



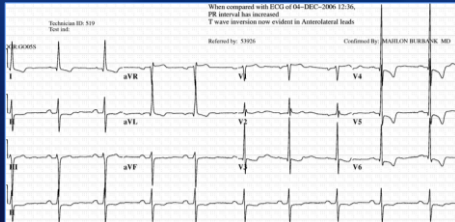
83 Year Old Man With Aortic Stenosis *Hemodynamic Case Presentation*

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83 Year Old Man With Aortic Stenosis

- Aortic stenosis was moderate 7 years ago
- He has been followed carefully since that time
- Presents with several month history of dyspnea on exertion
- No angina

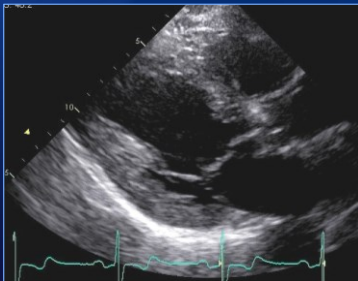
83 Year Old Man With Severe Aortic Stenosis *ECG*



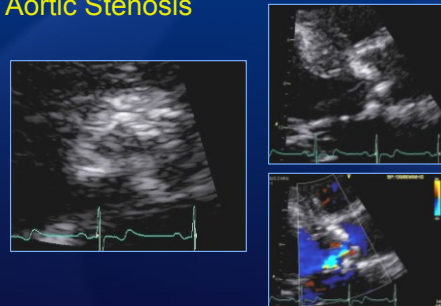
83 Year Old Man With Aortic Stenosis

- Moderately increased LV wall thickness
- LVEF 73%
- Grade 2/4 LV diastolic dysfunction
- Mildly thickened MV with mild MR
- Mildly enlarged ascending aorta
- Normal pulmonary artery pressure

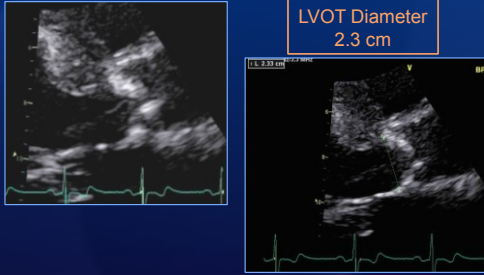
83 Year Old Man With Aortic Stenosis



83 Year Old Man With Aortic Stenosis

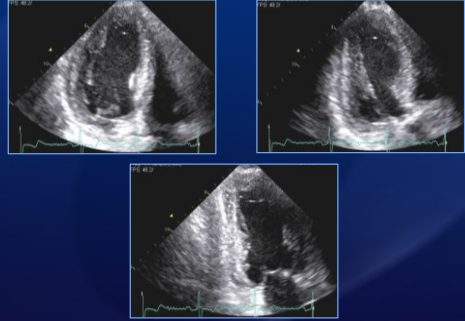


83 Year Old Man With Aortic Stenosis



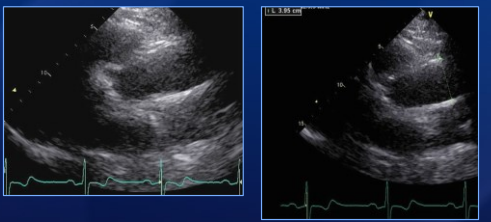
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83 Year Old Man With Aortic Stenosis



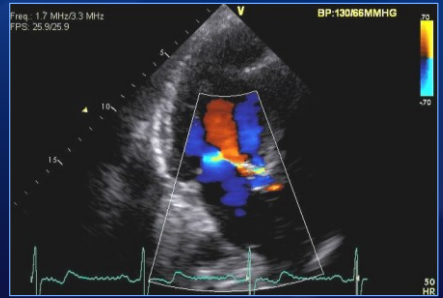
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83 Year Old Man With Aortic Stenosis



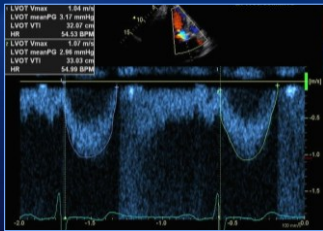
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83 Year Old Man With Aortic Stenosis



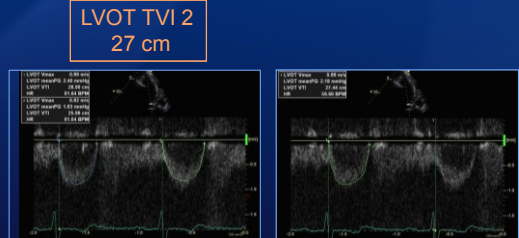
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83 Year Old Man With Aortic Stenosis



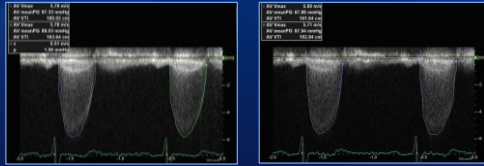
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83 Year Old Man With Aortic Stenosis



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83 Year Old Man With Aortic Stenosis



MG 88 mmHg
TVI 163 cm



83 Year Old Man With Aortic Stenosis

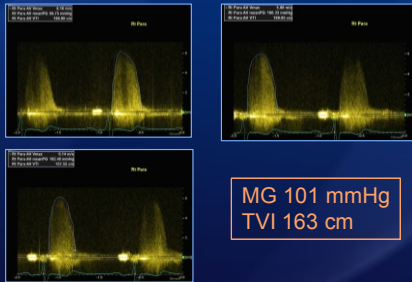
Measurements for Hemodynamics

| | |
|---------------|--------------------|
| BSA | 1.98m ² |
| LVOT diameter | 2.3 cm |
| LVOT TVI 1 | 33 cm |
| LVOT TVI 2 | 27 cm |
| AV MG | 88 mmHg |
| AV TVI | 164 cm |

Should we make aortic stenosis hemodynamic calculations yet?



83 Year Old Man With Aortic Stenosis



MG 101 mmHg
TVI 163 cm



83 Year Old Man With Aortic Stenosis

Measurements for Hemodynamics

| | |
|---------------|--------------------|
| BSA | 1.98m ² |
| LVOT diameter | 2.3 cm |
| LVOT TVI 1 | 33 cm |
| LVOT TVI 2 | 27 cm |
| AV MG | 101 mmHg |
| AV TVI | 167 cm |



83 Year Old Man With Aortic Stenosis

Measurements for Hemodynamics

We have two sets of TVI measurements
Which set should we use to calculate his Aortic Valve Area (AVA)?

In order to decide, we have to calculate his LV stroke volume and stroke volume index, with each TVI, and decide which makes most sense



83 Year Old Man With Aortic Stenosis

Stroke Volume 1

$$\begin{aligned} \text{LVOT diameter} &= 2.3 \text{ cm} & \text{LVOT TVI} &= 33 \text{ cm} \\ \text{LVOT AREA} &= (0.785) \times (2.3 \text{ cm})^2 = 4.2 \text{ cm}^2 \\ \text{SV} &= (\text{LVOT area}) \times (\text{LVOT TVI}) \\ &= (4.2 \text{ cm}^2) \times (33 \text{ cm}) = 139 \text{ cc} \\ \text{SVI} &= (\text{SV}) \div (\text{BSA}) = (139 \text{ cc}) \div (1.98 \text{ m}^2) \\ &= 70 \text{ cc/m}^2 \end{aligned}$$

Normal SVI = 32-58 cc/m²



83 Year Old Man With Aortic Stenosis Stroke Volume 2

LVOT diameter = 2.3 cm LVOT TVI = 27 cm²
 LVOT AREA = $(0.785) \times (2.3 \text{ cm})^2 = 4.2 \text{ cm}^2$
 SV = (LVOT area) x (LVOT TVI)
 = $(4.2 \text{ cm}^2) \times (27 \text{ cm}) = 113 \text{ cc}$
 SVI = $(SV) \div (\text{BSA}) = (113 \text{ cc}) \div (1.98 \text{ m}^2)$
 = 57 cc/m^2

Normal SVI = 32-58 cc/m²



83 Year Old Man With Aortic Stenosis Measurements for Hemodynamics

We have two sets of TVI measurements

Which set should we use to calculate his Aortic Valve Area (AVA)?

He has only mild to moderate aortic regurgitation

There is no reason for him to have a markedly increased stroke volume index, such as what we calculated using TVI 1 (70 cc/m²)

We should use the stroke volume that we calculated using TVI 2 (113 cc) that is associated with a clinically reasonable stroke volume index (57 cc/m²)

Normal SVI = 32-58 cc/m²



83 Year Old Man With Aortic Stenosis Aortic Valve Area Calculation

AVA = $(SV) \div (\text{AV CW TVI})$
 = $(113 \text{ cc}) \div (167 \text{ cm})$
 = 0.68 cm^2

This very small valve area is concordant with his very large aortic valve mean gradient
101 mmHg



I. Classification of Aortic Stenosis with valve area $\leq 1.0 \text{ cm}^2$ and stroke volume index $\geq 35 \text{ cc/m}^2$ (Normal Flow)

| Classification | Velocity | Mean Gradient mmHg | LVEF % |
|----------------|------------------------|-----------------------|-----------------------|
| Severe | ≥ 4.0 and < 5.0 | ≥ 40 and < 60 | ≥ 50 or $< 50\%$ |
| Very Severe | ≥ 5.0 | ≥ 60 | ≥ 50 or $< 50\%$ |
| Moderate | < 4.0 | < 40 | ≥ 50 |

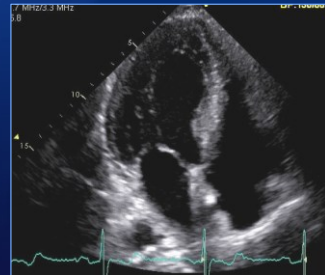


83 Year Old Man With Aortic Stenosis Echo

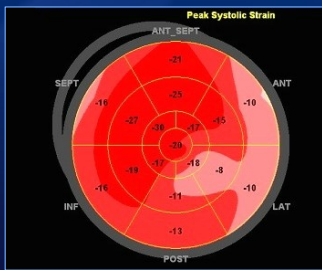
- Very severe calcific AS with mild to moderate AR
- AVA 0.67 cm² ; MG 101 mmHg



83 Year Old Man With Severe Aortic Stenosis

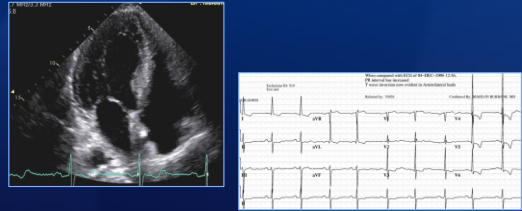


83 Year Old Man With Severe Aortic Stenosis



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83 Year Old Man With Severe Aortic Stenosis



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83 Year Old Man With Severe Aortic Stenosis *Coronary Angiography*

- Balanced dominance
- Normal left main
- 20% stenosis mid LAD
- Normal circumflex
- 20% stenosis mid RCA



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83 Year Old Man With Severe Aortic Stenosis *Surgery*

- Aortic valve was severely calcified
- It was excised and replaced with 25 mm Hancock II porcine tissue prosthesis
- Developed postoperative Afib
- Treated with amiodorone and warfarin
- Dismissed day 6, in sinus rhythm



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83 Year Old Man With Aortic Stenosis *Pre dismissal Echo*

- Normal appearance of aortic prosthesis with no regurgitation
- MG 18 mmHg; EOA 2.6 cm²
EOA index 1.3 cm² / m²
- Normal LV size with EF 73%
- Grade 2/4 diastolic dysfunction
- Normal RVSP
- No pericardial effusion



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