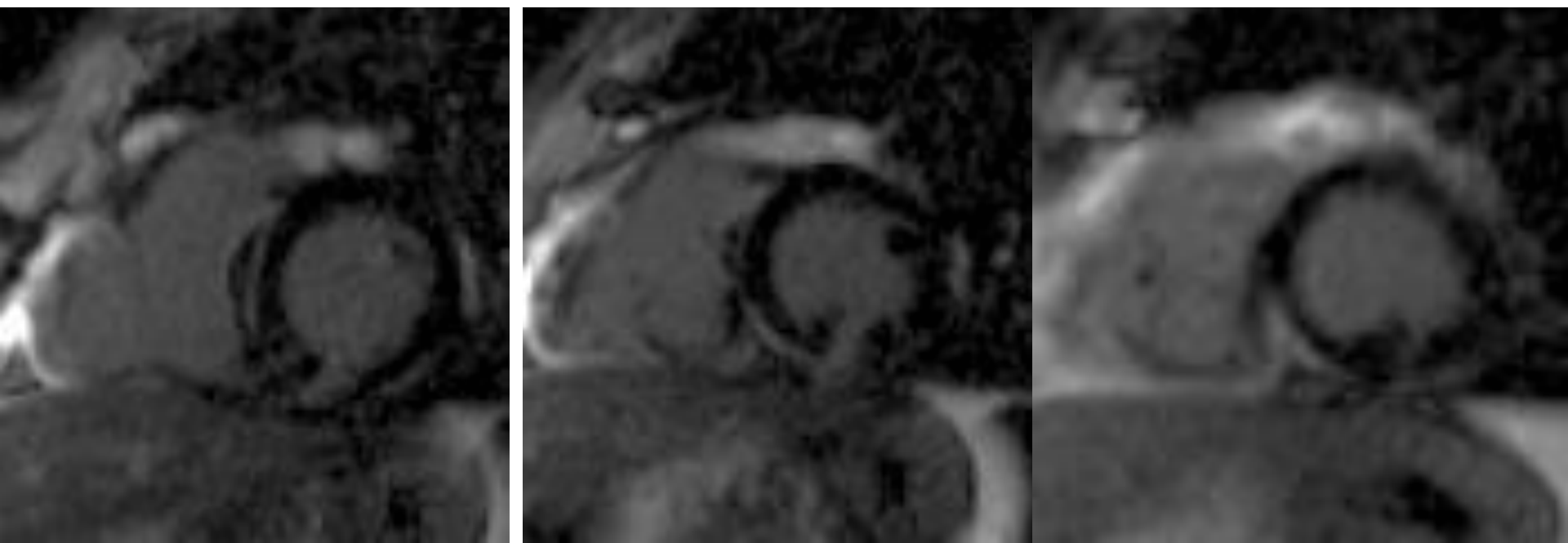
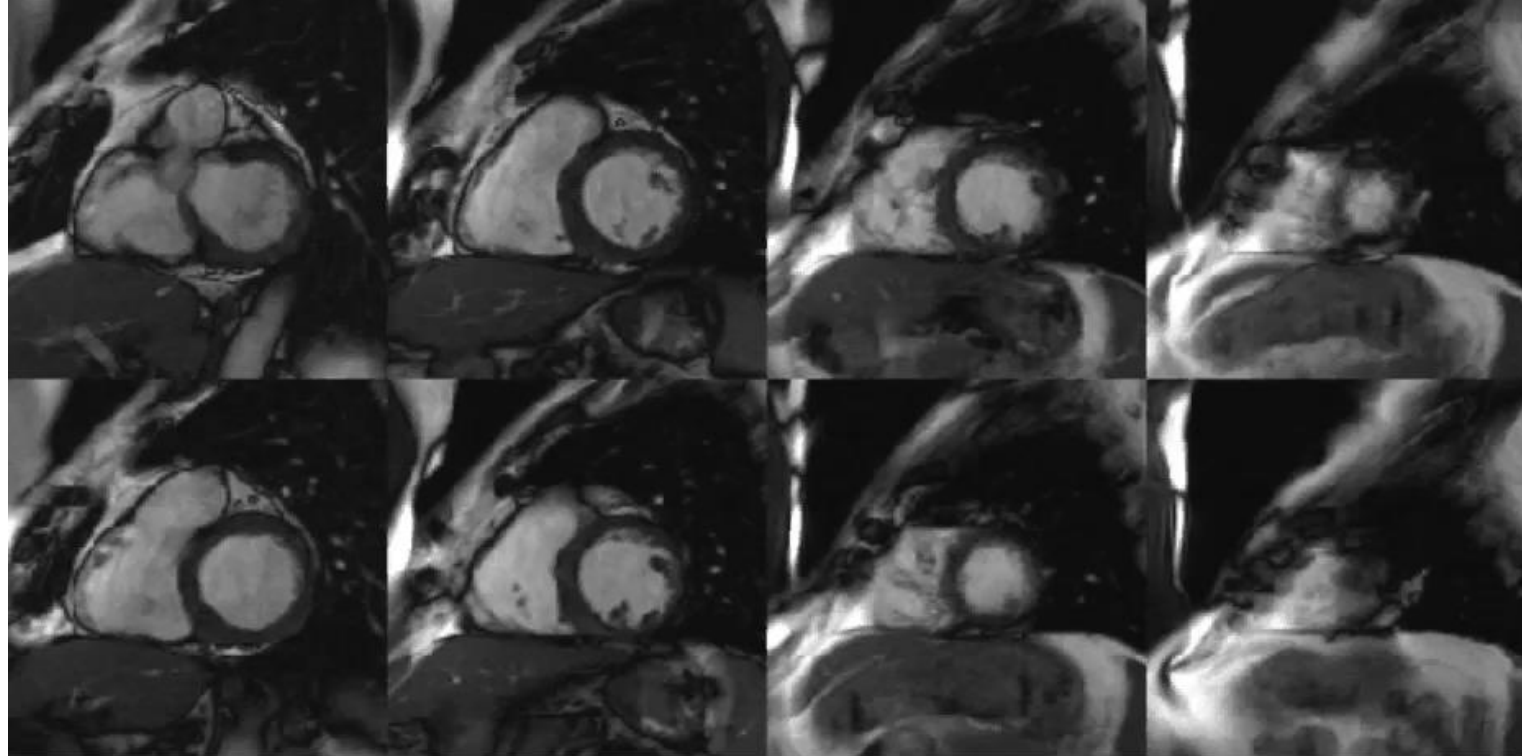
54  
10

# Granulomatous Cardiomyopathy

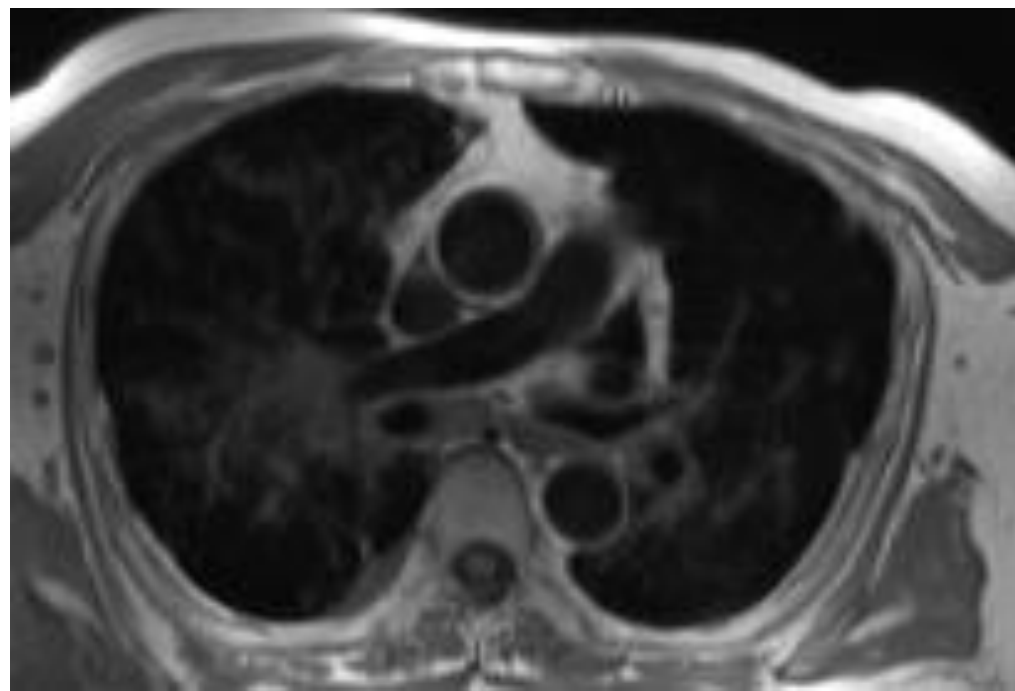
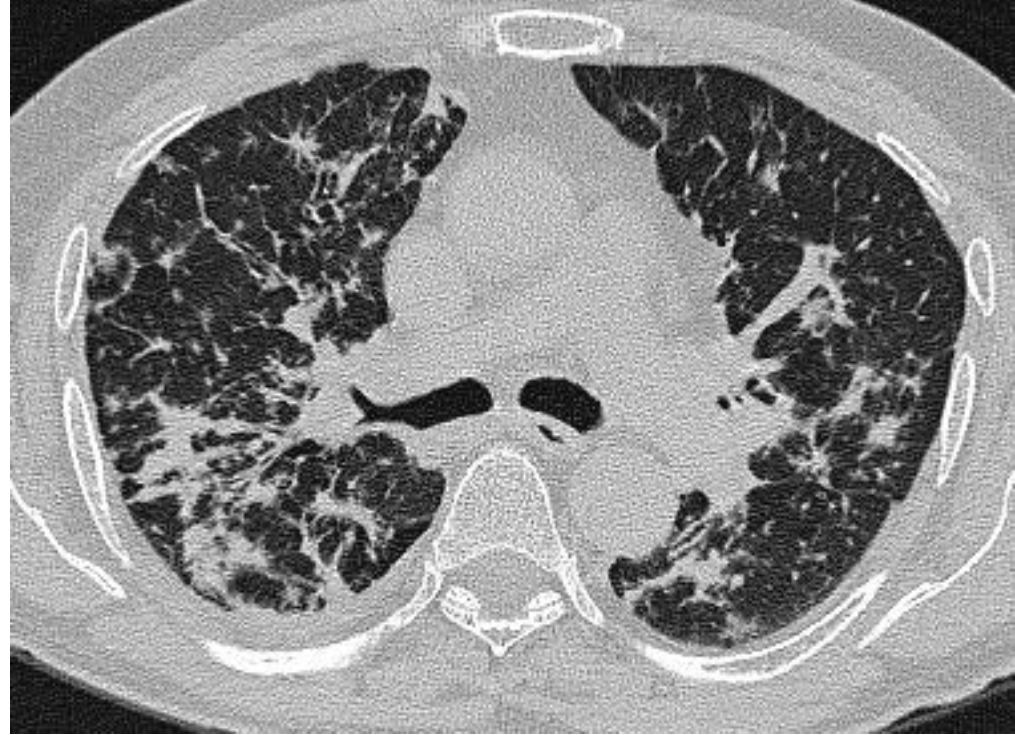


65-years old with  
tachyarrhythmias





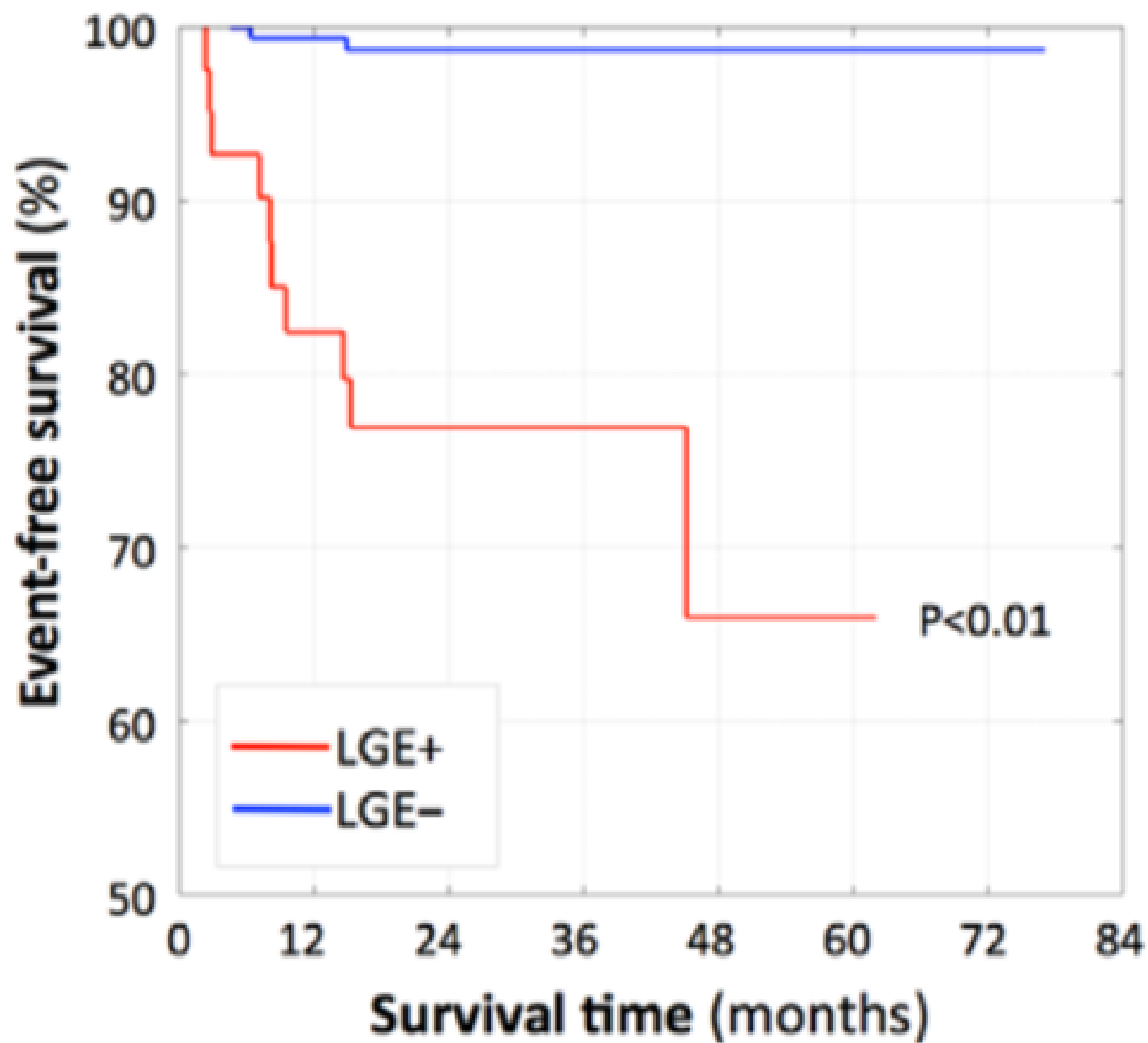
CT chest and black blood MRI axial



# LGE in Sarcoidosis

## Patients with Preserved EF

- Patients with sarcoidosis with LGE are at increased risk for sudden cardiac death / VT





# Sudden Cardiac Death Risk Stratification

## LGE

- Hypertrophic cardiomyopathy
- Dilated cardiomyopathy
- Granulomatous cardiomyopathy - sarcoidosis

In dilated cardiomyopathy and granulomatous cardiomyopathy, the mere presence of LGE is associated with increased risk of SCD

In HCM, the mere presence of LGE does not imply a risk immediately. It is the amount of fibrosis that matters



**Thank you**



**Picture  
This**  
Imaging & Beyond  
by Jankharia



