Cardiac Auscultation

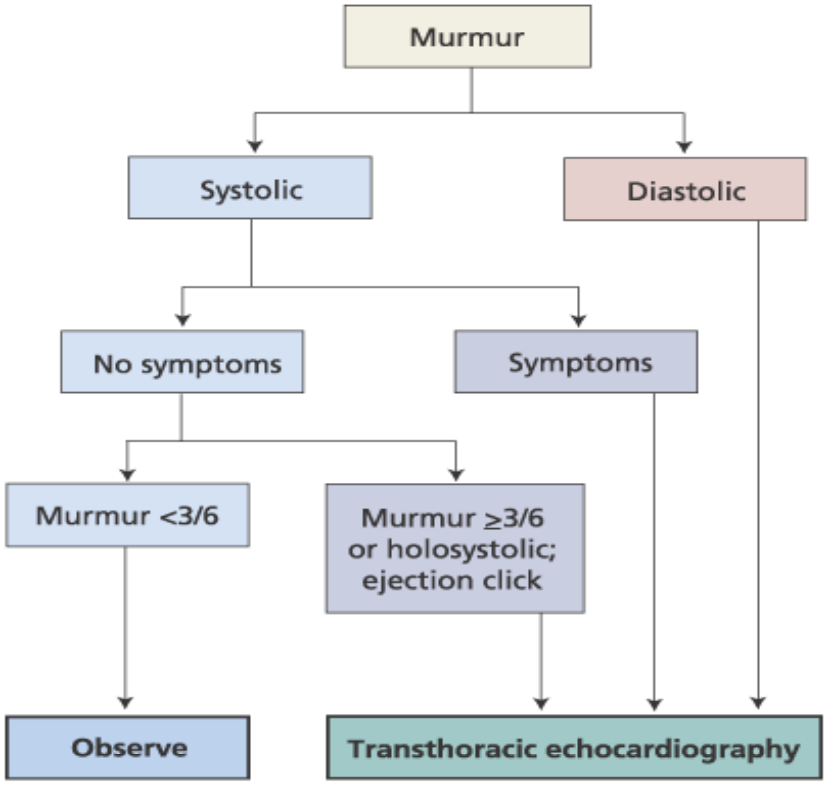
1. Auscultatory findings have modest sensitivity and specificity for cardiac hemodynamic parameters:
   a) S3: ~ 95% specificity & 30%-50% sensitivity for EF<50% or LV filling pressures>15mmHg. S4 is less diagnostic
   b) Crackles on pulm exam in pts w/ dyspnea is not specific for ↑ LV filling pressures; may be absent in chronic CHF
   c) In VHD, auscultation helps establish disease, not severity. Severe AS may be missed on PE

2. Auscultatory skills are difficult to teach and skill levels are low: 20%-24% of cardiac findings recognized by trainees in internal or family medicine; & 35% after intensive training

3. Acoustic stethoscopes rely on transmission of sound from the pt's chest wall, through the stethoscope tubes, and to the ear: a process prone to sound loss and resonance effects

4. Electronic stethoscope has a receiver with filtering circuitry to ↓ ambient noise and amplification control to ↑ recognition of low-amplitude signals; with a choice of frequency range, providing better separation of high-frequency (100-500 Hz) and low-frequency (<200 Hz) signals than an acoustic stethoscope. Complex models allow storage & playback, external digital recording and transmission of heart sounds to other stethoscopes

Grade	Description
Grade 1	Murmur heard with stethoscope, but not at first
Grade 2	Faint murmur heard with stethoscope on chest wall
Grade 3	Murmur heard with stethoscope on chest wall, louder than grade 2 but without a thrill
Grade 4	Murmur associated with a thrill
Grade 5	Murmur heard with just the rim of the stethoscope held against the chest
Grade 6	Murmur heard with the stethoscope held away and in from the chest wall

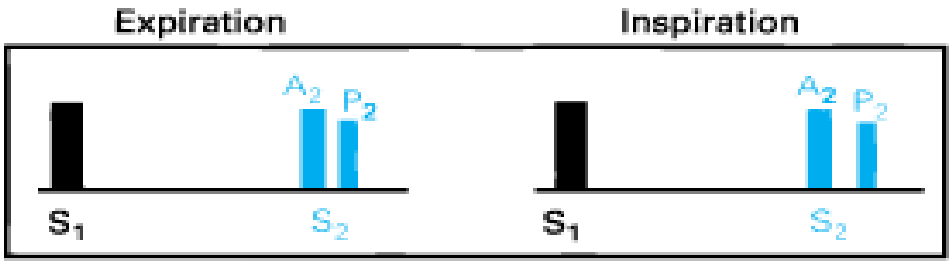


Maneuver	Hemodynamic Effect	Murmur Effect
Normal respiration	Transient increase in venous filling during inspiration	Increases right-sided murmurs
Passive leg elevation	Increases venous return (transient increase in LV size and preload)	Increases right-sided murmurs; decreases murmur of HOCM and MVP
Stand to squat	Increases venous return (transient increase in LV size and preload)	Increases right-sided murmurs; decreases murmur of HOCM and MVP
Squat to stand	Decreases venous return (transient decrease in LV size and preload)	Increases murmur of HOCM; moves midsystolic click of MVP closer to S_1 and *increases* murmur of MVP; decreases AS murmur
Valsalva	Decreases venous return (transient decrease in LV size, preload, and relative systemic hypotension)	Increases murmur of HOCM; moves midsystolic click of MVP closer to S_1 and *decreases* murmur of MVP
Isometric handgrip exercise	Increases afterload	Increases murmur of MR and VSD; decreases murmur of HOCM; decreases AS murmur
Inhaled amyl nitrate	Decreases afterload	Decreases murmur of MR and VSD; no change to AS murmur

Systolic Cardiac Sounds

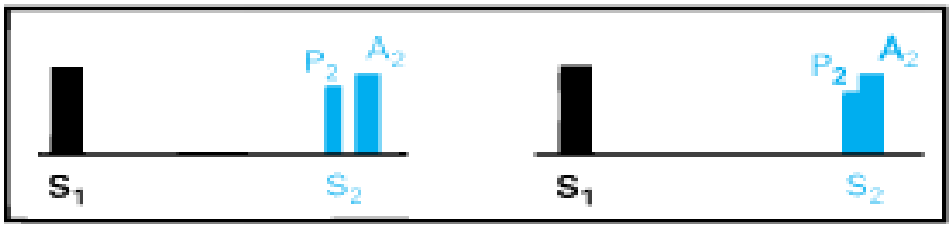
Normal Physiologic Splitting

Audible Expiratory Splitting



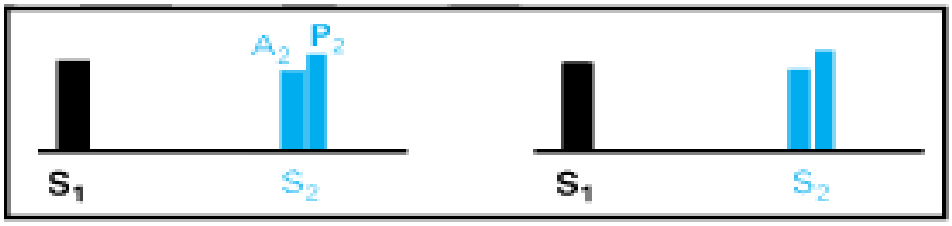
Wide physiologic splitting

PS; RBBB; MR; VSD. ASD if fixed splitting



Reversed splitting

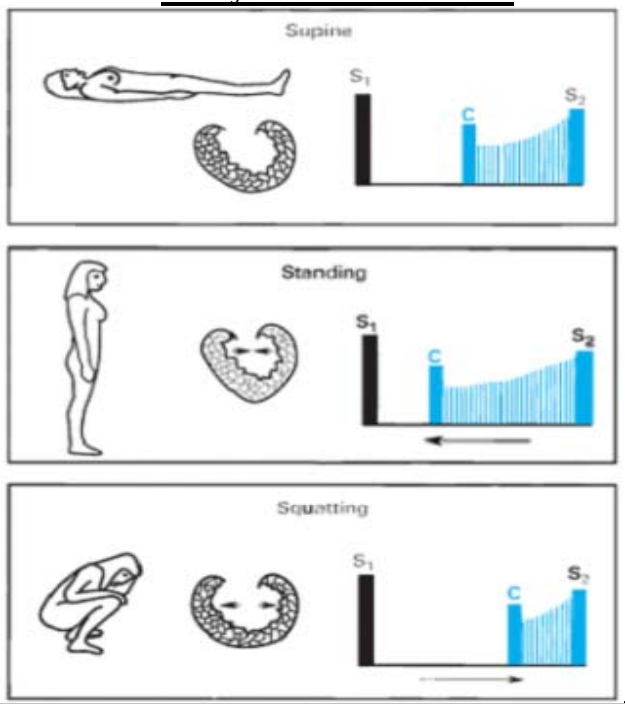
LBBB, RV pacing; HOCM; Severe AS, CHF



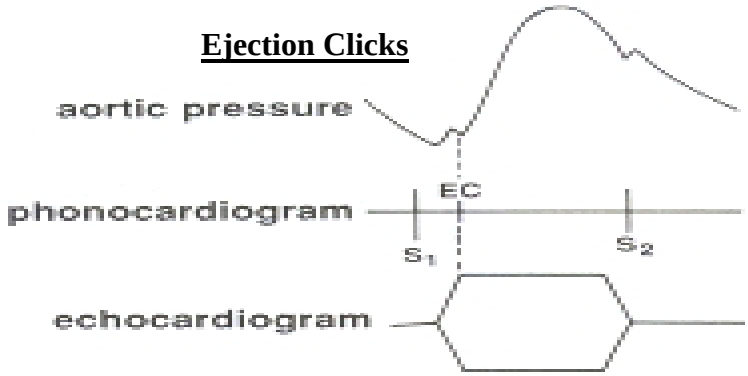
Narrow physiologic splitting (↓ P_2)

PH

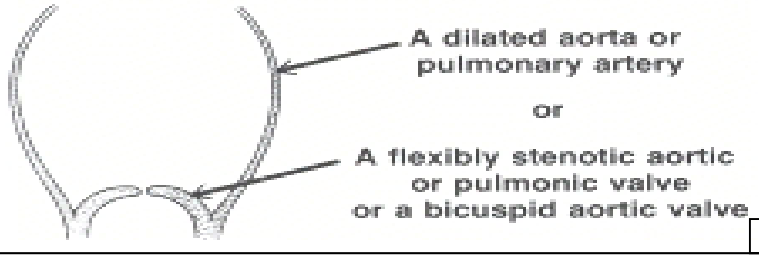
Midsystolic Click of MVP



Ejection Clicks

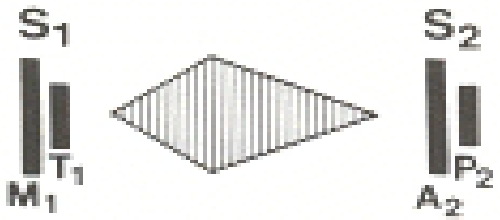


Ejection clicks are early systolic sounds found in association with



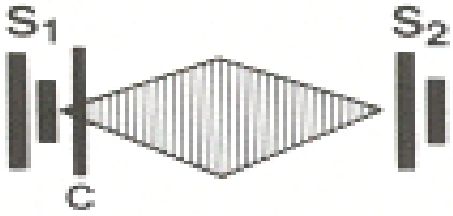
Systolic Cardiac Murmurs

A **Functional systolic ejection murmur**



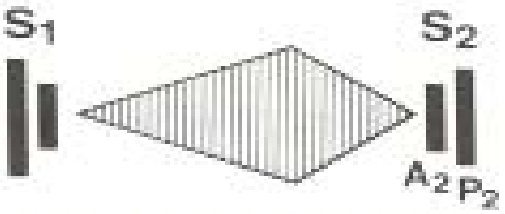
Note early peaking

B **Mild aortic valvular stenosis**



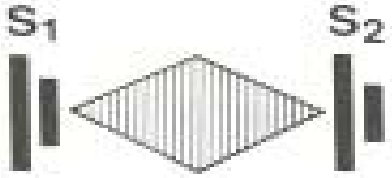
Note relatively early peaking and systolic ejection click

C **Severe aortic stenosis**

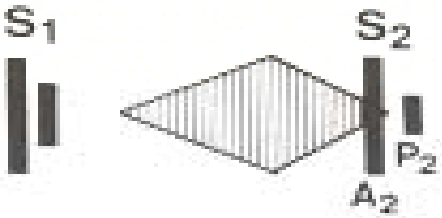


Note late peaking and decreased intensity of A_2

D **Hypertrophic obstructive cardiomyopathy**

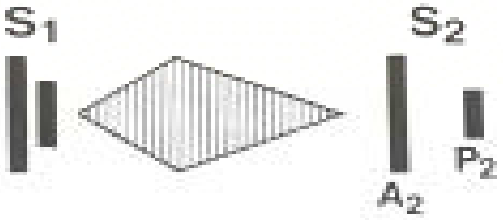


E **Severe pulmonary valvular stenosis**



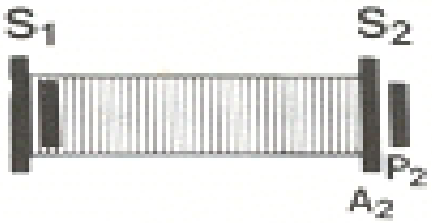
Note late peaking with murmur extending through A_2 and delayed appearance of P_2

F **Atrial septal defect**



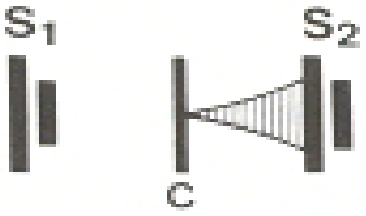
Note wide splitting of S_2

G **Uncomplicated mitral regurgitation**



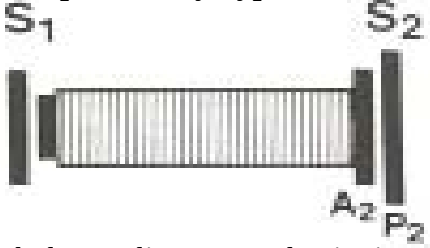
Note holosystolic murmur extending through A_2

H **Mitral valve prolapse**



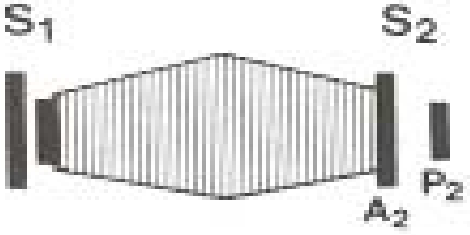
Note late systolic murmur ushered in by midsystolic click

I **Tricuspid regurgitation due to pulmonary hypertension**



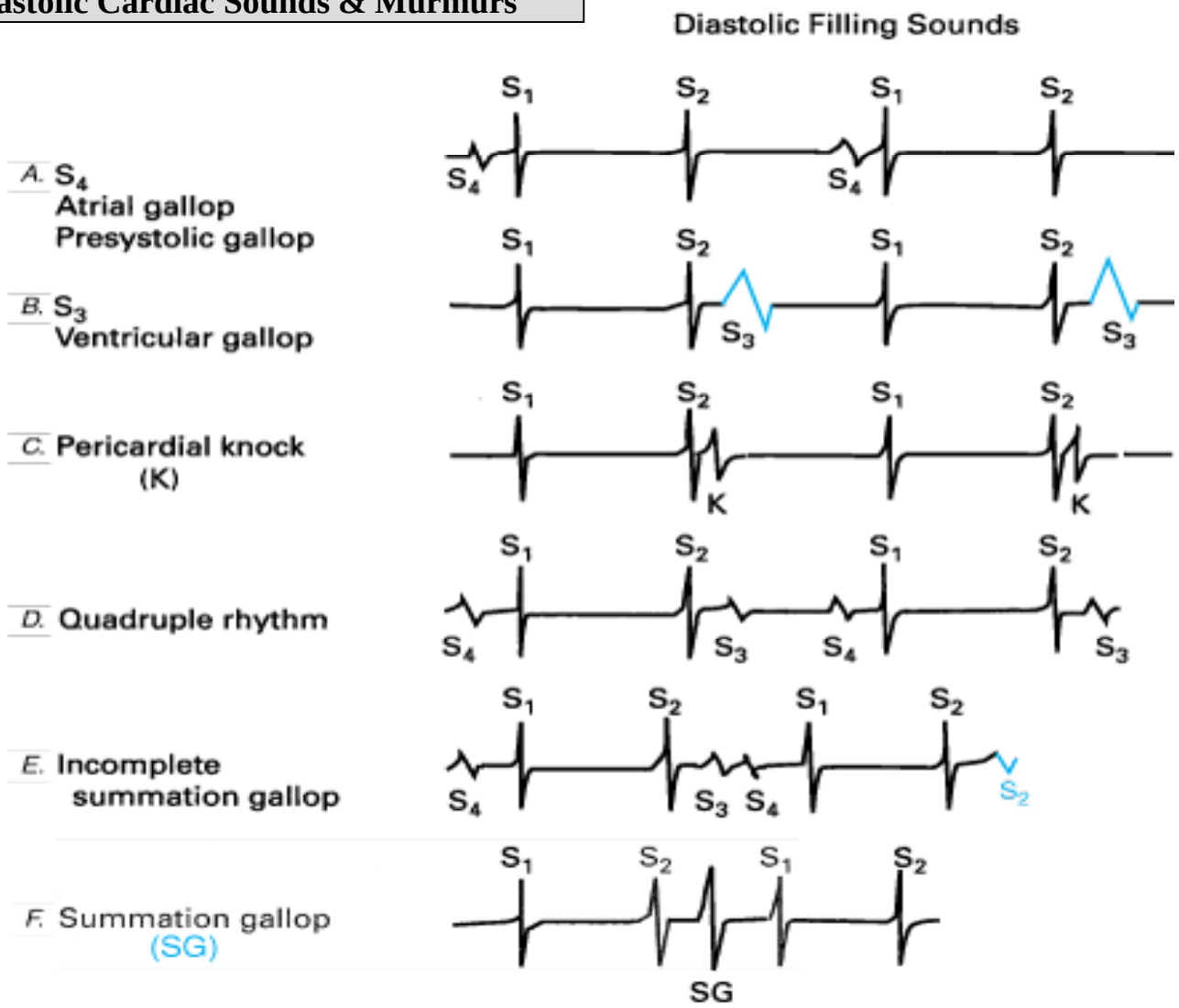
Note holosystolic murmur beginning with T_1 and early, loud P_2

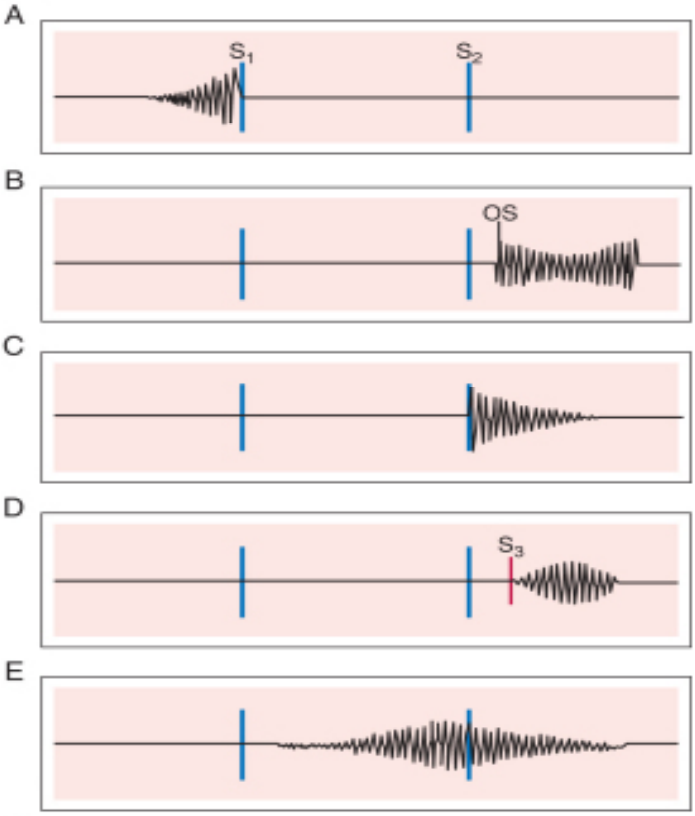
J **Uncomplicated ventricular septal defect**



Note loud, holosystolic murmur with mid-systolic accentuation and slightly delayed P_2

Diastolic Cardiac Sounds & Murmurs





Presystolic accentuation of the murmur of mitral stenosis with sinus rhythm

Opening snap and mid-diastolic rumble of mitral stenosis

Early decrescendo diastolic murmur of aortic or pulmonic regurgitation

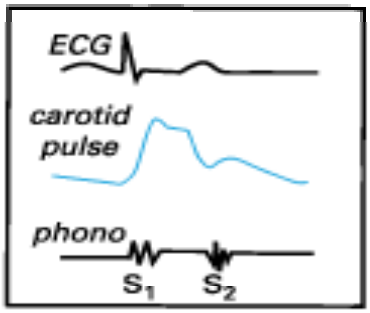
Diastolic filling sound (S_3) and mid-diastolic murmur associated with severe mitral regurgitation, tricuspid regurgitation, or atrial septal defect with significant left to right shunt

Continuous murmur of patent ductus arteriosus that envelops S_2

Carotid Pulses

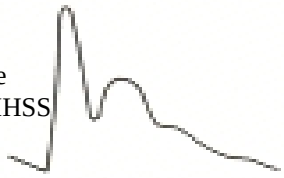
A. Hyperkinetic Pulse

Normal



B. Bisferiens Pulse

F. Bifid pulse characteristic of IHSS

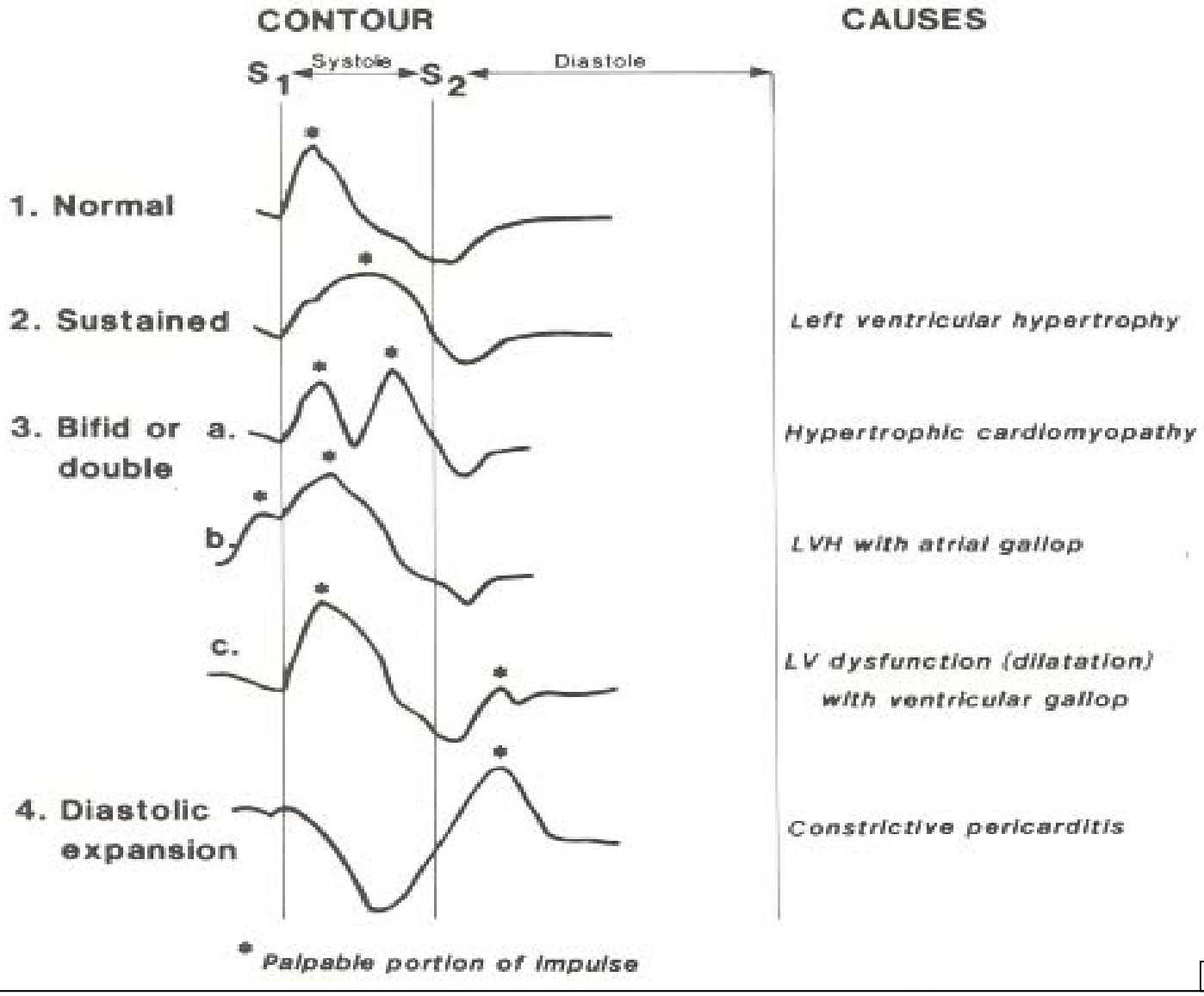


C. Hypokinetic Pulse

D. Parvus et Tardus Pulse

E. Dicrotic Pulse + Alternans

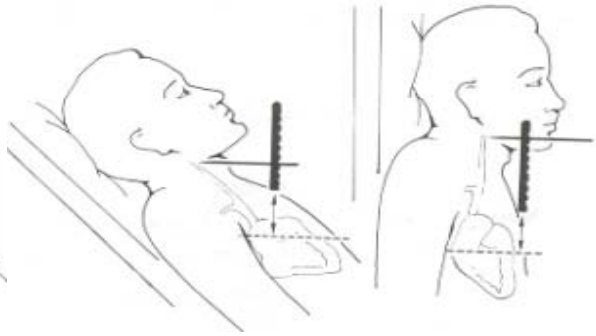
Apical impulse



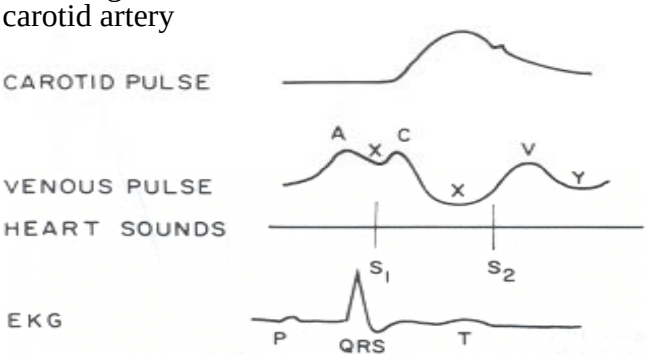
Jugular Vein Pressure

Positioning of the penlight with respect to the patient's neck. Placement of the right third finger over the left carotid artery

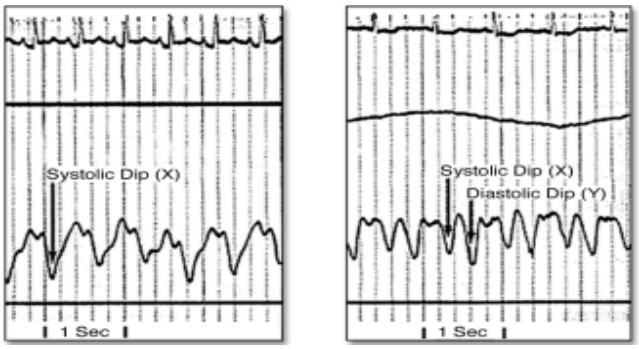
Proper technique to obliterate the venous pulse by digital compression

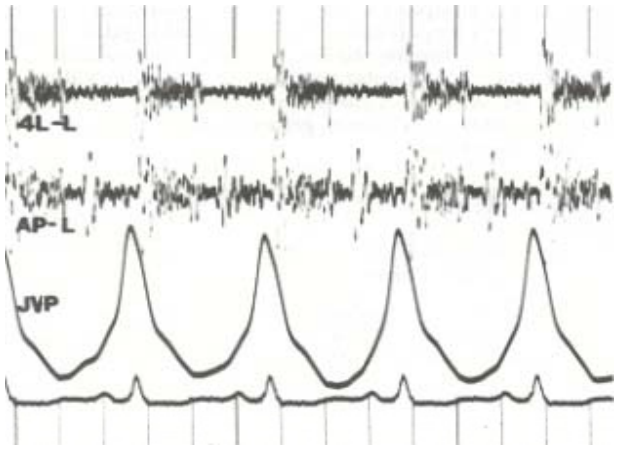


Measurement of the mean venous pressure with regard to the sternal angle of Louis



Venous Pressure in Cardiac Tamponade and Constrictive Pericarditis





Phonocardiogram and jugular venous pulse tracing from a middle-aged man with pulmonary hypertension (pulmonary artery pressure 70 mm Hg) caused by cardiomyopathy. The jugular venous pulse tracing demonstrates a prominent a wave without a c or v wave being observed. The phonocardiograms (fourth left interspace and cardiac apex) show a murmur of tricuspid insufficiency and ventricular and atrial gallops