

Dallas  
CARDIOVASCULAR  
INNOVATIONS 2015



# Cardiac Hemodynamics

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# Disclosures

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- I have nothing to disclose

# Case

## *How Would You Approach This Patient?*

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### ■ Medical History

- 74 year old white gentleman
- Chronic obstructive lung disease
- Type II diabetes mellitus, hypertension and hyperlipidemia
- Major depressive disorder

### ■ Symptoms

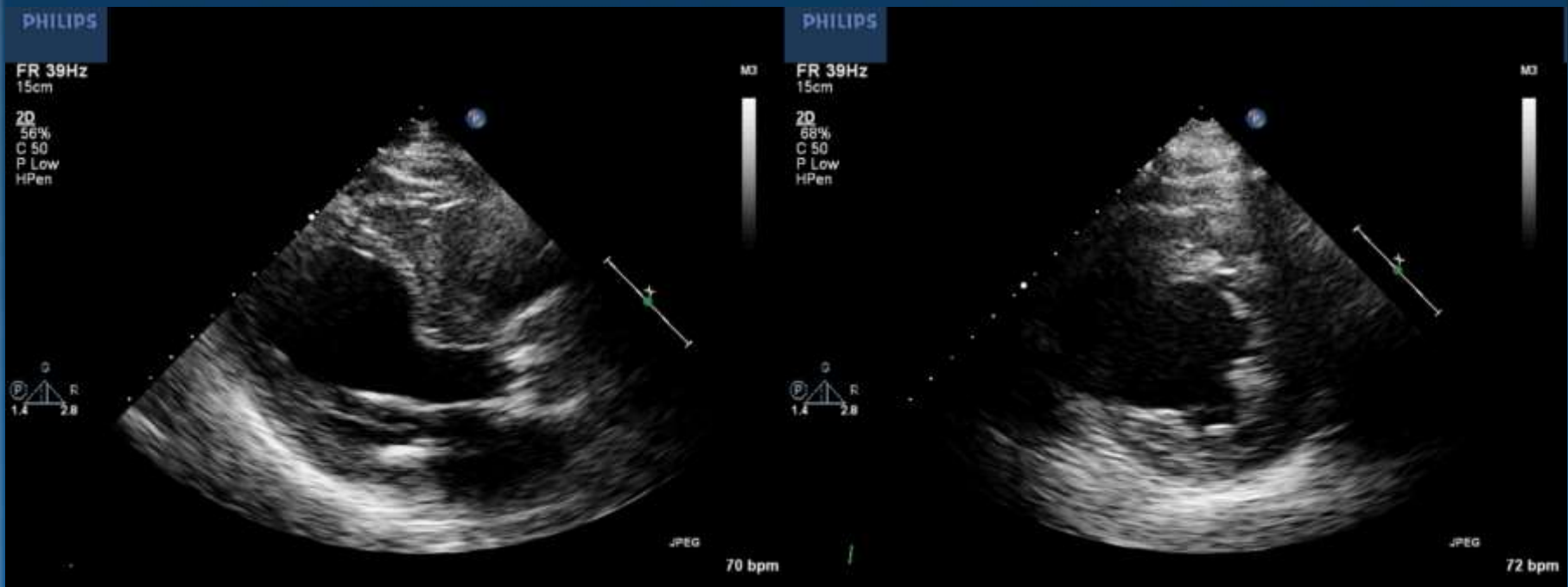
- Dyspnea on exertion at 50 yards

### ■ Exam

- Barely audible S2, late-peaking systolic murmur at right upper sternal border, radiating to carotids

# Case

## *How Would You Approach This Patient?*



Parasternal long axis

Parasternal short axis

# Case

*How Would You Approach This Patient?*



**Apical 4 chamber**

**Apical 2 chamber**

# Case

## How Would You Approach This Patient?



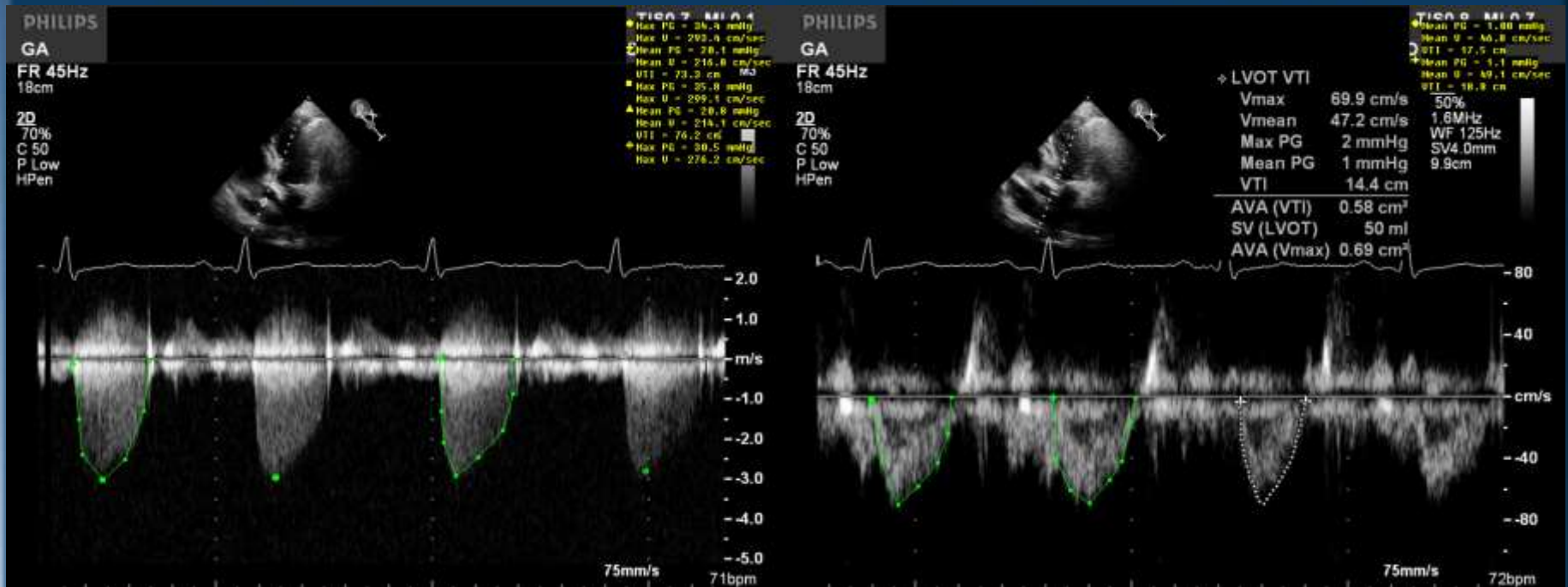
Parasternal long axis,  
AV zoom

LVOT diameter = 2.1 cm



# Case

## How Would You Approach This Patient?



Continuous Wave Doppler,  
Apical 5 chamber

Pulse Wave Doppler,  
Apical 5 chamber

# Case

## How Would You Approach This Patient?



**Continuous Wave  
Doppler, Apical 3 chamber**

**Pulse Wave Doppler,  
Apical 3 chamber**



# Case

## *How Would You Approach This Patient?*

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- **Summary**
  - **Preserved left ventricular systolic function**
  - **Peak velocity: ~3 m/s**
  - **Mean gradient: 24 mmHg**
  - **Aortic valve area: 0.6-0.7 cm<sup>2</sup>**
  
- **Clinical history and exam are not validated by non-invasive findings.**

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**Next best step?**

# Case

## *How Would You Approach This Patient?*

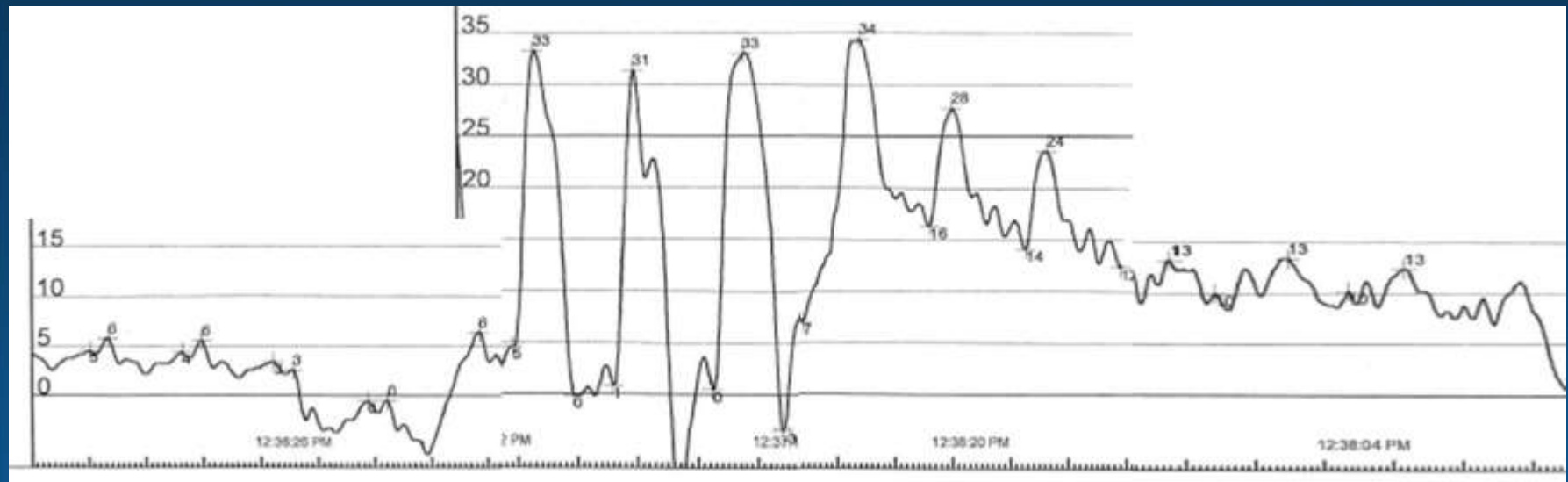
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- Limited utility for further non-invasive evaluation in preserved left ventricular ejection fraction
- Given the underlying COPD history, will need further evaluation of intra-pulmonary pressures
- Proceed with right and left heart catheterization

# Case

## *Right and Left Heart Catheterization*

- Normal/borderline elevated right and left filling pressures



RA

RV

PA

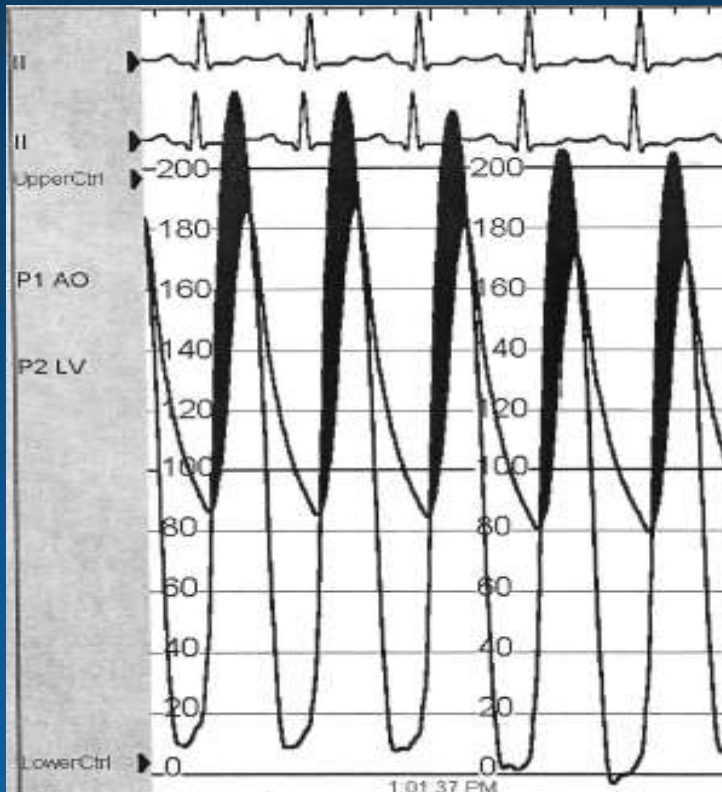
PCWP

- Non-obstructive coronary artery disease

# Case

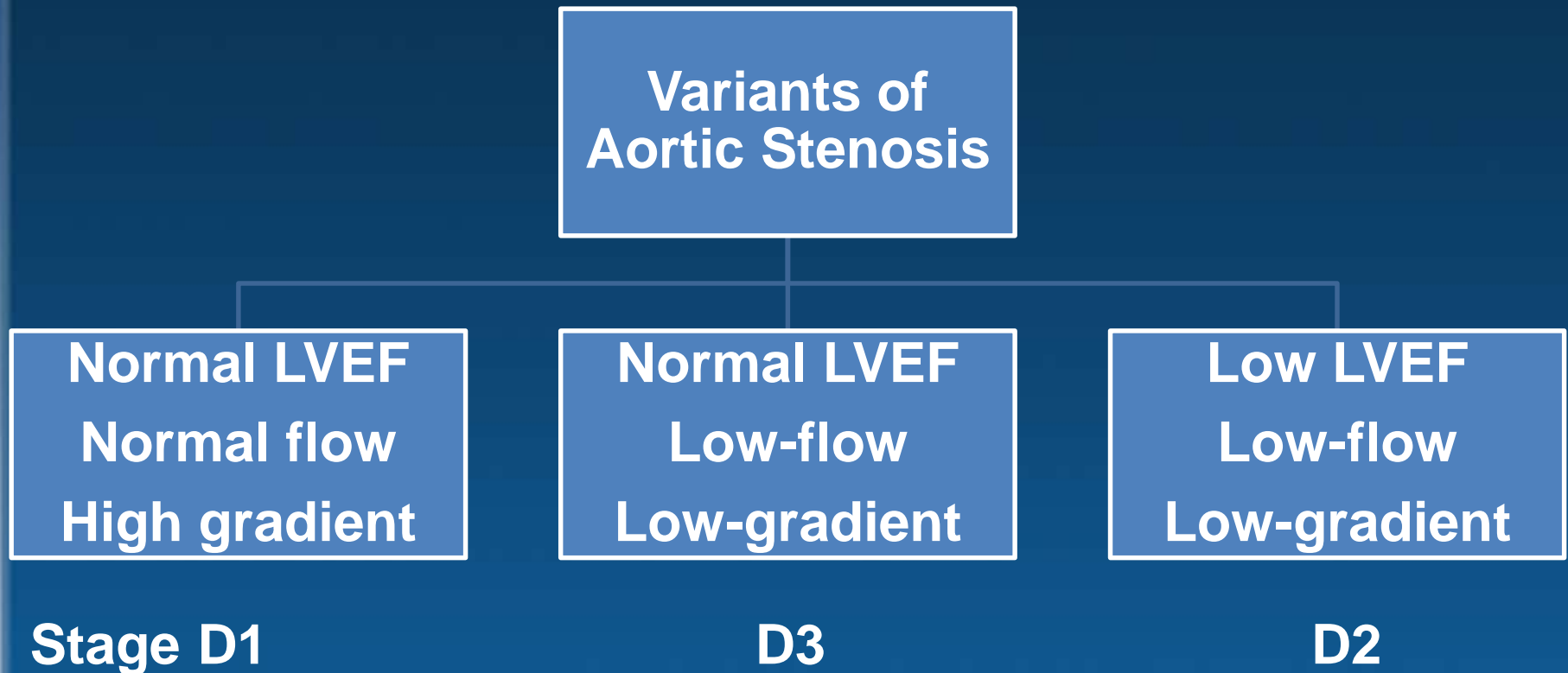
## *Aortic Valve Study*

- Moderate gradient noted across aortic valve



<b>Heart Rate</b>	<b>92 bpm</b>
<b>Cardiac Output</b>	<b>5.8 L/min</b>
<b>Cardiac Index</b>	<b>2.98 L/min/m<sup>2</sup></b>
<b>Mean Gradient</b>	<b>32 mmHg</b>

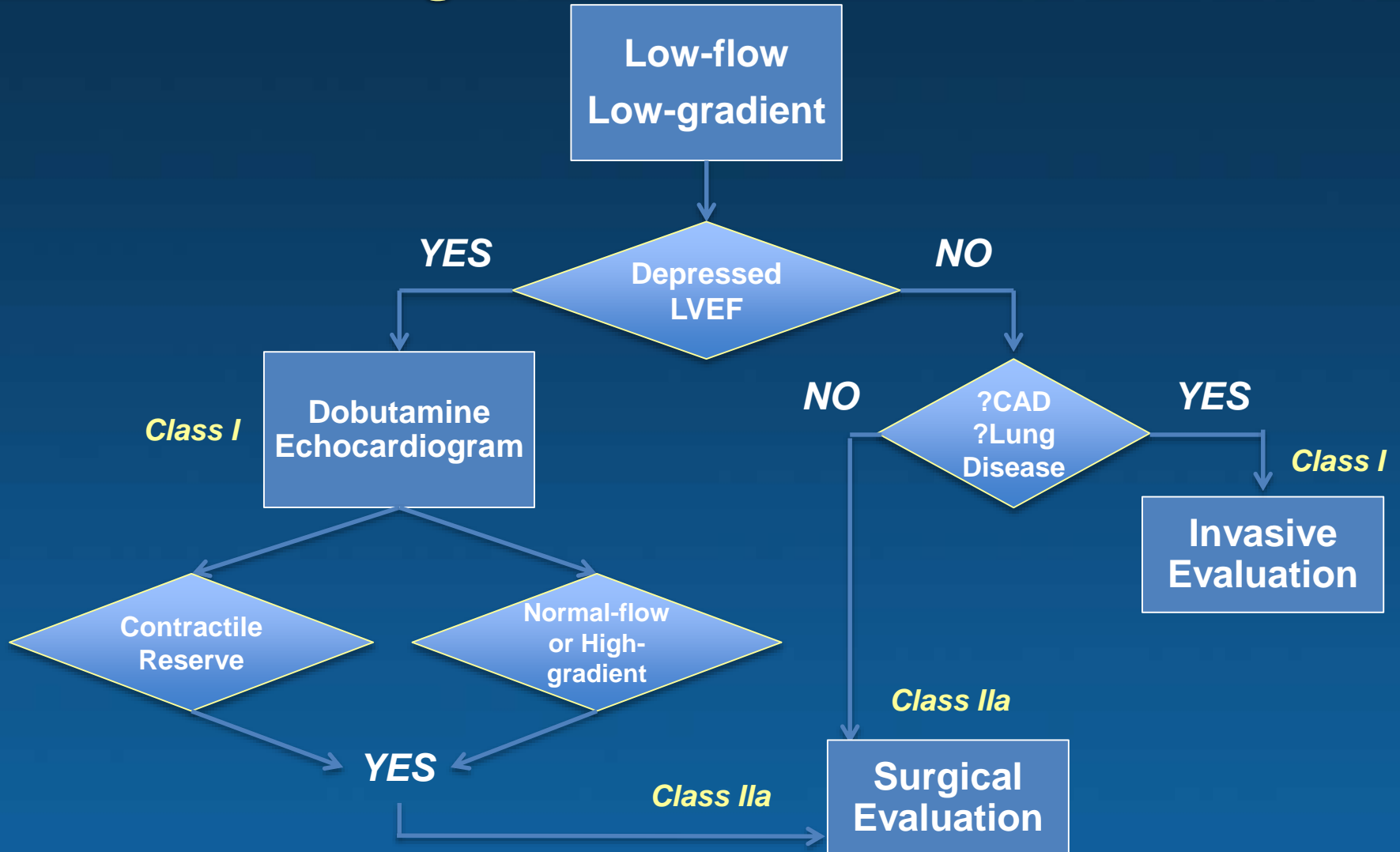
# Variants of Aortic Stenosis





# Low-flow, Low-gradient AS

## Diagnostic Assessment

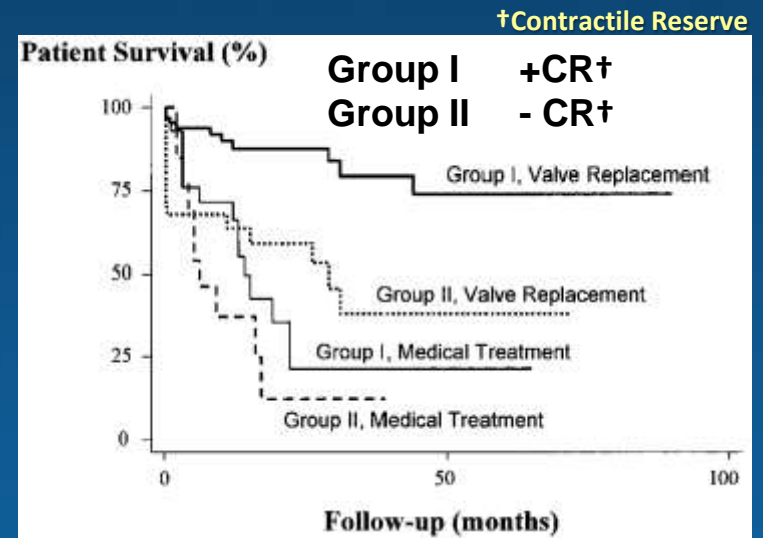
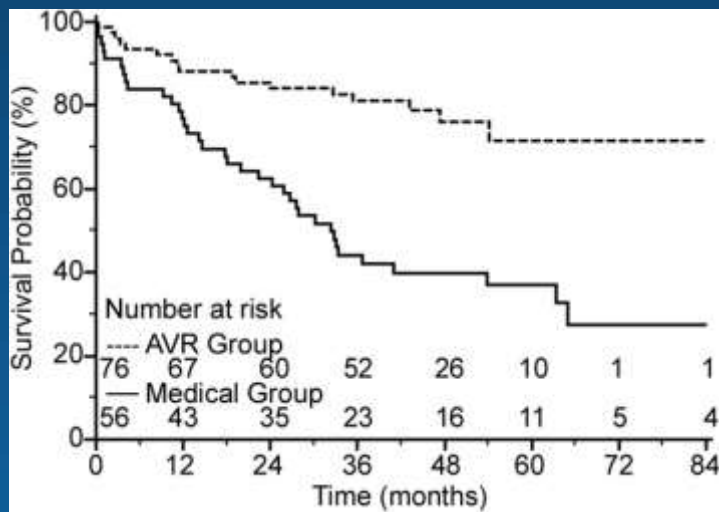


# Prognosis of Aortic Stenosis

## Variants of Aortic Stenosis

Normal LVEF  
Normal flow  
High gradient

Low LVEF  
Low-flow  
Low-gradient

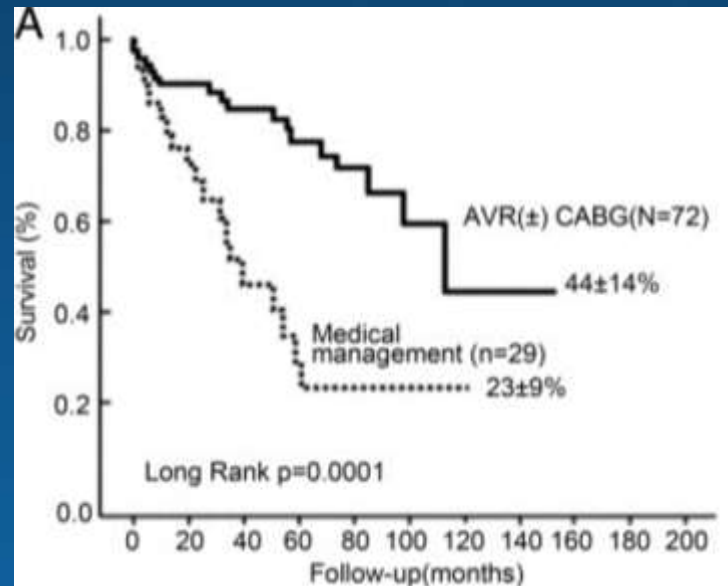


Annals Thoracic Surgery 2011; 92: 866-72.  
Circulation 2003; 108: 319-324.

# Case

## *Normal LVEF, Low flow, low-gradient AS management*

- Surgical referral rate
  - 40%-50% lower in patients with “paradoxical” AS than in patients with normal flow severe AS
- “Paradoxical” AS outcomes are better with surgery than medical management



# Summary of Key Points

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- Low-flow, low-gradient aortic stenosis is one of the most challenging aspects of valvular heart disease.
- Paradoxical LF-LG AS despite normal LVEF can represent advanced pathology and worse prognosis.
- Surgical evaluation is a Class IIa indication for this particular sub-group; however, it continues to be under-utilized.