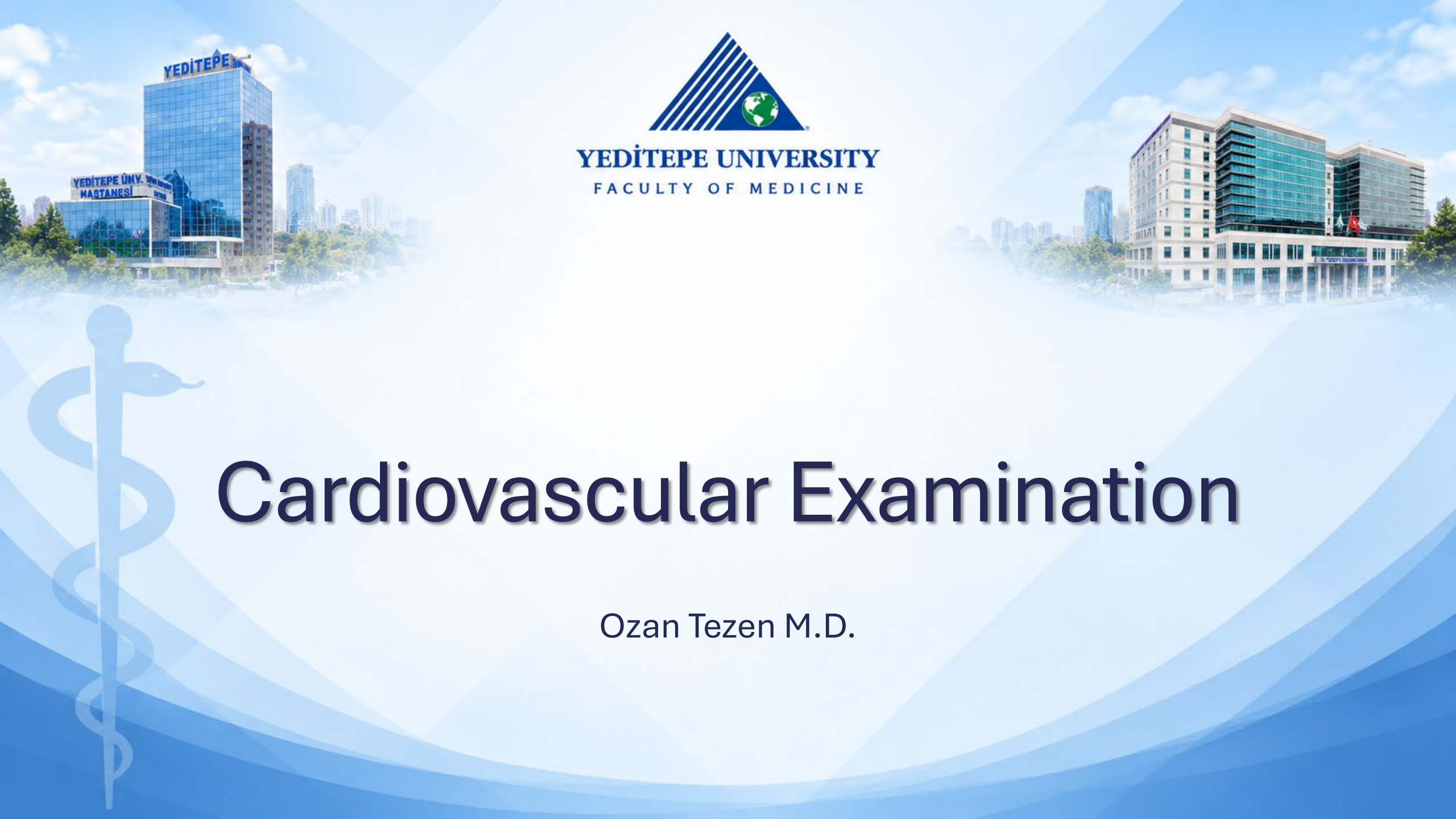




YEDİTEPE UNIVERSITY
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Cardiovascular Examination

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General Physical Examination

- Physical examination has 4 components
 - Inspection
 - Palpation
 - Percussion
 - Auscultation
- In cardiology palpation is mostly used for pulse examination
percussion is actually never used
- Even auscultation is increasingly overshadowed by
echocardiography. But should it be?



Inspection



Inspection — General Appearance

- The cardiovascular examination begins with an assessment of the patient's **general appearance, posture, demeanor, and overall health status**.
- Look for signs of **pain, distress, diaphoresis, pallor, cyanosis, or jaundice**.
- The patient's posture may provide an important clue. **Pericarditic pain may improve when the patient sits up and leans forward**.
- **Cachexia** may suggest chronic heart failure or another systemic disease.
- The **respiratory pattern and mental status** should also be observed as part of the initial assessment

Inspection — Skin & Head

- The skin may provide important clues to both **cardiovascular and systemic disease**.
- **Central cyanosis** may indicate significant right-to-left shunting, whereas **peripheral cyanosis** may reflect reduced peripheral blood flow in severe heart failure or shock.
- **Ecchymoses** are common with antiplatelet or anticoagulant therapy, while **petechiae and purpura** may raise suspicion for infective endocarditis or vasculitis.
- **Xanthomas** may indicate an underlying lipid disorder.
- Examination of the head may reveal additional clues: poor **dentition** can represent a source of infection, **macroglossia** may suggest amyloidosis, and **proptosis with lid lag** suggests hyperthyroidism.





Inspection — Extremities

- Inspection of the hands and extremities can reveal several characteristic cardiovascular signs.
- **Clubbing** may occur with central right-to-left shunting, while **arachnodactyly** is a characteristic feature of Marfan syndrome.
- In suspected infective endocarditis, look for:
 - **Janeway lesions**
 - **Osler nodes**
 - **Splinter hemorrhages**
- In the lower extremities, note **edema, asymmetric swelling, varicosities, venous ulcers, hair loss, or other trophic skin changes.**

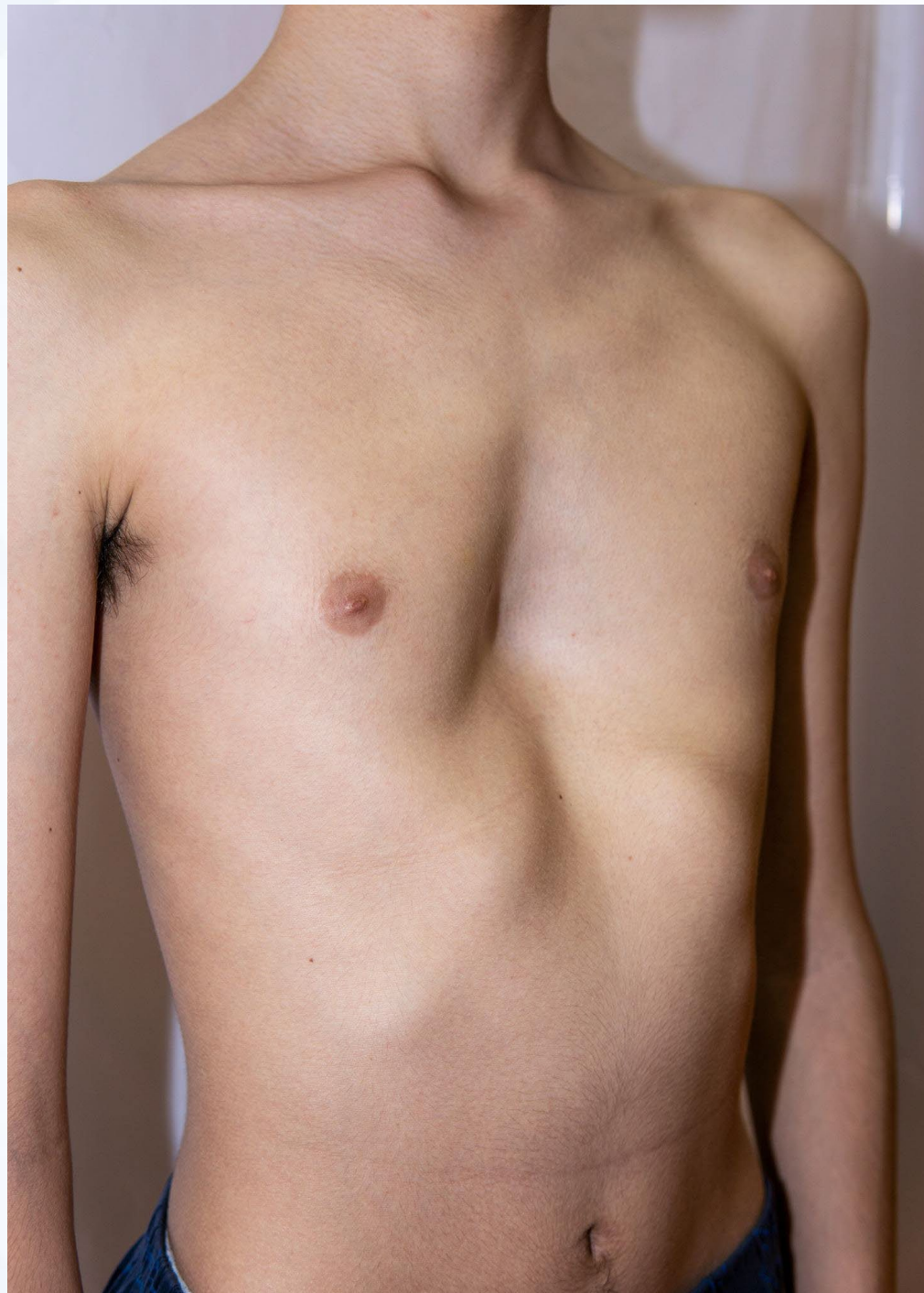




Inspection — Chest & Abdomen

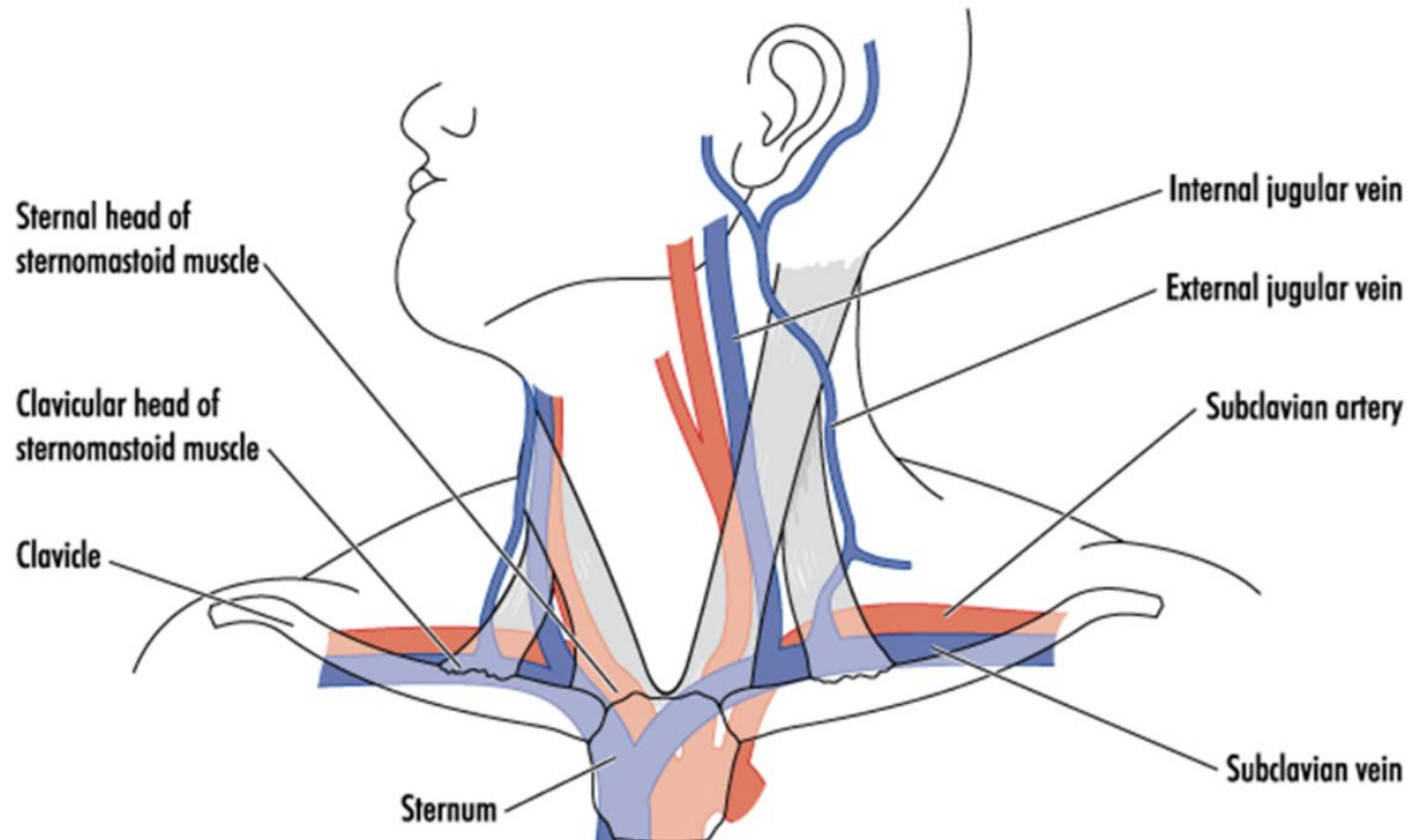
- Inspection of the chest may reveal **venous collaterals**, suggesting chronic SVC or subclavian vein obstruction.
- Chest wall abnormalities can also provide diagnostic clues. **Pectus excavatum or carinatum** may accompany connective tissue disorders, whereas a **barrel chest** suggests emphysema and severe **kyphoscoliosis** may be associated with cor pulmonale.
- Abdominal distension or **ascites** may be a visible manifestation of advanced right-sided heart failure or systemic venous congestion.

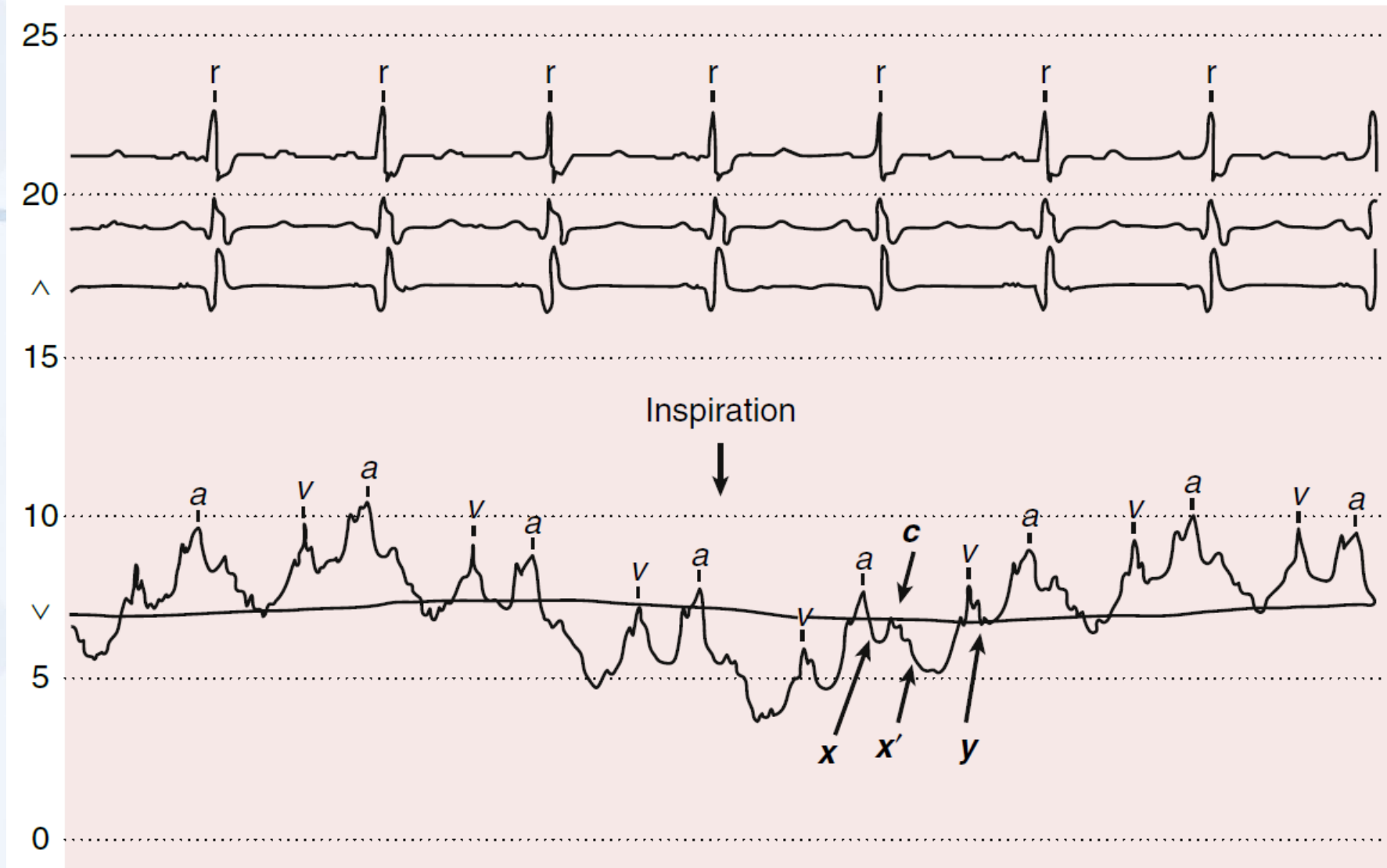




Inspection-Jugular Venous Pressure and Waveform

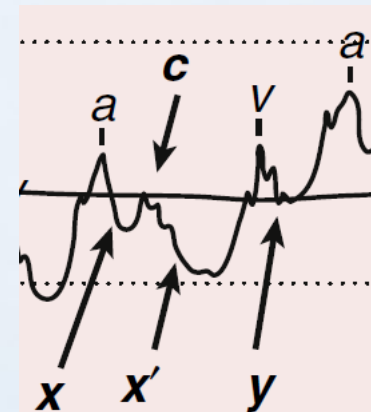
- JVP aids in the estimation of volume status.
- The external jugular vein is easier to visualize; however, the internal jugular vein is preferred because it more accurately reflects right atrial pressure
- The venous waveform can sometimes be difficult to distinguish from the carotid artery pulse
- Bedside venous pressure is usually estimated by the vertical distance between the top of the venous pulsation and the sternal angle, where manubrium meets the sternum (angle of Louis)
- A distance greater than 3 cm is considered abnormal





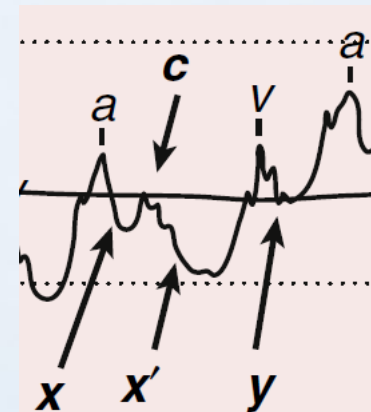
Inspection-Jugular Venous Pressure and Waveform

- a wave reflects atrial presystolic contraction occurs just after ECG P wave and precedes S1
 - Patients with reduced RV compliance from any cause have a prominent a wave
 - A cannon a wave occurs with AV dissociation
- x descent reflects the fall in right atrial pressure after a wave peak. The c wave interrupts this descent as right ventricular systole pushes closed tricuspid valve into the RA



Inspection-Jugular Venous Pressure and Waveform

- The v wave represents atrial filling, occurs at the end of ventricular systole and follows just after S2. Its height is determined by right atrial compliance and by the volume of blood returning to RA from all sources. Normally v wave is smaller than the a wave because of the normally compliant right atrium.
 - In patients with ASD the a and v waves may be equal
 - With TR, the v wave merges with the c wave because retrograde flow and right atrial filling occur simultaneously



Inspection-Jugular Venous Pressure and Waveform

- The y descent follows the v wave and reflects the fall in right atrial pressure after tricuspid valve opening.
- Resistance to RV filling blunts y wave as is the case with pericardial tamponade and TS
 - The y wave will be steep when ventricular diastolic filling occurs early and rapidly as with pericardial constriction, restrictive cardiomyopathy
- The normal venous pressure should fall at least 3mmHg with inspiration. A rise in VP with inspiration (Kussmaul sign) is associated with constrictive pericarditis, restrictive cardiomyopathy pulmonary embolism RV infarction.
 - Kussmaul sign is seen with RV volume overload



Measuring Blood Pressure

Measuring Blood Pressure

- Auscultatory measurement of the blood pressure yields lower systolic higher diastolic values than direct intra-arterial recordings.
- BP should be measured with the patient in the seated position, back supported, feet on the floor with arm at the level of the heart, using appropriate-size cuff after 5 mins of rest, repeated 5 mins after and the readings averaged.
 - Small cuff overestimation, big cuff underestimation
- BP should be measured in both arms in rapid succession or simultaneously

Measuring Blood Pressure

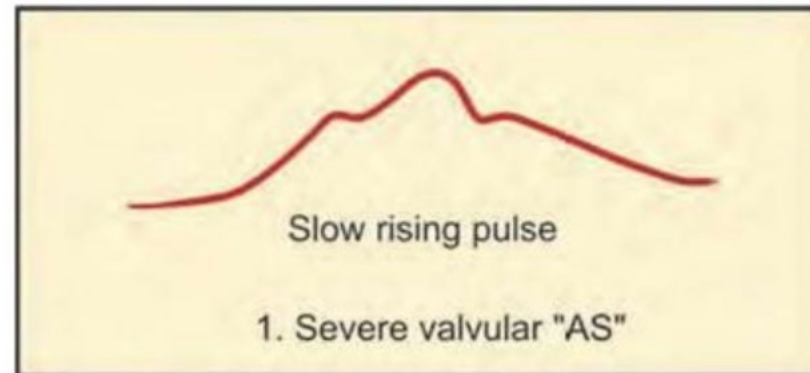
- Korotkoff sounds:
 - Phase 1 is a sharp tapping sound and indicates the systolic blood pressure. Phase 2 is a swishing sound associated with blood flow. Phase 3 transitions to a softer thump, while Phase 4 is a thump that becomes muffled. The diastolic blood pressure is determined when all sound ceases at Phase 5.



Assessing the Pulses

Assessing the Pulses

Anacrotic Pulse (Parvus et Tardus)



A low amplitude pulse (parvus) with a slow rising and late peak (tardus).

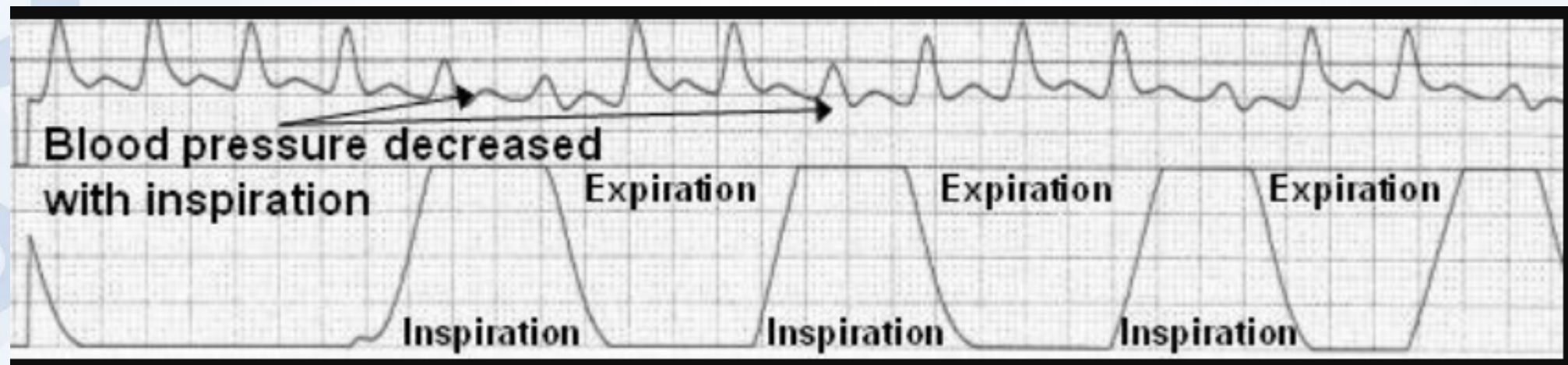
Assessing the Pulses

- Pulsus celer et altus (bounding pulse), hyperkinetic states such as fever anemia, thyrotoxicosis or in severe AR



Assessing the Pulses

- Actually BP falls during inspiration however if it falls over 10mmHg it is pulsus paradoxus, and a sign of cardiac tamponade or severe pulmonary disease



Assessing the Pulses

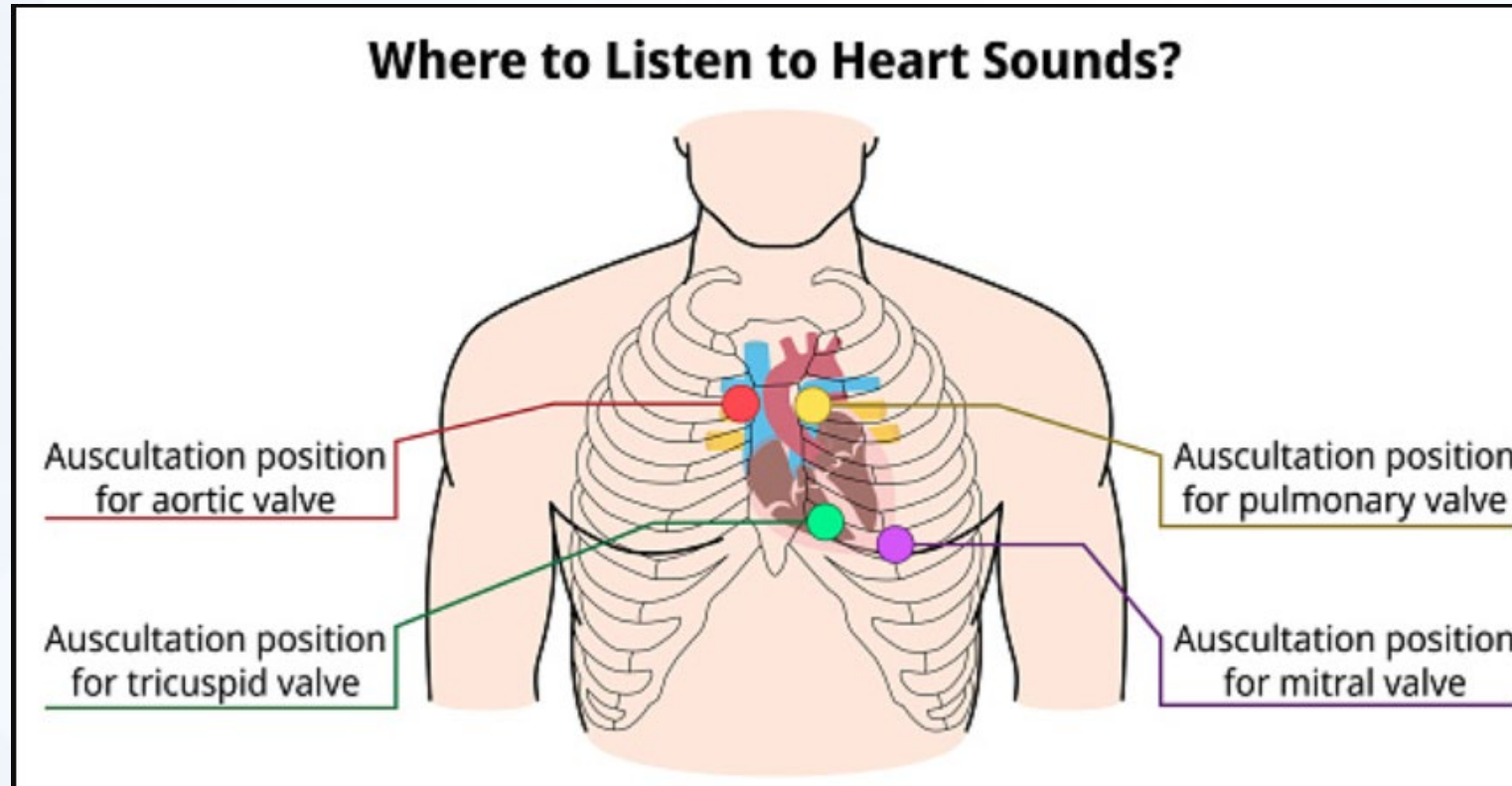
- Despite a regular heart rhythm, independent of respiratory cycle, beat to beat variability of the pulse amplitude





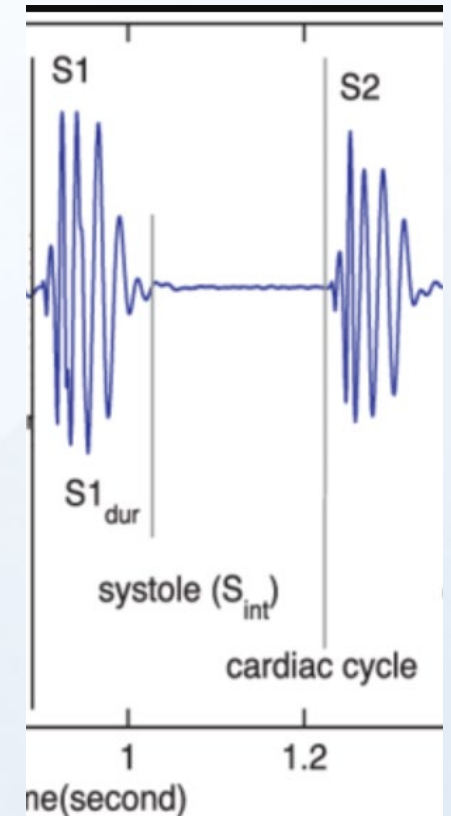
Auscultation of the Heart

Auscultation of the Heart



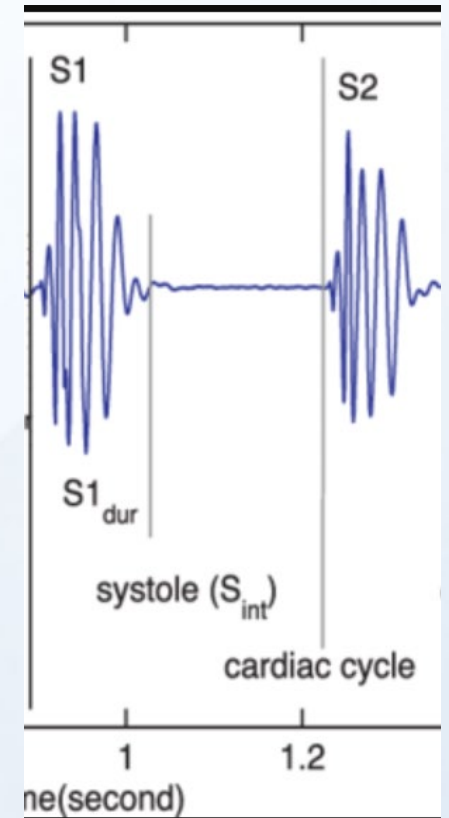
Auscultation of the Heart

- First Heart Sound (S1)
 - The normal first heart sound (S1) comprises mitral (M1) and tricuspid (T1) valve closure. The two components usually are best heard at the lower left sternal border in younger subjects.
 - Normal splitting of S1 is accentuated with complete right bundle branch block.
- Second Heart Sound (S2)
 - The second heart sound (S2) comprises aortic (A2) and pulmonic (P2) valve closure.
 - With normal, or physiologic, splitting, the A2–P2 interval increases during inspiration and narrows with expiration. The individual components are best heard at the second left interspace with the patient in the supine position.



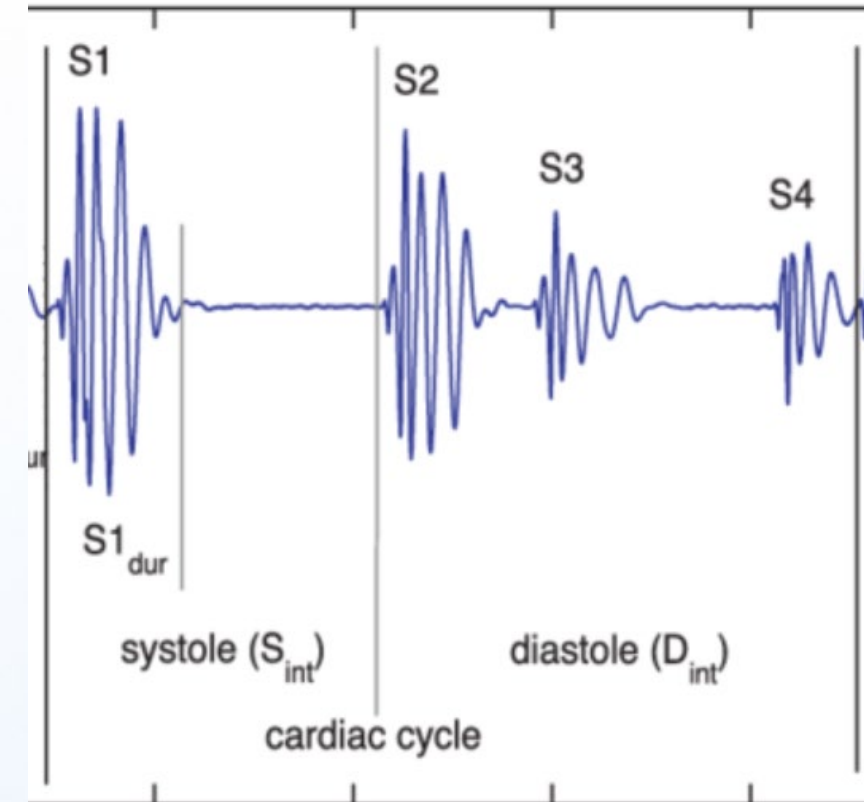
Auscultation of the Heart

- Second Heart Sound (S2)
 - The A2–P2 interval widens with complete right bundle branch block because of delayed pulmonic valve closure, and with severe MR because of premature aortic valve closure.
 - With fixed splitting, the A2–P2 interval is wide and remains unchanged during the respiratory cycle, indicating ostium secundum ASD.
 - Reverse, or paradoxical, splitting occurs as a consequence of a pathologic delay in aortic valve closure, as may occur with complete left bundle branch block, RV apical pacing, severe aortic stenosis, HCM, and myocardial ischemia.



Auscultation of the Heart

- Third Heart Sound (S3)
 - Third heart sound (S3) occurs during the rapid filling phase of ventricular diastole. An S3 may be normally present in children, adolescents, and young adults, but indicates systolic heart failure in older adults and carries important prognostic weight.
- Fourth Heart Sound (S4)
 - Fourth heart sound (S4) occurs during the atrial filling phase of ventricular diastole and is thought to indicate presystolic ventricular expansion. An S4 is especially common in patients with accentuated atrial contribution to ventricular filling (e.g., LV hypertrophy).



Auscultation of the Heart

- Not all murmurs indicate valvular or structural heart disease. The accurate identification of a functional (benign) systolic murmur can obviate the need for echocardiography in many healthy subjects.
- Intensity is graded on a scale of 1 to 6; a palpable thrill characterizes murmurs of grade 4 or higher intensity.
- Other important attributes that aid in identification include location, radiation, and response to bedside maneuvers, including quiet respiration.

Auscultation of the Heart - functional (benign) systolic murmur

- Soft, less than 3/6 in intensity (although note that even when structural heart disease is present, intensity does not predict severity.)
- Otherwise healthy individual, no concerns about growth, no symptoms of heart failure such as dyspnea on exertion. (In infants, ask if the baby cries during feeding, becomes diaphoretic, or develops a rapid respiratory rate. In older children, this can be elucidated by asking whether or not the child can keep up with peers during play.)
- Occurs during systole
- Physiologic splitting of S2 (A2 and P2 components should only be resolvable during inspiration and should merge during expiration.)
- No palpable thrill

Systolic Murmurs

Early Systolic

Mitral—acute MR

VSD

Muscular

Nonrestrictive with pulmonary hypertension

Tricuspid—TR with normal pulmonary artery pressure

Midsystolic

Aortic

Obstructive

Supravalvular—supravalvular aortic stenosis, coarctation of the aorta

Valvular—aortic stenosis and sclerosis

Subvalvular—discrete, tunnel, or HCM

Increased flow, hyperkinetic states, AR, complete heart block

Dilation of ascending aorta, atheroma, aortitis

Pulmonary

Obstructive

Supravalvular—pulmonary artery stenosis

Valvular—pulmonic valve stenosis

Subvalvular—infundibular stenosis (dynamic)

Increased flow, hyperkinetic states, left-to-right shunt (e.g., ASD)

Dilation of pulmonary artery

Late Systolic

Mitral—MVP, acute myocardial ischemia

Tricuspid—tricuspid valve prolapse

Holosystolic

Atrioventricular valve regurgitation (MR, TR)

Left-to-right shunt at ventricular level (VSD)

Diastolic Murmurs

Early Diastolic

Aortic regurgitation

Valvular—congenital (bicuspid valve), rheumatic deformity, endocarditis, prolapse, trauma, postvalvulotomy

Dilation of valve annulus—aortic dissection, annuloaortic ectasia, cystic medial degeneration, hypertension, ankylosing spondylitis

Widening of commissures—syphilis

Pulmonic regurgitation

Valvular—postvalvulotomy, endocarditis, rheumatic fever, carcinoid

Dilation of valve annulus—pulmonary hypertension; Marfan syndrome

Congenital—isolated or associated with tetralogy of Fallot, VSD, pulmonic stenosis

Mid-diastolic

Mitral

Mitral stenosis

Carey Coombs murmur (mid-diastolic apical murmur in acute rheumatic fever)

Increased flow across nonstenotic mitral valve (e.g., MR, VSD, PDA, high-output states, complete heart block)

Tricuspid

Tricuspid stenosis

Increased flow across nonstenotic tricuspid valve (e.g., TR, ASD, anomalous pulmonary venous return)

Left and right atrial tumors (myxoma)

Severe or eccentric AR (Austin Flint murmur)

Late Diastolic

Presystolic accentuation of mitral stenosis murmur

Austin Flint murmur of severe or eccentric AR

Continuous Murmurs

PDA

Coronary arteriovenous fistula

Ruptured sinus of Valsalva aneurysm

Aortic septal defect

Cervical venous hum

Anomalous left coronary artery

Proximal coronary artery stenosis

Mammary soufflé of pregnancy

Pulmonary artery branch stenosis

Bronchial collateral circulation

Small (restrictive) ASD with mitral stenosis

Intercostal arteriovenous fistula

TABLE 13.7 Interventions for Altering Intensity of Cardiac Murmurs

Respiration: Right-sided murmurs generally increase with inspiration. Left-sided murmurs usually are louder during expiration.

Valsalva maneuver: Most murmurs decrease in length and intensity. Two exceptions are the systolic murmur of HCM, which usually becomes much louder, and that of MVP, which becomes longer and often louder. After release of the Valsalva maneuver, right-sided murmurs tend to return to baseline intensity earlier than left-sided murmurs.

Exercise: Murmurs caused by blood flow across normal or obstructed valves (as in pulmonic and mitral stenosis) become louder with both isotonic and isometric (handgrip) exercise. Murmurs of MR, VSD, and AR also increase with handgrip exercise.

Positional changes: With standing, most murmurs diminish; two exceptions are the murmur of HCM, which becomes louder, and that of MVP, which lengthens and often is intensified. With squatting, most murmurs become louder, but those of HCM and MVP usually soften and may disappear. Passive leg raising usually produces the same results as squatting.

Post-ventricular premature beat or AF: Murmurs originating at normal or stenotic semilunar valves increase in intensity during the cardiac cycle after a ventricular premature beat or in the beat after a long cycle length in AF. By contrast, systolic murmurs caused by AV valve regurgitation do not change, diminish (papillary muscle dysfunction), or become shorter after a premature beat (MVP).

Pharmacologic interventions: During the initial relative hypotension after amyl nitrite inhalation, murmurs of MR, VSD, and AR decrease in intensity, whereas the murmur of AS increases in intensity because of increased stroke volume. During the later tachycardia phase, murmurs of mitral stenosis and right-sided lesions also become louder. This intervention may help distinguish the murmur of the Austin Flint phenomenon from that of mitral stenosis. The response in MVP often is biphasic (softer and then louder than control).

Transient arterial occlusion: Transient external compression of both brachial arteries by bilateral cuff inflation to 20 mm Hg greater than peak systolic pressure augments the murmurs of MR, VSD, and AR, but not murmurs from other causes.

References

- Braunwald's Heart Disease 12th Edition



In the world, the most
genuine guide for everything,
civilization, life, and success
is knowledge, science.
Seeking a guide outside of
knowledge and science is
negligence, ignorance, and
deviation.

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Thank you for listening.