



INTERNATIONAL HCM SUMMIT

**Boston, MA
October 2017**

HYPERTROPHIC CARDIOMYOPATHY

**A Contemporary and Treatable Genetic Disease:
Diagnosis, Heart Failure Management,
and Prevention of Sudden Death**

#HCMSummitVI

Tufts Medical
Center

HCM, CMR, and LGE: The Newest Risk Marker

Martin Maron, MD

Director, Hypertrophic Cardiomyopathy Center

Tufts Medical Center;

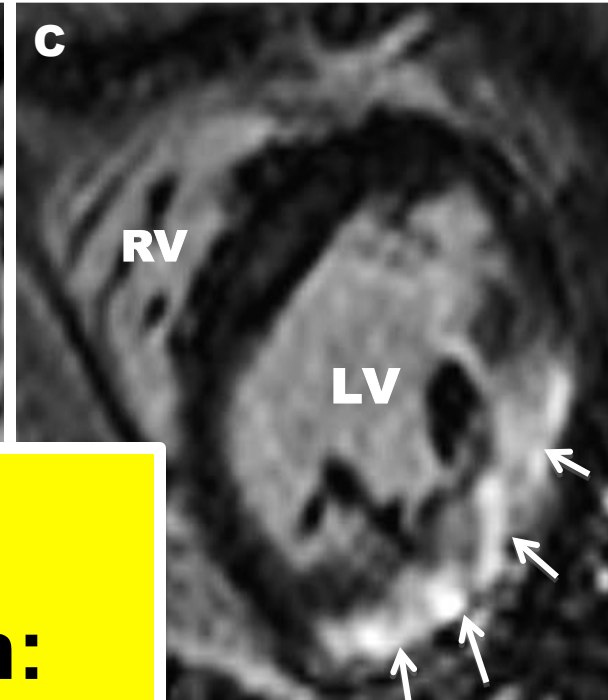
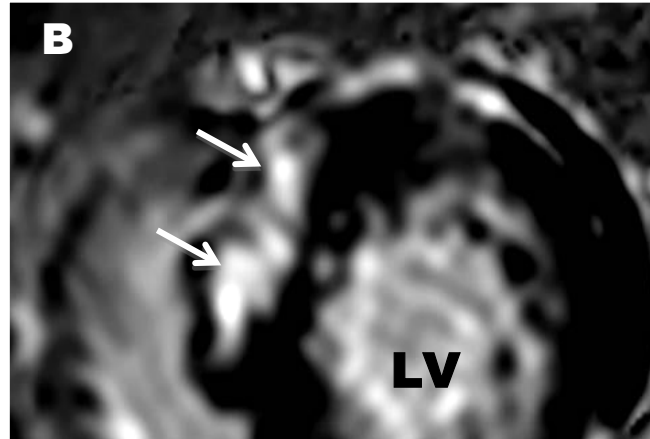
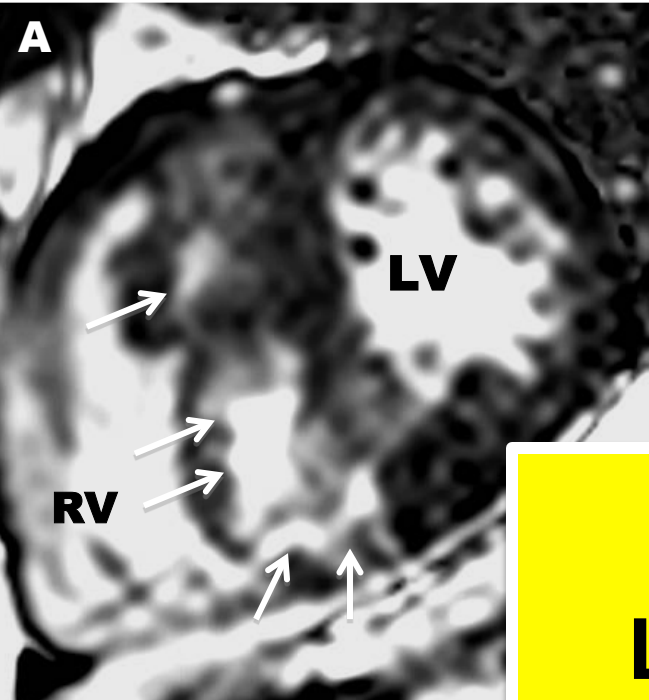
Chanin T. Mast Hypertrophic Cardiomyopathy Center

Morristown Medical Center, NJ

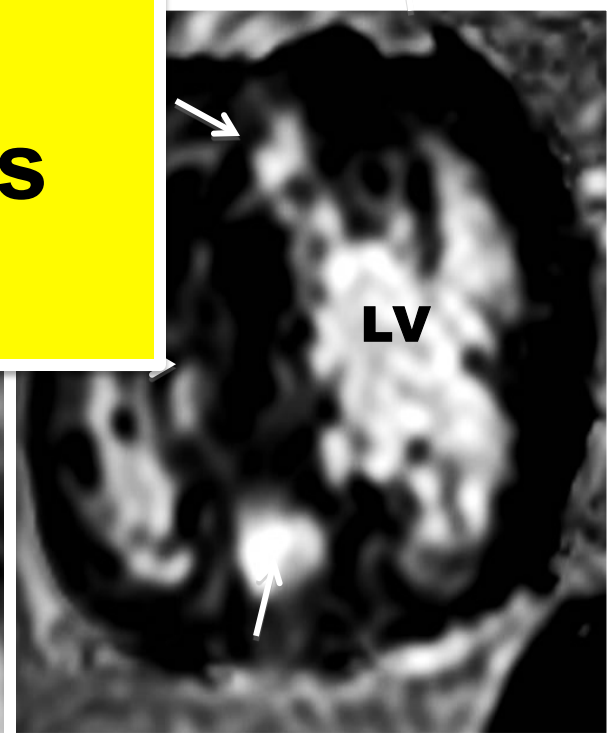
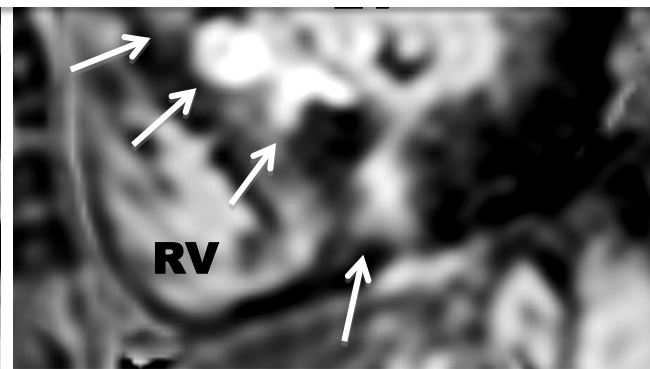
Disclosure: Gadolinium is FDA off-label use for CV imaging

Challenges of Risk Stratification in HCM

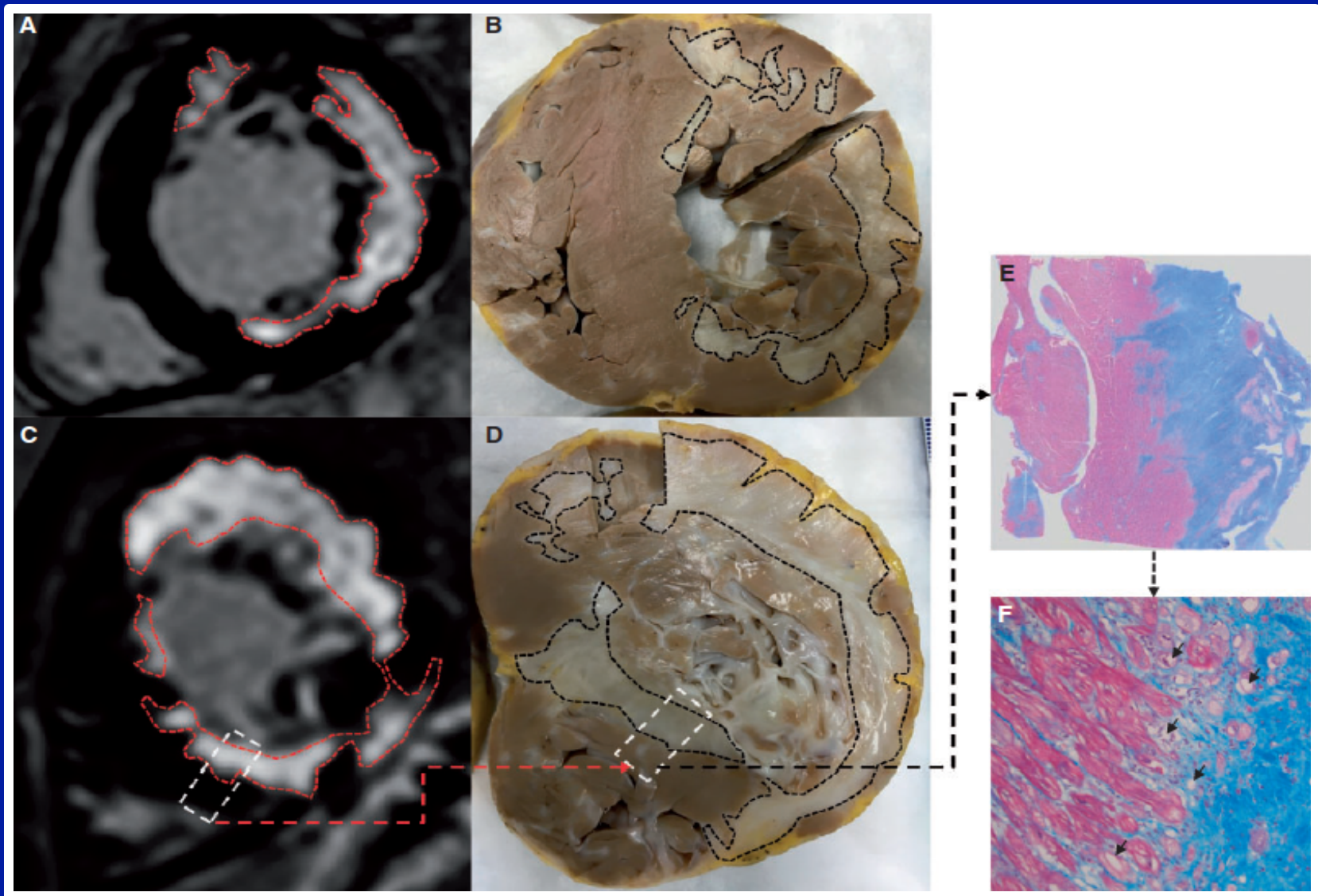




**LGE is present in:
~60%
of HCM Patients**



LGE correlates to Myocardial Fibrosis in HCM

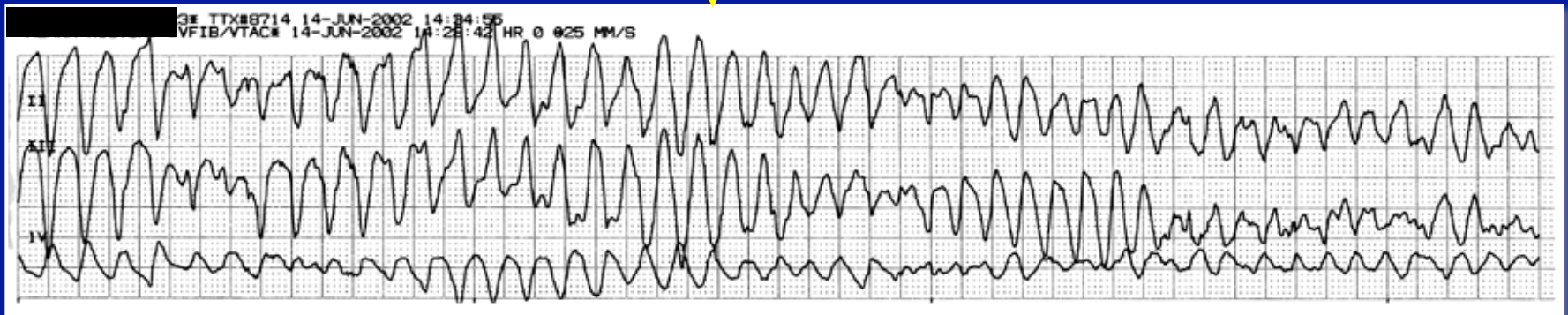
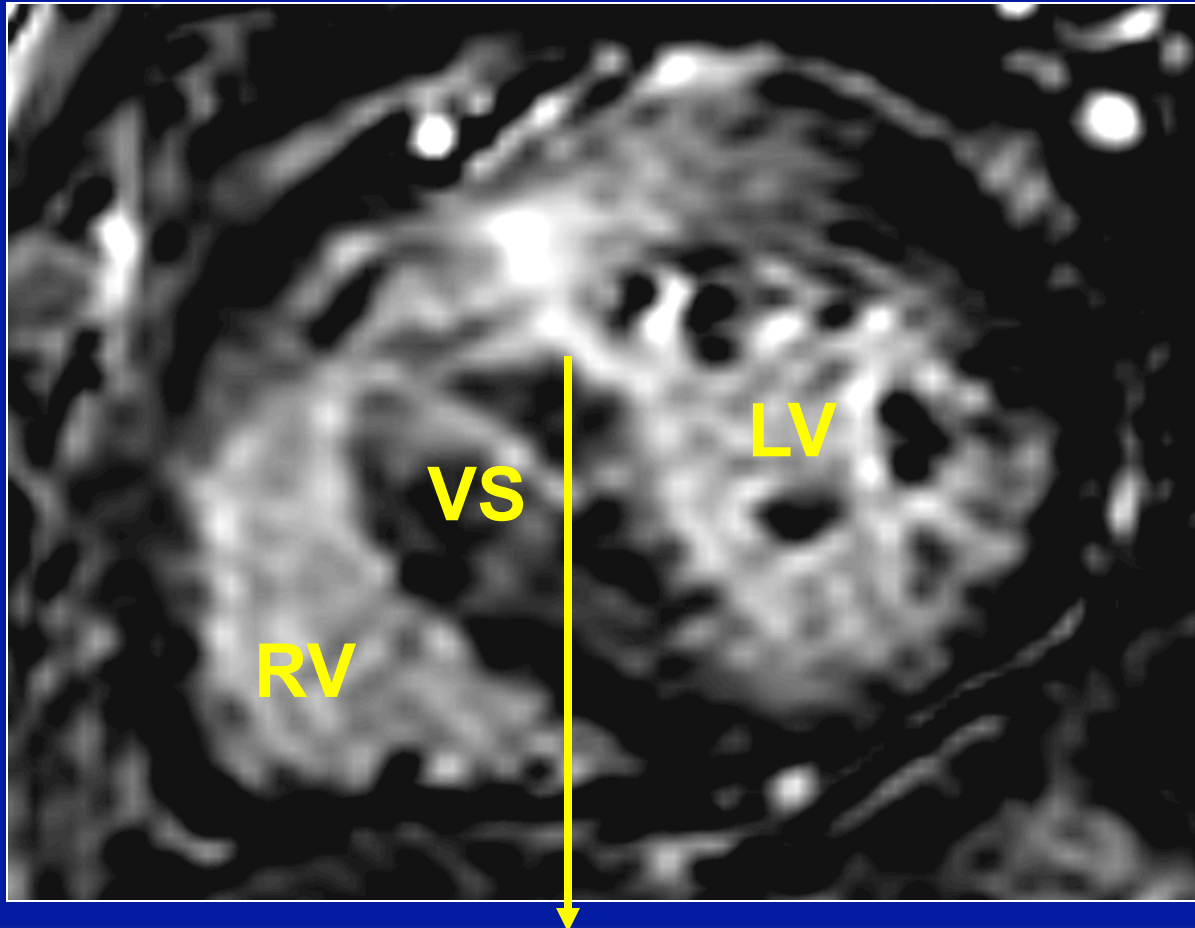


Is LGE *always* fibrosis in HCM?

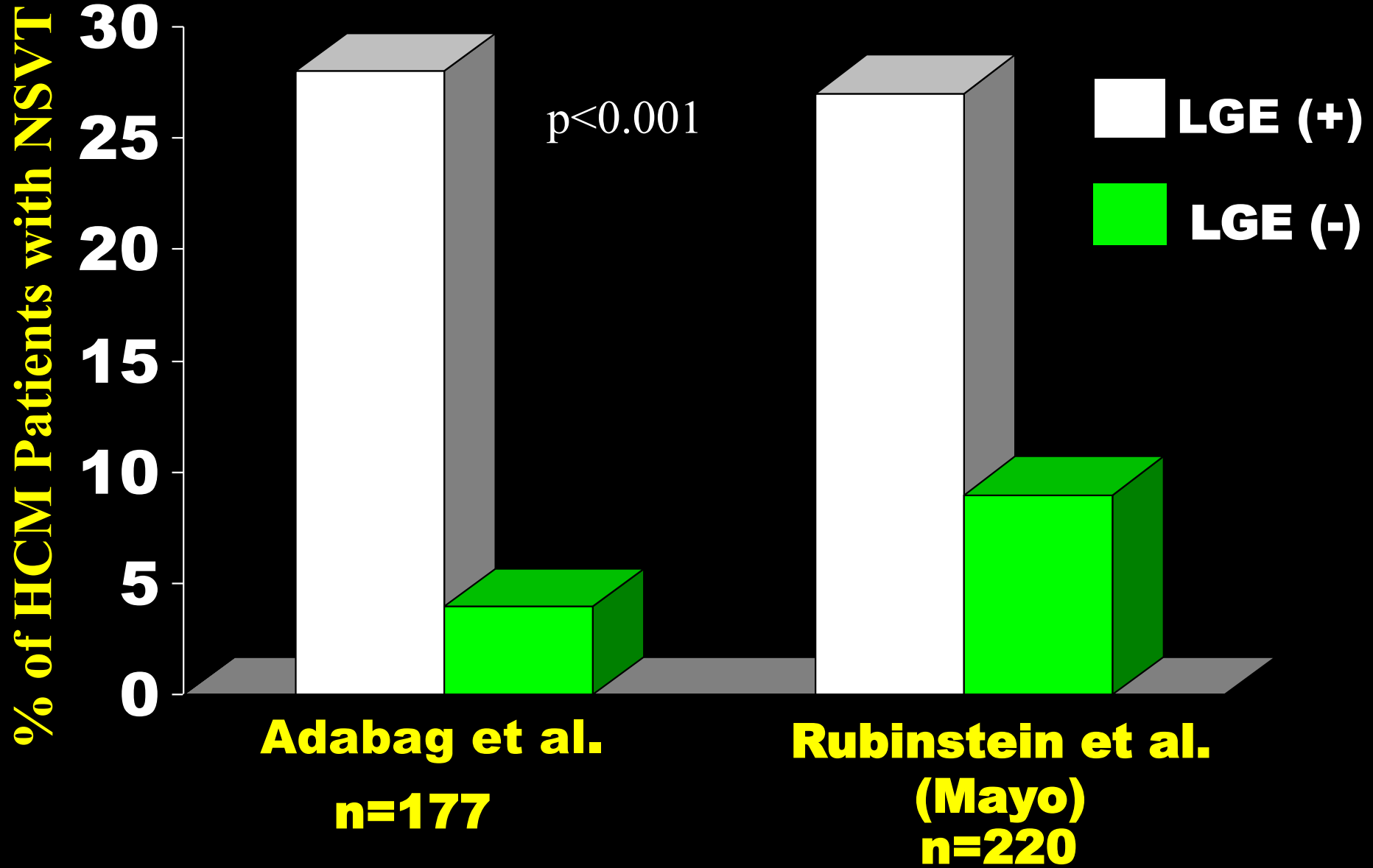
- **LGE Most Common in Thickest Segments...**
- **No WMA in segments of LGE (and preserved EF)...**
- **RV Insertion Point LGE...**
- **No Animal Model**

**LGE is used as an Imaging
Marker for Clinical Outcome
and Events...**

Foci For Ventricular Arrhythmias?



Holter NSVT and *Presence of LGE*



***Presence* of LGE is not
enough to manage HCM
patients...too common
(60%)**

LGE for Prognosis in HCM Multicenter Study

Tufts Medical Center, Boston, MA

Minneapolis Heart Institute

Toronto General Hospital, Canada

Azzendia Carregia, Florence, Italy

Bologna, Italy

Pisa, Italy

Rome, Italy

1,293 HCM
Patients

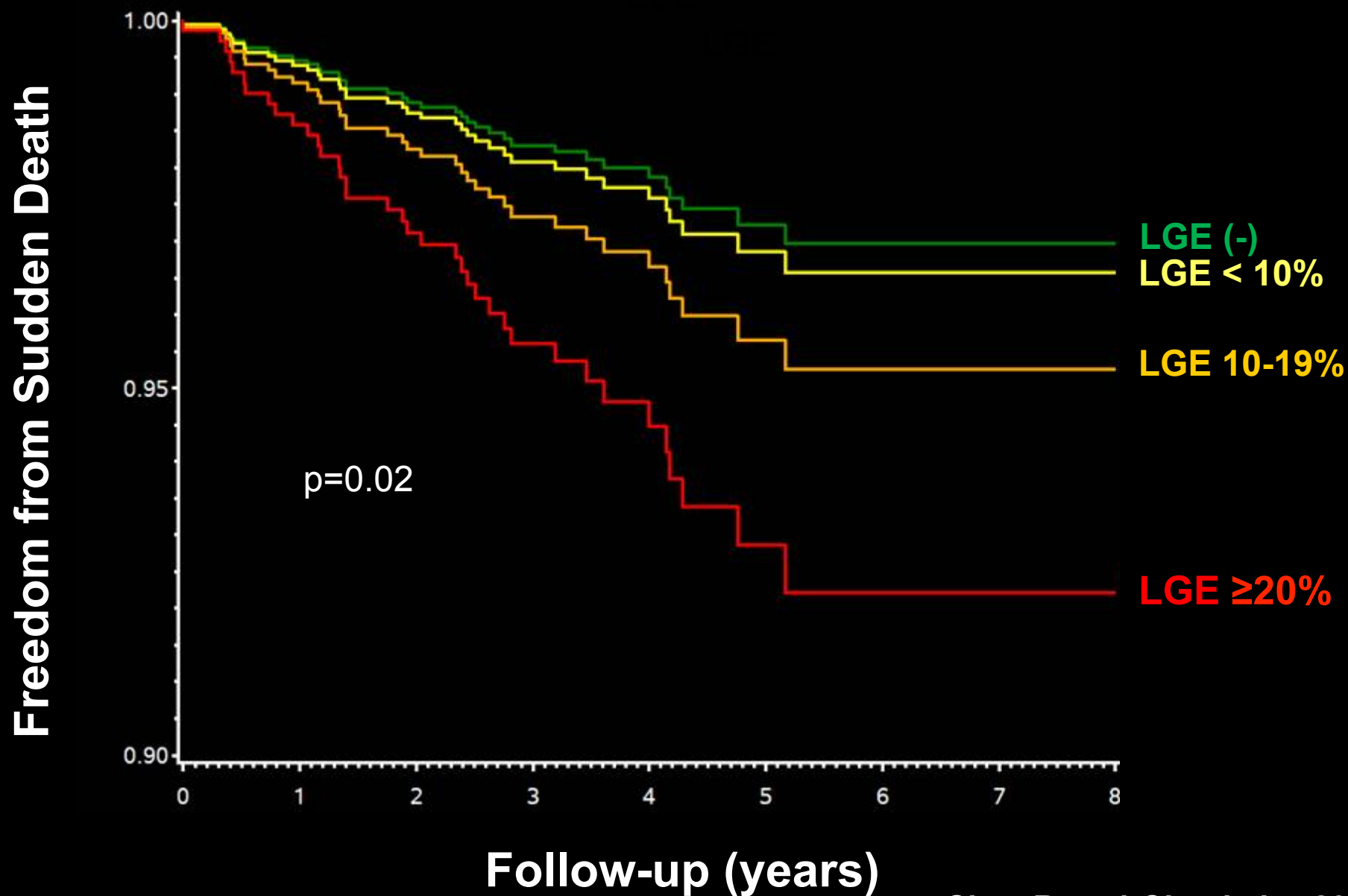


3.5 ± 1.7

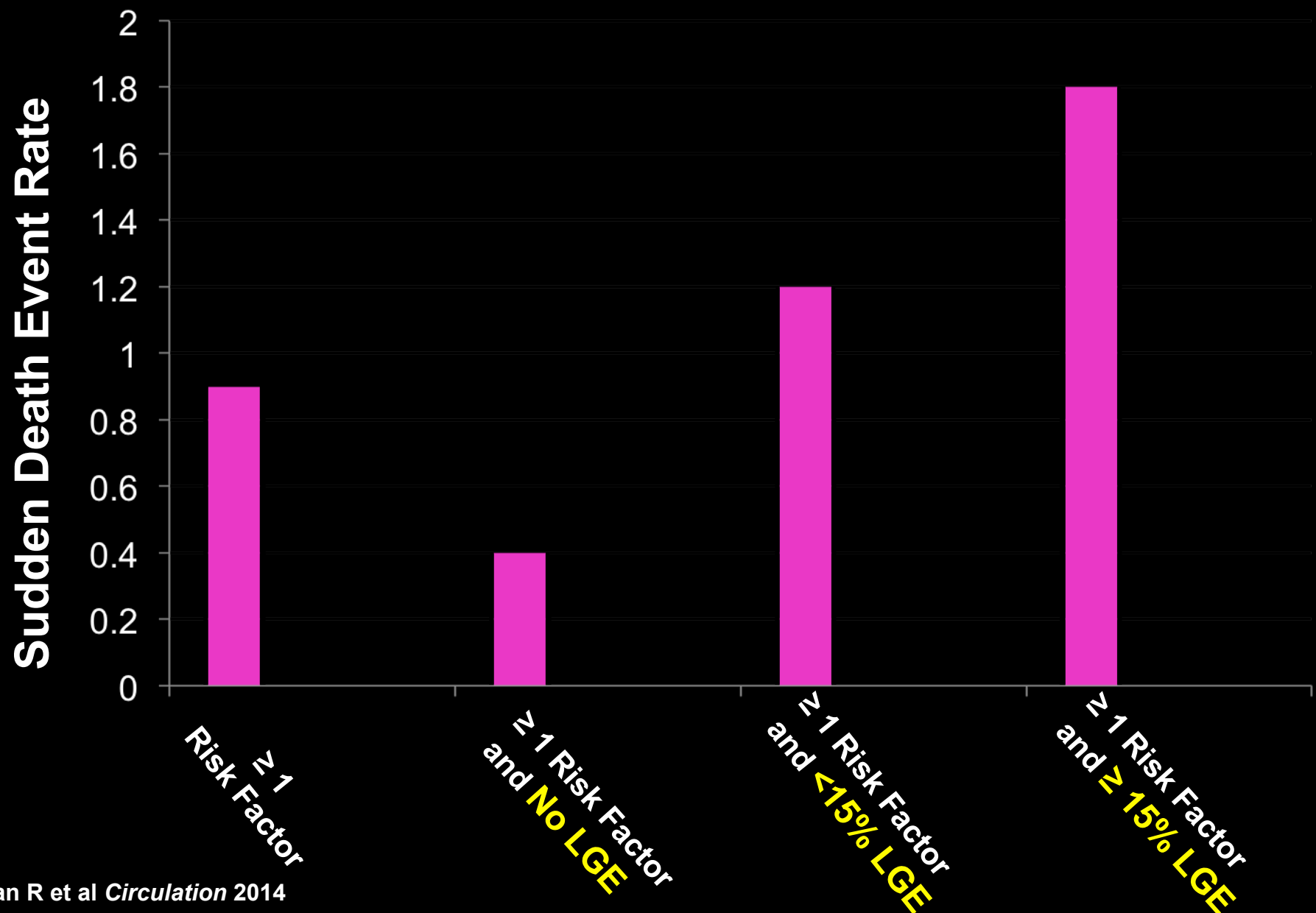
SCD
Event

PERFUSE CMR Core Laboratory

Relation Between Sudden Death and Extent of LGE in 1293 HCM Patients



Improvement of Sudden Death Prediction with Addition of %LGE to Risk Model



Sudden Death Event Rates in HCM Patients Without Conventional Risk Factors

% LGE	Adjusted HR	Est. 5-year Event Rate(%)
0%	1.0	2.5
5%	1.3	3.2
10%	1.6	4.0
15%	2.0	5.0
20%	2.6	6.3
25%	3.2	8.0
30%	4.2	10.0
40%	6.7	15.5

Studies Investigated Prognostic Value of LGE in HCM

	No. Pts	F/U (mo)	Age (yrs)	% w/LGE	SCD	HF Death
Bruder et al. (2010)	220	36	58	67	20	5
n = 2,993; 3 year follow-up						
Ismail et al. (2014)	711	40	46	66	31	14
Chan et al. (2014)	1293	42	55	42	51	5

* Maron et al (2008) and O'Hanlon et al. (2010) not included due to overlapping data

Meta-analysis:

Extent of LGE:

Increased Risk of *All-Cause Mortality* (HR1.3/10% LGE)

Increased Risk of *Cardiovascular Mortality* (HR 1.6/10%LGE)

Increased Risk of *Heart Failure Death* (HR1.6/10% LGE)

Increased Risk of *Sudden Death Events* (HR 1.6/10% LGE)

Extent of LGE is a strong prognostic marker in HCM

Strongest 1^o Risk Factors:

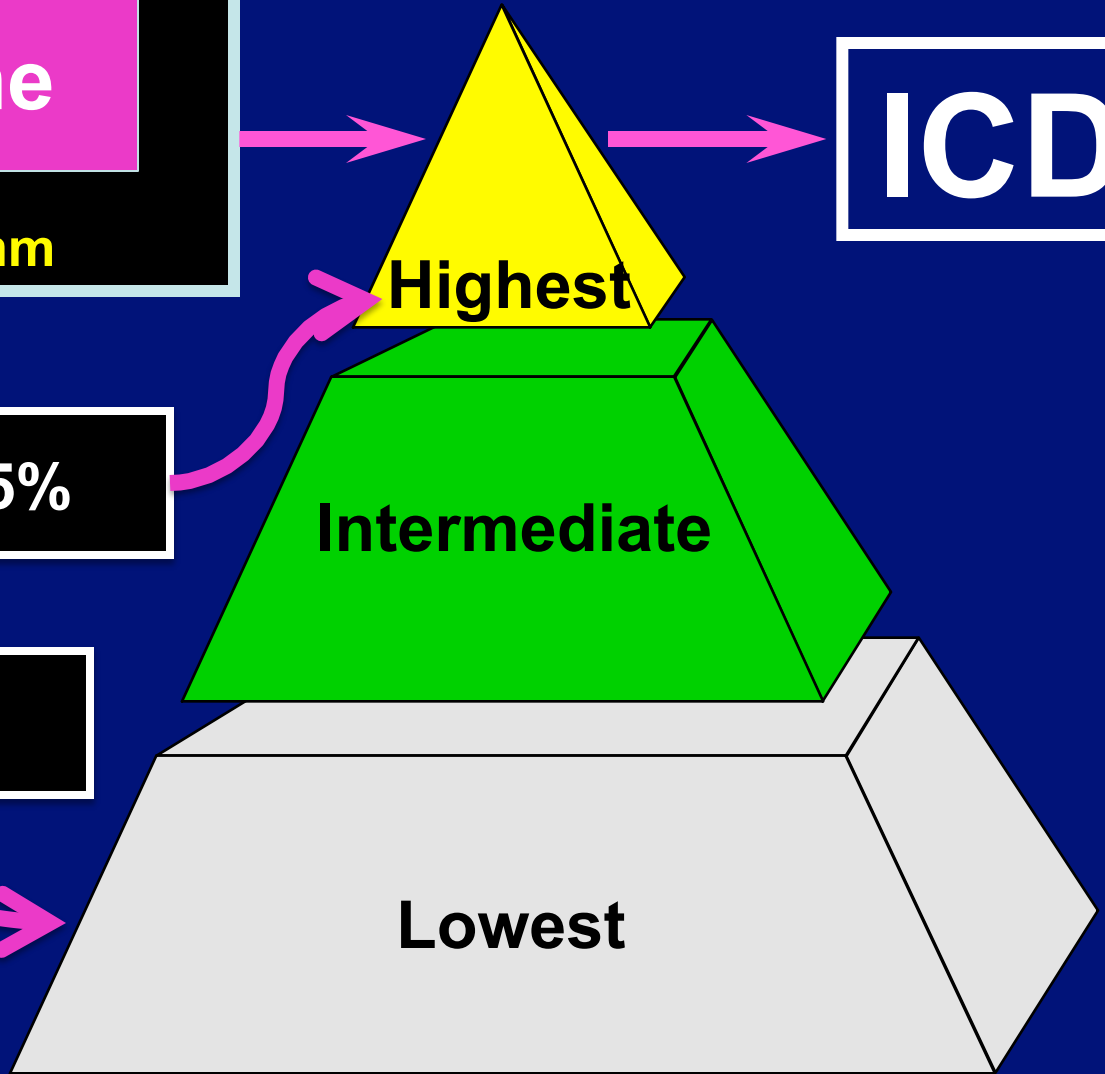
Grey zone

↓ BP — exercise
Massive LVH ≥30 mm

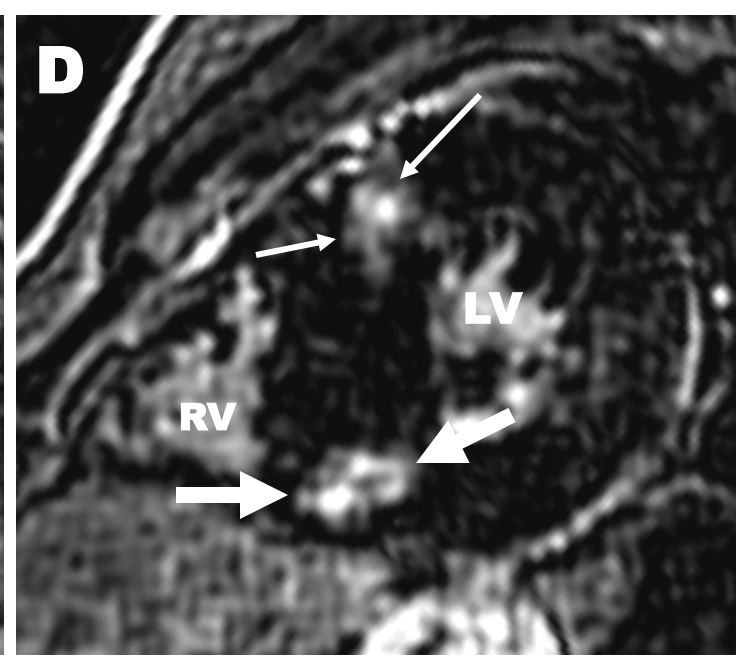
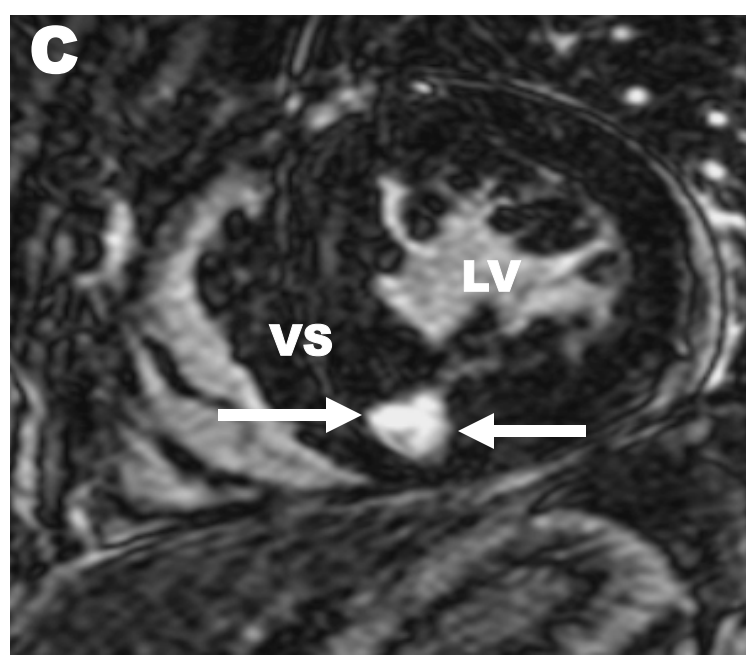
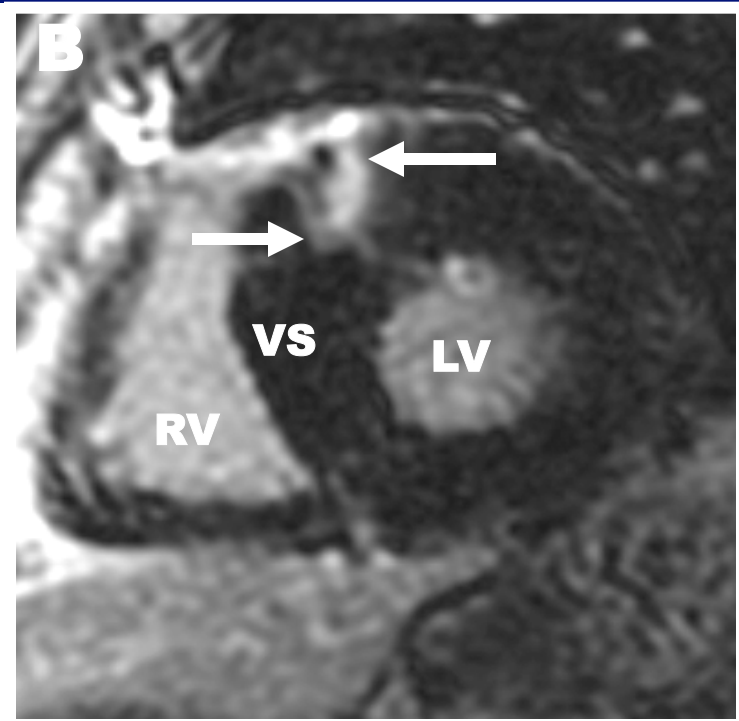
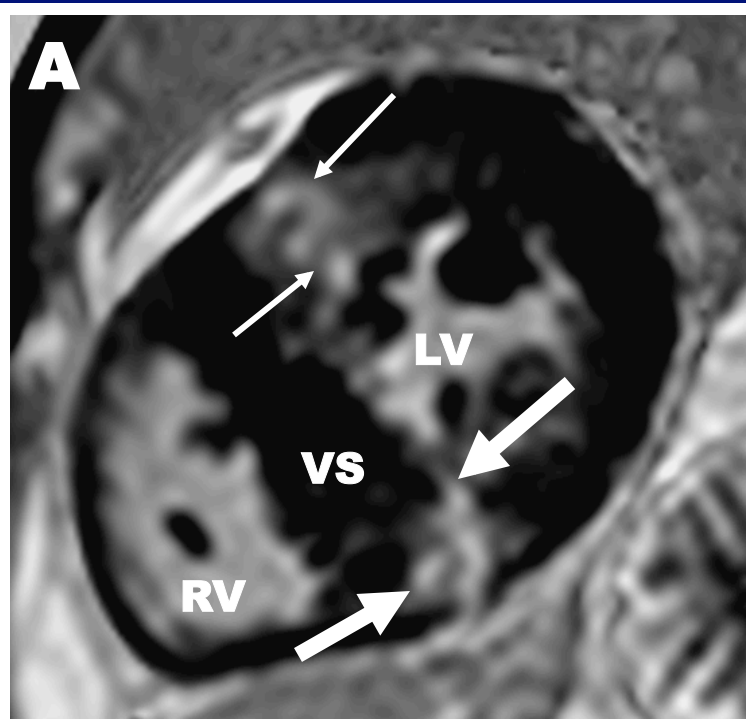
+

CMR LGE ≥15%

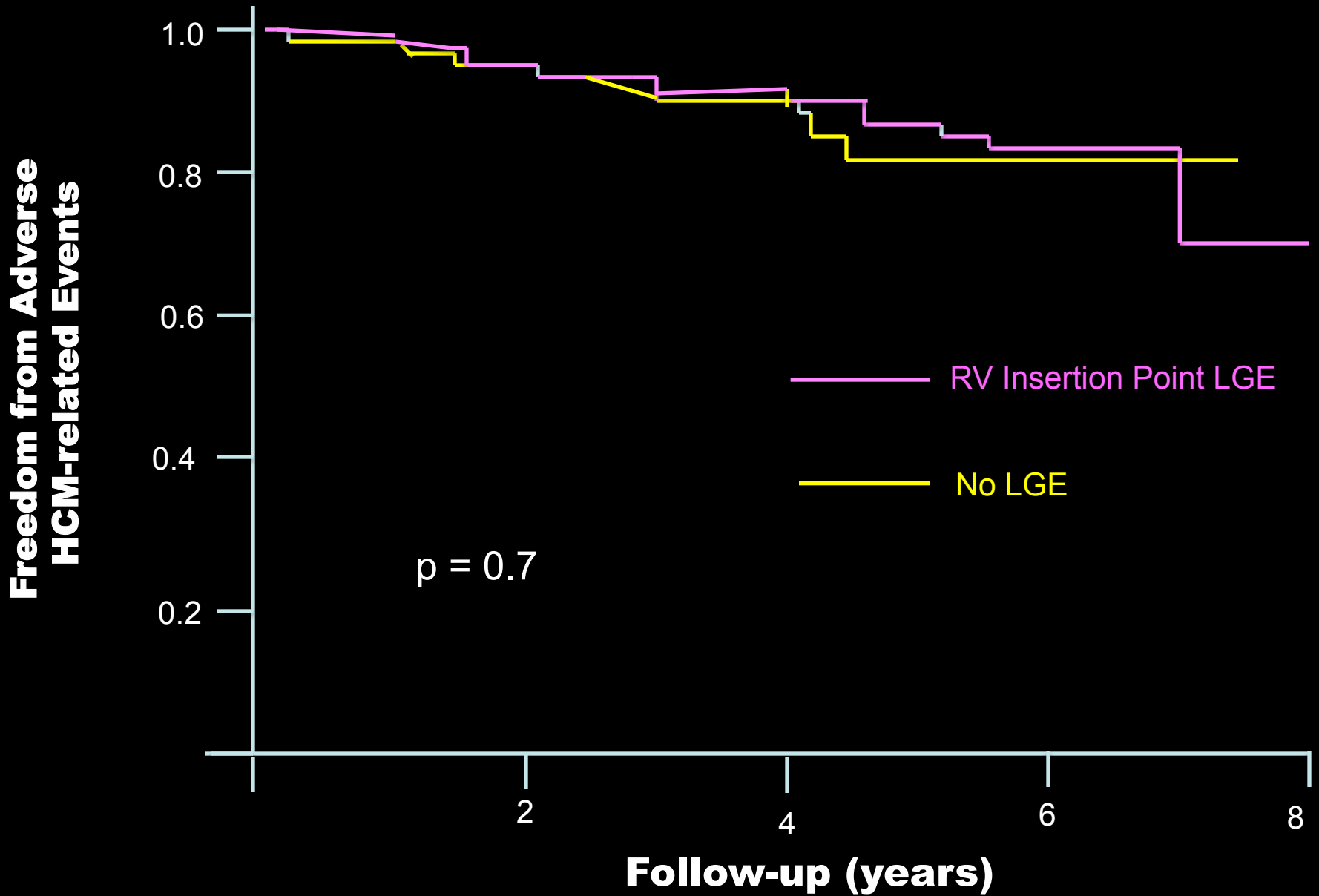
NO/Little LGE

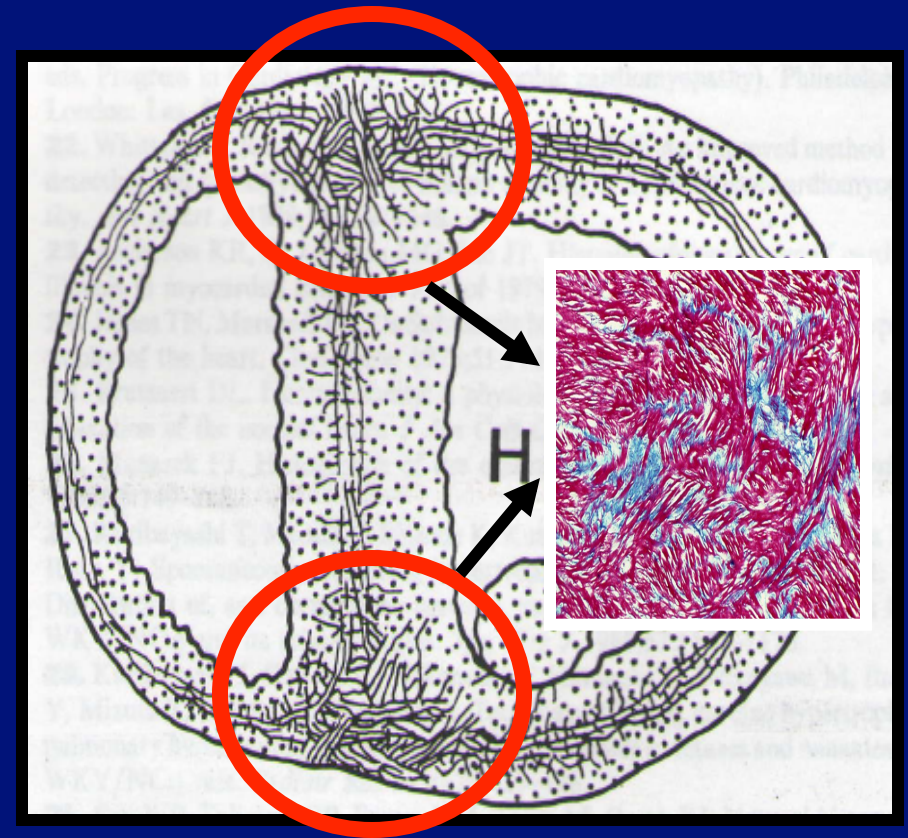
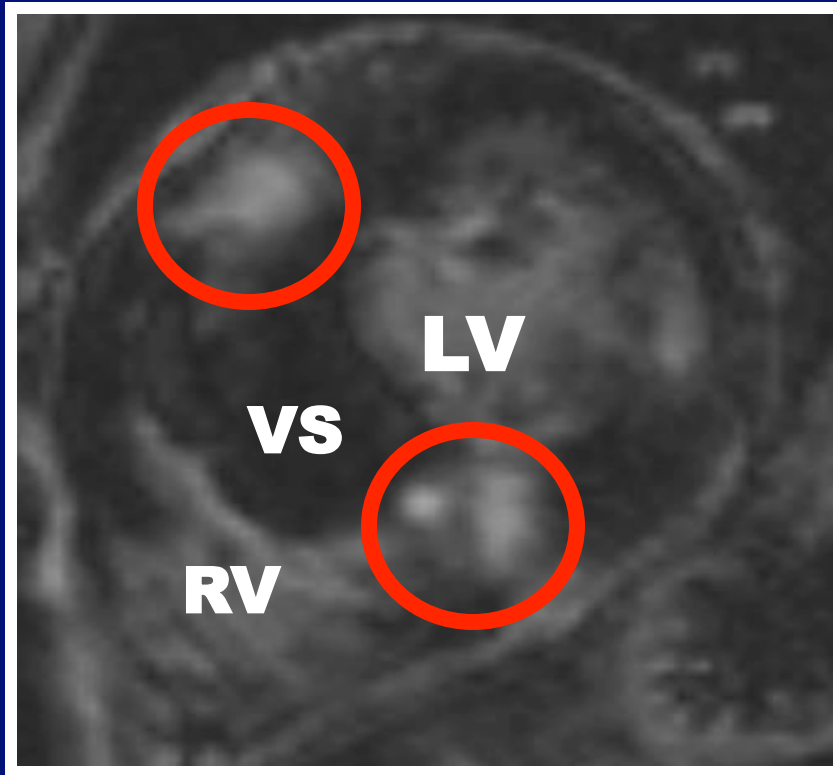


**Risk of SD is about the
Amount of LGE...Not its
Pattern or Location**



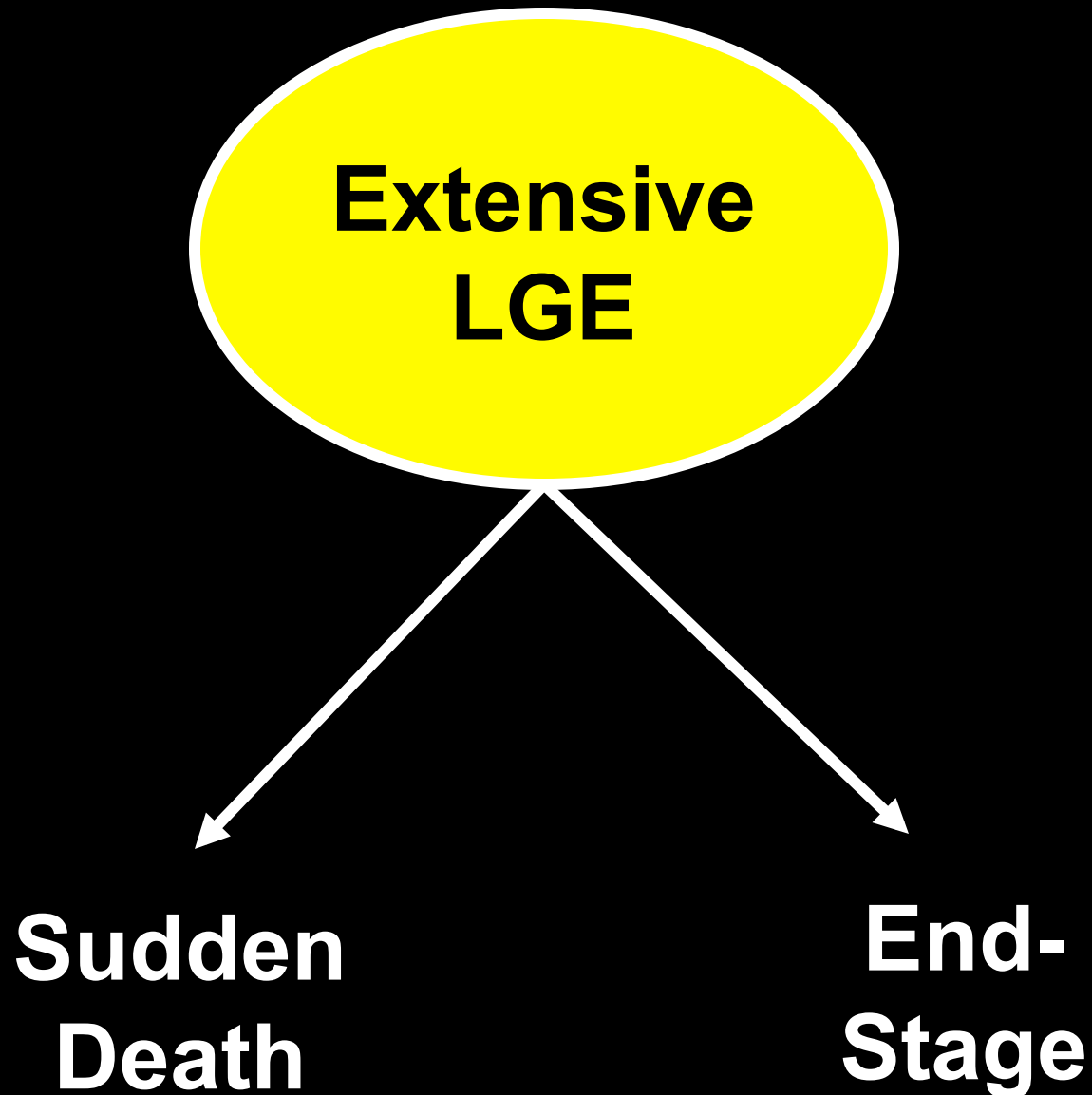
Sudden Death Risk in Patients with RV Insertion Point LGE Only



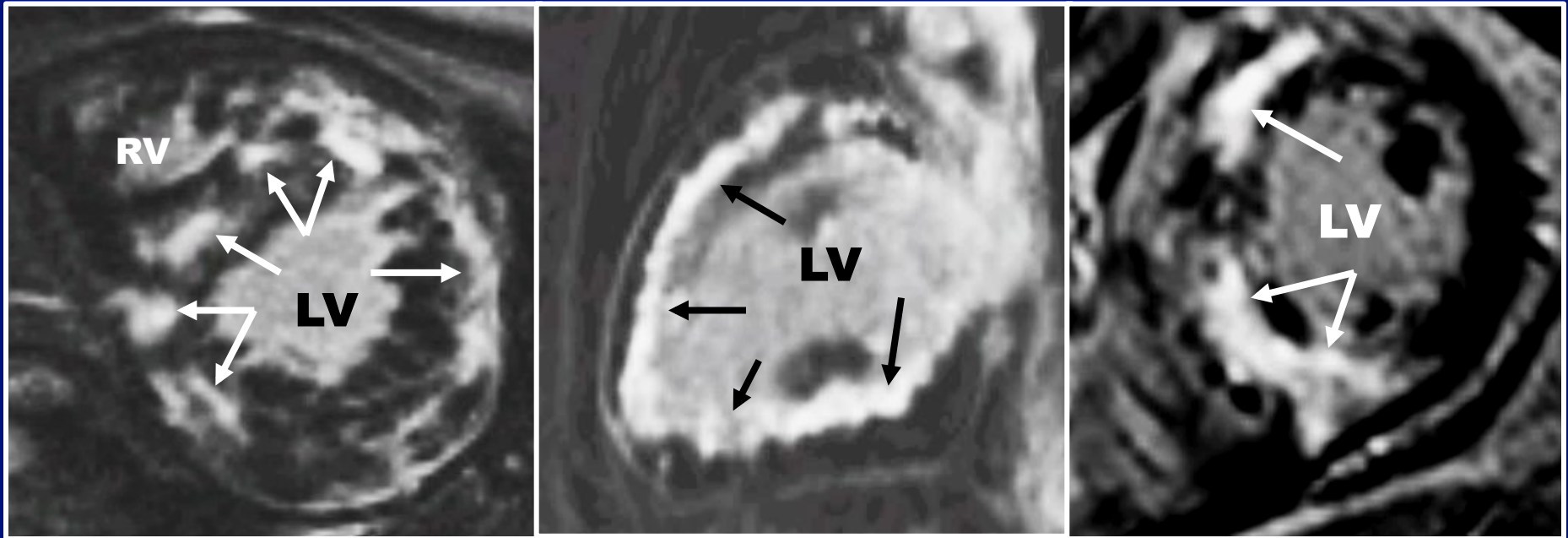


**RV Insertion Point LGE in HCM =
Expanded Extracellular space
Not Likely Replacement Fibrosis**

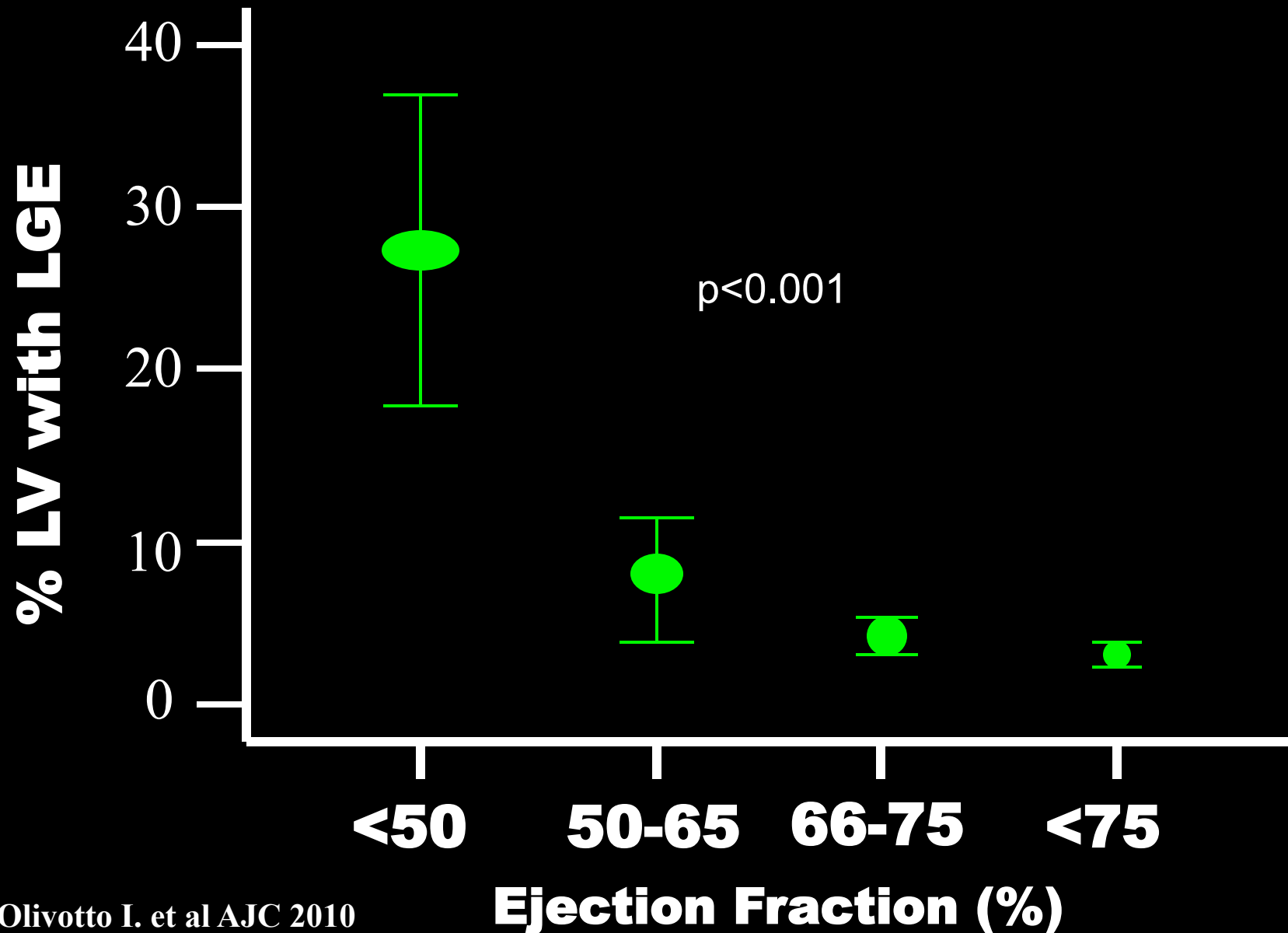
LGE and Divergent Clinical Pathways in HCM



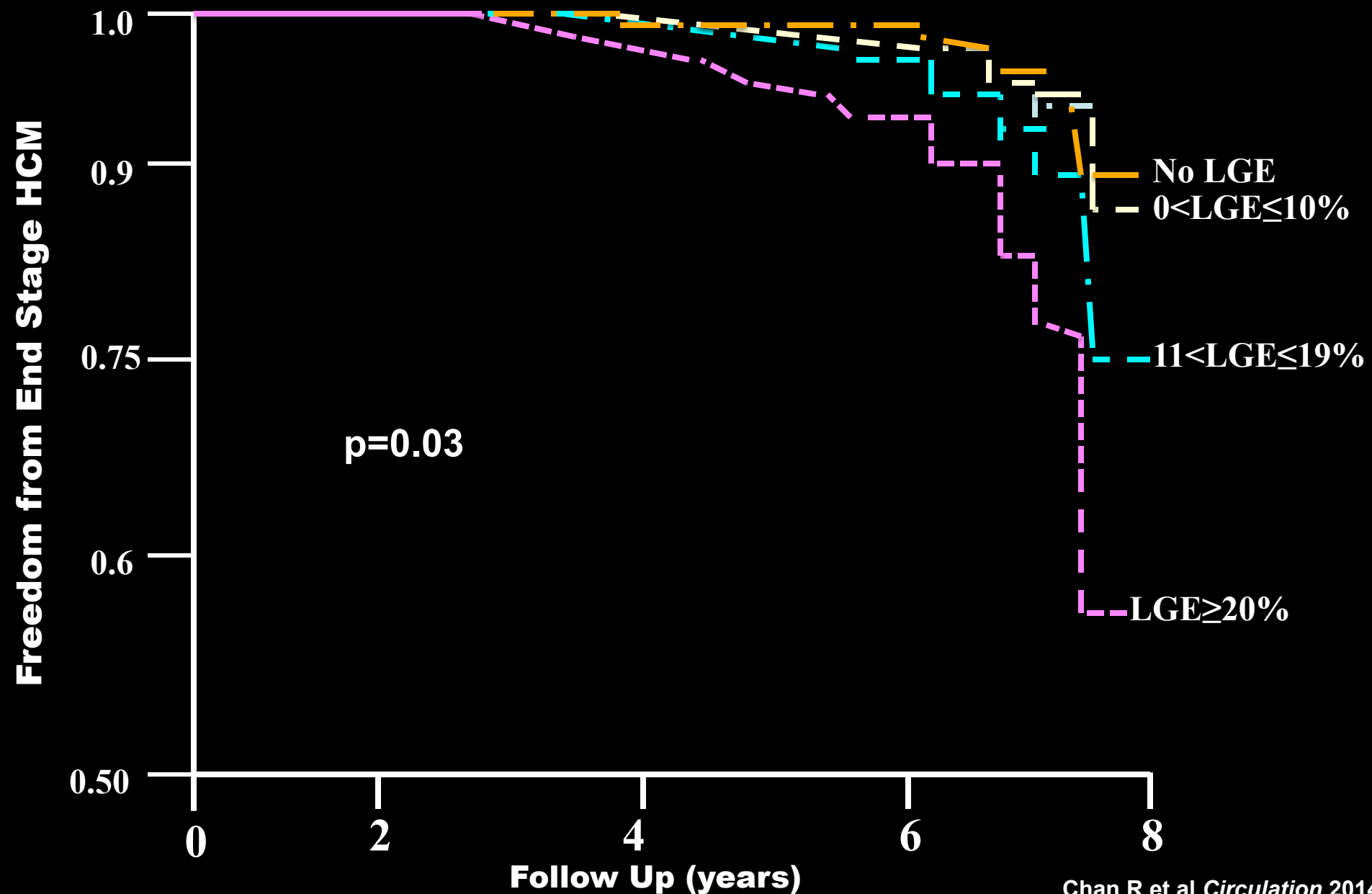
Extensive LGE in the End-Stage Phase (EF<50%) of HCM



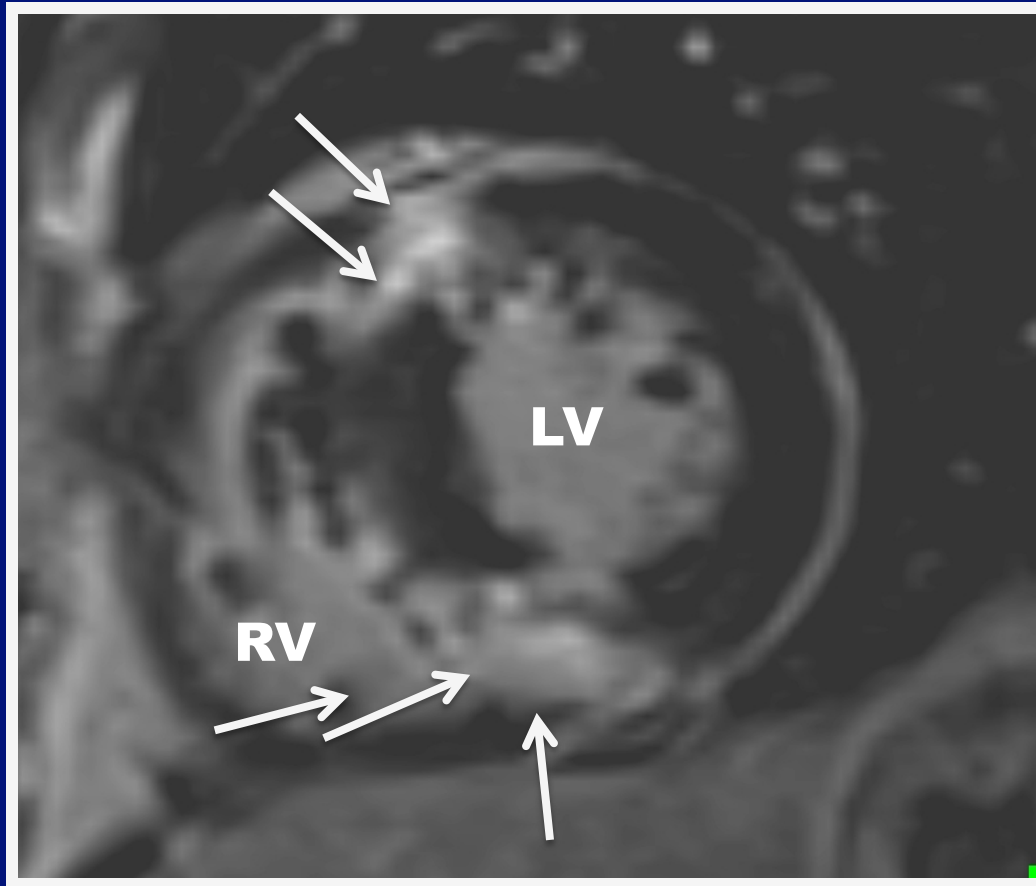
Ejection Fraction and Extent of LGE in HCM



LGE Predicting Future Risk of Developing End-Stage Phase HCM



Cautionary Note....



**Ejection Fraction:
50-60%**

LGE: 10-15% of LV Mass

Hypertrophic Cardiomyopathy Registry (HCMR)

Christopher Kramer, MD and Stefan Neubauer, MD

- **2750 HCM Pts**
- **44 International Sites**
- **Enrolled Prospectively**
 - **CMR with LGE and**
- **Genetic and serum Biomarkers**

CMR in HCM

CMR is well suited to characterize the diverse phenotypic expression of this complex disease...

HCM diagnosis

Assessment of Family members

Management strategies for invasive septal reduction

Identify High-risk HCM subgroups (LVAA, Massive LVH)

Extensive LGE: new high risk subgroup both SD and HF and SD risk arbitrator)

Unavoidable to conclude that CMR should be considered as part of initial evaluation in nearly all HCM Patients