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# AORTIC VALVE DISEASE

▶ David Grech, MD, FACC





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# Aortic Stenosis

▶ Aortic  
Regurgitation





# Table 1. Applying Classification of Recommendations and Level of Evidence†

		SIZE OF TREATMENT EFFECT <span style="float: right;">→</span>			
		CLASS I <i>Benefit &gt;&gt;&gt; Risk</i> Procedure/Treatment <b>SHOULD</b> be performed/administered	CLASS IIa <i>Benefit &gt;&gt; Risk</i> <i>Additional studies with focused objectives needed</i> <b>IT IS REASONABLE</b> to perform procedure/administer treatment	CLASS IIb <i>Benefit ≥ Risk</i> <i>Additional studies with broad objectives needed; additional registry data would be helpful</i> Procedure/Treatment <b>MAY BE CONSIDERED</b>	CLASS III <i>Risk ≥ Benefit</i> <i>No additional studies needed</i> Procedure/Treatment should <b>NOT</b> be performed/administered <b>SINCE IT IS NOT HELPFUL AND MAY BE HARMFUL</b>
ESTIMATE OF CERTAINTY (PRECISION) OF TREATMENT EFFECT	LEVEL A Multiple (3-5) population risk strata evaluated* General consistency of direction and magnitude of effect	<ul style="list-style-type: none"> <li>Recommendation that procedure or treatment is useful/effective</li> <li>Sufficient evidence from multiple randomized trials or meta-analyses</li> </ul>	<ul style="list-style-type: none"> <li>Recommendation in favor of treatment or procedure being useful/effective</li> <li>Some conflicting evidence from multiple randomized trials or meta-analyses</li> </ul>	<ul style="list-style-type: none"> <li>Recommendation's usefulness/efficacy less well established</li> <li>Greater conflicting evidence from multiple randomized trials or meta-analyses</li> </ul>	<ul style="list-style-type: none"> <li>Recommendation that procedure or treatment is not useful/effective and may be harmful</li> <li>Sufficient evidence from multiple randomized trials or meta-analyses</li> </ul>
	LEVEL B Limited (2-3) population risk strata evaluated*	<ul style="list-style-type: none"> <li>Recommendation that procedure or treatment is useful/effective</li> <li>Limited evidence from single randomized trial or nonrandomized studies</li> </ul>	<ul style="list-style-type: none"> <li>Recommendation in favor of treatment or procedure being useful/effective</li> <li>Some conflicting evidence from single randomized trial or nonrandomized studies</li> </ul>	<ul style="list-style-type: none"> <li>Recommendation's usefulness/efficacy less well established</li> <li>Greater conflicting evidence from single randomized trial or nonrandomized studies</li> </ul>	<ul style="list-style-type: none"> <li>Recommendation that procedure or treatment is not useful/effective and may be harmful</li> <li>Limited evidence from single randomized trial or nonrandomized studies</li> </ul>
	LEVEL C Very limited (1-2) population risk strata evaluated*	<ul style="list-style-type: none"> <li>Recommendation that procedure or treatment is useful/effective</li> <li>Only expert opinion, case studies, or standard-of-care</li> </ul>	<ul style="list-style-type: none"> <li>Recommendation in favor of treatment or procedure being useful/effective</li> <li>Only diverging expert opinion, case studies, or standard-of-care</li> </ul>	<ul style="list-style-type: none"> <li>Recommendation's usefulness/efficacy less well established</li> <li>Only diverging expert opinion, case studies, or standard-of-care</li> </ul>	<ul style="list-style-type: none"> <li>Recommendation that procedure or treatment is not useful/effective and may be harmful</li> <li>Only expert opinion, case studies, or standard-of-care</li> </ul>
Suggested phrases for writing recommendations†		should is recommended is indicated is useful/effective/beneficial	is reasonable can be useful/effective/beneficial is probably recommended or indicated	may/might be considered may/might be reasonable usefulness/effectiveness is unknown/unclear/uncertain or not well established	is not recommended is not indicated should not is not useful/effective/beneficial may be harmful

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# Aortic Stenosis



# Typical Case:

- ▶ 56 yo male. D.O.E. for 6 months
- ▶ No C.P., syncope or palpitations
- ▶ PMH of hyperlipidemia
- ▶ Murmur “since I was a child”
- ▶ Mother died of heart failure in 60’s
- ▶ Nonsmoker.



- HR 66 BP 120/85
- Neck: No bruits
- Chest: CTA
- CVS: RRR, harsh 3/6 SEM radiating to carotids
- Abdomen: Soft, NT
- Ext: No c/c/e



# AORTIC STENOSIS

- ▶ Congenital – most common is bicuspid AV
- ▶ Acquired
- ▶ Degenerative (senile) calcific – usually appears the 7th or 8th decade
- ▶ Most common in USA
- ▶ Calcific AS is associated with traditional risk factors for atherosclerosis (smoking, high LDL, HTN)





# Aortic Stenosis

- ▶ Rheumatic – most common cause worldwide.
- ▶ Usually present with co-existing mitral valve disease
- ▶ Other rare causes include obstructive vegetations, homozygous type II
- ▶ hypercholesterolemia, Paget disease, Fabry disease, and irradiation.

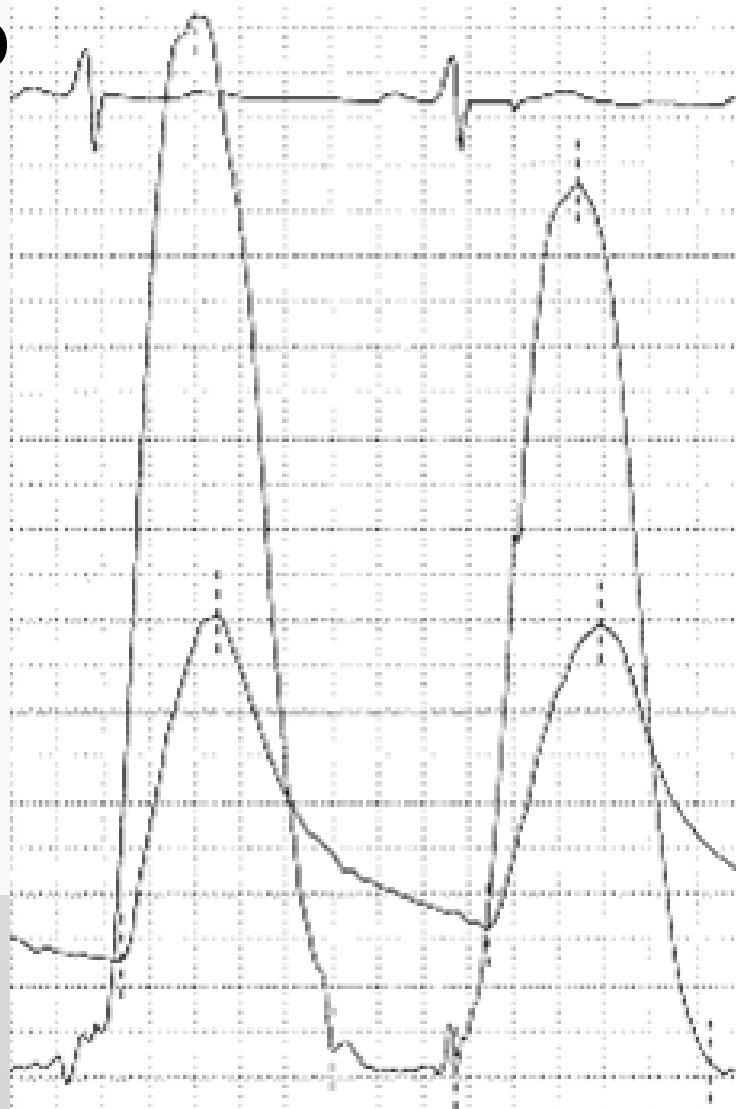


# Pathophysiology

- Aortic stenosis generally develops gradually, leading to LV hypertrophy
- As stenosis progresses, LVEDP begins to increase – LV function usually remains normal until late in disease process
- Diastolic dysfunction may also contribute to symptom onset



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"It's a great spa. You just relax while they do a makeover on your Electronic Medical Record. Now I'm blonde, lost 30 pounds, and no high blood pressure."



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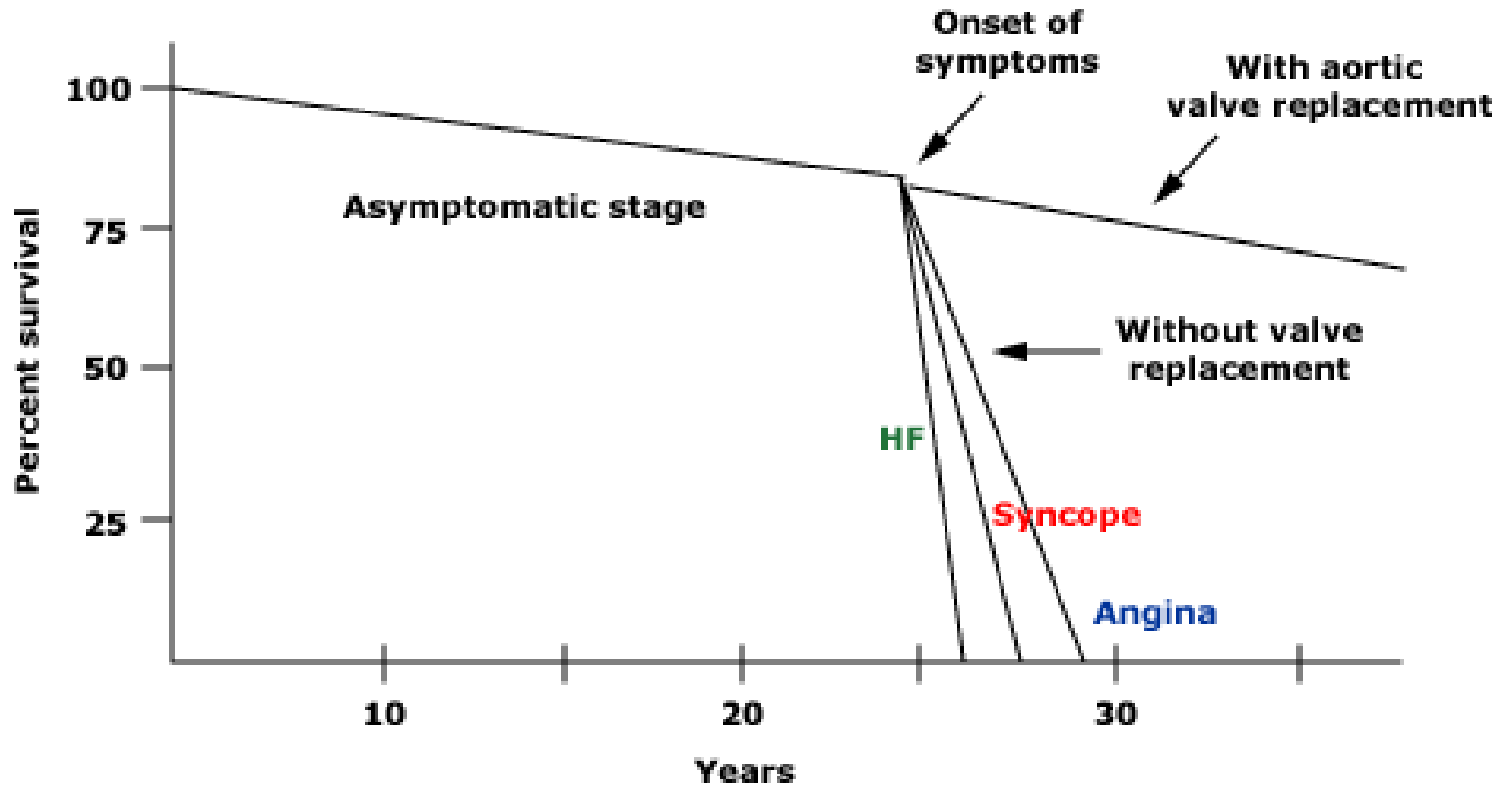
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# Clinical Features

- ▶ 3 Classic symptoms of severe AS
- ▶ Angina
- ▶ Syncope
- ▶ Dyspnea



# Importance of symptoms

- ▶ Patients with pure AS do not have symptoms until the valve area is  $<1.0$  sq cm
- ▶ Long latent period without symptoms
- ▶ Even with severe AS, the asymptomatic patient has a low risk of death
- ▶ With onset of symptoms survival decreases
- ▶ With onset of angina, average survival (without AVR) is 5 yrs
- ▶ With syncope, 3 yrs
- ▶ With CHF, 2 yrs





# Physical exam

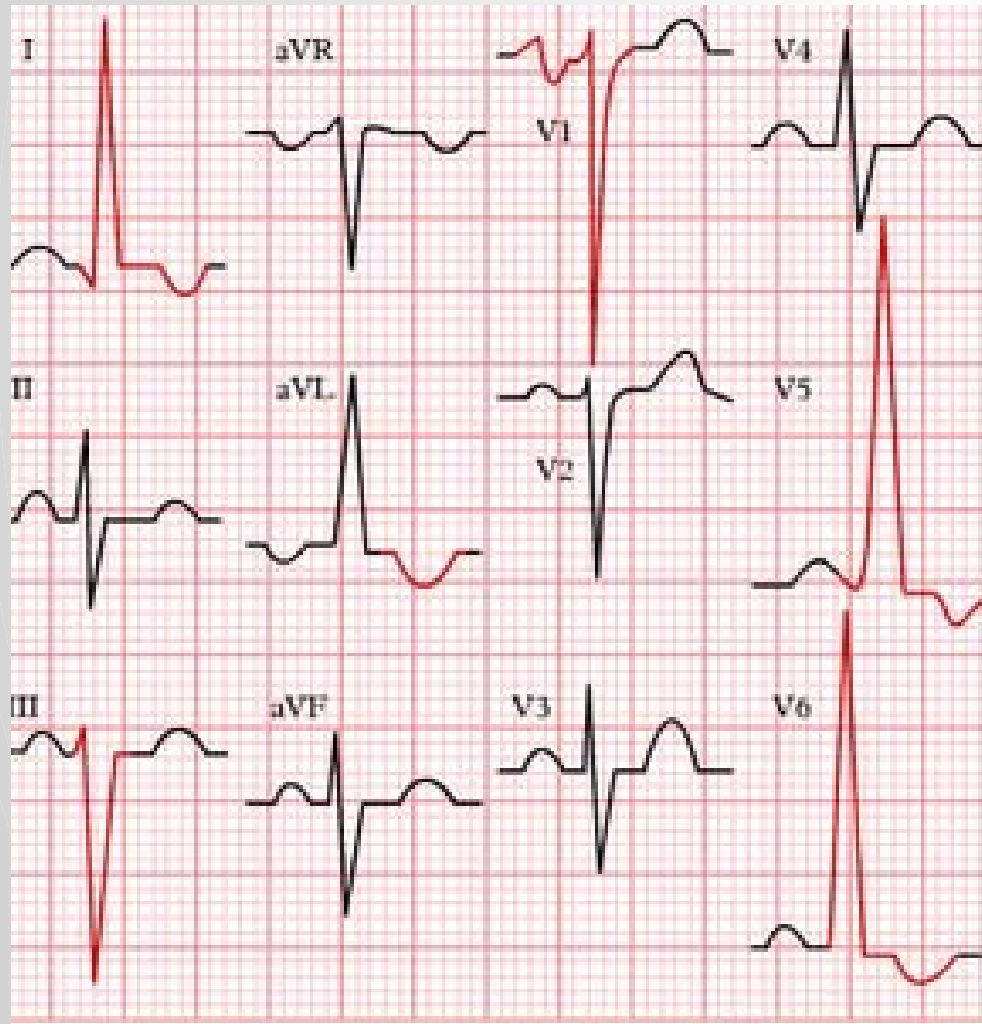
- ▶ Pulsus parvus et tardus (diminished amplitude and delayed)
- ▶ Diminished S2 (A2)
- ▶ Paradoxical splitting of S2
- ▶ Prominent S4
- ▶ Classic crescendo–decrescendo systolic murmur
- ▶ More severe AS is associated with a late peaking murmur.

# Testing

- EKG
- CXR
- Echo
- Cardiac catheterization
- CT/MRI?



# ECG







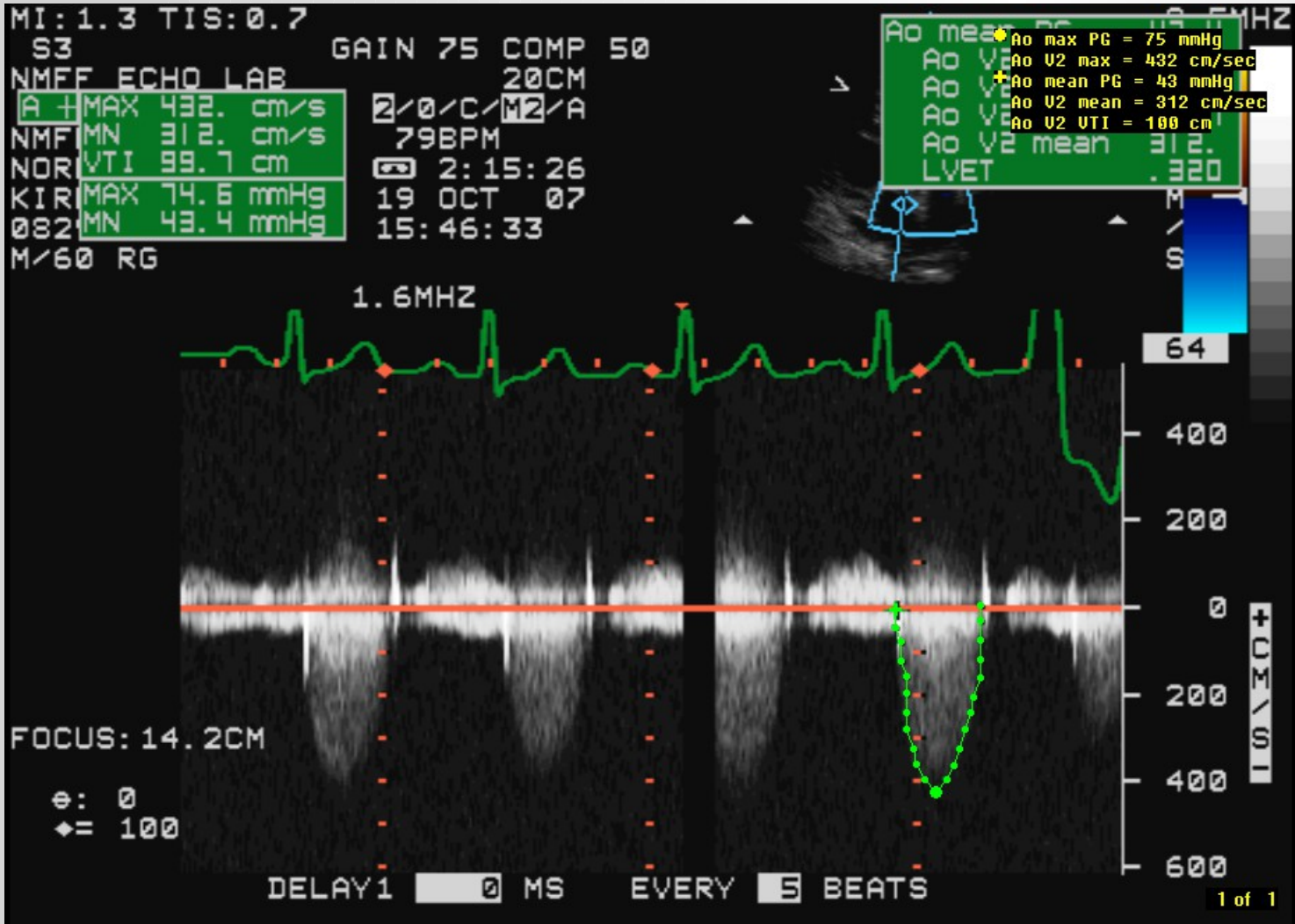
MI: 1.5  
S3  
19 OCT 07  
15:34:08  
2/0/D/H5  
NMFF ECHO LAB

2:15:22  
GAIN 75  
COMP 50  
72BPM

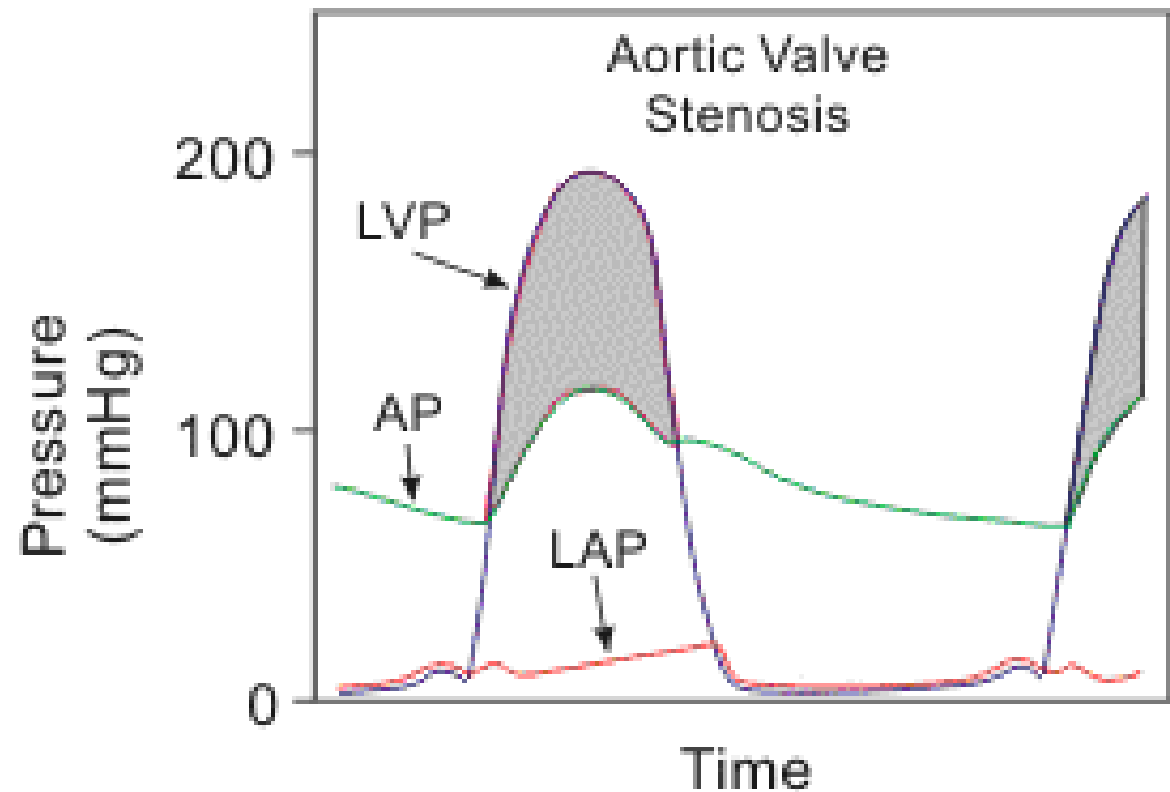
16CM  
60HZ

P T R  
1.6 3.2



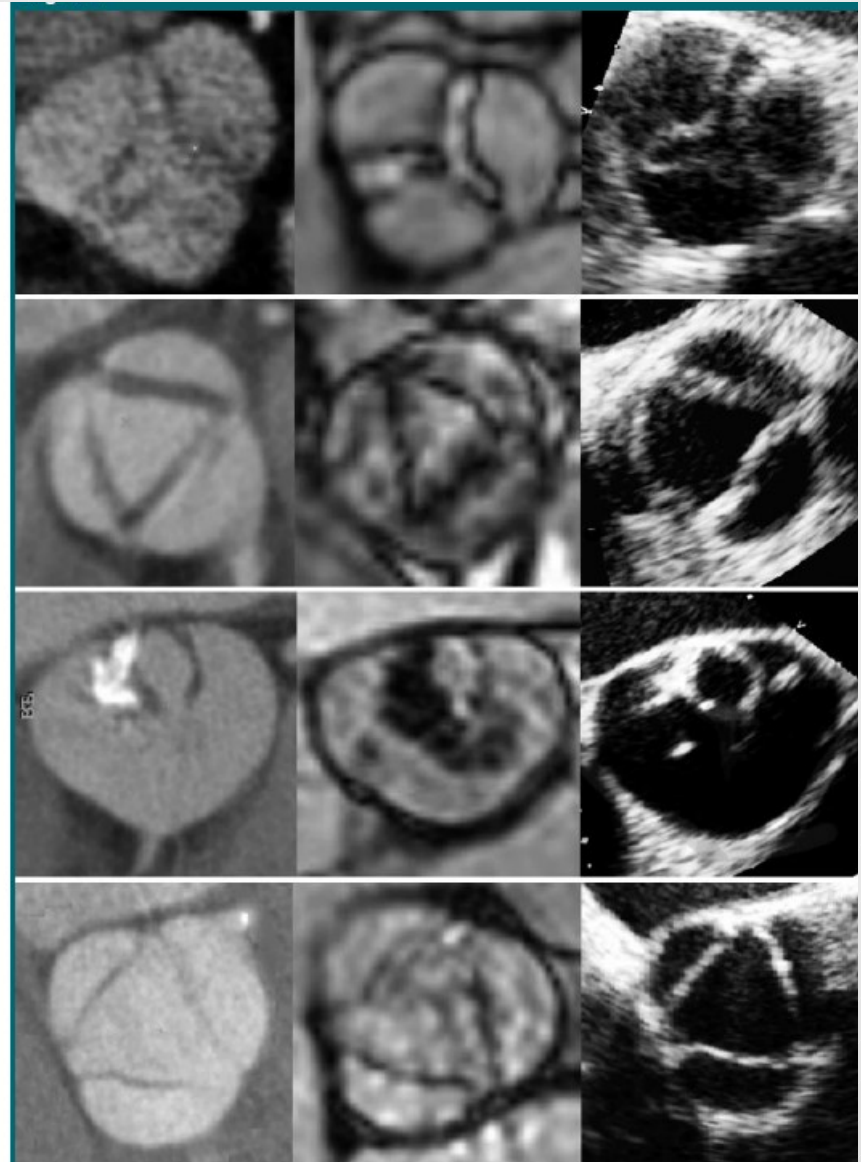


# Cath

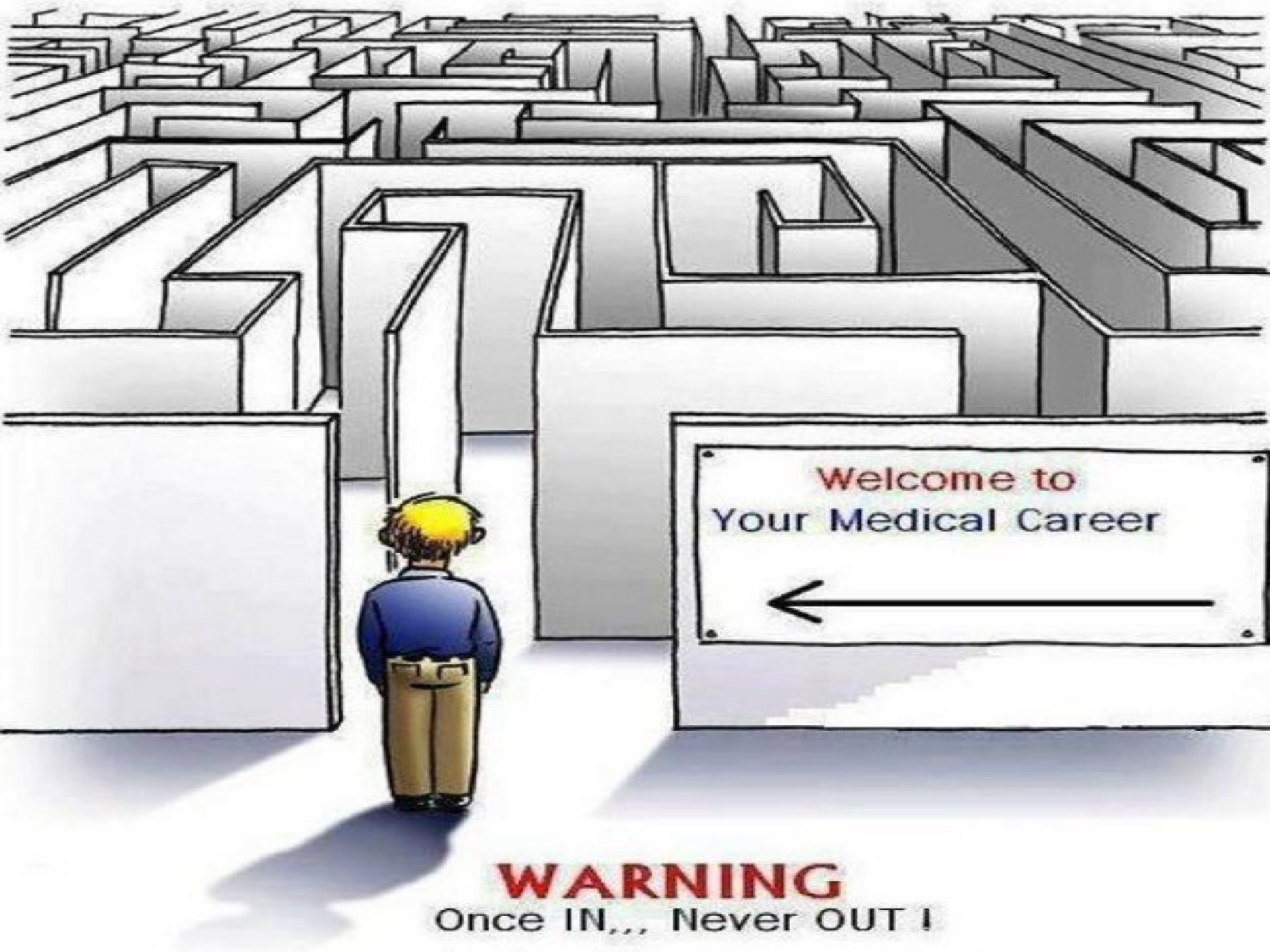


During ventricular ejection, LVP exceeds AP (gray area, pressure gradient generated by stenosis).  
*Abbreviations:* LAP, left atrial pressure; LVP, left ventricular pressure; AP, aortic pressure.

# MRI and CT







Welcome to  
Your Medical Career



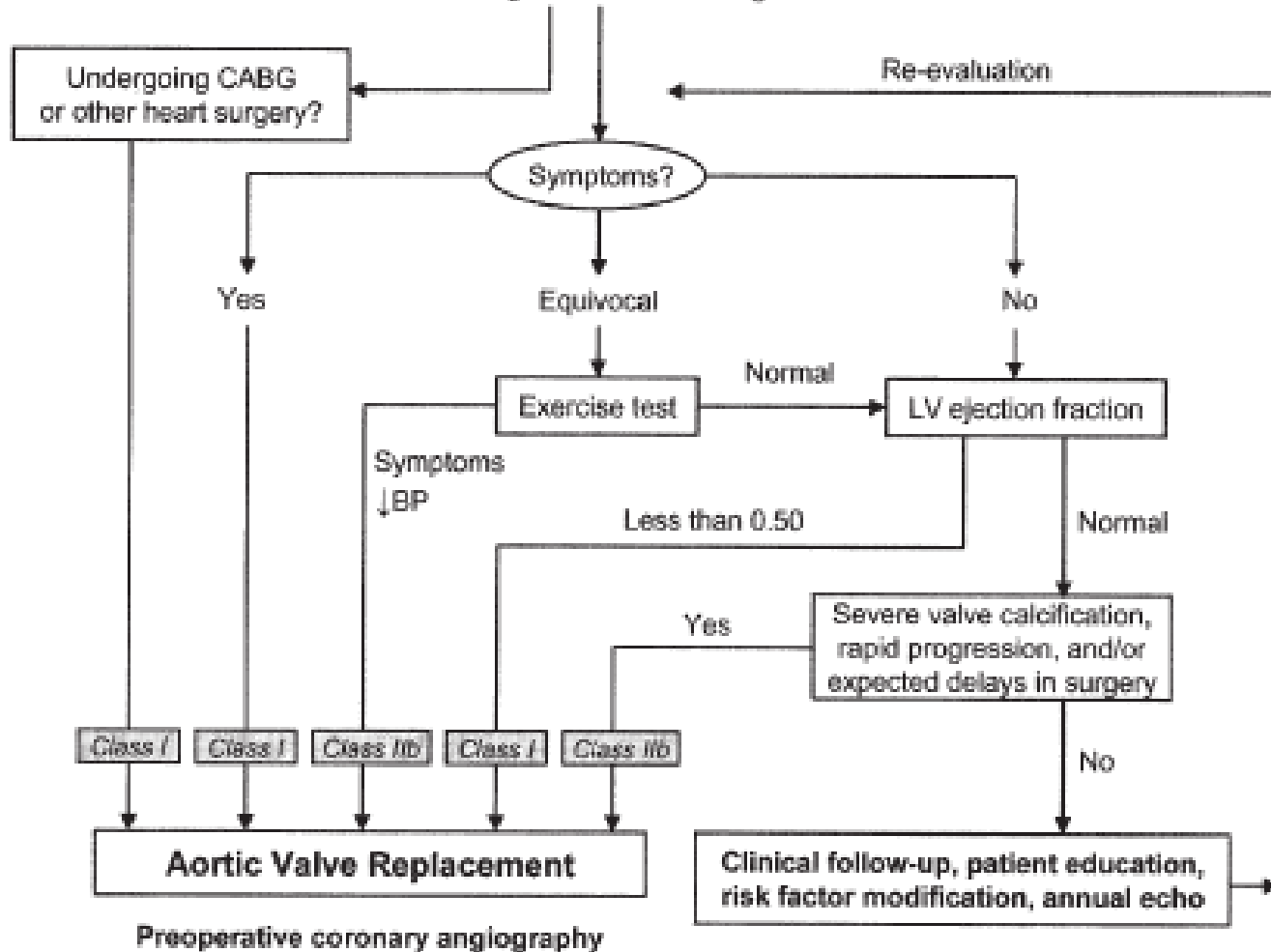
**WARNING**  
Once IN,,, Never OUT!

# Grading severity of AS

- Mild (area  $1.5 \text{ cm}^2$ , mean gradient less than 25 mm Hg, or jet velocity less than 3.0 m per second)
- Moderate (area 1.0 to  $1.5 \text{ cm}^2$ , mean gradient 25–40 mm Hg, or jet velocity 3.0–4.0 m per second)
- Severe (area less than  $1.0 \text{ cm}^2$ , mean gradient greater than 40 mm Hg or jet velocity greater than 4.0 m per second).

# Severe Aortic Stenosis

$V_{max}$  greater than 4 m/s  
AVA less than 1.0 cm<sup>2</sup>  
Mean gradient > 40 mm Hg





# Indications for surgery

## Class I

1. AVR is indicated for symptomatic patients with severe AS.\* (*Level of Evidence: B*)
2. AVR is indicated for patients with severe AS\* undergoing coronary artery bypass graft surgery (CABG). (*Level of Evidence: C*)
3. AVR is indicated for patients with severe AS\* undergoing surgery on the aorta or other heart valves. (*Level of Evidence: C*)
4. AVR is recommended for patients with severe AS\* and LV systolic dysfunction (ejection fraction less than 0.50). (*Level of Evidence: C*)



## Class IIa

AVR is reasonable for patients with moderate AS\* undergoing CABG or surgery on the aorta or other heart valves (see Section X-D). *(Level of Evidence: B)*

## Class IIb

1. AVR may be considered for asymptomatic patients with severe AS\* and abnormal response to exercise (e.g., development of symptoms or asymptomatic hypotension). *(Level of Evidence: C)*
2. AVR may be considered for adults with severe asymptomatic AS\* if there is a high likelihood of rapid progression (age, calcification, and CAD) or if surgery might be delayed at the time of symptom onset. *(Level of Evidence: C)*
3. AVR may be considered in patients undergoing CABG who have mild AS\* when there is evidence, such as moderate to severe valve calcification, that progression may be rapid. *(Level of Evidence: C)*
4. AVR may be considered for asymptomatic patients with extremely severe AS (aortic valve area less than  $0.6 \text{ cm}^2$ , mean gradient greater than 60 mm Hg, and jet velocity greater than 5.0 m per second) when the patient's expected operative mortality is 1.0% or less. *(Level of Evidence: C)*



### **Class III**

**AVR is not useful for the prevention of sudden death in asymptomatic patients with AS who have none of the findings listed under the Class IIa/IIb recommendations. (*Level of Evidence: B*)**

# Treatment

- No effective medical therapy for what is primarily a mechanical obstruction
- Aortic valve replacement is standard of care
- Mechanical vs. Bioprosthetic valves
- The Ross procedure



# What about percutaneous AVR?

- ▶ I am NOT going to speak on this.
- ▶ Please listen to Dr. Martinez–Clark on Saturday



# ENDOCARDITIS PROPHYLAXIS?

## 3.1.4.4. Aortic Stenosis: Medical Therapy

*Antibiotic prophylaxis is no longer indicated in patients with aortic stenosis for prevention of infective endocarditis.*

- ▶ 2008 update to guidelines.
- ▶ The exception is a bicuspid AV.





# AORTIC REGURGITATION

- ▶ Any conditions resulting in incompetent aortic leaflets
- ▶ Congenital
  - Bicuspid valve
- ▶ Aortopathy
  - Cystic medial necrosis
  - Collagen disorders (e.g. Marfan's)
  - Ehler-Danlos
  - Osteogenesis imperfecta
  - Pseudoxanthoma elasticum



▶ Acquired

- Rheumatic heart disease
- Dilated aorta (e.g. hypertension..)
- Degenerative
- Connective tissue disorders
  - E.g. ankylosing spondylitis, rheumatoid arthritis, Reiter's syndrome, Giant-cell arteritis )
- Syphilis (chronic aortitis)

▶ Acute AI: aortic dissection, infective endocarditis, trauma



# Physical examination

- ▶ Widened pulse pressure
  - Systolic - diastolic = pulse pressure
- ▶ High pitched, blowing, decrescendo diastolic murmur at LSB
- ▶ Best heard at end-expiration & leaning forward
- ▶ Hands & Knee position



# Symptoms

- ▶ Dyspnea, orthopnea, PND
- ▶ Chest pain.
  - Nocturnal angina >> exertional angina
  - (\*diastolic aortic pressure and increased LVEDP thus \* coronary artery diastolic flow)
- ▶ With extreme reductions in diastolic pressures (e.g. < 40) may see angina



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**Light House** →  
Malar flushing with heartbeat

→ **Alfred De Musset's**  
Nodding of head with heartbeat

**Quincke's** →  
Pulsatile blanching & reddening  
of nail when slight pressure  
is applied

→ **Corrigan's pulse**  
Large Carotid pulse

**HILL's**  
Systolic BP in Lower Limb  
greater than upper limb  
by 20mm Hg

→ **Durozier's**  
Diastolic murmur  
over femoral artery on  
Distal pressure

<http://medicalmnemonics4u.blogspot.com>



# Assess severity by impact on peripheral signs and LV

- ★ peripheral signs = ★ severity
- ★ LV = ★ severity
- S3
- Austin –Flint
- LVH
- radiological cardiomegaly







"Off hand, I'd say you're suffering from an arrow through your head, but just to play it safe, I'm ordering a bunch of tests."

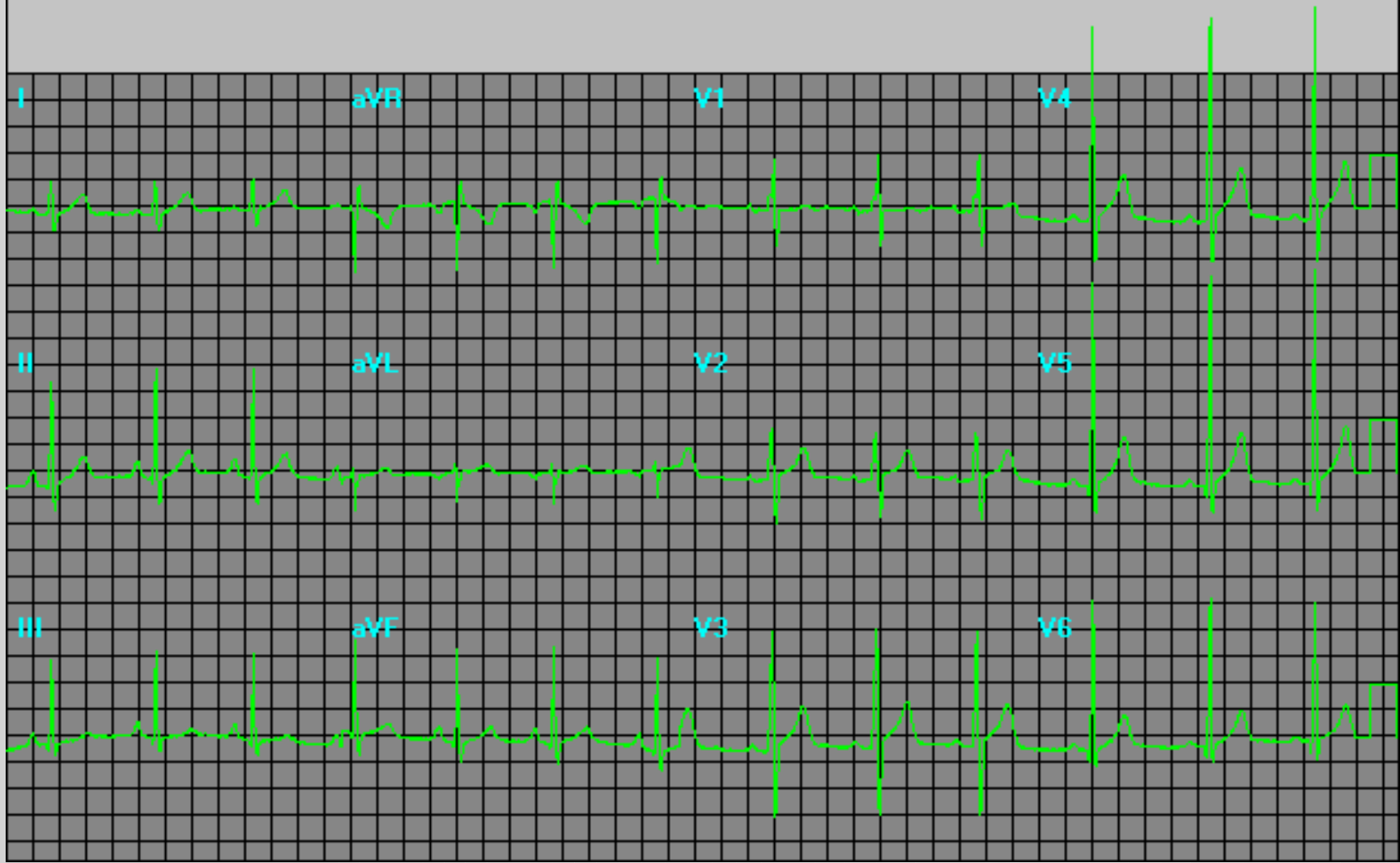


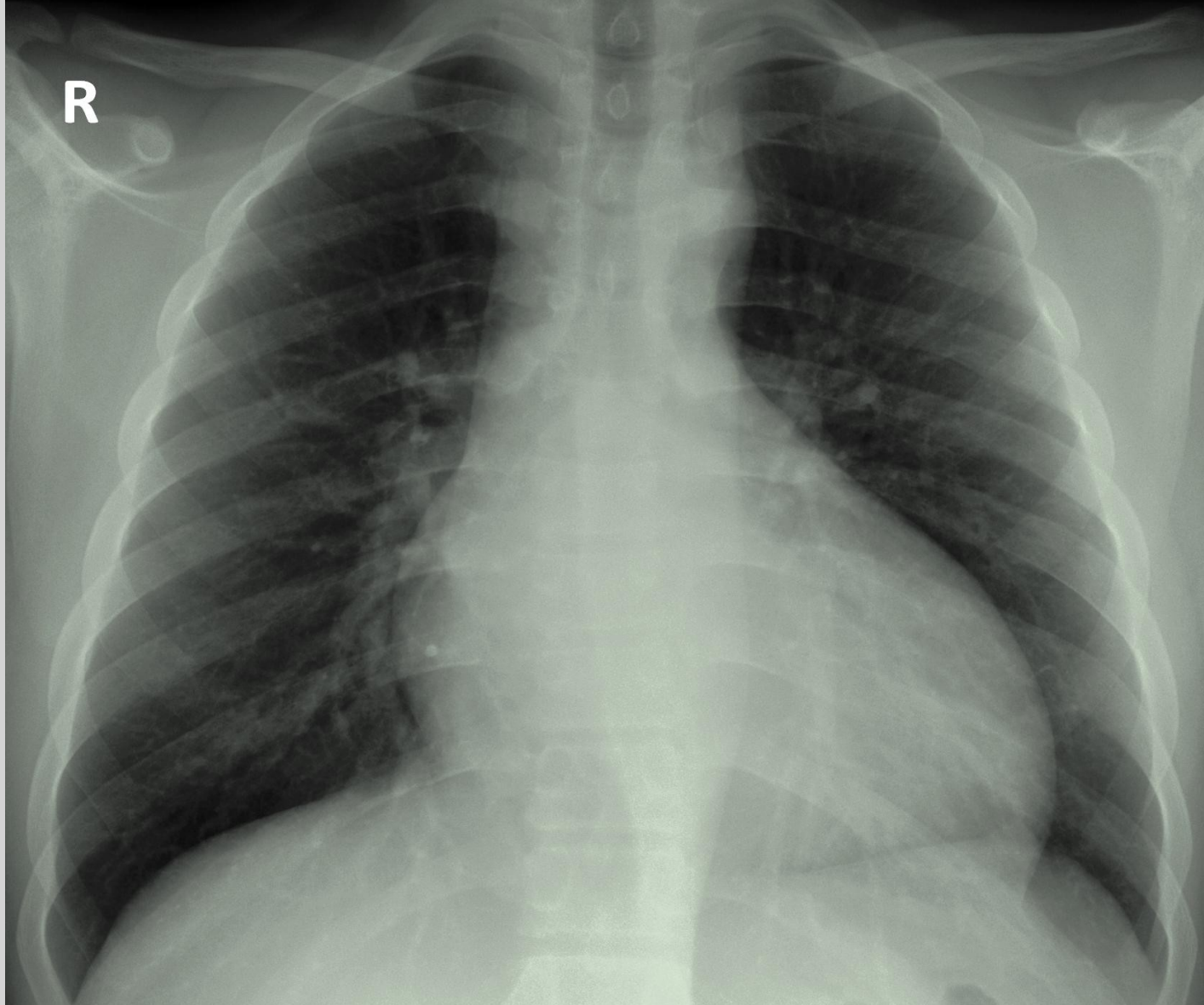
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# Testing

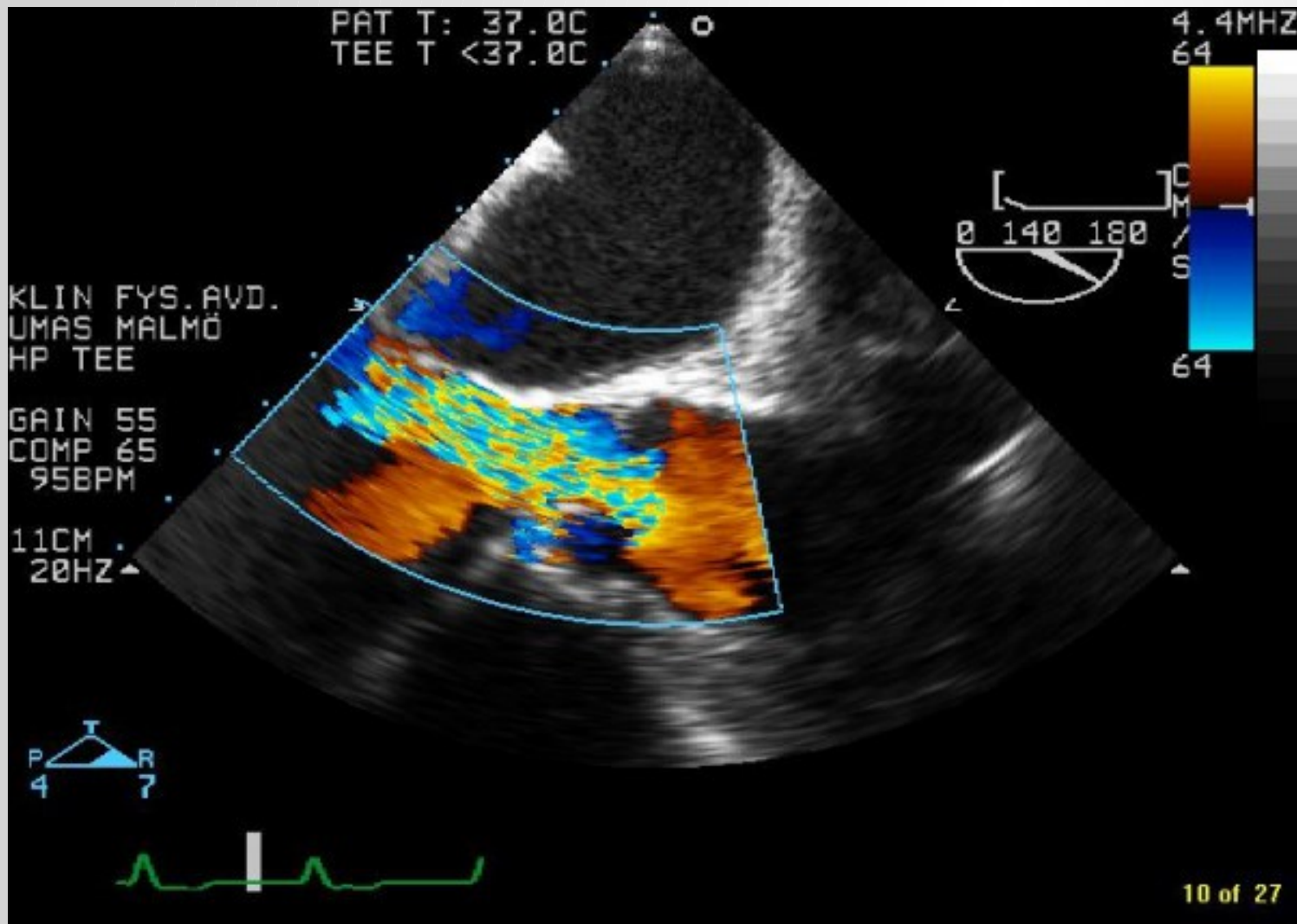
- ▶ ECG
- ▶ Echo
- ▶ Cath











HDI  
5000

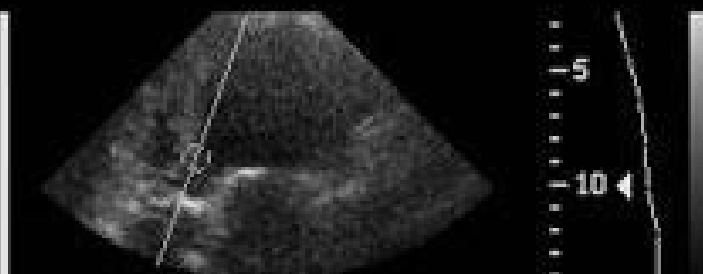
16 Mar 06  
1:46:34 pm

TIs 1.1 MI 0.06  
Fr #105 14.2cm

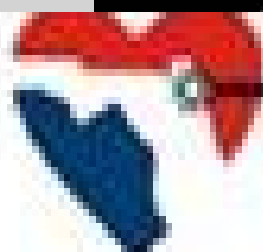
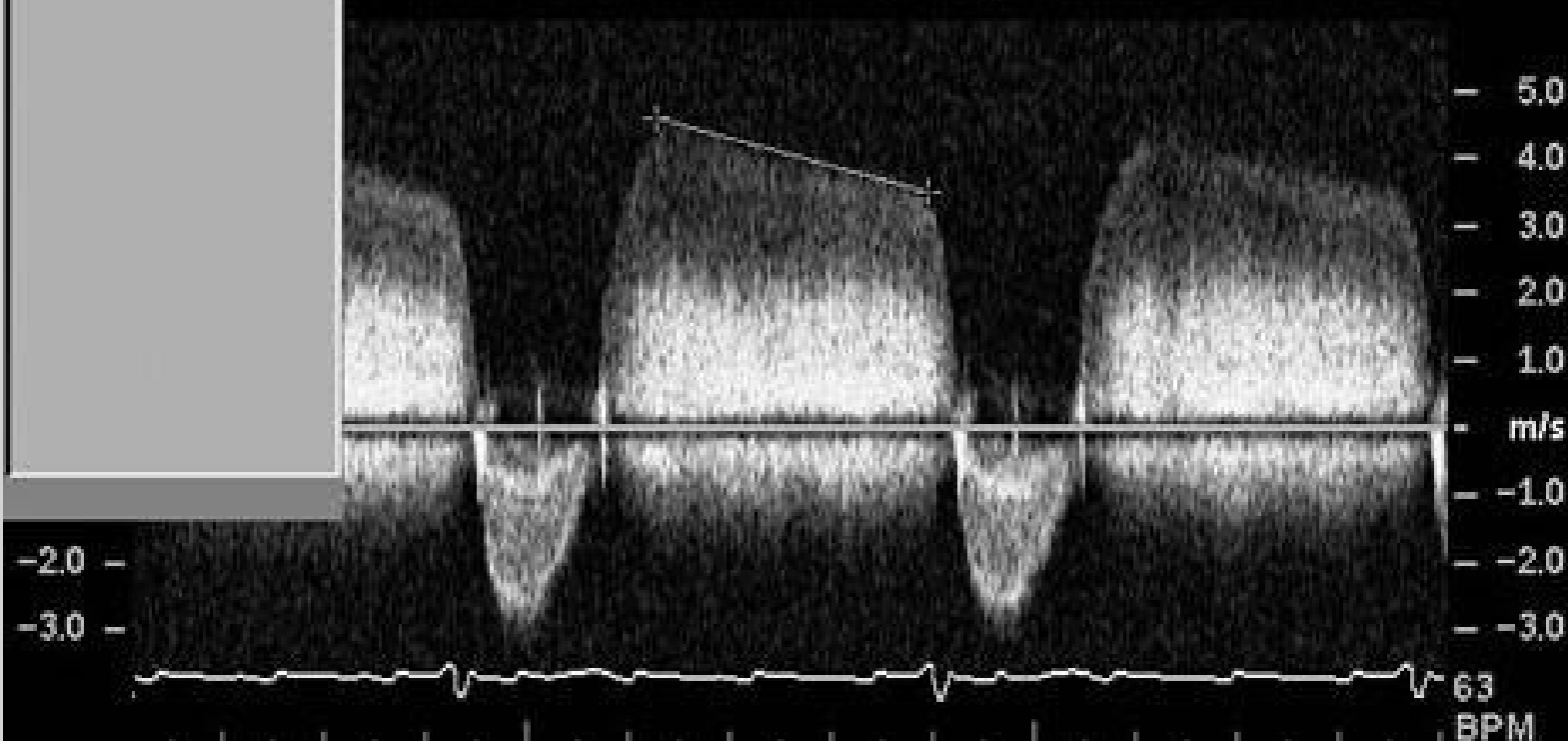
A

End Dias Vel

3.5m/s  
P 1/2 T  
653ms  
NEW

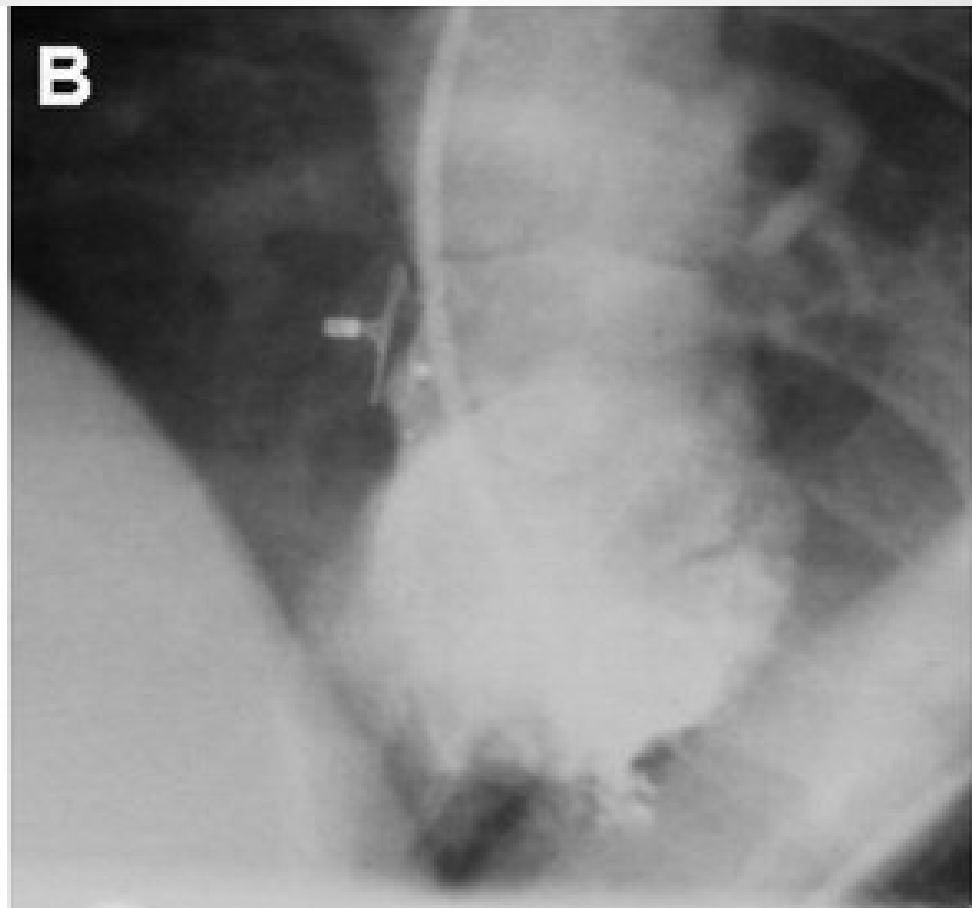
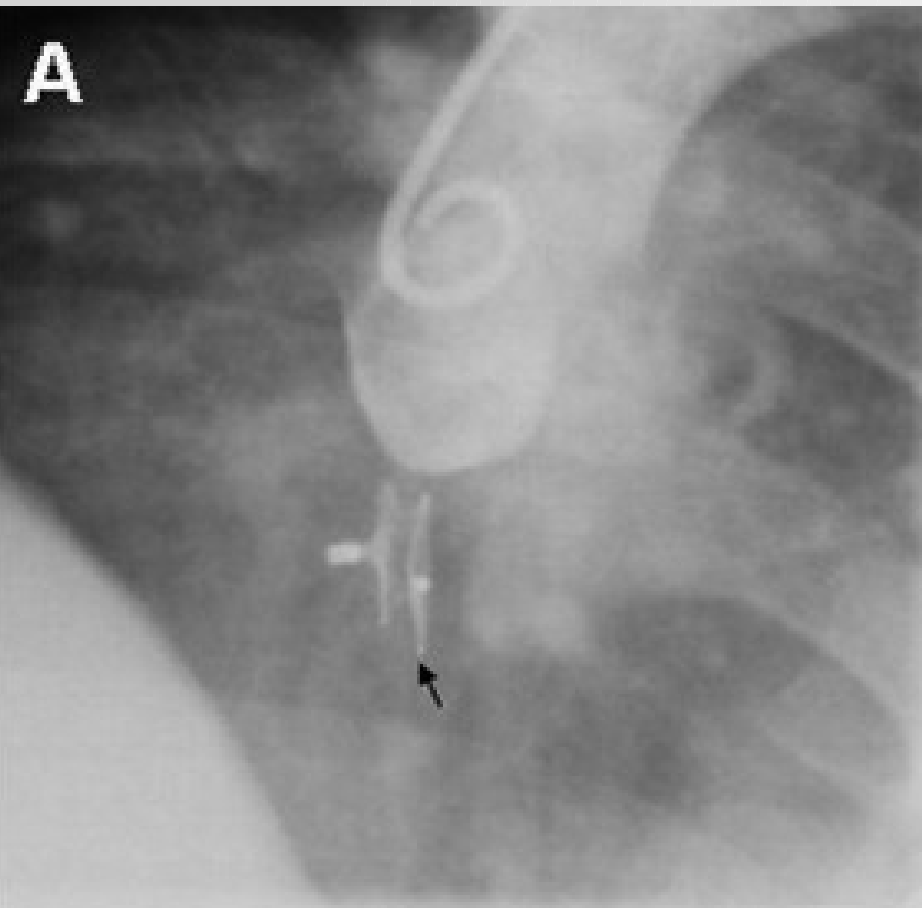


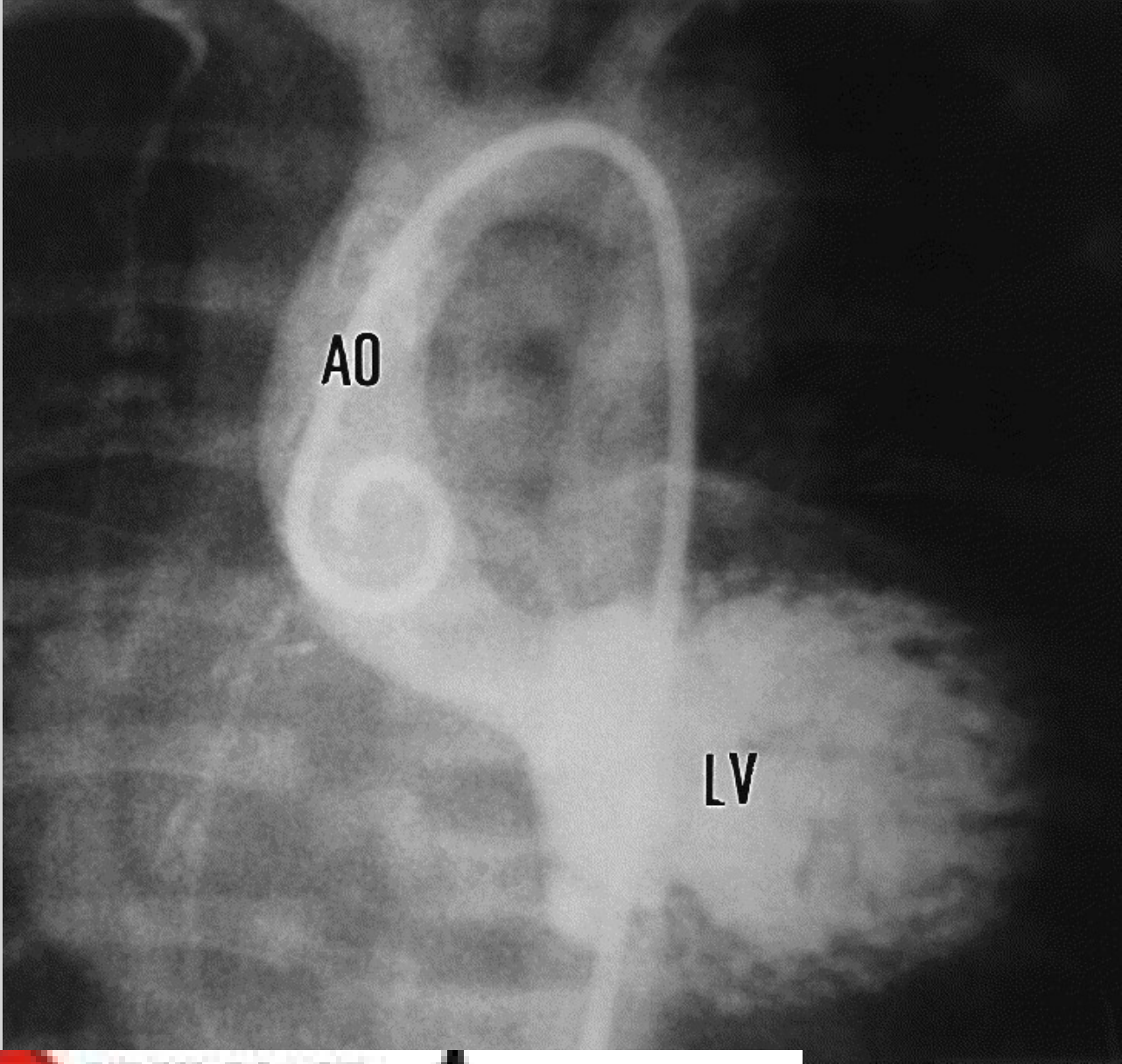
Freq 2.0 MHz  
WF Low  
Dop 64% Map 3  
PRF 25000Hz



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# Aortic Regurgitation: Natural History

- Asymptomatic %/Y
- ▶ Normal LV function (~good prognosis)
    - Progression to symptoms or LV dysfunction < 6
    - Progression to asymptomatic LV dysfunction < 3.5
    - 75% 5-year survival
    - Sudden death < 0.2
  - ▶ Abnormal LV function
    - Progression to cardiac symptoms 25
  - ▶ Symptomatic (Poor prognosis)
- Treatment:
- ▶ Mortality
  - ▶ Medical → Surgery BEFORE LV dysfunction

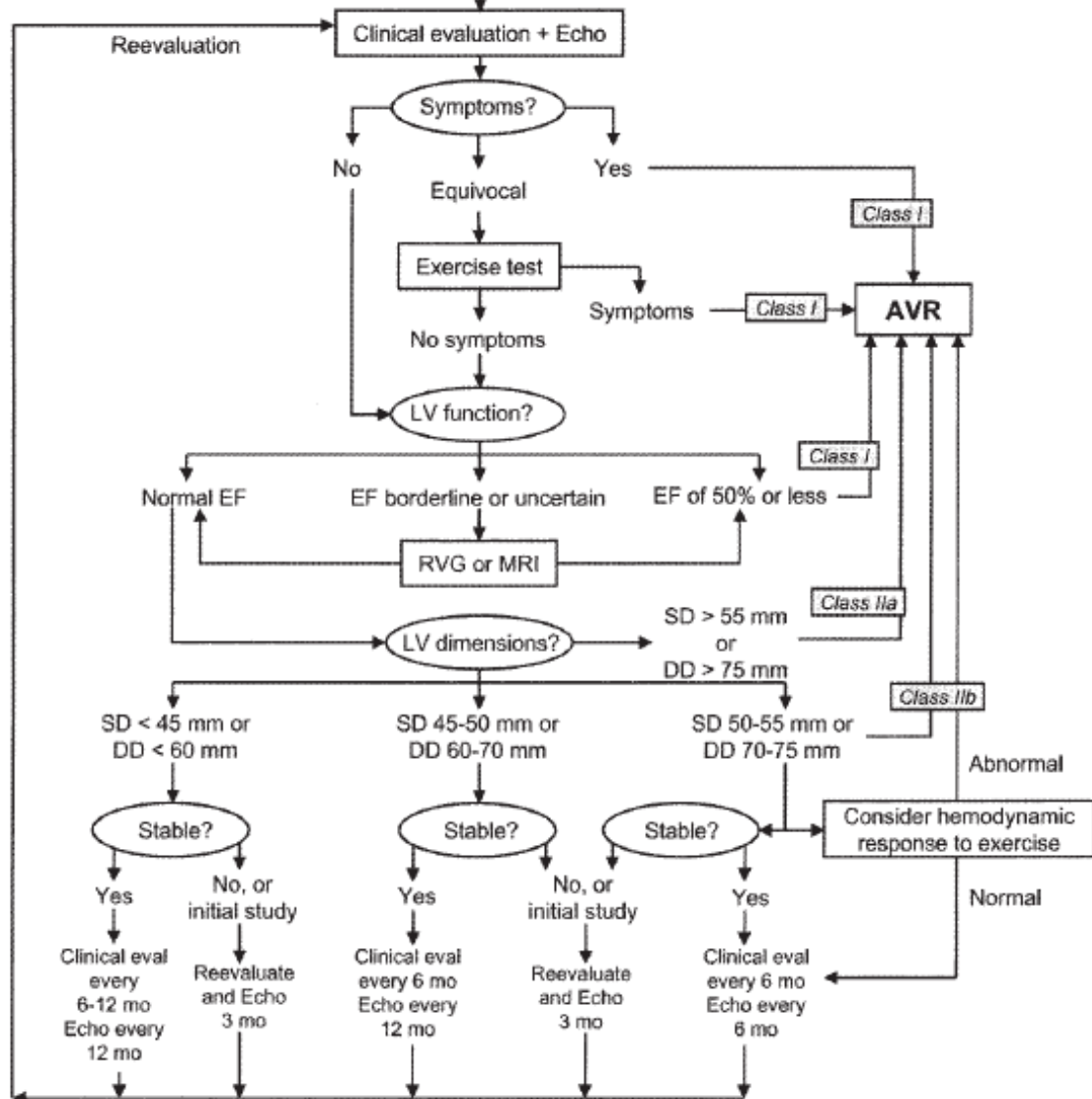
# Echo Indications for Valve Replacement in Asymptomatic AR

> 55	< 55	< .27

# Indication for Valve Replacement in Aortic Regurgitation

- Symptomatic patients with preserved LVF (LVEF > 50%)
- Asymptomatic patients with mild to moderate LV dysfunction (EF 25–49%)
- Patients undergoing CABG, aortic or other valvular surgery
- ▶ ACC/AHA Class II a
  - Asymptomatic patients with preserved LVEF but severe LV dilatation (EDD > 75 mm or ESD > 55mm)

# Chronic Severe Aortic Regurgitation



# SBE PROPHYLAXIS

- ▶ Not recommended







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