

# 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

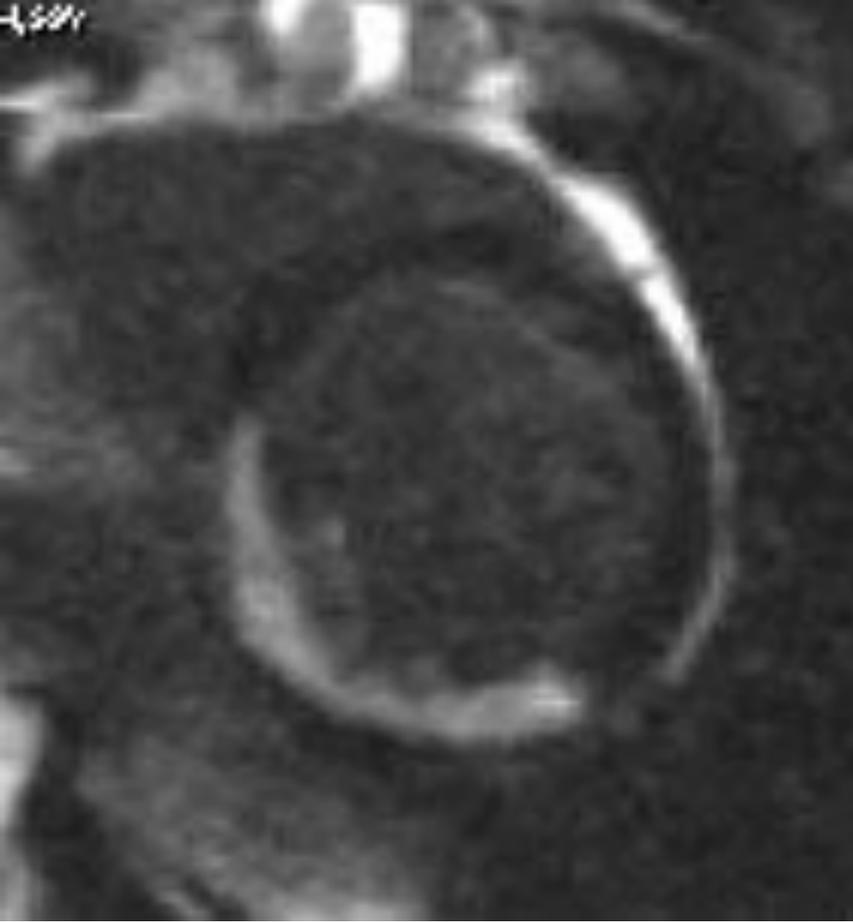
# Late Gd Enhancement

# Delayed Enhancement

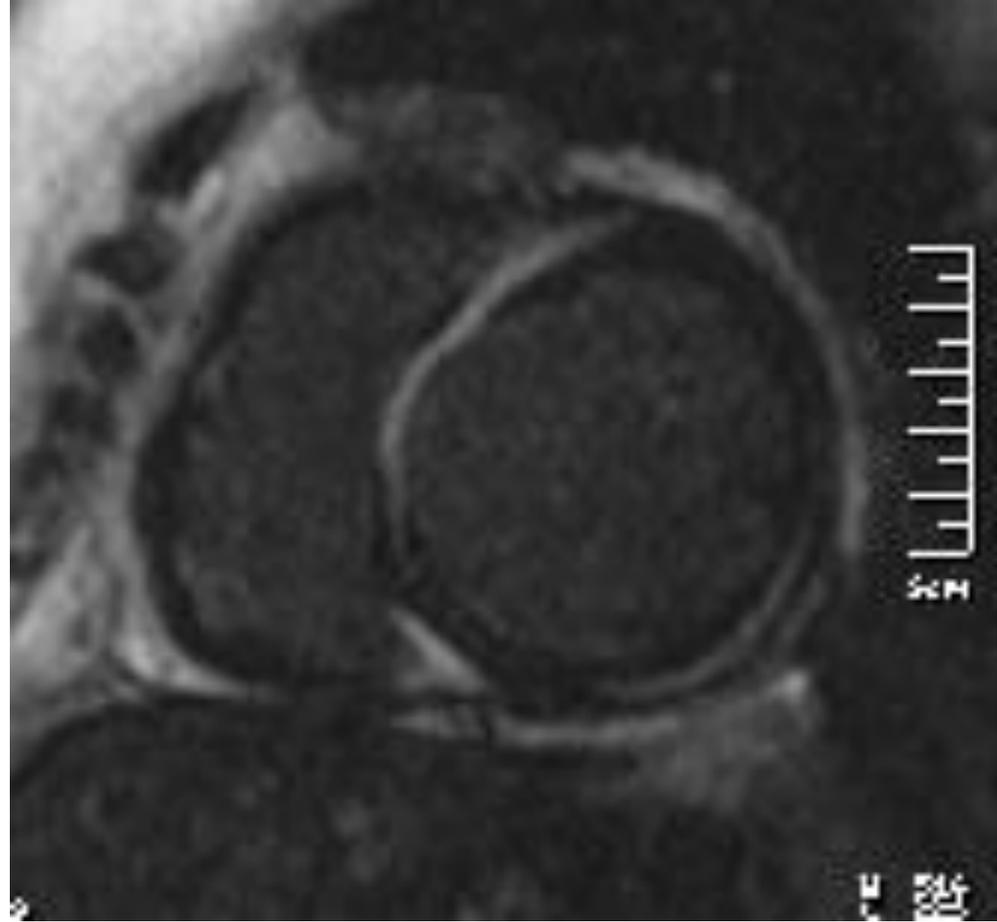
# Tissue Characterization

## 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

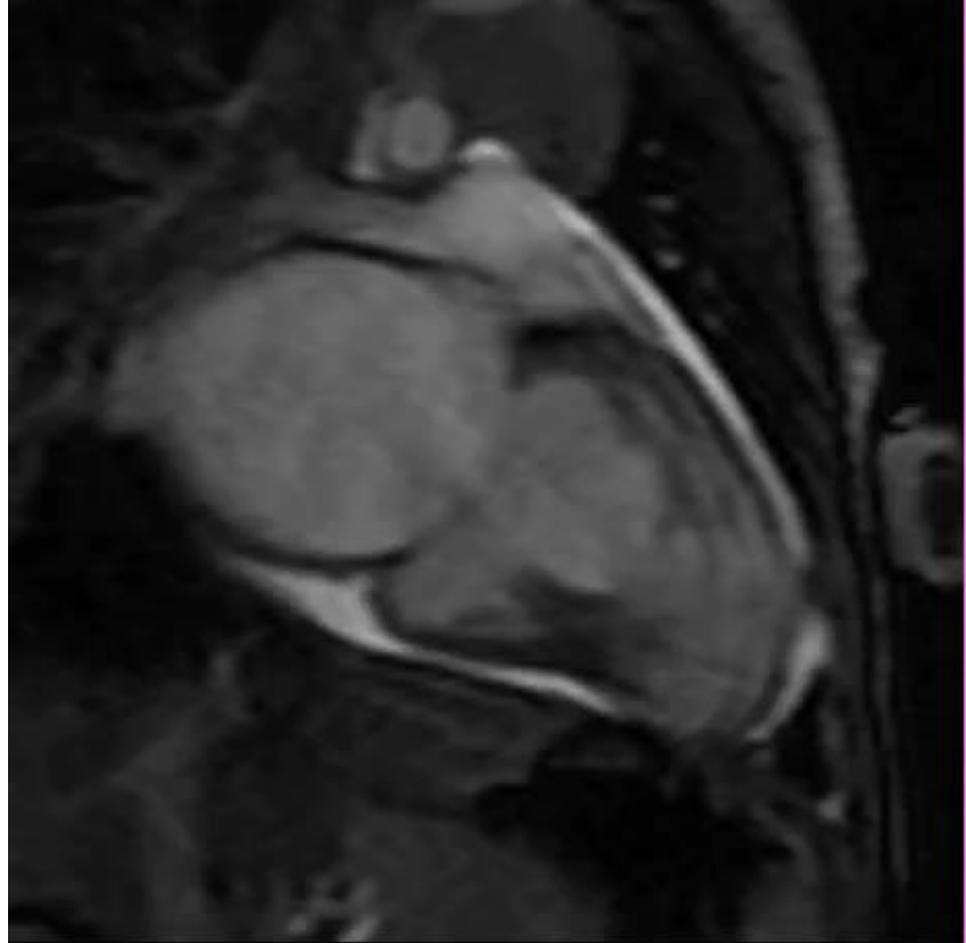
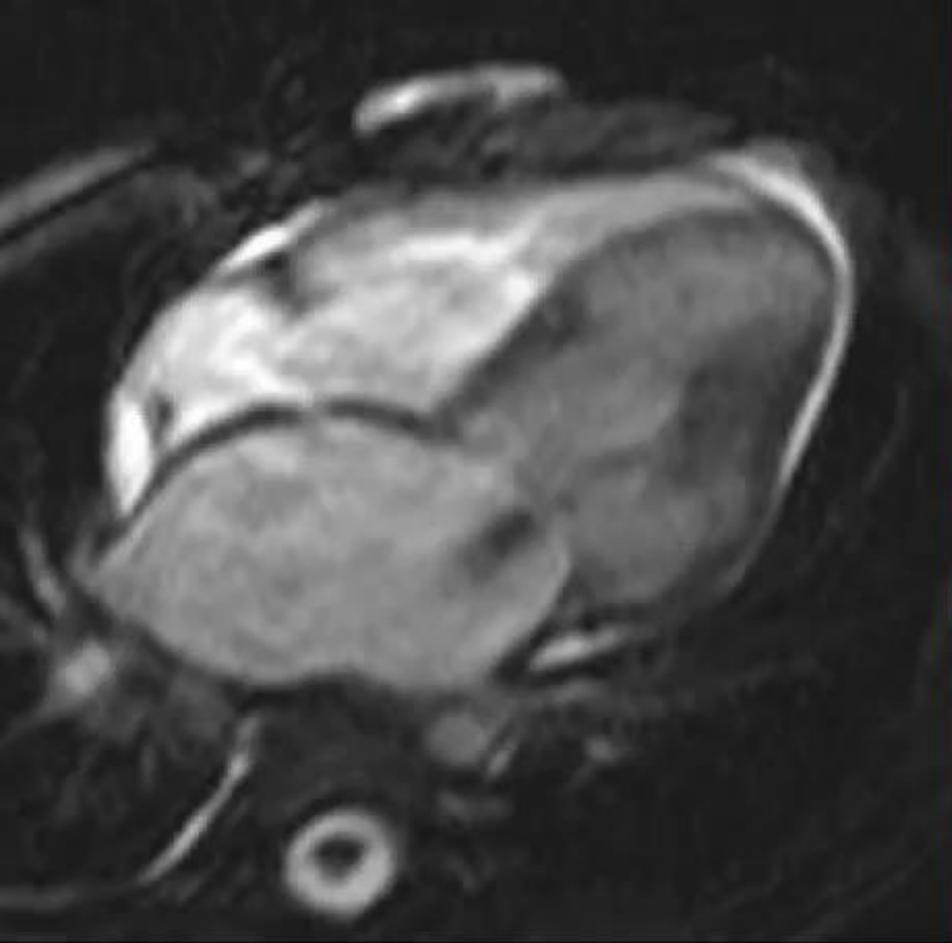


Infarct

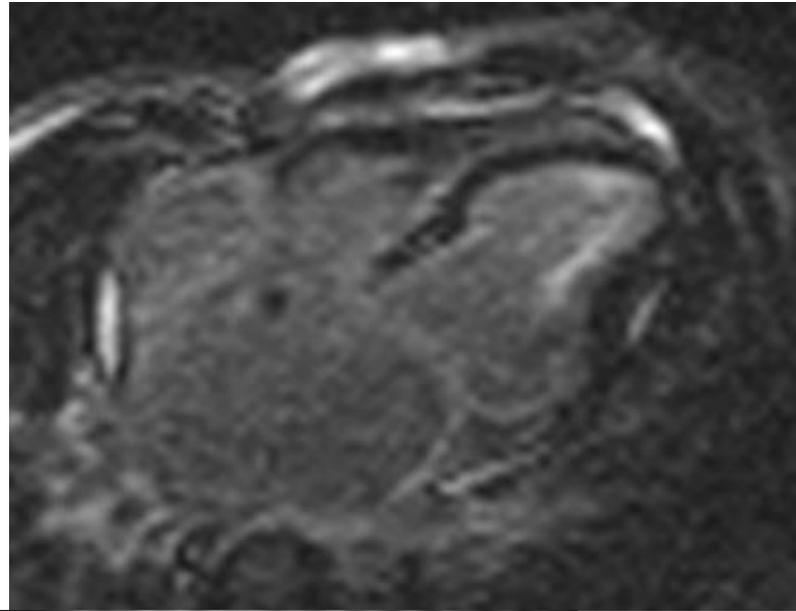
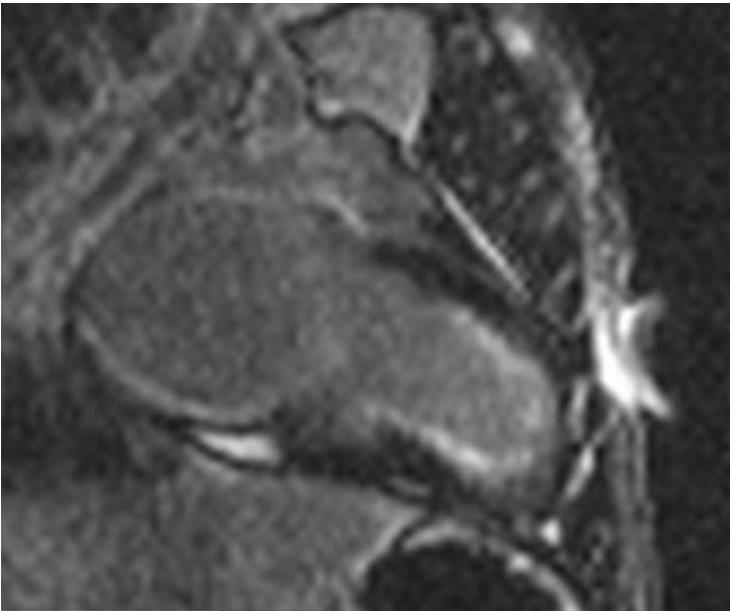


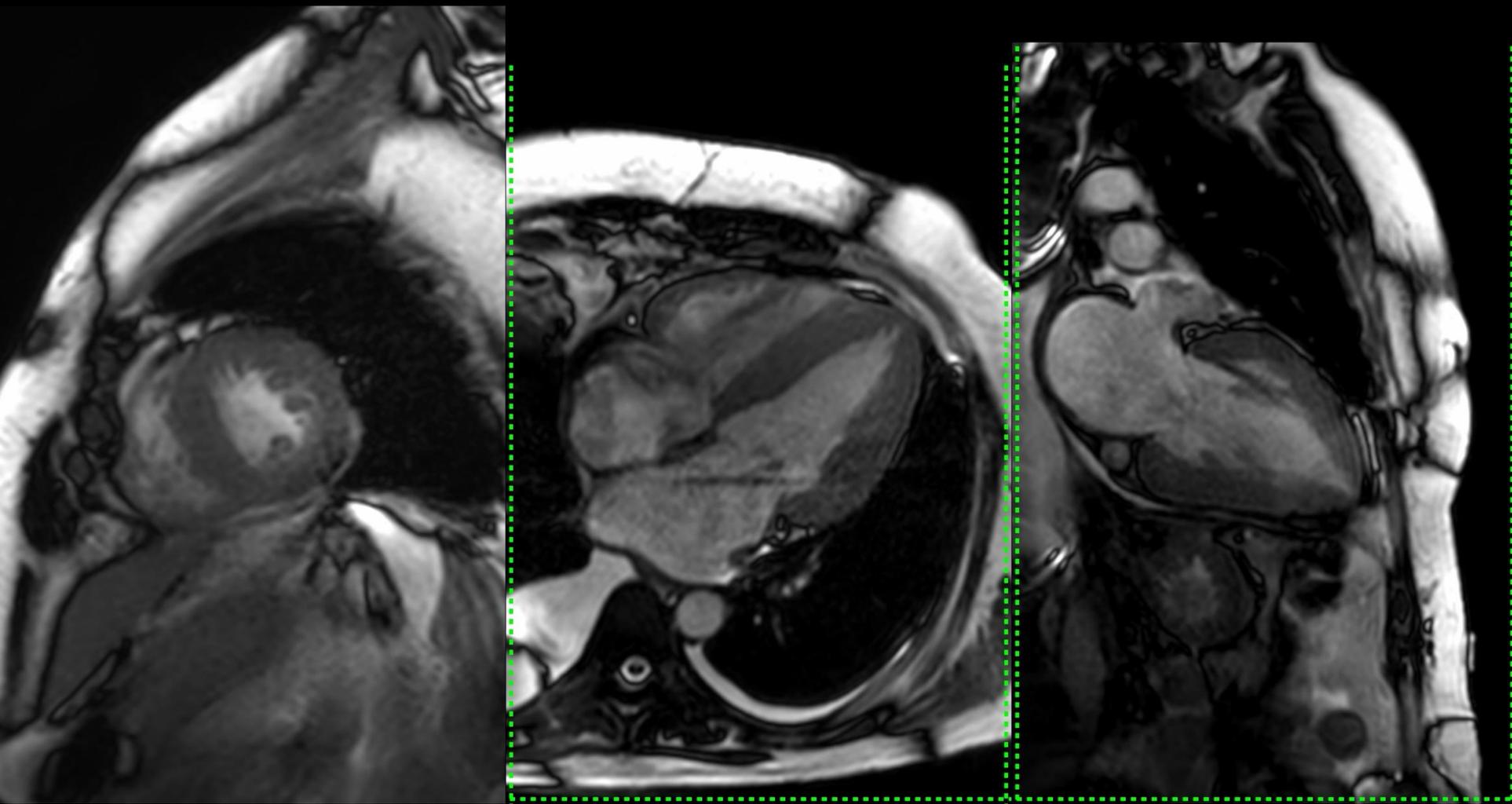
Infiltration / fibrosis

# Other types of enhancement

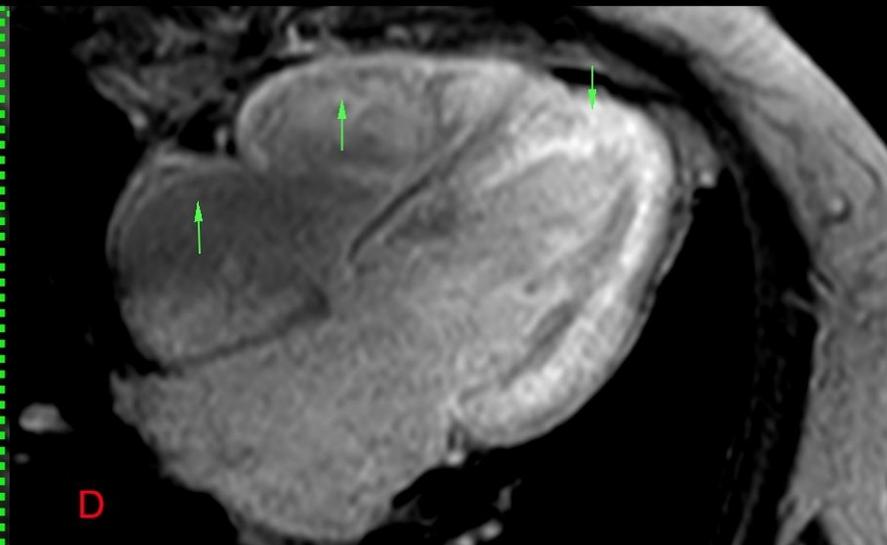
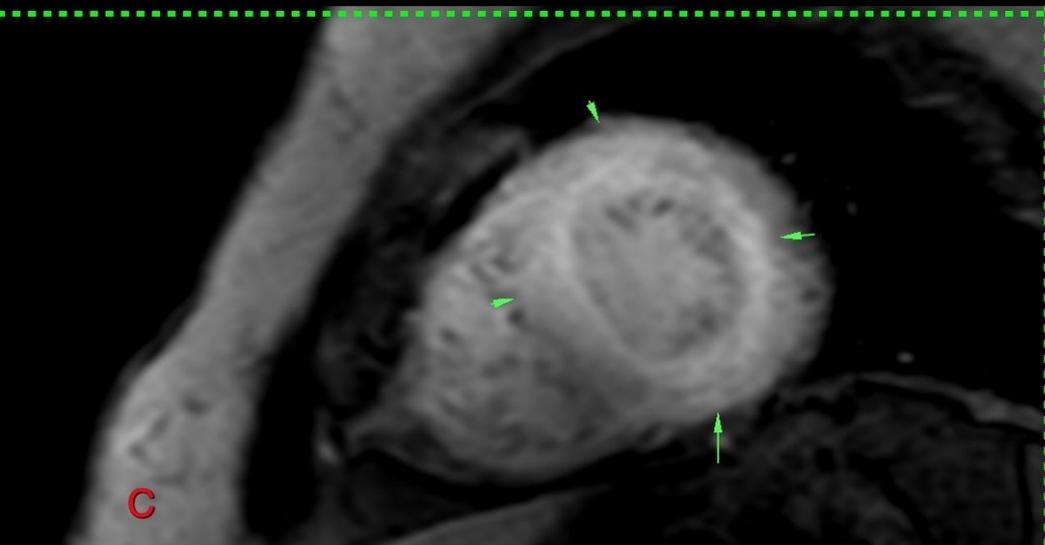
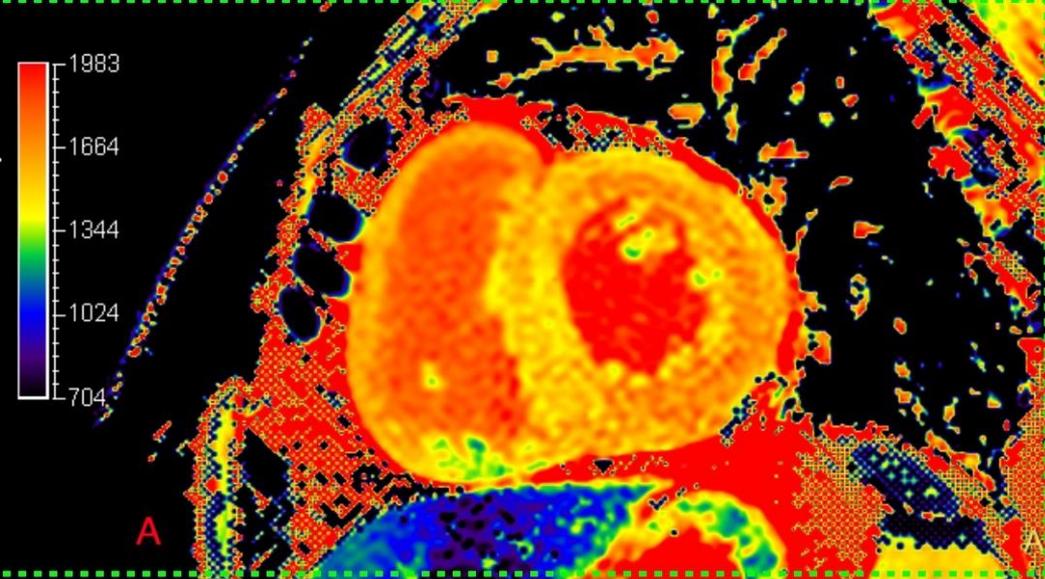


Restrictive physiology





53-years old man in failure



## Amyloidosis

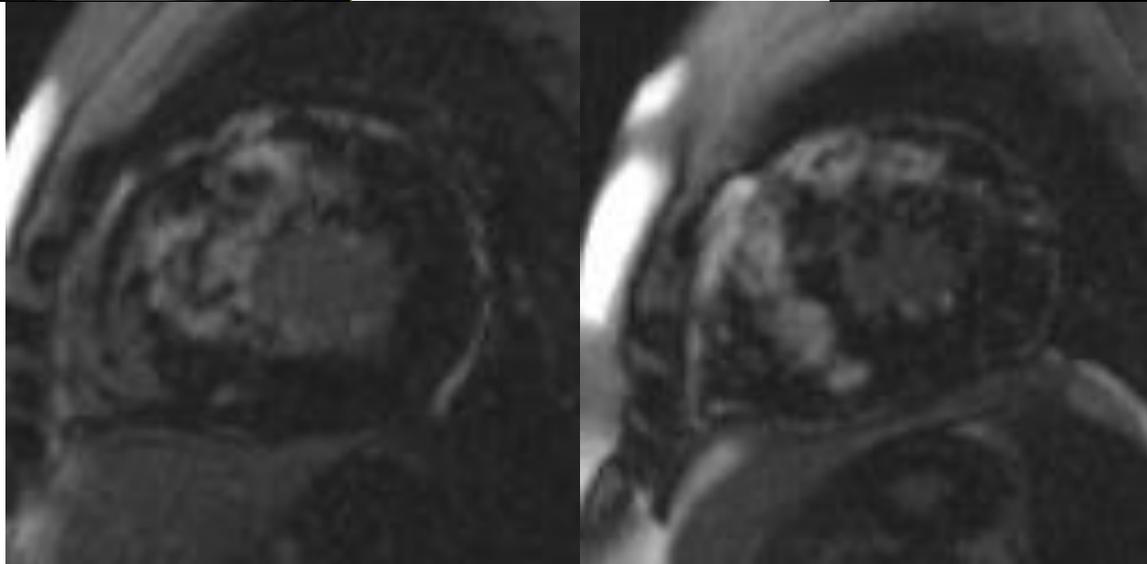
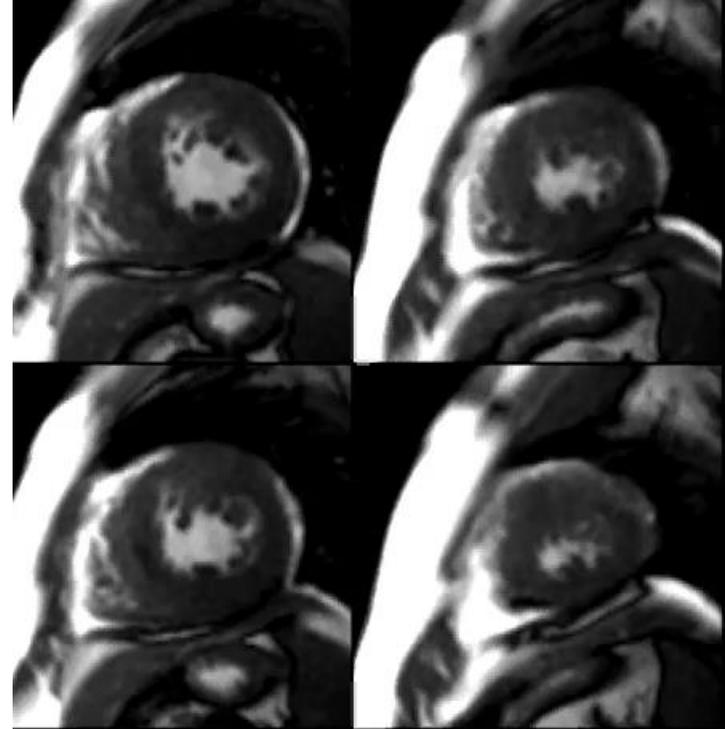
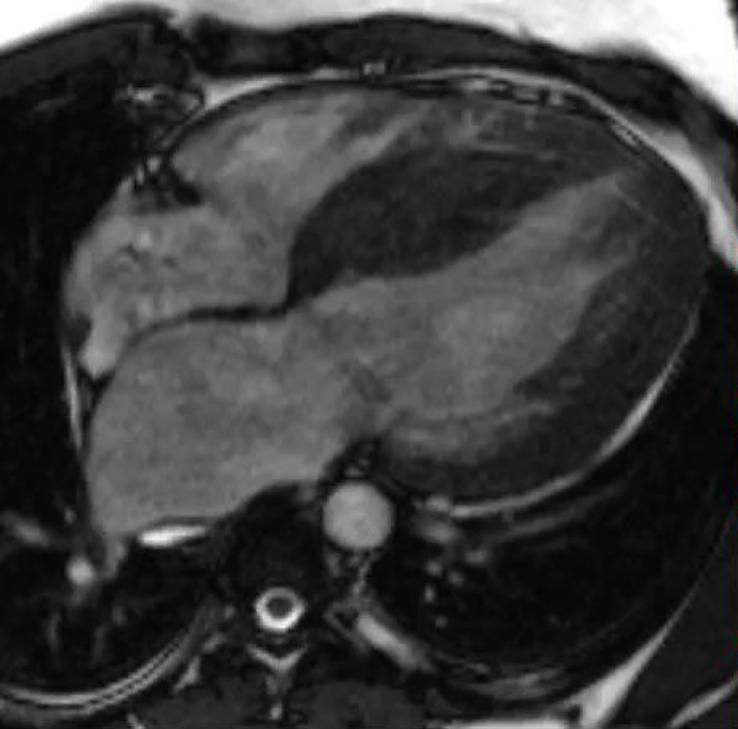
# Sudden Cardiac Death Risk Stratification

## LGE

- Hypertrophic cardiomyopathy
- Dilated cardiomyopathy
- Granulomatous cardiomyopathy - sarcoidosis

# Hypertrophic Cardiomyopathy

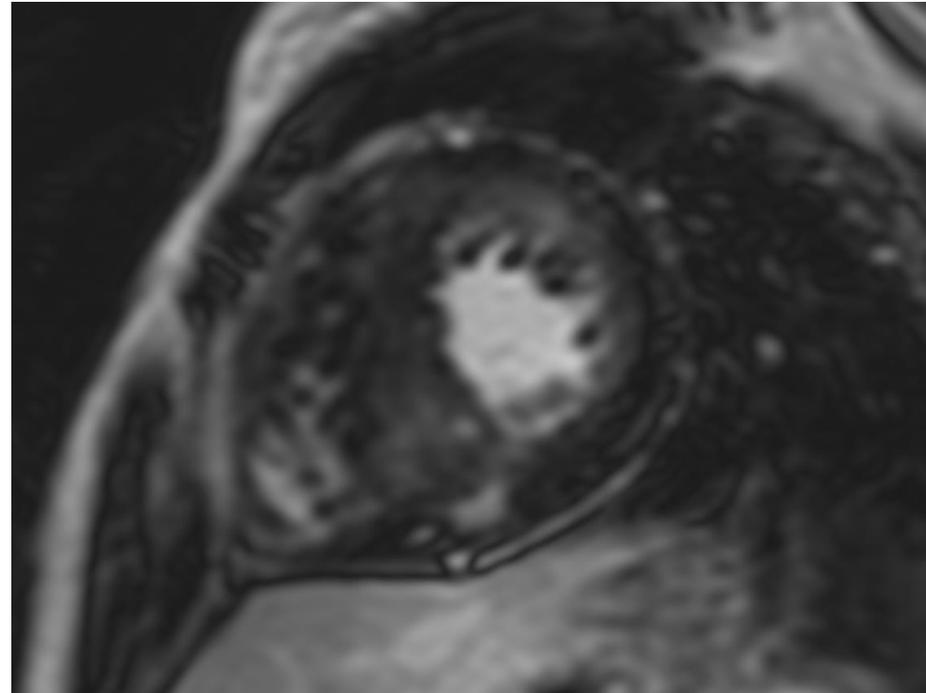
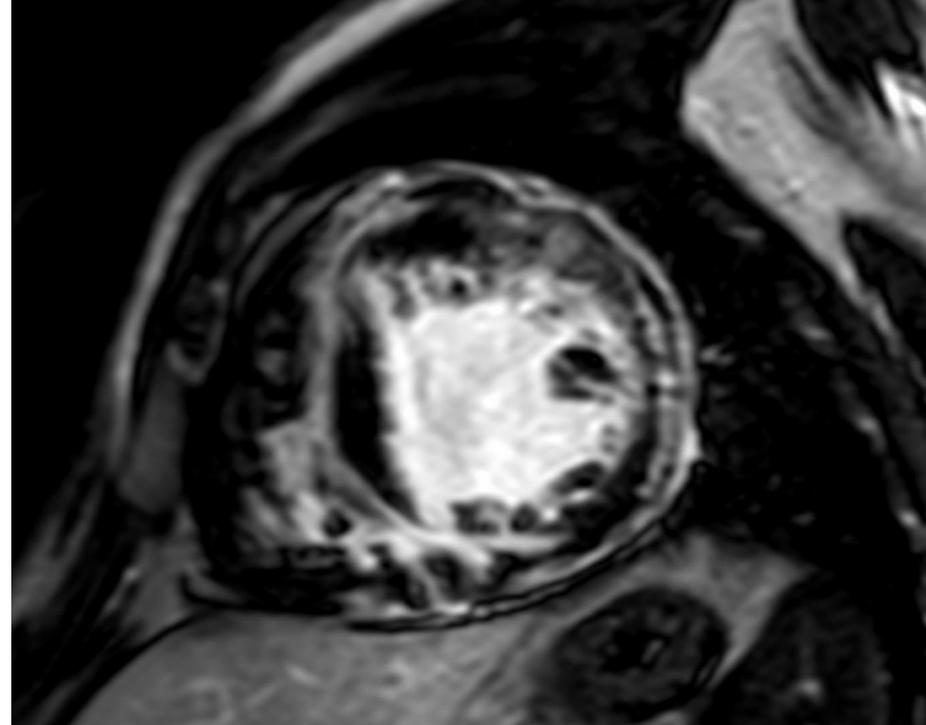
# Case



# 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

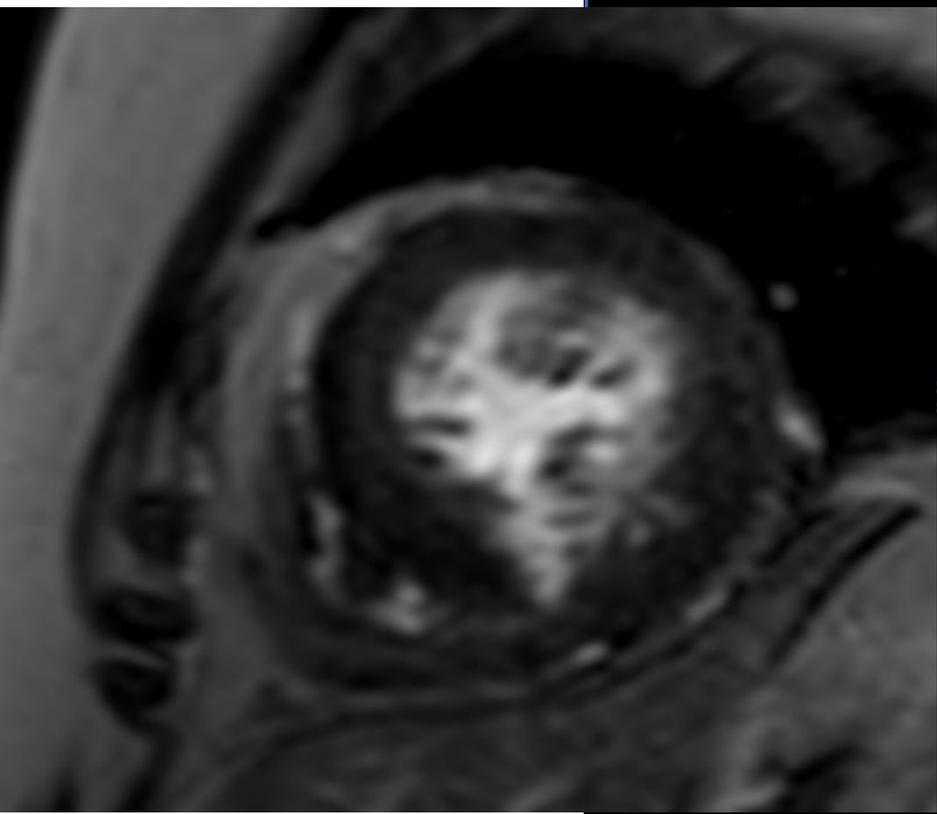


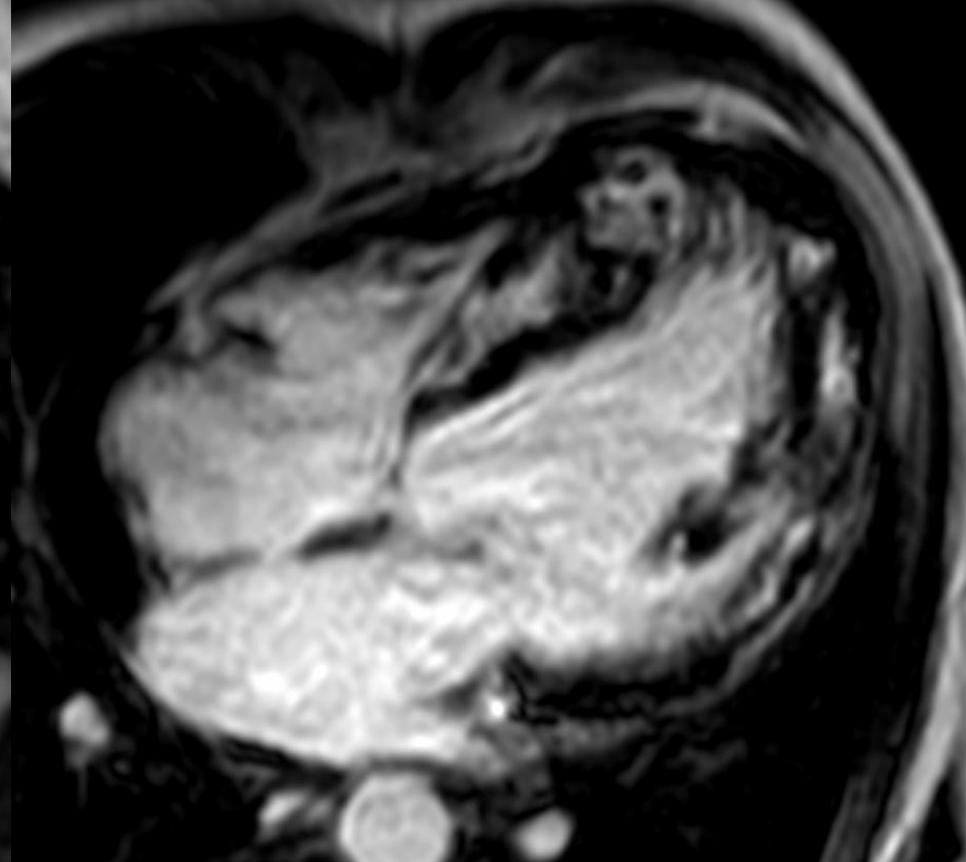
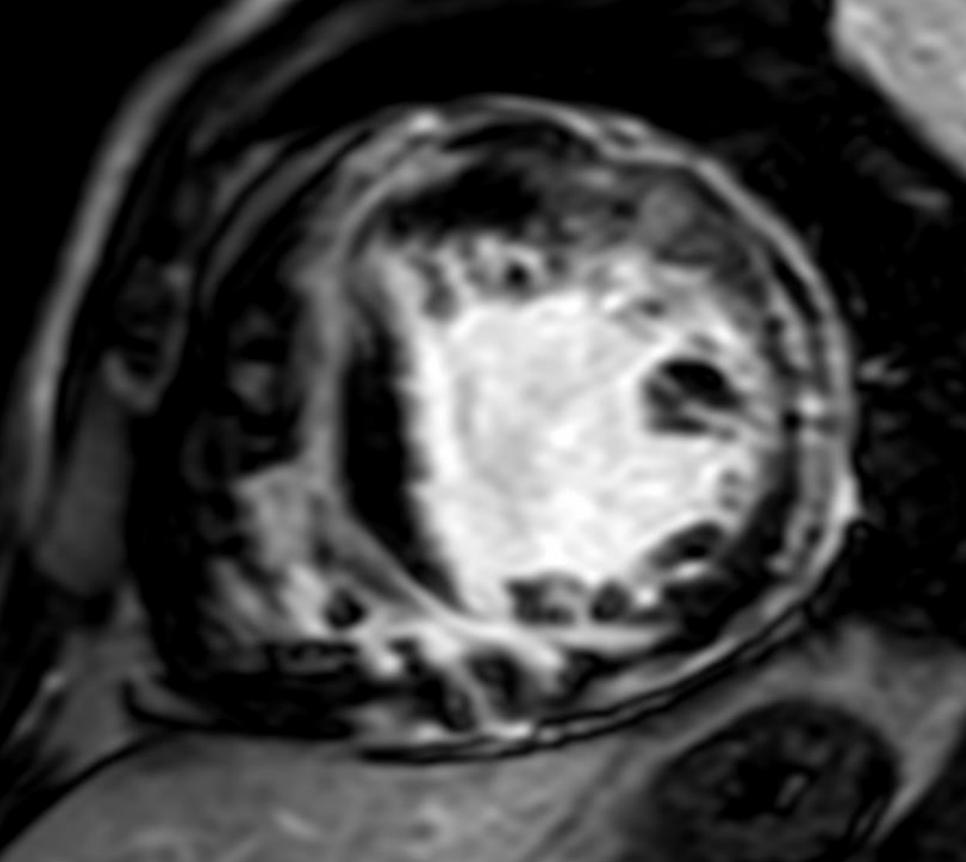
# LGE in HCM

## PERFUSE study

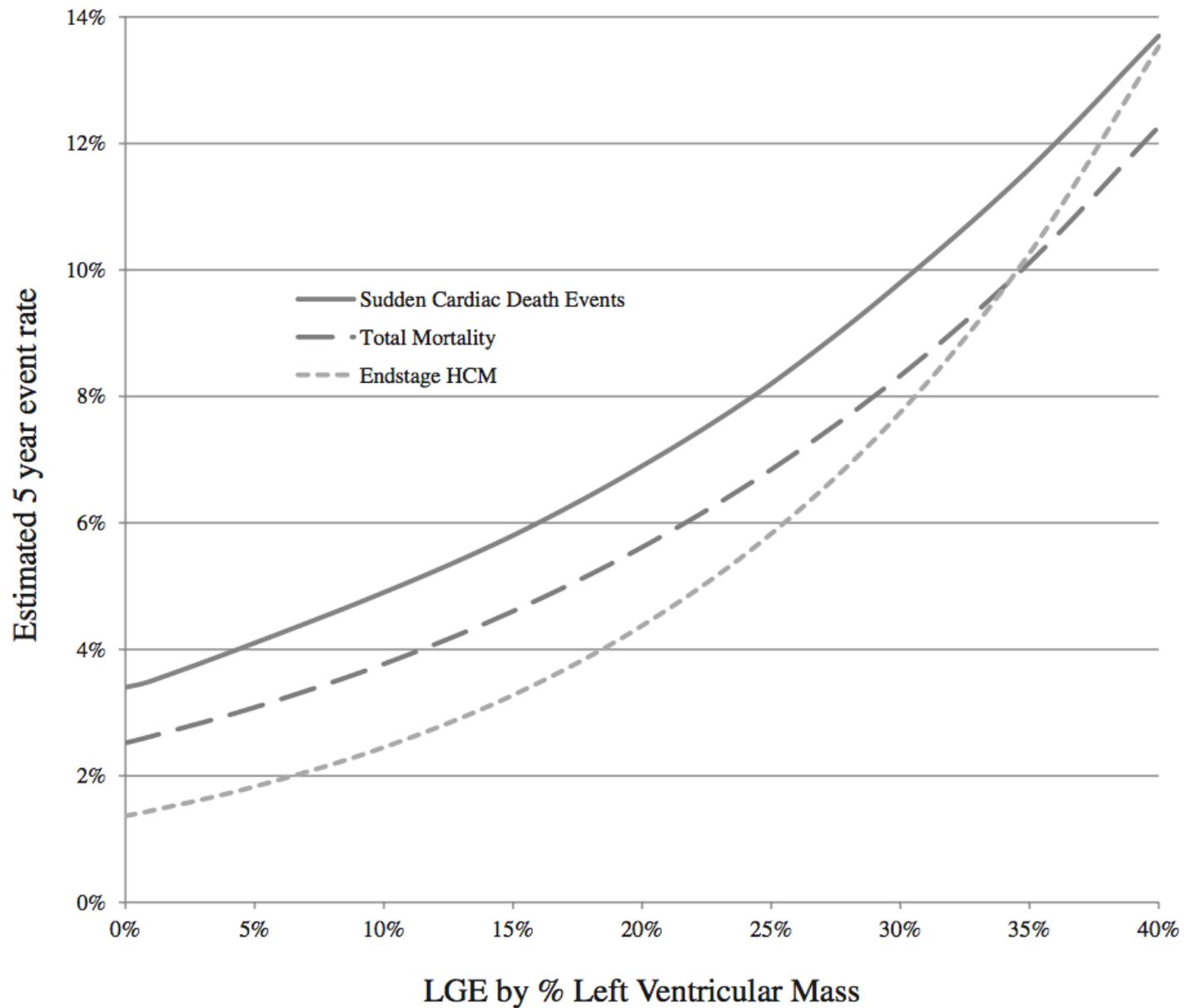
- 1293 patients over a median of 3.3 years
- Absence of LGE is associated with low risk (but not zero risk)
- The mere presence of LGE is not a risk factor
- LGE of >15% is associated with a 2-fold risk of SCD even in the presence of 1 additional risk factor
- The relationship is linear

	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





43%

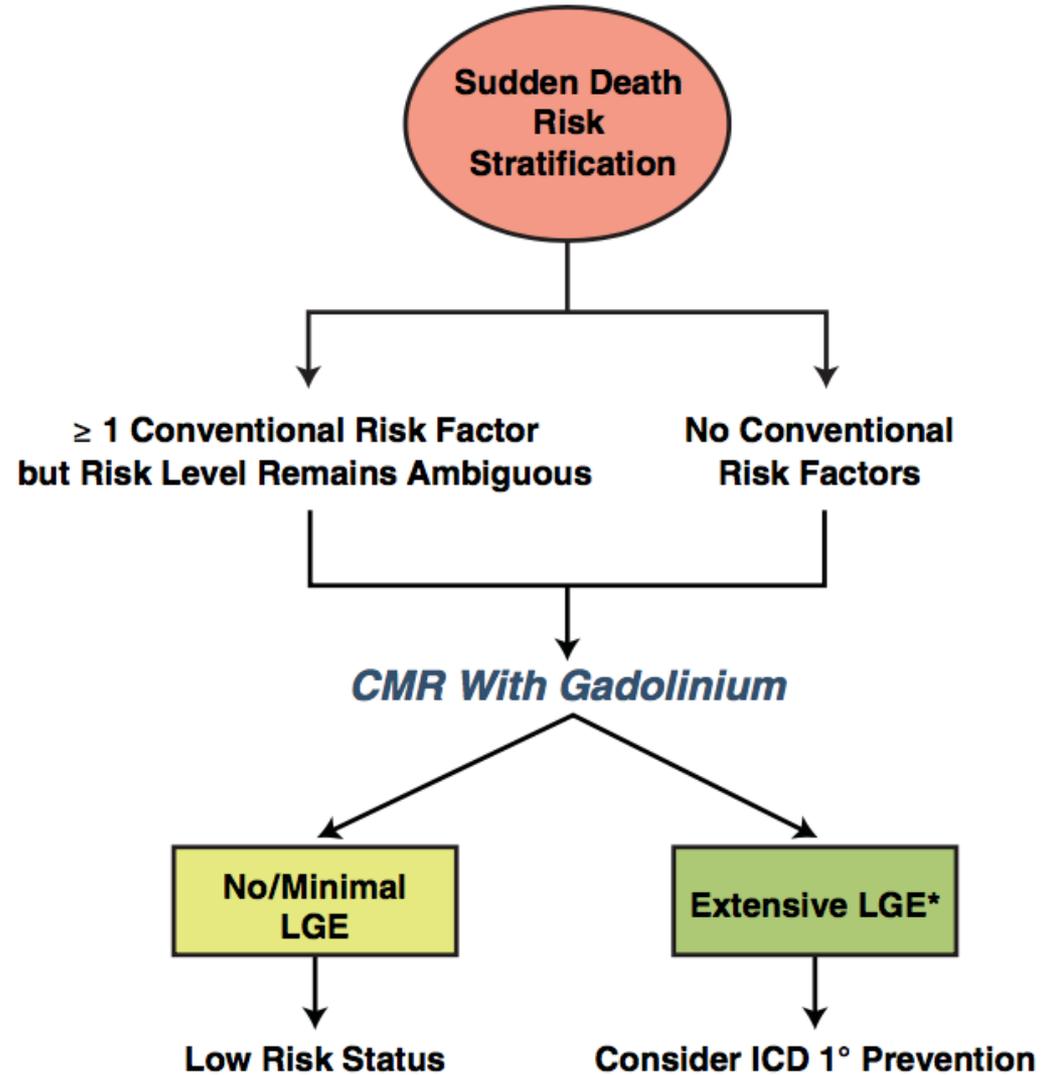


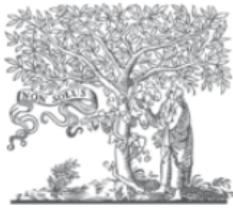
# LGE in HCM

## 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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# Journal of the American College of Cardiology

Volume 72, Issue 8, 21 August 2018, Pages 857-870



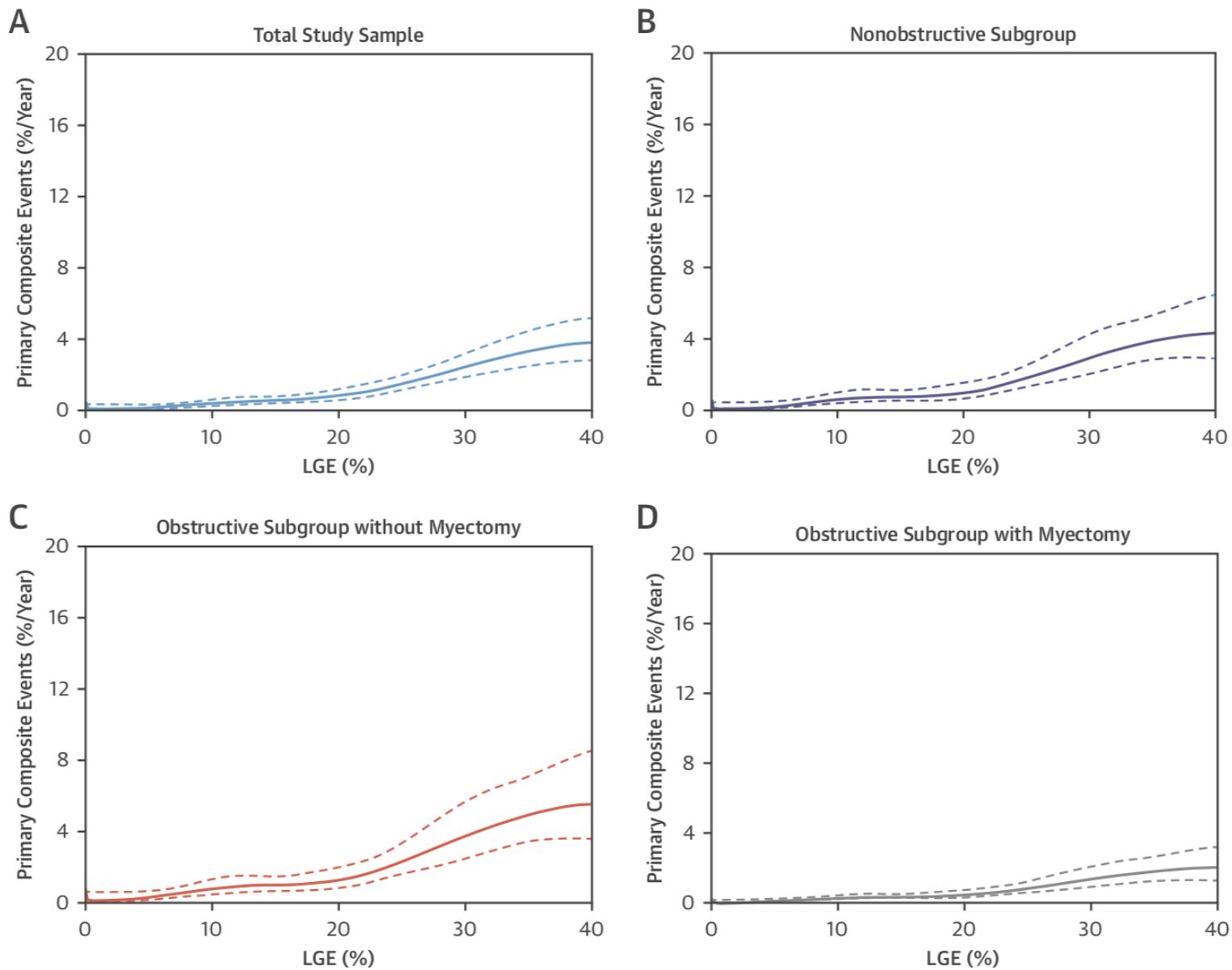
Original Investigation

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

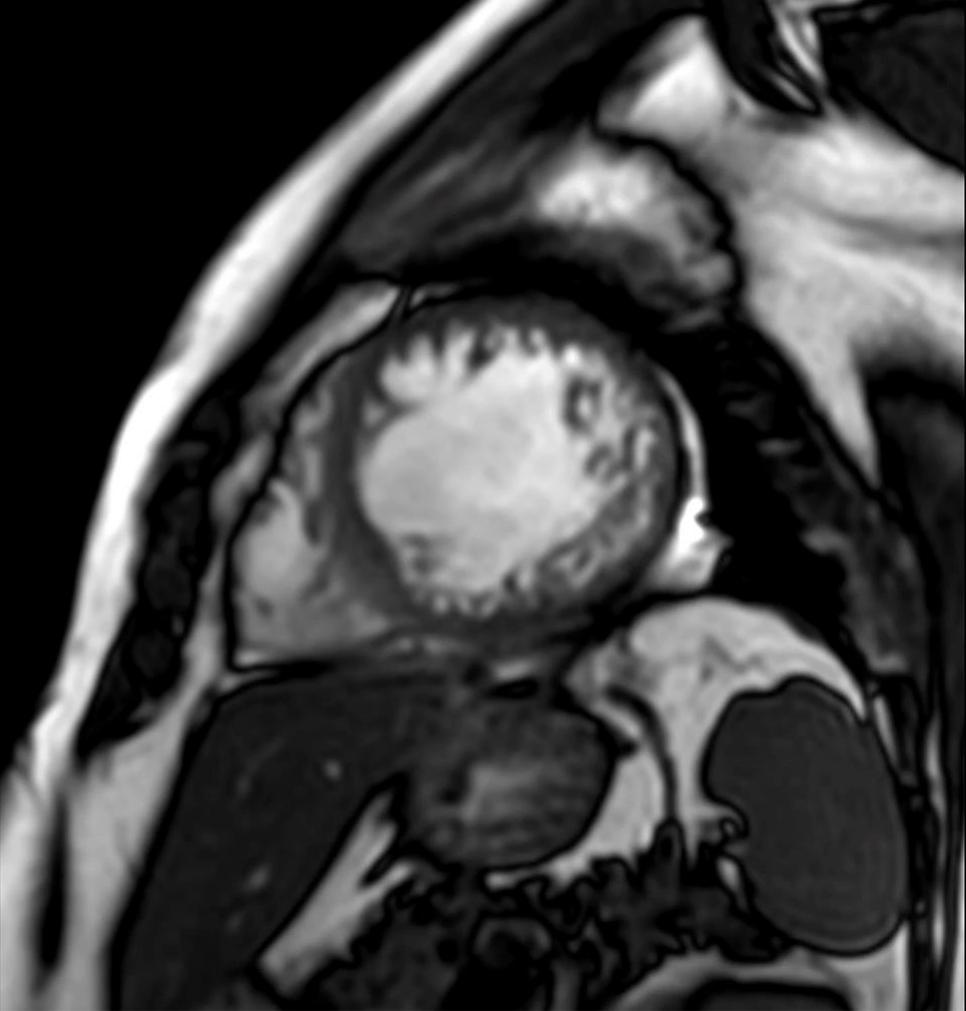
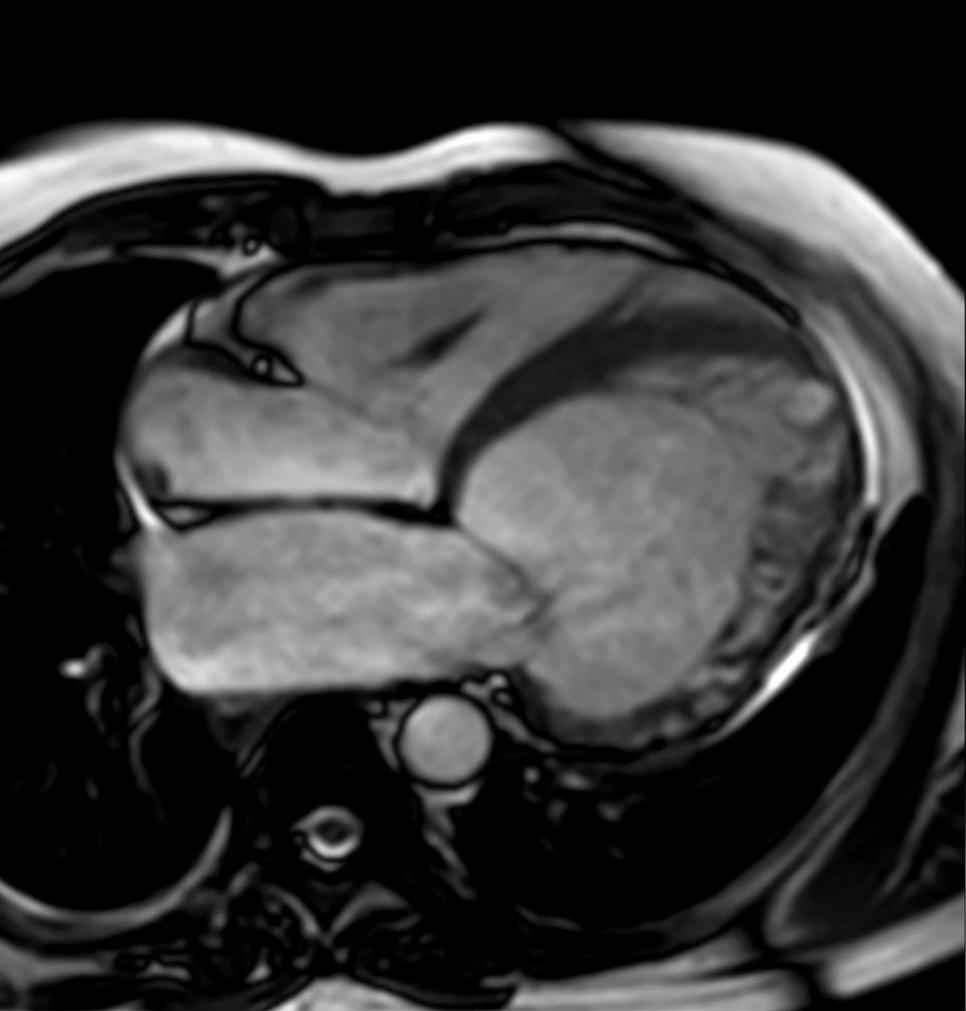
Amgad Mentias MD, Pejman Raeisi-Giglou MD, Nicholas G. Smedira MD, Ke Feng MD, [Kimi Sato MD, PhD](#), Oussama Wazni MD, Mohamad Kanj MD, Scott D. Flamm MD, Maran Thamilarsan MD, Zoran B. Popovic MD, PhD, Harry M. Lever MD, Milind Y. Desai MD   

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.

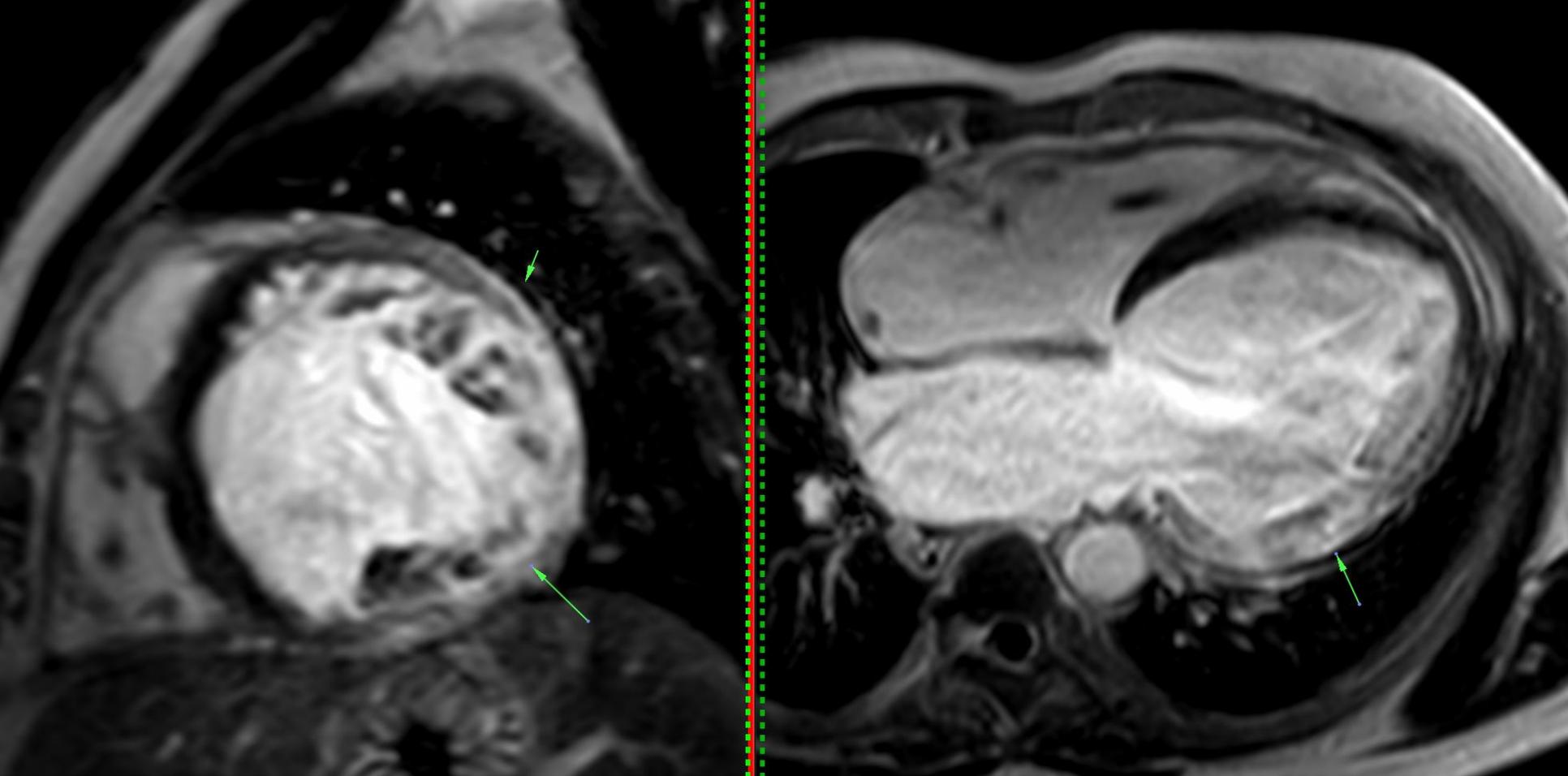
**FIGURE 2** Quadratic Spline Analysis Demonstrating Estimated Risk of Primary Composite Event at 5 Years for %LGE



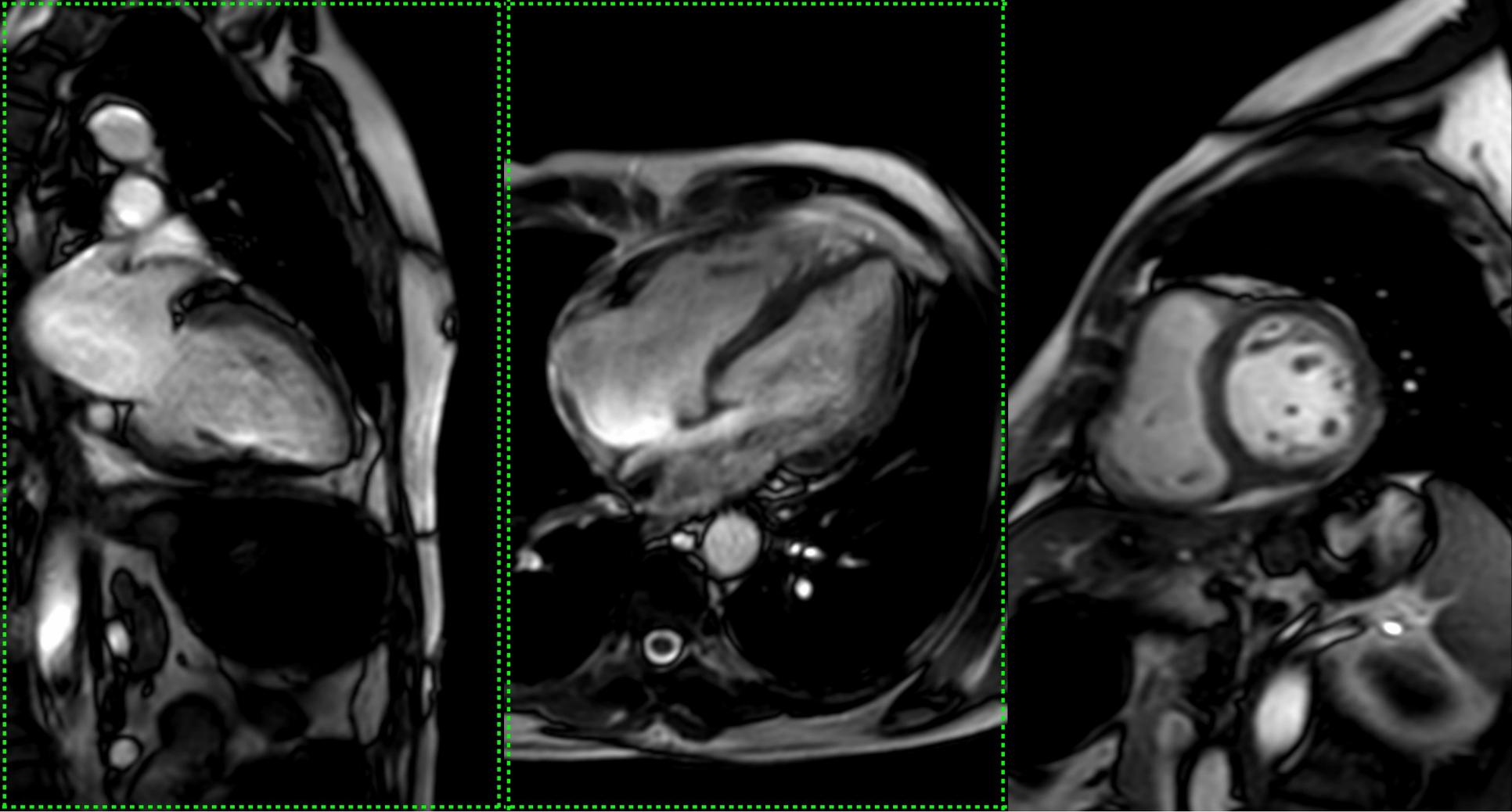
# Dilated Cardiomyopathy



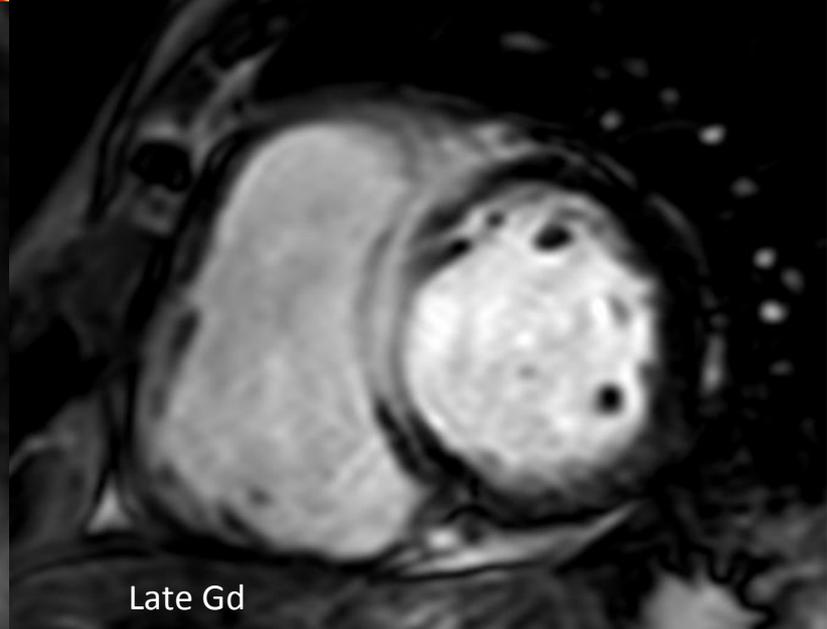
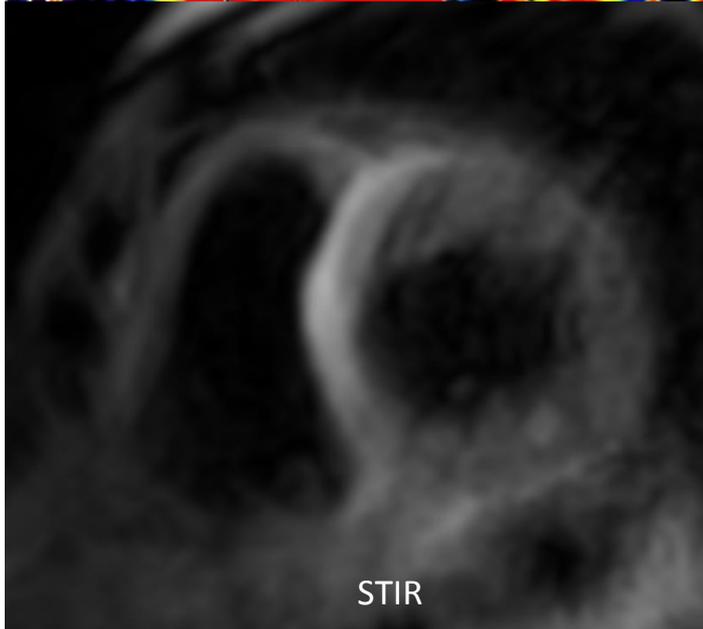
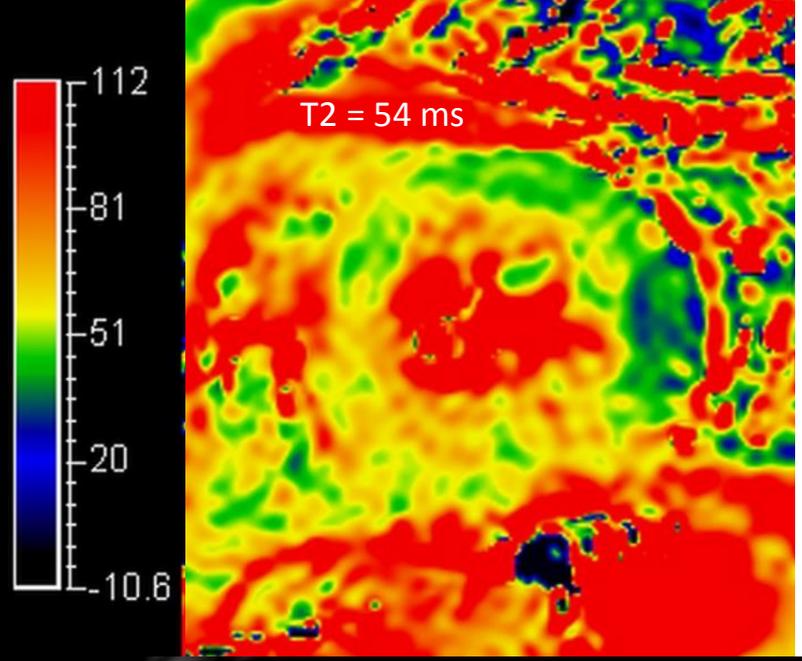
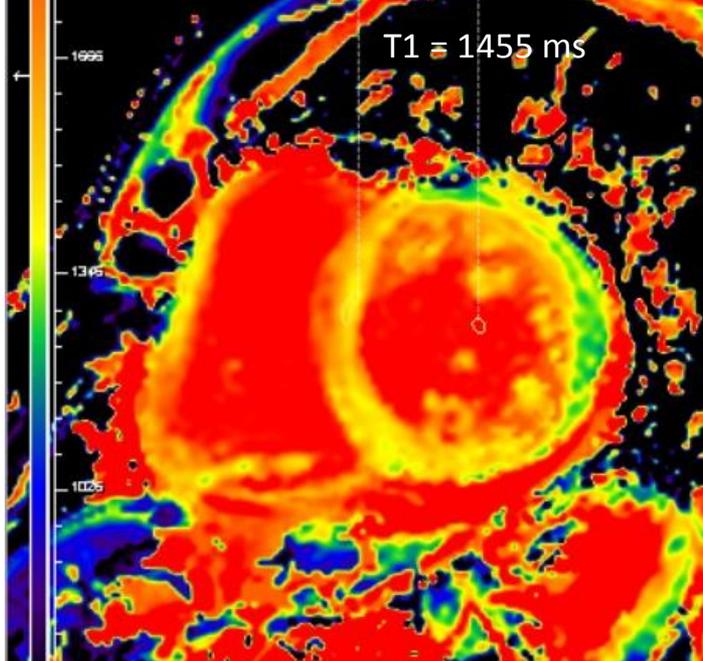
49-years old man with an EF of 18% - DCM



Fibrosis



43-years old man

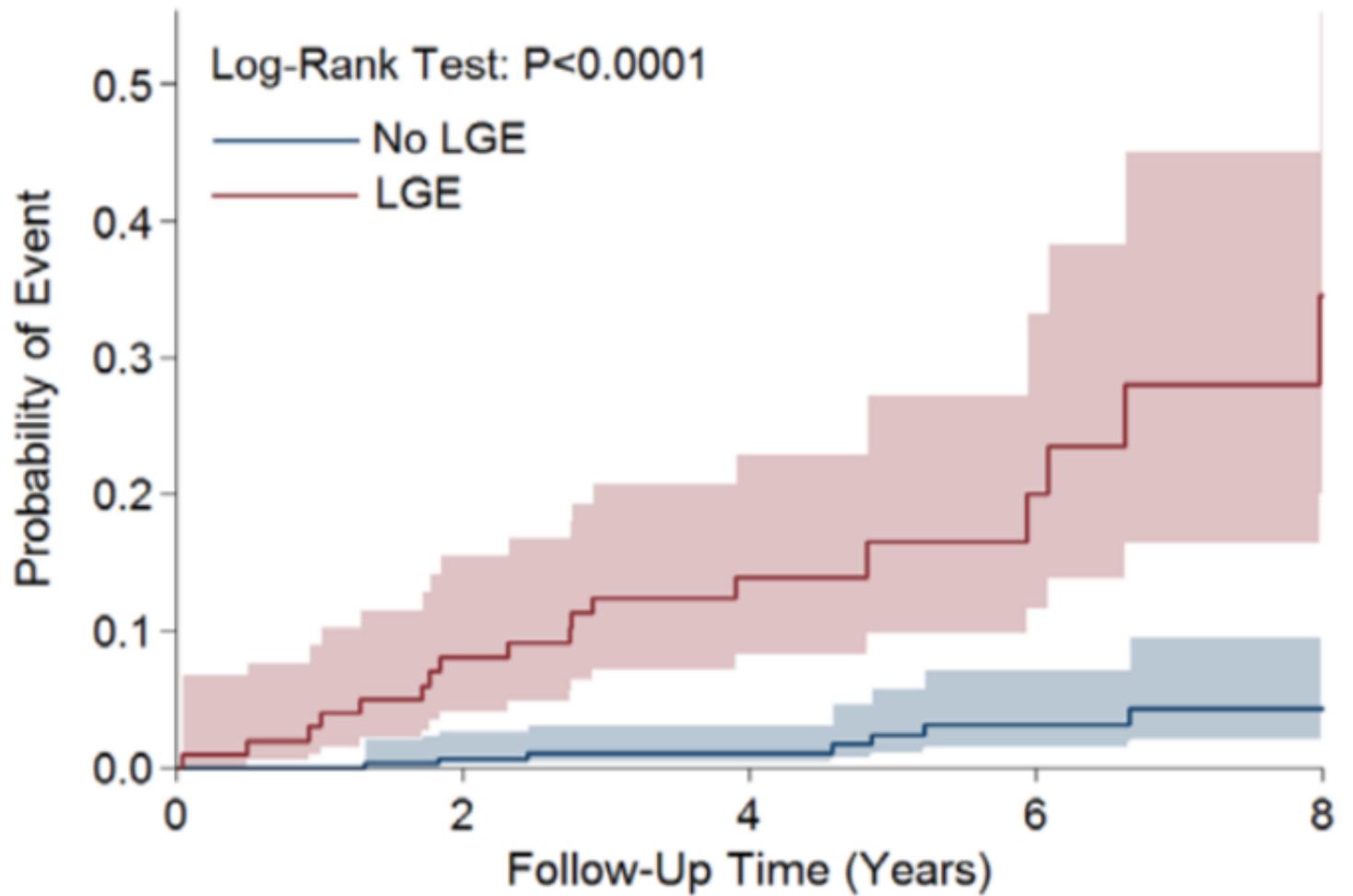


Fibrosis

# LGE in DCM

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

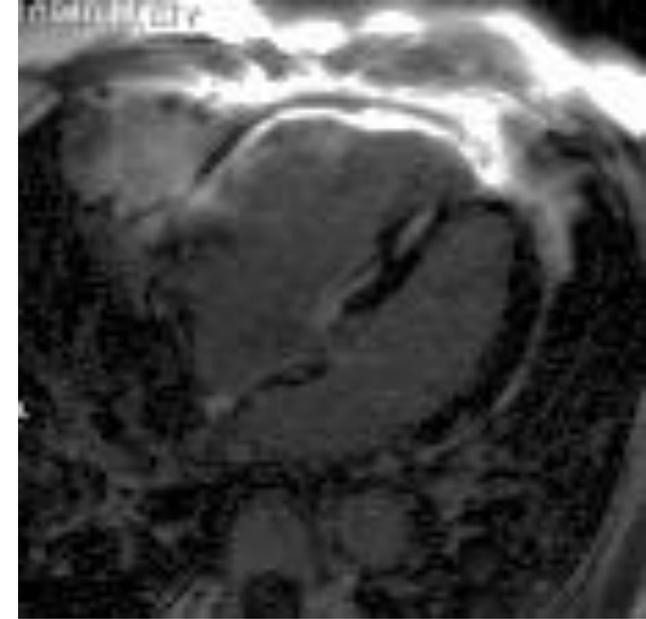
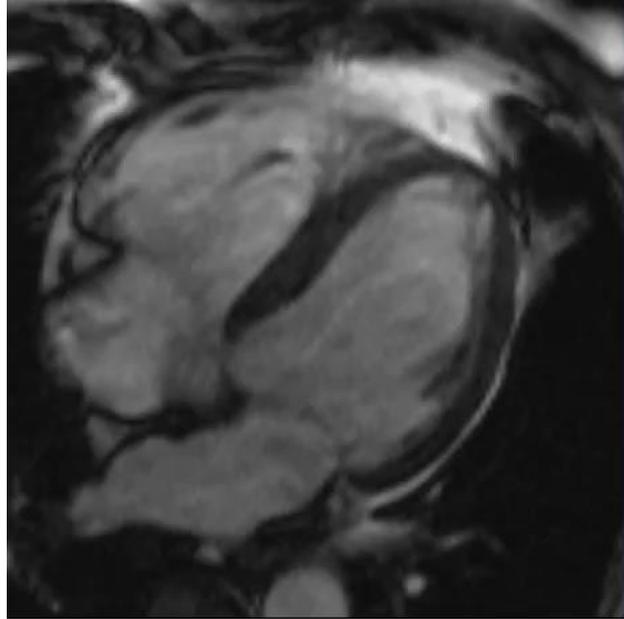
- If there is LGE, there is increased risk of sudden cardiac death



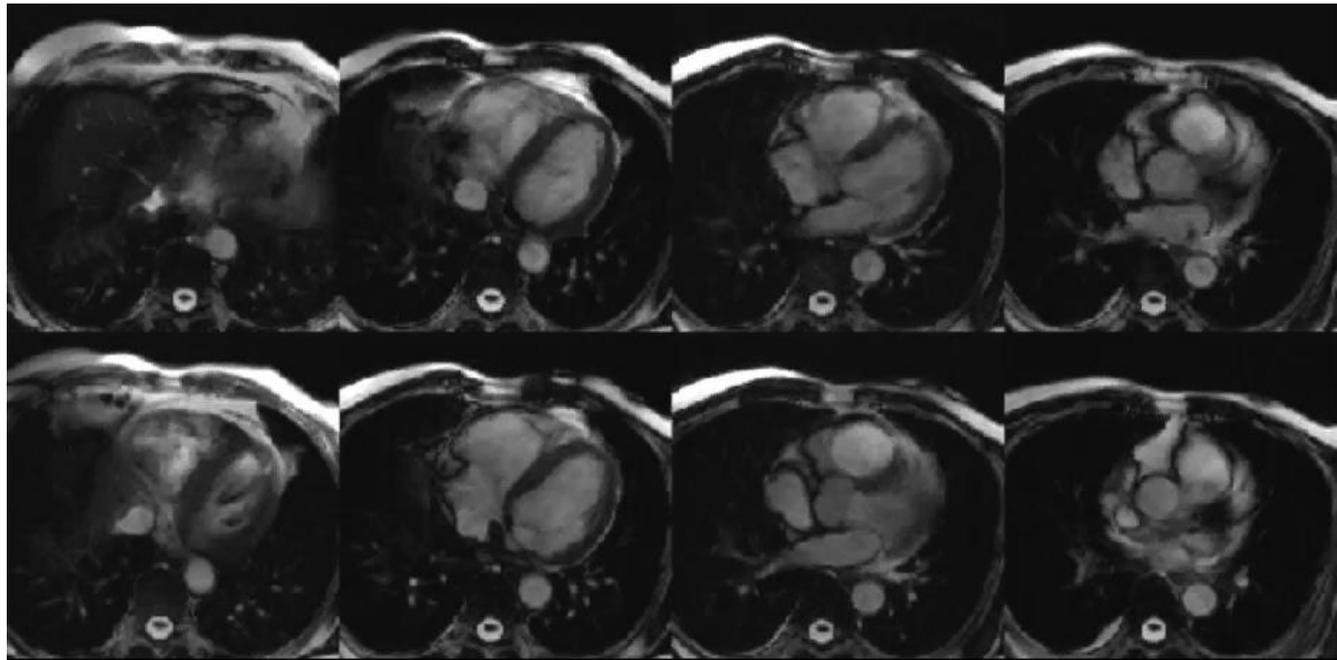
Number at Risk

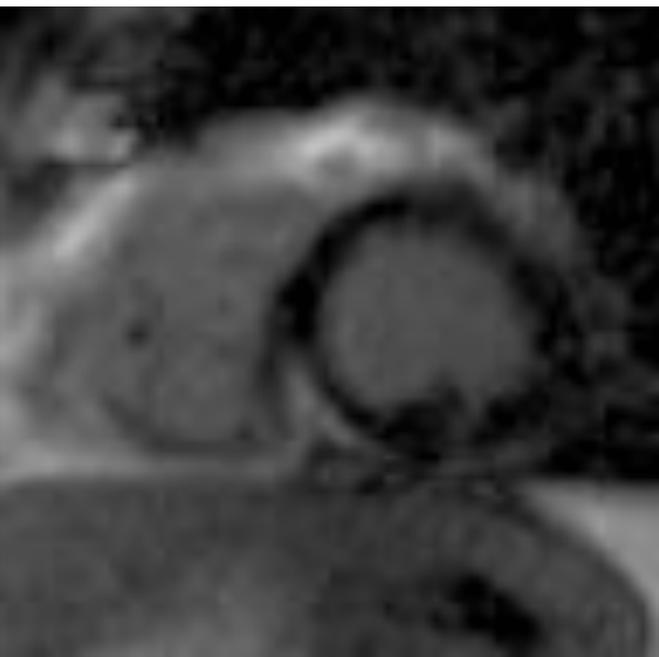
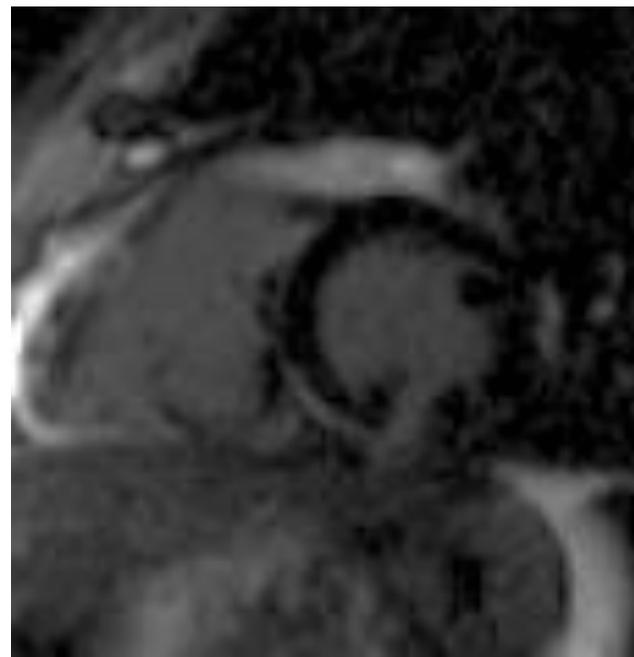
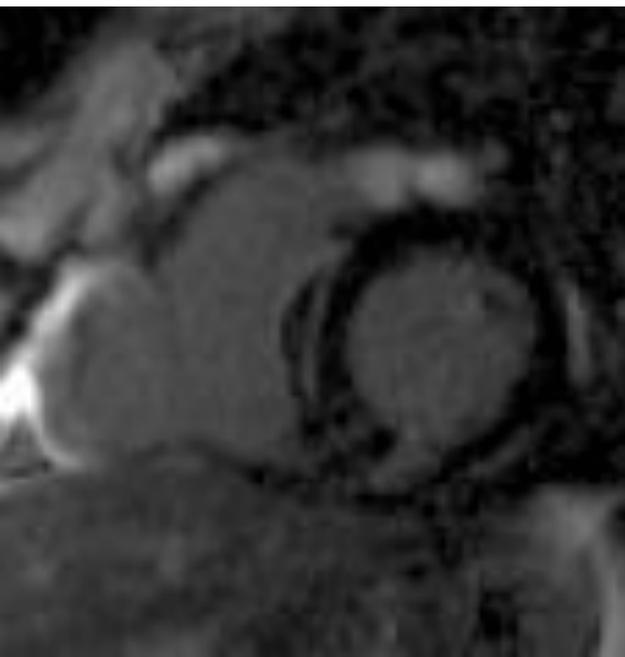
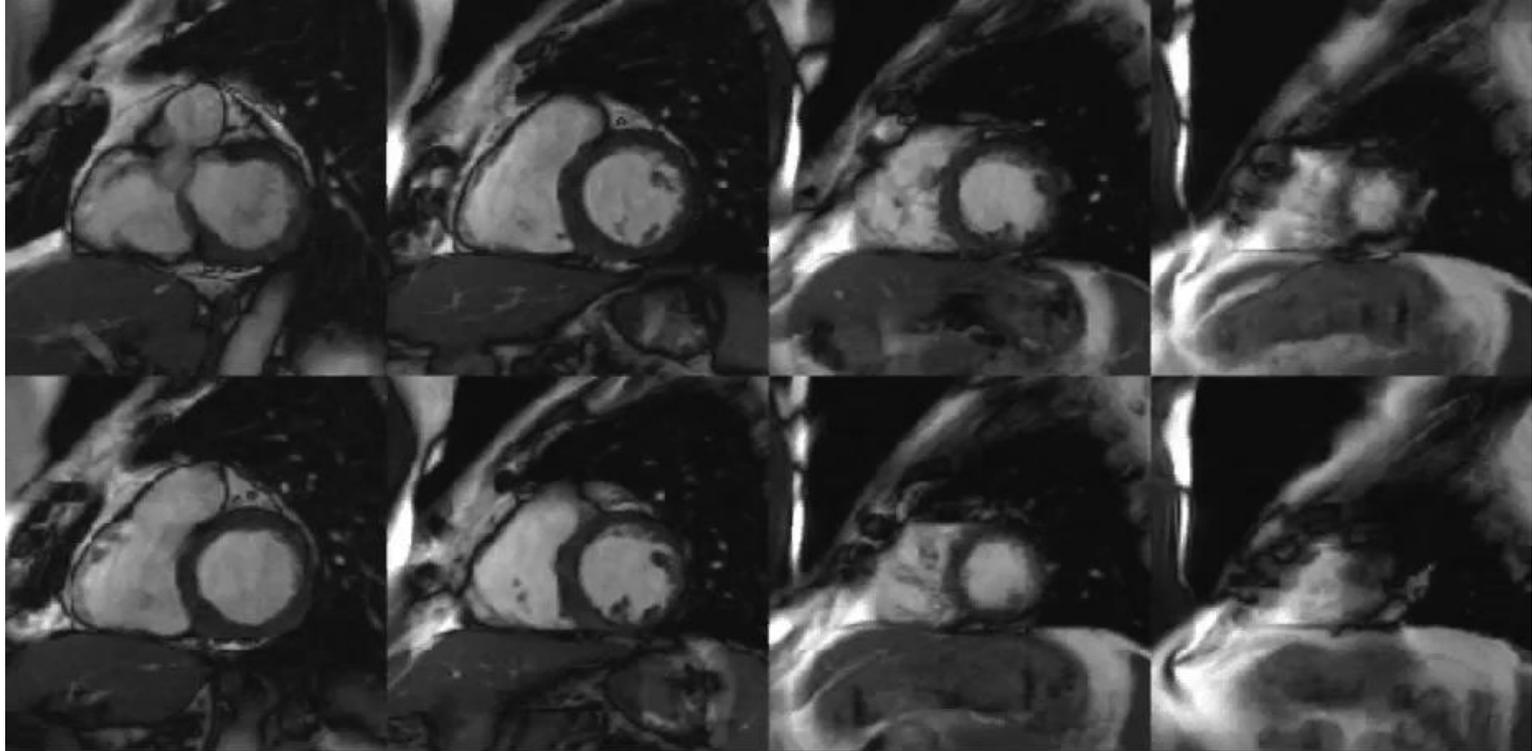
No LGE	298	289	182	103	54
LGE	101	89	53	23	10

# Granulomatous Cardiomyopathy

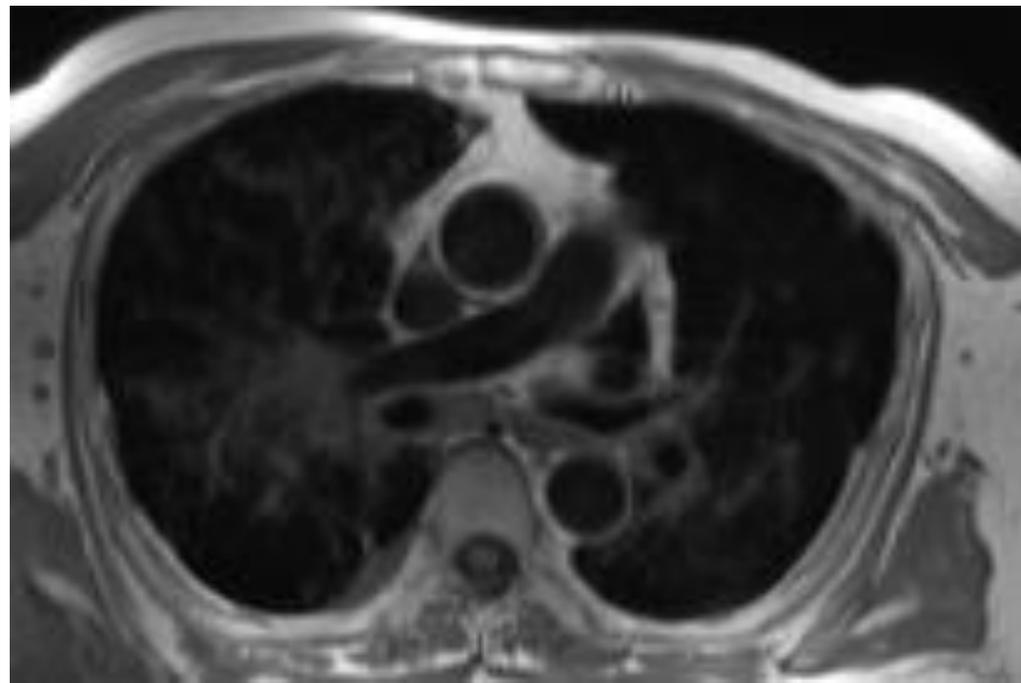
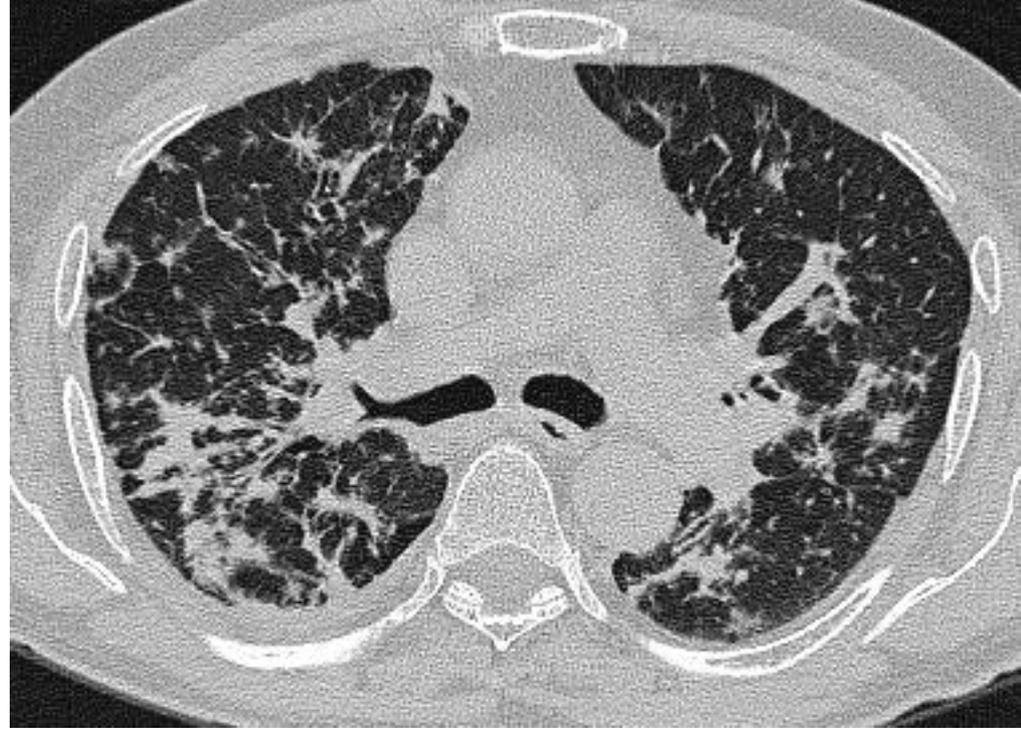


65-years old with  
tachyarrhythmias





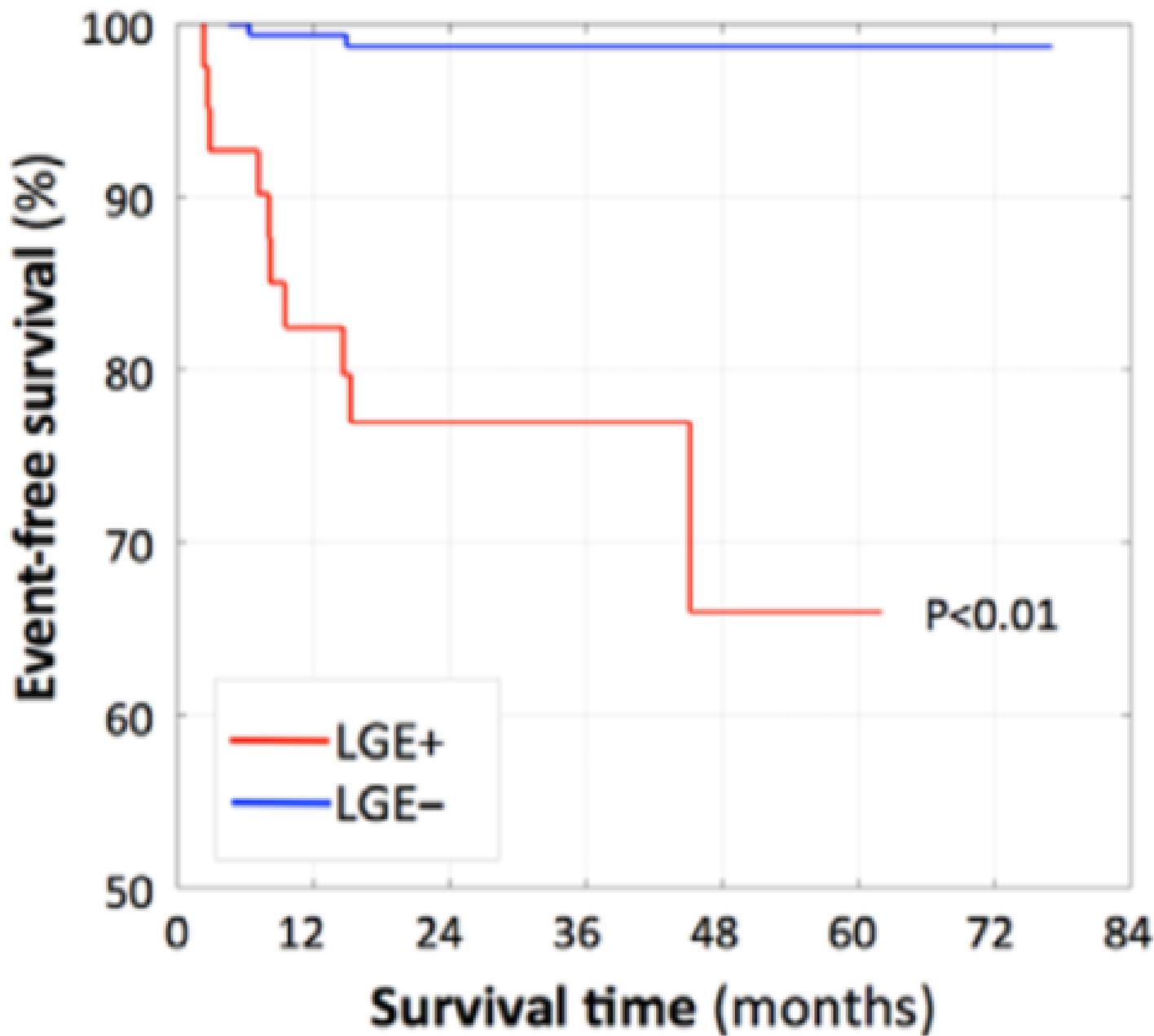
CT chest and black blood MRI axial



# 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



