INTERNATIONAL CENTRE FOR CIRCULATORY HEALTH

Heart Sounds and Cardiac Murmurs

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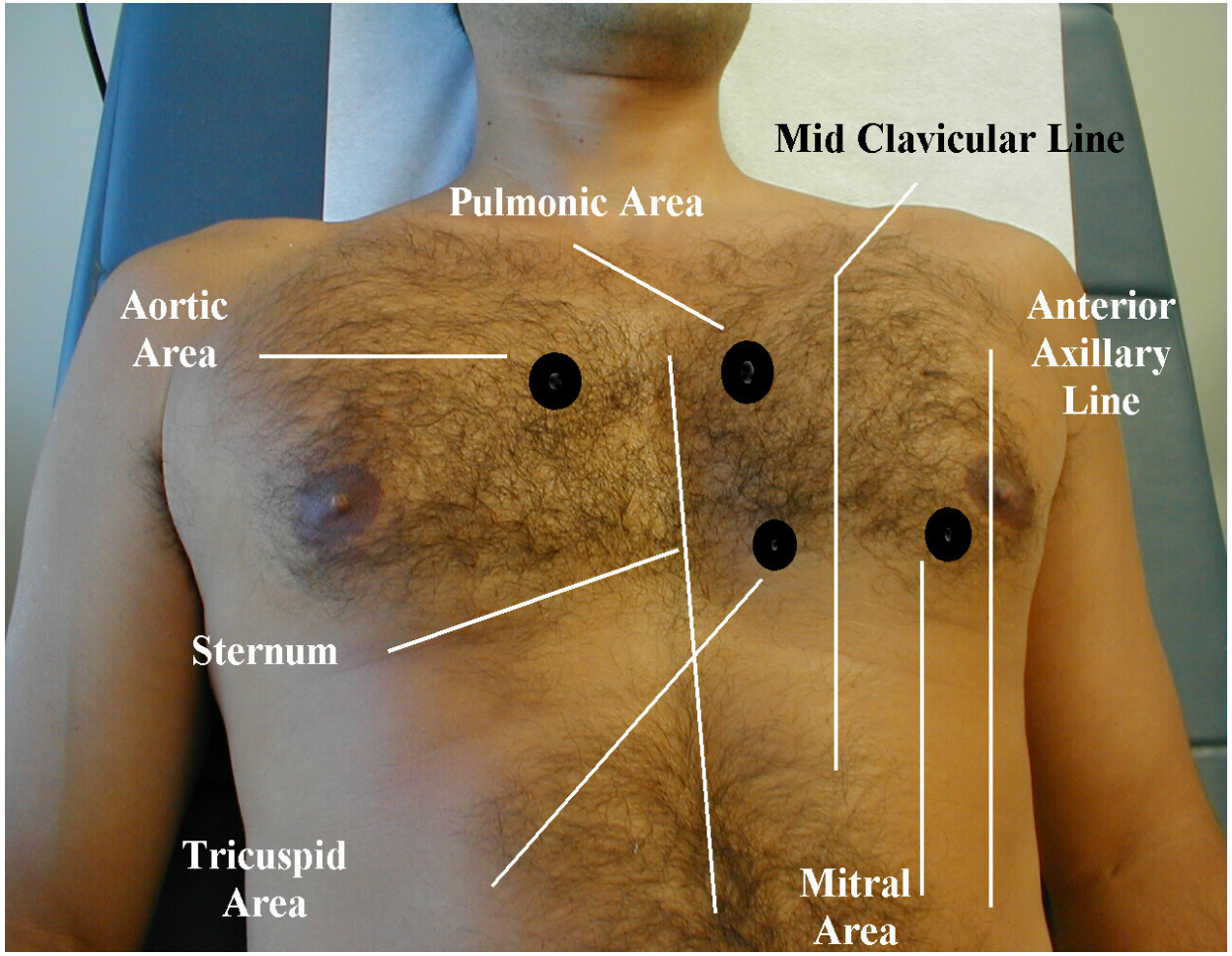
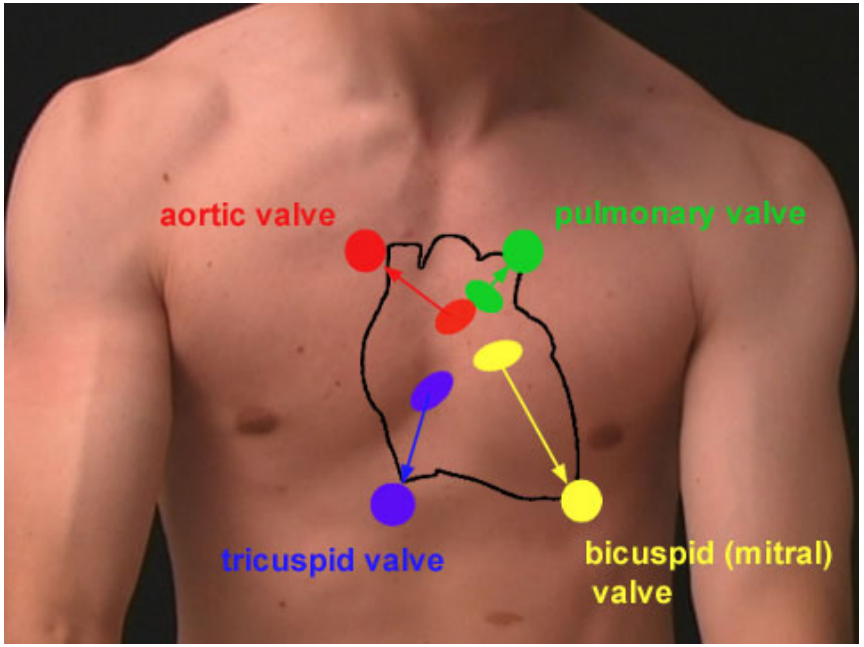
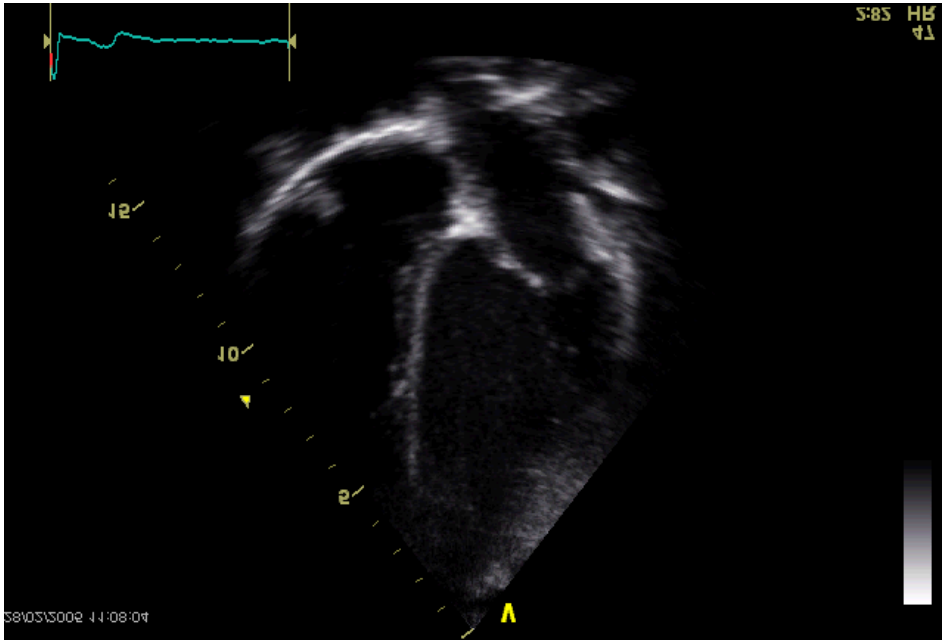
Imperial College Healthcare NHS Trust

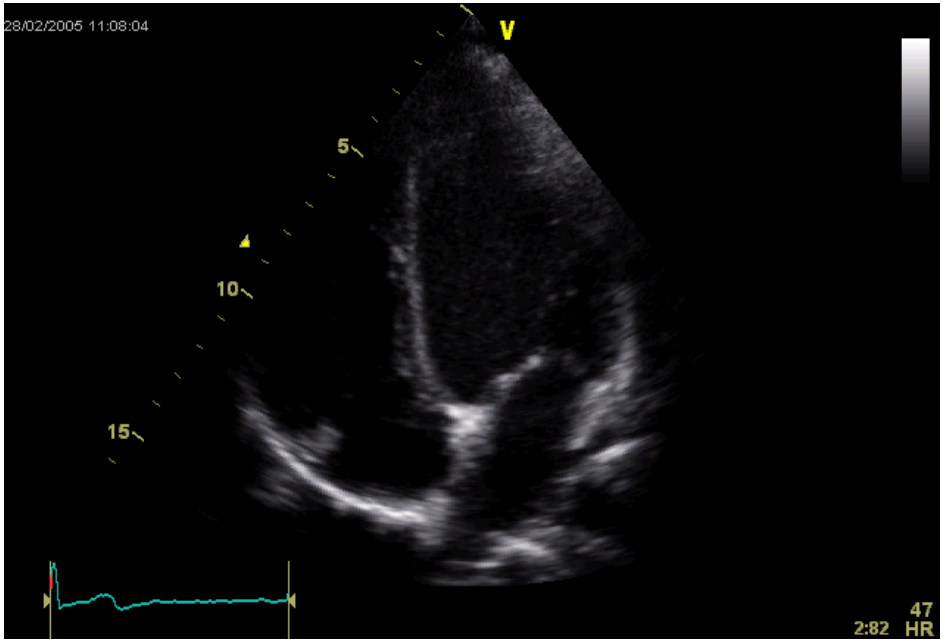
Auscultation



1st sound
2nd sound
Systole
Diastole


aortic valve
pulmonary valve
tricuspid valve
bicuspid (mitral) valve

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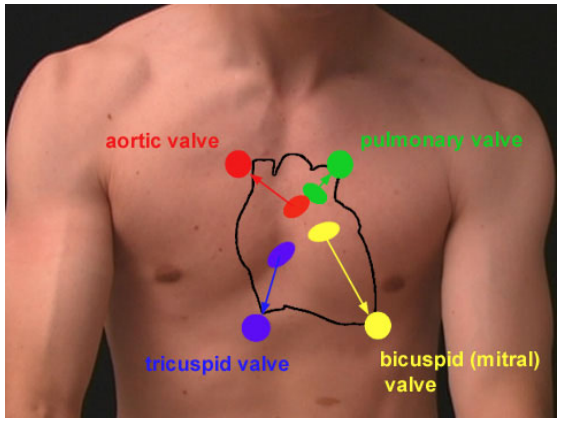
2:82 HR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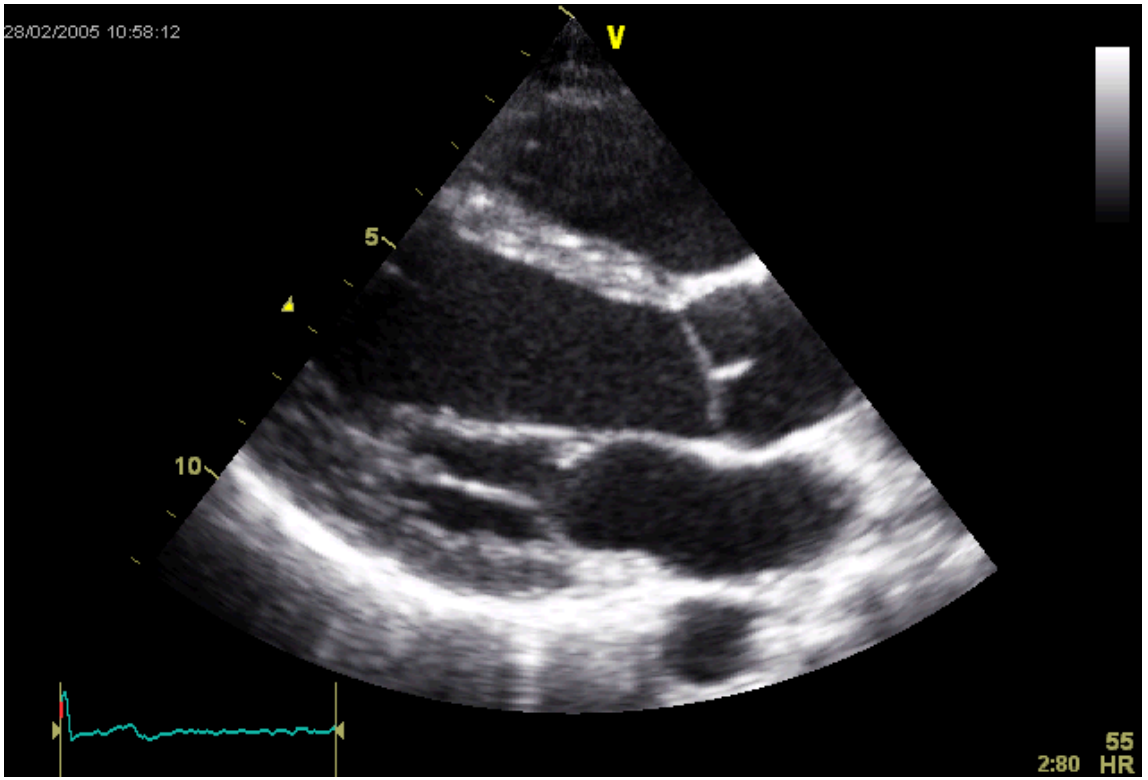
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V
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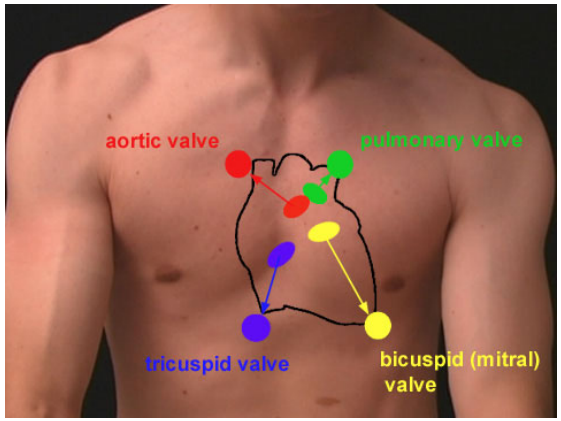
2:80 HR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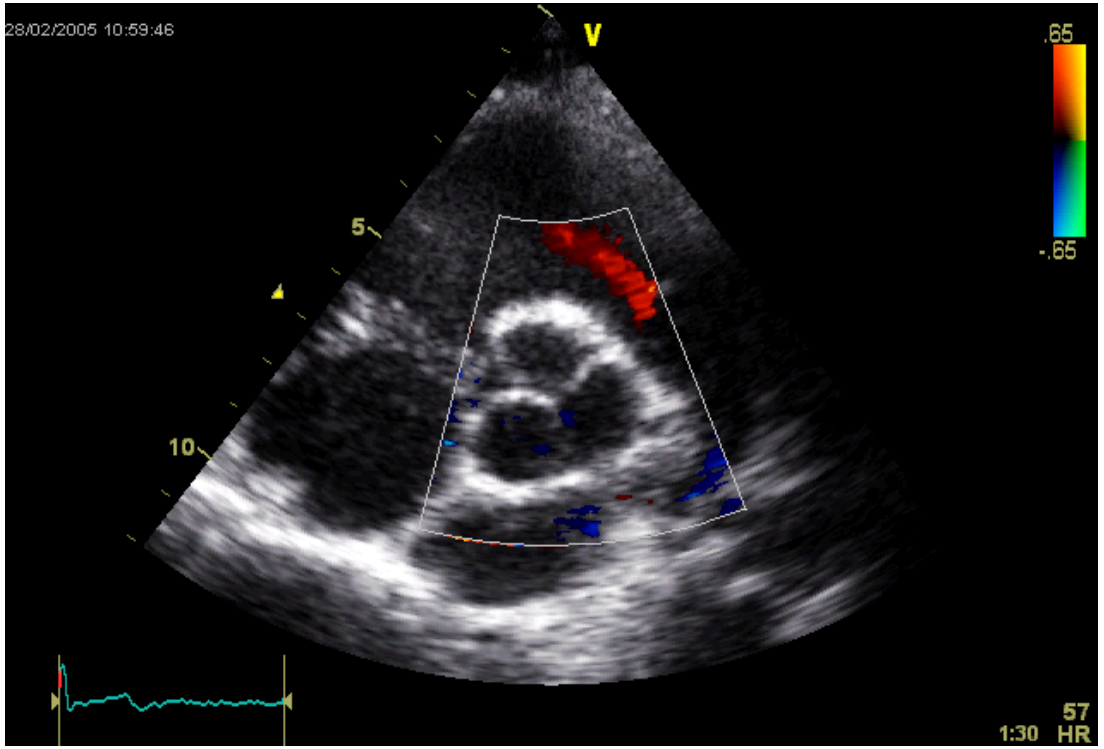
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V
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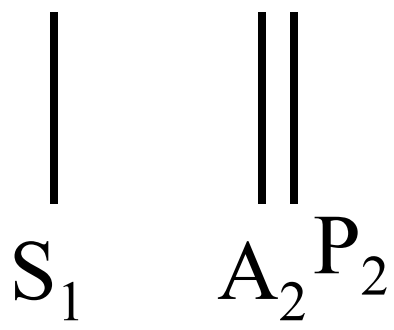
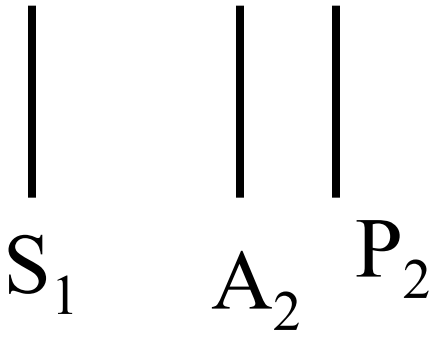
HR
1:30

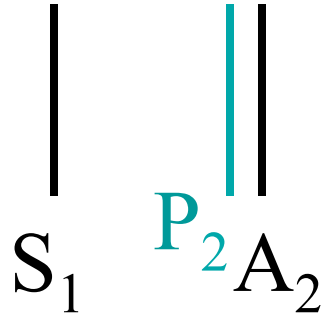
Physiologically split S_2:

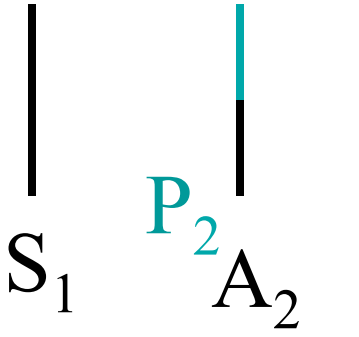




Inspiration

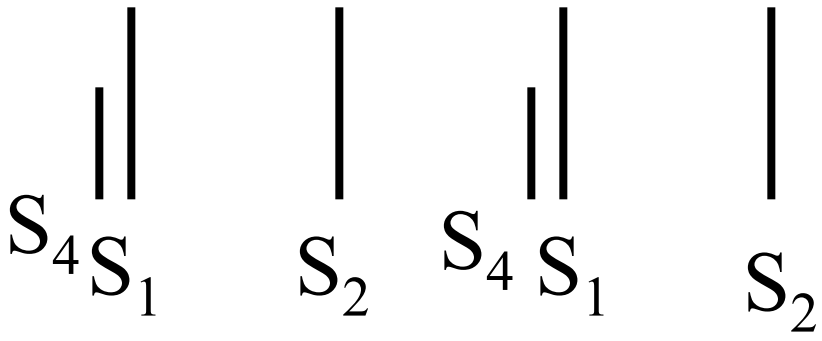
Paradoxically split S_2:



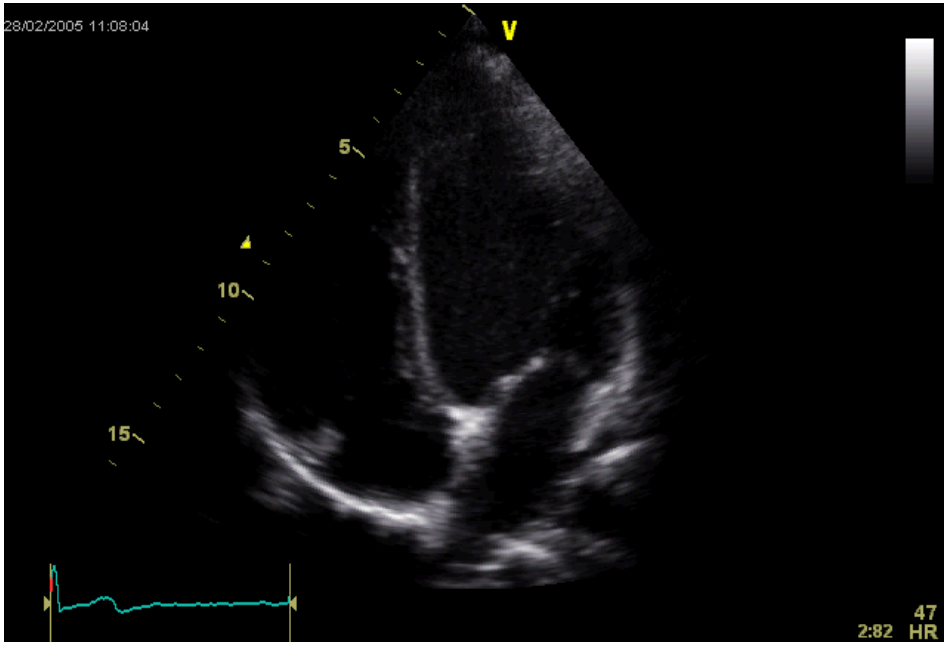


Inspiration

S4



S3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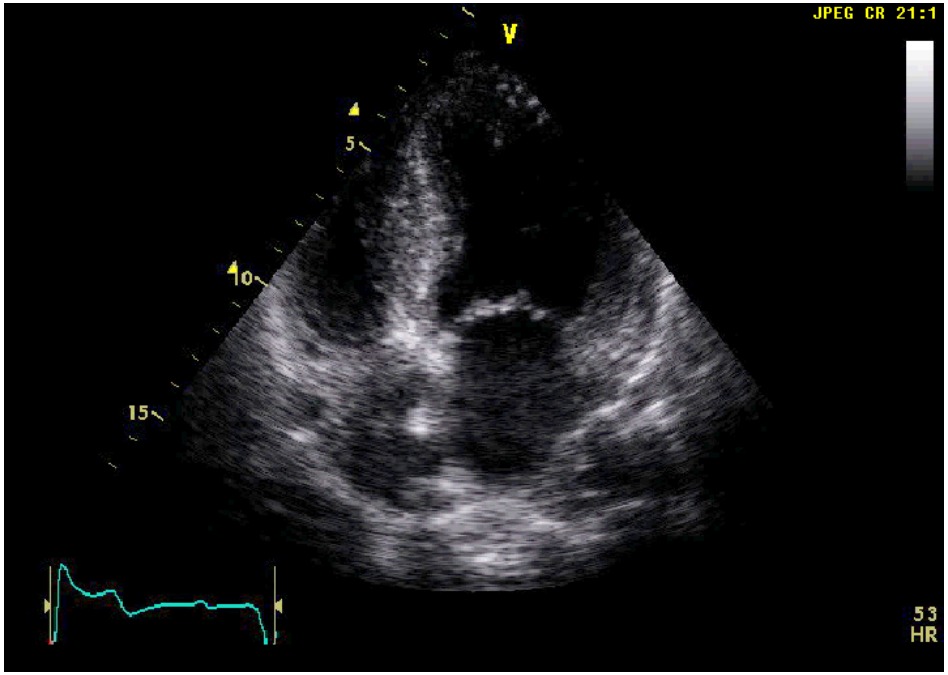
2:82 HR


JPEG CR 21:1
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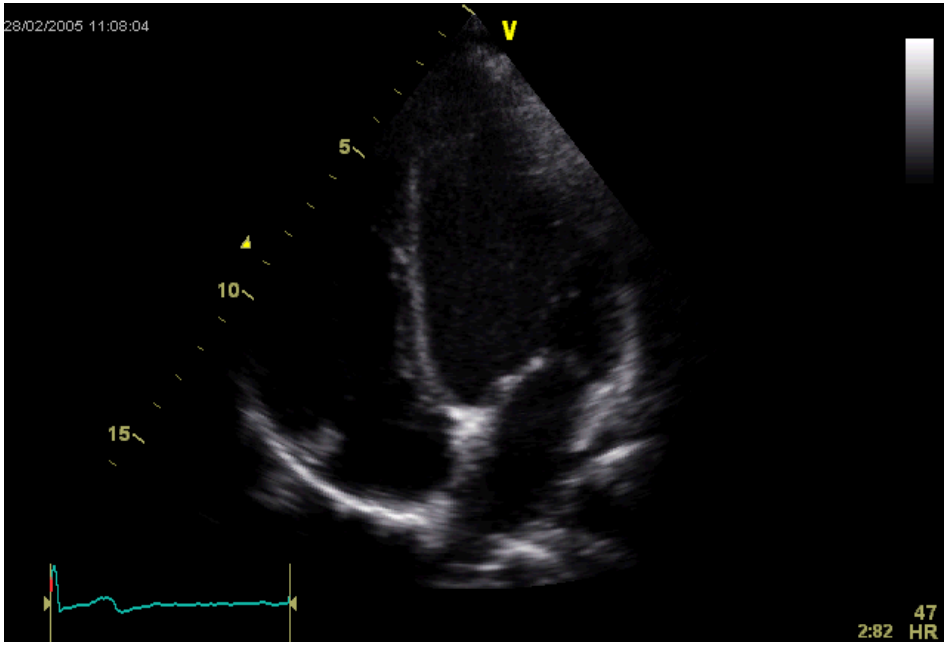
53
HR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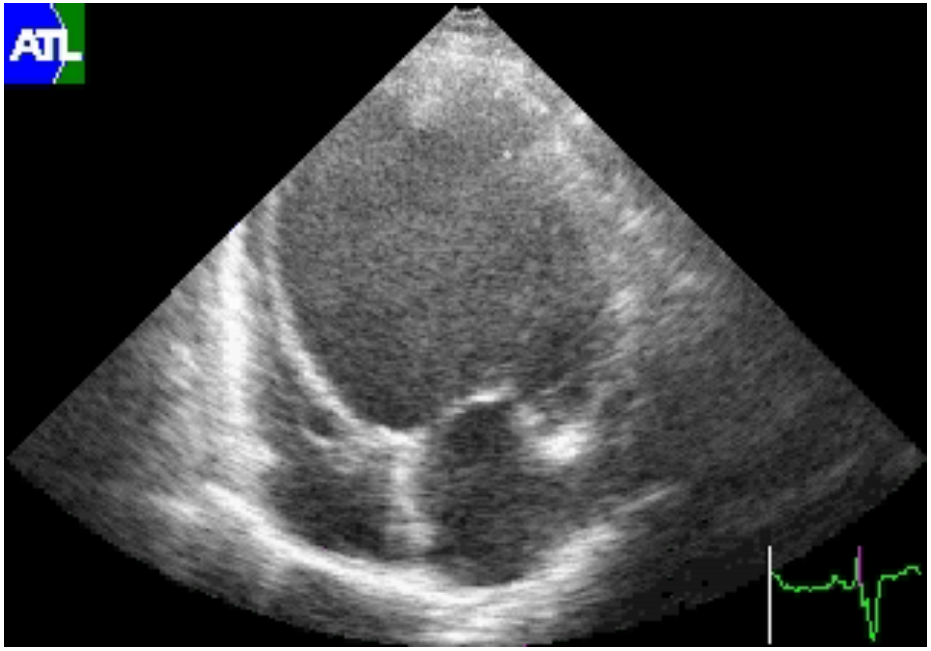
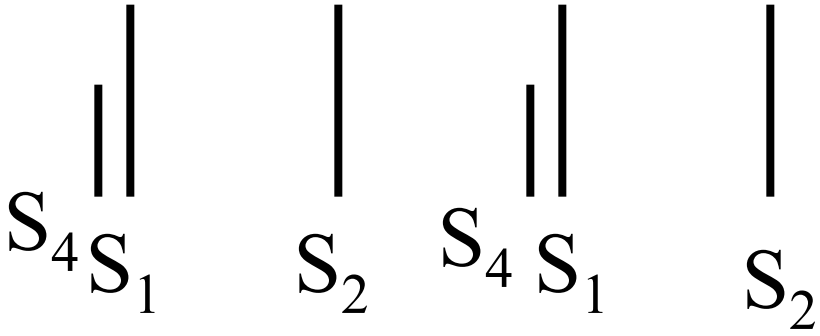
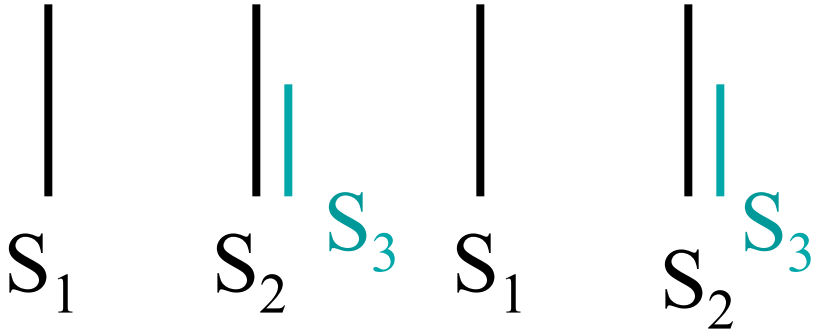

ATL

S4



S3

How is this different from a Split S_2?



No change with inspiration

Pulse

Praecordium

Describing a heart murmur

1. **Timing**
   - murmurs are longer than heart sounds
   - HS can distinguished by simultaneous palpation of the carotid arterial pulse
   - systolic, diastolic, continuous
2. **Shape**
   - crescendo (grows louder), decrescendo, crescendo-decrescendo, plateau
3. **Location of maximum intensity**
   - is determined by the site where the murmur originates
   - e.g. A, P, T, M listening areas

Describing a heart murmur

4. **Radiation**
   - reflects the intensity of the murmur and the direction of blood flow
5. **Intensity**
   - graded on a 6 point scale
     - Grade 1 = very faint
     - Grade 2 = quiet but heard immediately
     - Grade 3 = moderately loud
     - Grade 4 = loud
     - Grade 5 = heard with stethoscope partly off the chest
     - Grade 6 = no stethoscope needed

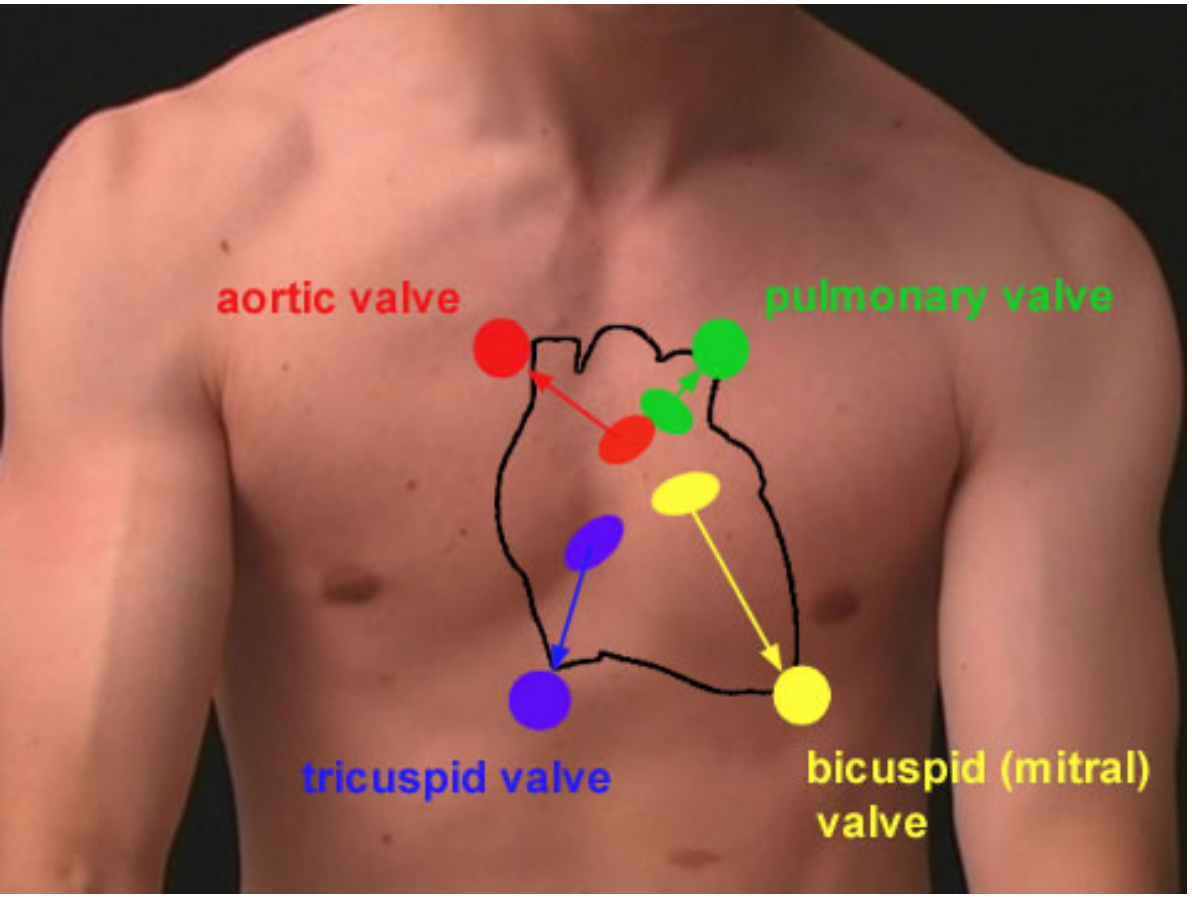
     *Note: Thrills are assoc. with murmurs of grades 4 - 6

Describing a heart murmur

6. **Pitch**
   - **high, medium, low**
7. **Quality**
   - **blowing, harsh, rumbling, and musical**
8. **Others:**
   i. **Variation with respiration**
      - **Right sided murmurs change more than left sided**

   ii. **Variation with position of the patient**

Auscultation



Radiation of murmurs

Left side with bell at apex

Sat forward in expiration

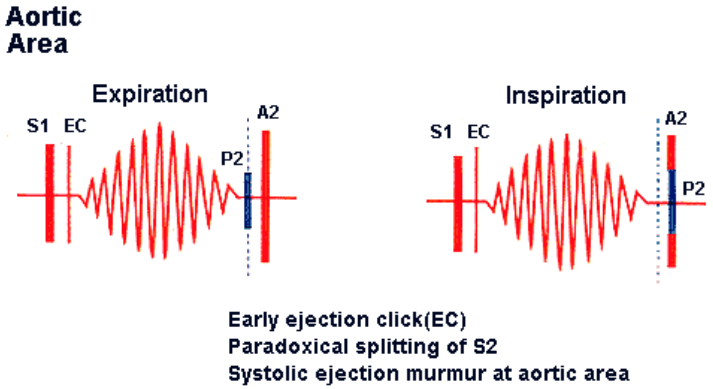
Systolic Murmurs

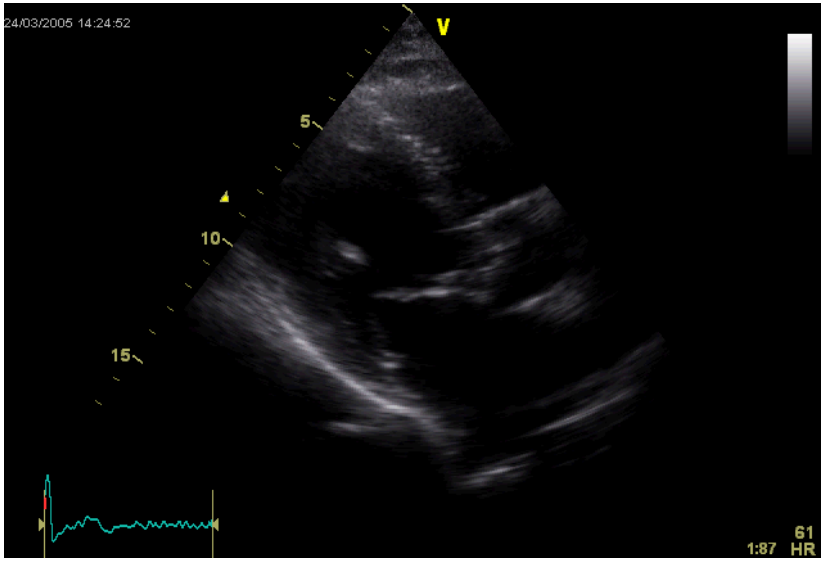
Derived from increased turbulence associated with:

1. Increased flow across normal SL valve or into a dilated great vessel
2. Flow across an abnormal SL valve or narrowed ventricular outflow tract - e.g. aortic stenosis
3. Flow across an incompetent AV valve - e.g. mitral regurg.
4. Flow across the interventricular septum

Midsystolic (ejection) murmurs

- Are the most common kind of heart murmur
- Are usually crescendo-decrescendo
- They may be:
  1. Innocent
     - common in children and young adults
  2. Physiologic
     - can be detected in hyperdynamic states
     - e.g. anemia, pregnancy, fever, and hyperthyroidism
  3. Pathologic
     - are secondary to structural CV abnormalities
     - e.g. Aortic stenosis, Hypertrophic cardiomyopathy, Pulmonary stenosis

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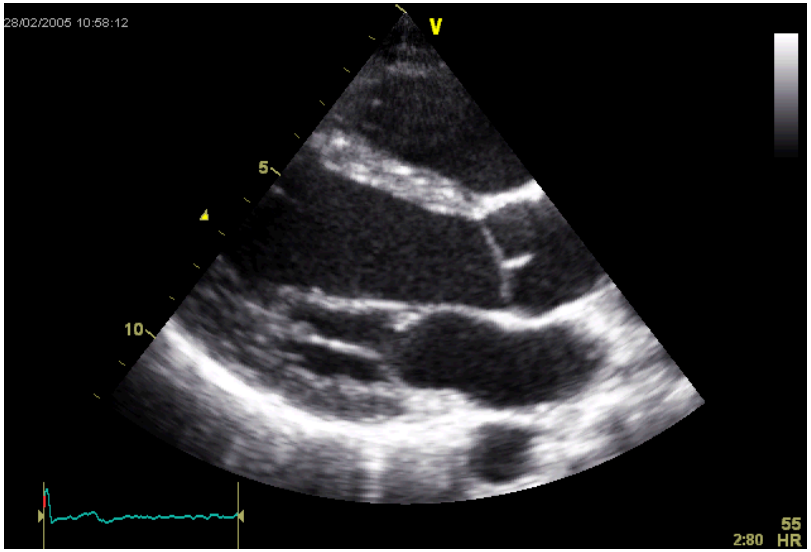
61
1:87 HR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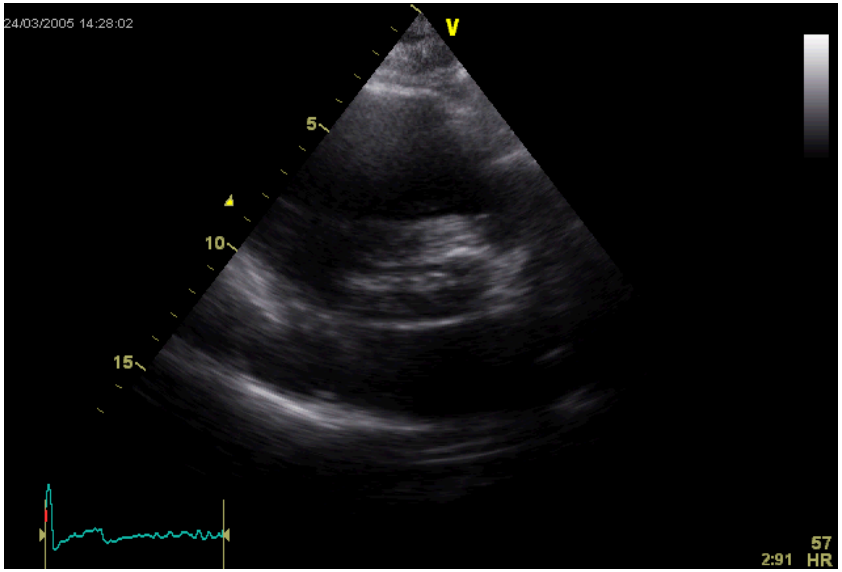
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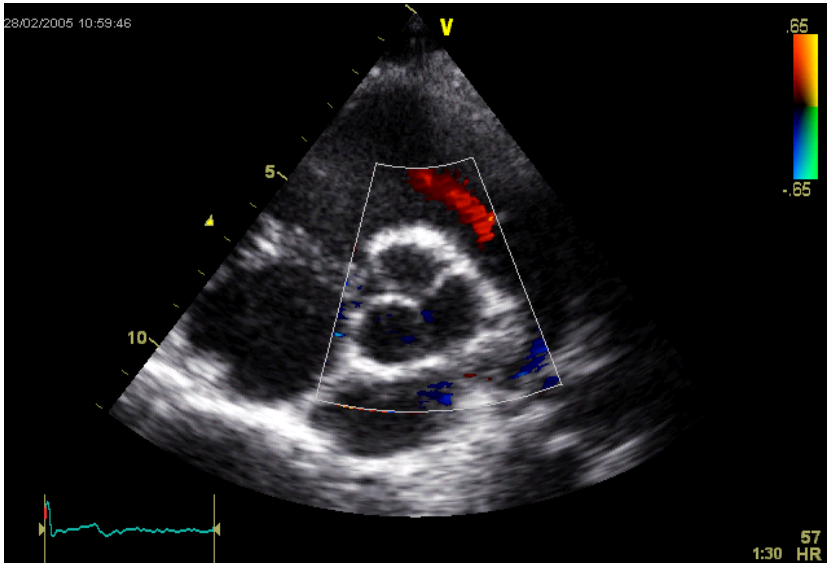
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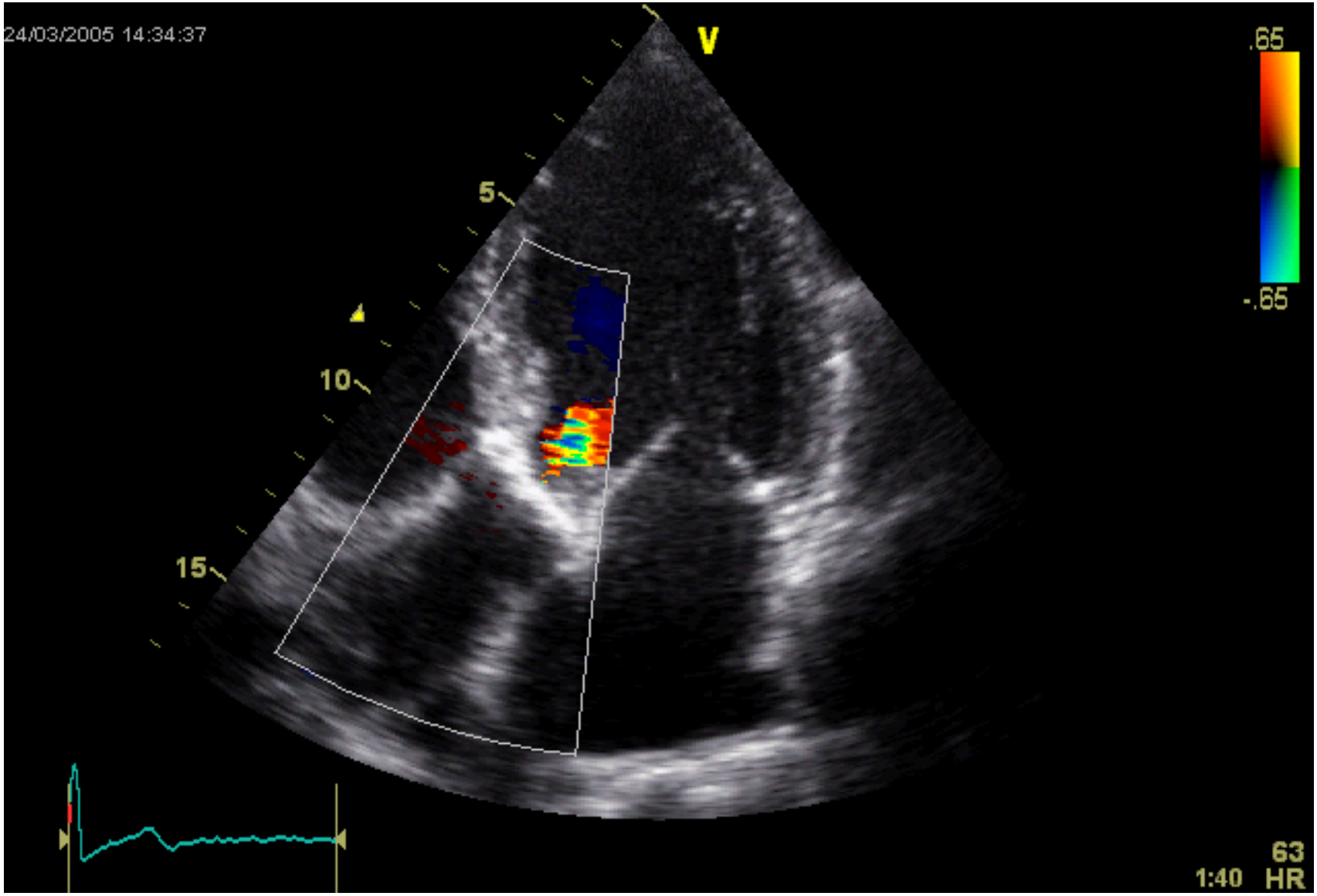
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.65
-.65
63
1:40 HR

Aortic stenosis

- Loudest in aortic area; radiates along the carotid arteries
- Intensity varies directly with CO
- A2 decreases as the stenosis worsens
- Other conditions which may mimic the murmur of aortic stenosis w/o obstructing flow:
  1. Aortic sclerosis
  2. Bicuspid aortic valve
  3. Dilated aorta
  4. Increased flow across the valve during systole

Aortic stenosis – symptoms/ signs

- Slow rising pulse
- LV heave
- Soft / absent A2
- Ejection systolic murmur radiating to carotids

Pansystolic Murmurs

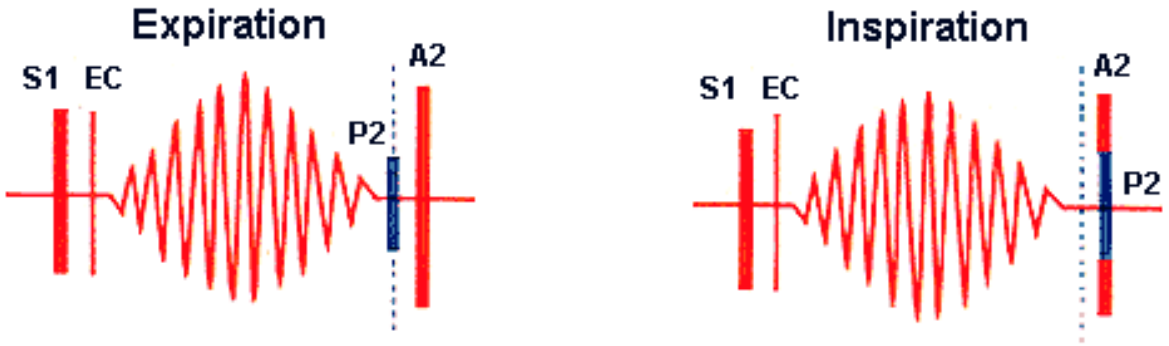
- Are pathologic
- Murmur begins immediately with S1 and continues up to S2

1. **Mitral valve regurgitation**
   - Loudest at the left ventricular apex
   - Radiation reflects the direction of the regurgitant jet

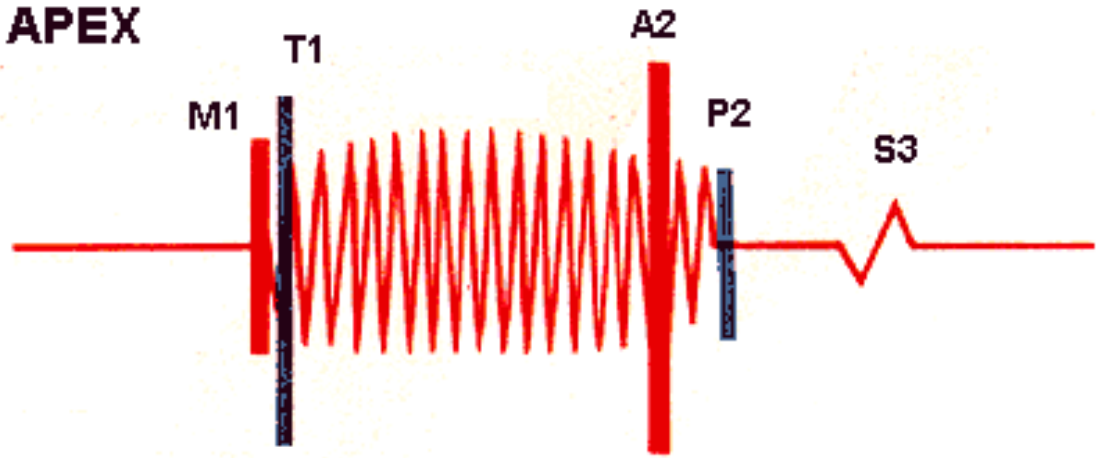
     i. To the base of the heart = anterosuperior jet (flail posterior leaflet)

     ii. To the axilla and back = posterior jet (flail anterior leaflet
   - Also usually associated with a **systolic thrill**, a **soft S3**, and a short **diastolic rumbling** (best heard in left lateral decubitus position)
2. **Tricuspid valve regurgitation**
3. **Ventricular septal defect**

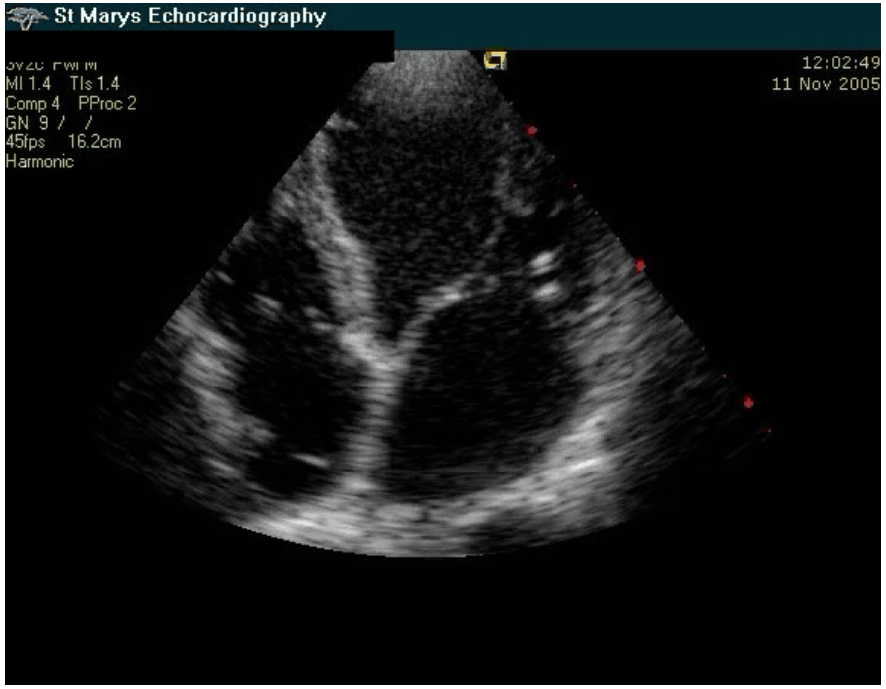
Aortic Area

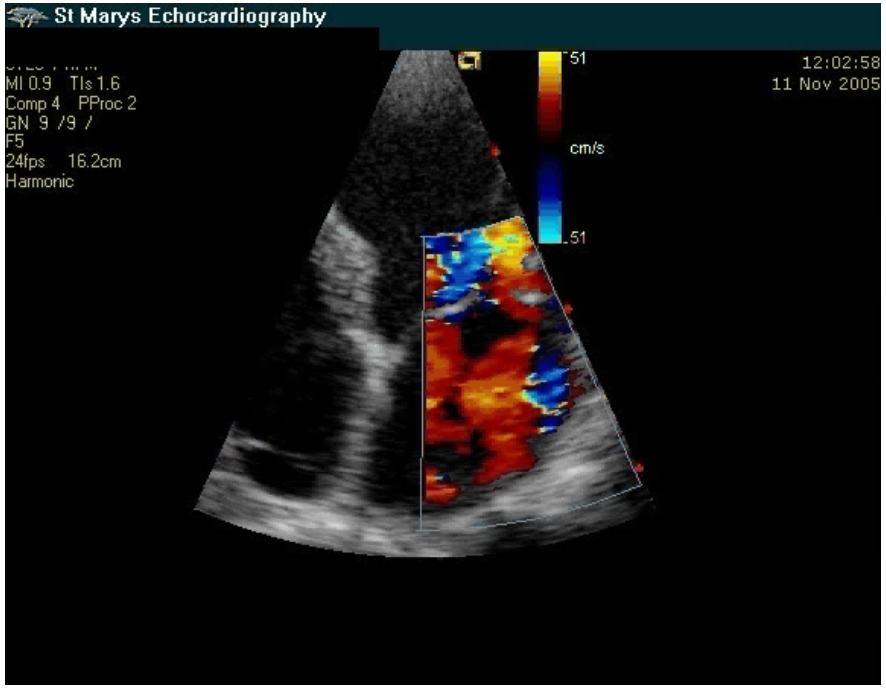


Early ejection click(EC)
Paradoxical splitting of S2
Systolic ejection murmur at aortic area



Soft S1





- Valvular
  - Rheumatic fever, endocarditis
- Mitral valve annulus
  - Dilation, calcification
- Chordae tendinae
  - Rupture, lengthening
- Papillary muscle
  - Ischaemia, dilatation

Diastolic Murmurs

- Almost always indicate heart disease
- **Two basic types**:
  1. Early decrescendo diastolic murmurs
     - signify regurgitant flow through an incompetent semilunar valve
       - e.g. aortic regurgitation
  2. Rumbling diastolic murmurs in mid- or late diastole
     - suggest stenosis of an AV valve
       - e.g. mitral stenosis

Aortic Regurgitation

- Best heard in the 2nd ICS at the left sternal edge
- High pitched, decrescendo
- Blowing quality => may be mistaken for breath sounds
- Radiation:

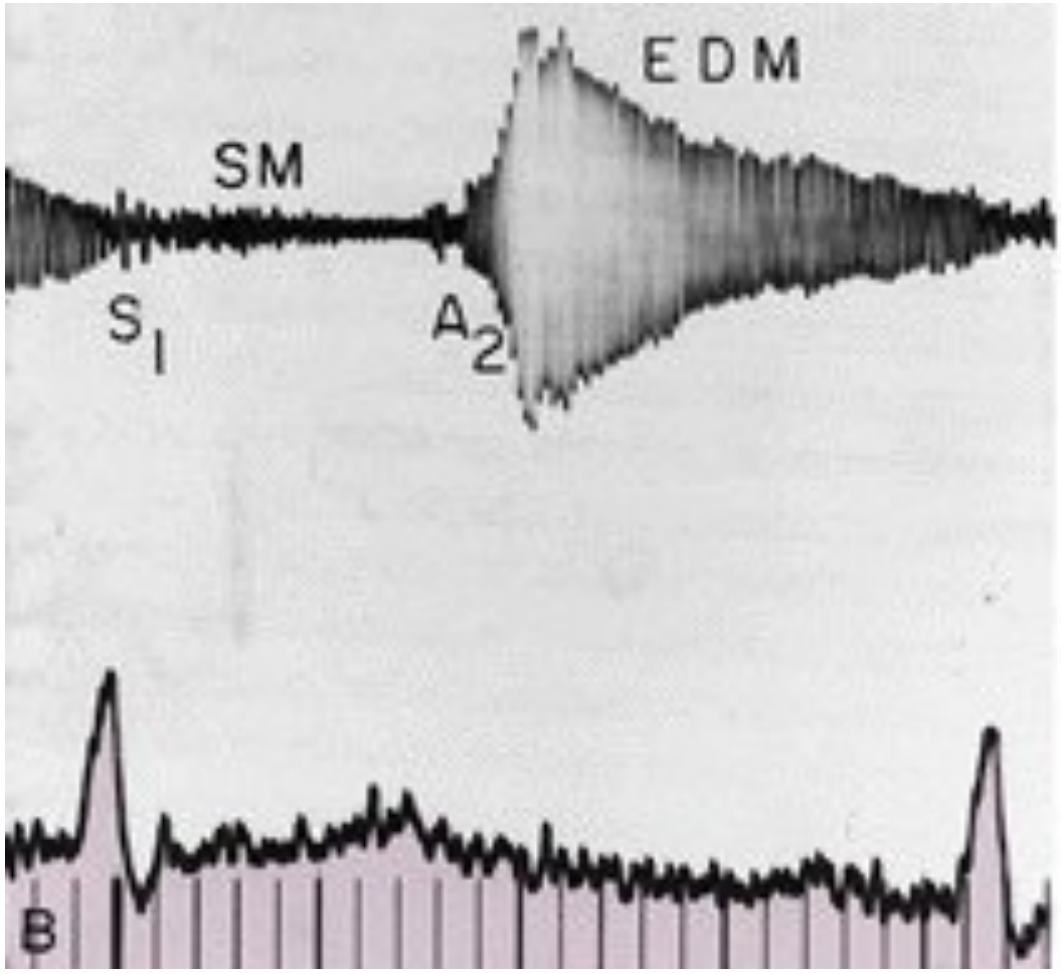
  i. Left sternal border = assoc. with primary valvular pathology;

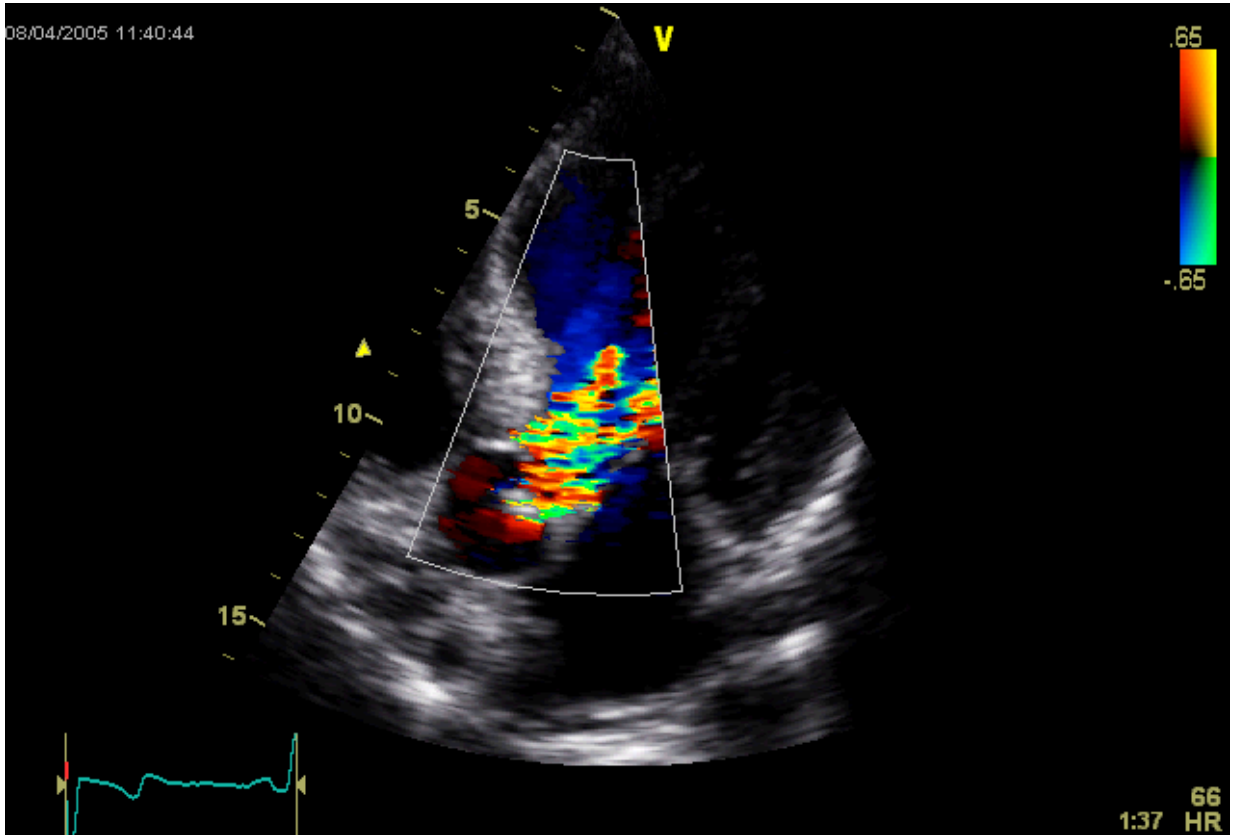
  ii. Right sternal edge = assoc. w/ primary aortic root pathology
- Often associated with midsystolic murmur

Pulse

Praecordium

Auscultation AR





Collapsing pulse

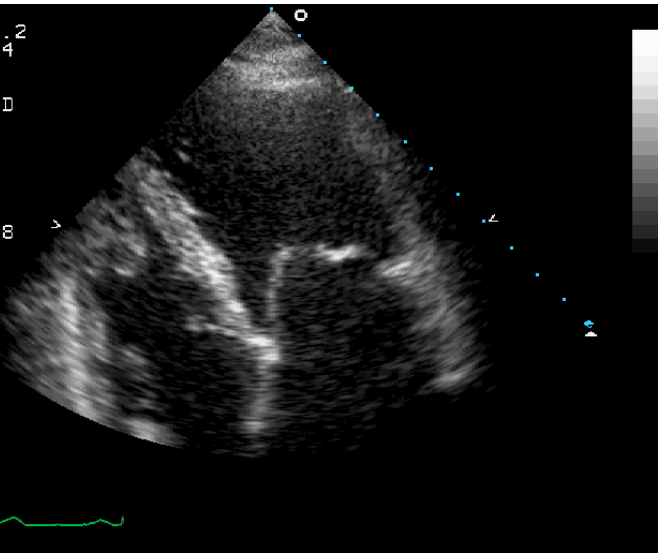
Displaced apex beat

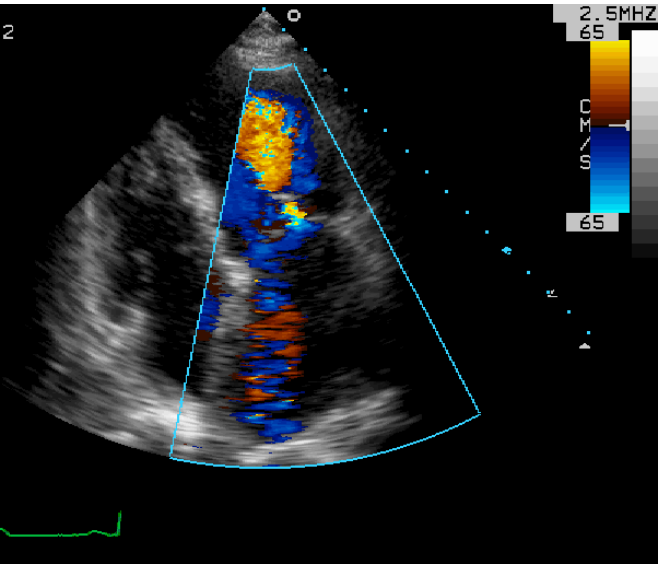
Early diastolic murmur

Mitral Stenosis

- Two components:
  1. Mid-diastolic - during rapid ventricular filling
  2. Presystolic - during atrial contraction; therefore, it disappears if atrial fibrillation develops
- Is low-pitched and best heard over the apex (w/ the bell)
- Little or no radiation
- Murmur begins after an Opening Snap; S1 is accentuated

Mitral Stenosis





- Atrial fibrillation
- Opening snap
- Rumbling diastolic murmur
- Presystolic accentuation
- Bell of stethoscope
- Patient on left side

Right heart valves

- Low pressure
- Tricuspid regurg (drug addicts)
- Pulmonary stenosis (congenital)

Continuous Murmurs

- Begin in systole, peak near S2, and continue into all or part of diastole.

1. Cervical venous hum
   - Audible in kids; can be abolished by compression over the IJV
2. Mammary souffle
   - Represents augmented arterial flow through engorged breasts
   - Becomes audible during late 3rd trimester and lactation
3. Patent Ductus Arteriosus
   - Has a harsh, machinery-like quality
4. Pericardial friction rub
   - Has scratchy, scraping quality

Back to the Basics

1. When does it occur - systole or diastole
2. Where is it loudest - A, P, T, M

I. Systolic Murmurs:

1. Aortic stenosis - ejection type
2. Mitral regurgitation - pansystolic
3. Mitral valve prolapse - late systole

II. Diastolic Murmurs:

1. Aortic regurgitation - early diastole
2. Mitral stenosis - mid to late diastole