

NCD
01/06/14

Review of blood flow:

Right A → Right ventricle → pulmonary artery → lungs → pulmonary veins → left atrium → left ventricle

Electrical conduction system:

SA node and AV node help regulate heartbeat

SA node: right atrium

AV node: between atria

Cardiovascular Exam:

Position is very important. Patient should be sitting supine at approximately 30 degrees.

The patient should be lying on their side to move the heart forward (left lateral decubitus).

It may help to have the patient lean forward to hear the heart.

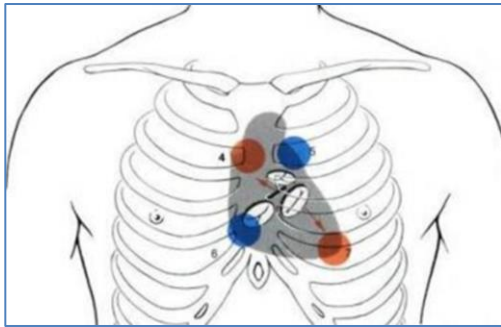
- Inspection:
 - Apical impulse/PMI: apex of the heart; beats maximally at this point. Tangential lighting is used to see this. Normally this is located at the intersection of the 5th intercostal space and the midclavicular line.
 - Other things to notice: nails, mucosa, palmar creases; look for areas of pallor or cyanosis.

- Palpation:
 - Palpate the PMI, note where it is, how large it is and duration.
 - Palpate the right ventricular area between the left sternal border, 3rd, 4th, and 5th interspaces. Is there a vibration (frill), or heaving or lifts?
 - Palpate the 2nd interspace (pulmonic-L, aortic-R)

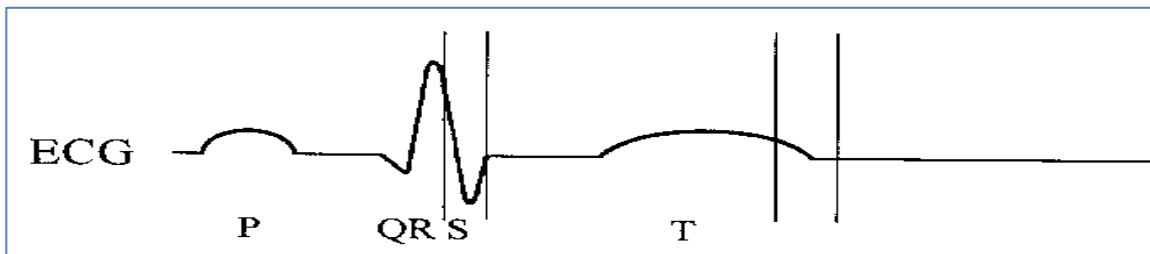
- Percussion:
 - This is mainly used to estimate the size of the heart. Percuss at the left anterior axillary line and move medially along the 3rd, 4th, 5th and 6th intercostal spaces. Note where the percussion changes to dullness. The dullness indicates the location of the border of the heart. Measure the distance between that and the midsternal line.

- Auscultation:
 - Heart sounds produced by opening/closing of the valves of the heart. (systolic and diastolic)
 - Murmurs: prolonged in comparison to brief heart sounds. They are produced due to turbulent blood flow. They can occur in diastole, systole, or continuously.
 - Rubs: High-pitched scratchy sound. It sounds like leather on leather usually due to viscera rubbing against each other.

- Sounds: <http://www.easyauscultation.com/heart-lung-sounds-reference-guide.aspx>
- The first sound (S1) marks the beginning of systole and marks when the mitral and tricuspid valves close. (Splitting is abnormal). S1 is “lub” (of “lub dub”)
- The second sound (S2) marks the end of systole, and splitting happens frequently on inspiration. This is very common in people that are very physically fit or in young individuals. S2 is “dub” (of “lub dub”).
- S3 and S4 are rarely heard. S3 is heard early in diastole (normal in young, pathologic in old) and is caused when the ventricle is filling quickly. S4 is heard late in diastole.



Points of auscultation



Extra Sounds:

S1 split: uncommon; heard best in the tricuspid area especially with deep inspiration.

<http://www.easyauscultation.com/cases-listing-details.aspx?caseID=40>

S2 split: common; heard best in the pulmonic site

<http://www.easyauscultation.com/cases-listing-details.aspx?caseID=46>

S3: it sounds like galloping (Ken-TUCK-y), heard the best at the left lateral recumbent position. Often heard post MI, with cardiomyopathy or people with CHF. It can also be heard in pregnant women in the third trimester.

<http://www.easyauscultation.com/cases-listing-details.aspx?caseID=84>

S4*: it has the rhythm of TEN-nes-see. It is best heard in left lateral recumbent position.

<http://www.easyauscultation.com/cases-listing-details.aspx?caseID=85>

*Distinguishing between an S1 split and an S4: A split in S1 would be best heard on inspiration, An S4 would not change. Splitting is the only sound that will be affected by inspiration.

Extra Heart sounds:

Click: Higher pitched and shorter than S1 and S2, Heard early it is most commonly due to aortic/pulmonic stenosis or hypertension but heard late it is most likely associated with mitral/tricuspid valve prolapse. It is only heard in systole.

Early click (Lub Click Dub): <http://www.easyauscultation.com/cases-listing-details.aspx?caseID=43>

Late click (Lub Click Dub): <http://www.easyauscultation.com/cases-listing-details.aspx?caseID=121>

Gallop: Occurs when S3 and S4 are present with tachycardia. It is a shortened diastole.

<http://www.easyauscultation.com/cases-listing-details.aspx?caseID=85>

Diastolic knock: happens at the same time as S3, it is a loud thudding sound. It is due to abrupt arrest of ventricular filling. Dr. Smith will look for a recording.

Opening snap: Heard at the 2nd left intercostal space and is usually due to mitral valve stenosis (can be tricuspid but that is rare).

<http://www.easyauscultation.com/cases-listing-details.aspx?caseID=52>

Pericardial friction rub: This sounds like leather rubbing on leather. It is heard best at the apex but is widely heard. It is usually due to adhesions between visceral and parietal pericardial layers. To distinguish if the lungs or heart is involved have the patient hold their breath; if it is still occurring it is likely due to heart rather than the lungs.

Heart sounds in systole: S1 and clicks

Heart sounds in diastole: S2, S3, S4, gallop, diastolic knock, opening snap

Murmurs: Due to turbulent blood flow; it can be due to problems in the heart or problems within the great vessels.

Note the timing of the murmur (diastole or systole), duration, pitch, and intensity.

Intensity of 1 is barely audible and an intensity of 6 is very loud (often with visible/palpable thrill).

Note the quality of the sound (harsh, musical, etc) and the location (where do you hear it best?). Do you hear the sound in other places? Does it increase in intensity with certain phases of respiration?

Causes (see picture below): partial obstruction, anemia (heart is pumping faster to increase nutrients), dilated chamber (enlarged chamber will increase flow), regurgitation (valves are incompetent, backward flow), or shunting (septal defect, patent ductus arteriosus).

Heart murmurs are of longer duration than heart sounds. They originate within the heart itself or in its great vessels and are usually caused by one of the following mechanisms:	
1. Flow across a partial obstruction (e.g., aortic stenosis)	4. Flow into a dilated chamber (e.g., aortic systolic murmur associated with aneurysmal dilatation of the ascending aorta)
2. Flow across a valvular or intravascular irregularity without obstruction (e.g., a bicuspid aortic valve without true stenosis)	5. Backward or regurgitant flow across an incompetent valve or defect (e.g., mitral regurgitation)
3. Increased flow through normal structures (e.g., aortic systolic murmur associated with anemia)	6. Shunting of blood out of a high pressure chamber or artery through an abnormal passage (e.g., ventricular septal defect, patent ductus arteriosus)

Systolic murmur: usually less pathologic.

Mid-systolic: aortic or pulmonic stenosis. (Lub-shhh-dub)

<http://www.easyauscultation.com/cases-listing-details.aspx?caseID=123>

Pansystolic, holosystolic: mitral or tricuspid regurgitation, ventricular septal defect.

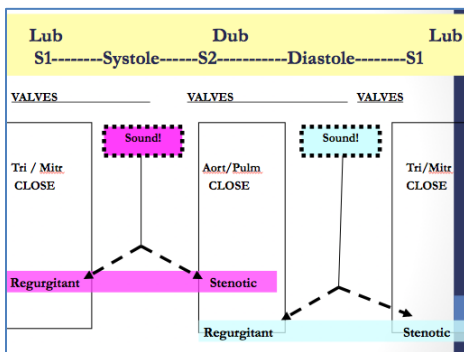
<http://www.easyauscultation.com/cases-listing-details.aspx?caseID=101>

Diastolic murmur: usually pathologic

Diastolic rumble: mitral stenosis (S1, S2, murmur)

<http://www.easyauscultation.com/cases-listing-details.aspx?caseID=98>

<http://www.easyauscultation.com/cases-listing-details.aspx?caseID=95>



Special Maneuvers:

- Capillary refill: should refill in less than 2 seconds
- Paradoxical pulse: Identify the top of systole. Inflate the BP cuff to the top of systole and listen. Lower the pressure and lock and again listen to the pulses.

Physical Exam:

Systolic: Top number of BP, ventricles are expelling (pressure is low)

Diastolic: Bottom number of BP, ventricles are filling (pressure is high)

Normal BP: <120/<80

Prehypertension: 120-139/80-89

Stage 1 hypertension: 140-159/90-99

Stage 2 hypertension: $\geq 160/\geq 100$

*Need two separate, simultaneous visits to get an average to attain a stage. It cannot be attained on one visit.

Patients will be treated with a reading of 150/90 per the JNC (Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure).

Activities:

Patient 1: 34 yo female with history of depression. BP reading is 150/88, repeated 2x, at a visit 1 month ago. Today her BP is 130/82. Would you classify her as having hypertension? If so, which classification?

Possibly classified as prehypertension but not stage 1 or stage 2.

Patient 2: 54 yo female with hx of CVD but no prior cardiovascular sx, has a BP of 160/90. She takes her BP at home with averages readings of 124/70. When you repeat her BP in her next 2 visits it is 156/84 and 148/92. Does she have HTN? If so, what is her classification? What do you think about her home readings?

Stage 1 hypertension

Orthostatic Blood pressure and Pulses:

Measure blood pressure and pulse at the same time. The patient needs to be supine for the first reading. This is repeated after having the patient sit or stand. Normally the systolic BP will rise slightly, lower slightly or stay the same and pulse will increase.

Hypovolemic patient: systolic BP falls >20mmHg or diastolic BP falls >10mmHg and pulse will increase more than 10 beats per minute

Autonomic dysfunction: systolic BP falls >20mmHg or diastolic BP falls >10mmHg and pulse will increase slightly (<10 beats per minute).

Pulses:

- Palpate the arterial pulses and note the rate, rhythm, contour, amplitude and symmetry. You also need to palpate the abdominal aorta and measure the width of the abdominal aorta. When it is greater than 3cm there is a higher risk associations.
- (Left versus Right). If there is asymmetry in pulses think about impaired circulation.
- Auscultate the temporal, carotid, subclavian, renal, iliac, femoral arteries and abdominal Aorta (using the bell). Recall that you need to have the patient hold their breath to hear the carotid arteries. Also remember to feel the carotid artery unilaterally.

Arterial insufficiency test: elevate the patient's legs (while supine) to about 60 degrees until maximum pallor of feet develops. Then have the patient sit up with the legs dangling. Compare the feet and note the time needed for color to return (normal is 15 seconds).

Allen test: have patient make tight fist. Press down on the ulnar and radial arteries. Lift your finger off of each artery individually and note any insufficiencies in color return.

Ankle Brachial Index: Measure systolic on both arms and legs. Apply BP cuff around the cuff. Take the highest systolic from the tibial or pedal and divide it by the highest systolic

from the brachial. The normal Ankle Brachial ratio is .90 to 1.30. A ratio of 0.41-0.9 indicates mild peripheral artery disease (PAD) while a ratio of 0.0-0.4 indicates severe PAD.

Assess veins:

- Thrombosis: redness, thickness, swelling, pain or tenderness along a vein.
- Note any prominence/varicosity
- Edema: grade the severity by pressing against the tibia and noting the pitting. A grade of 1 is slight pitting with immediate resolution and a grade of 4 or more is deep pitting that stays for 2-5 minutes. Also note the difference between the legs, is the edema bilateral?

Jugular Vein distension: Patient is supine at 30-40 degrees. Gradually raise the head of the bed until you see the column of blood (between clavicle and jawline). Hold straight edge at the midaxillary line. If JVP (jugular venous pressure) is greater than 4 cm it indicates other possible cardiovascular issues including: heart failure, volume overload, cardiac tamponade, constrictive pericarditis, tricuspid stenosis, superior vena cava obstruction, or reduced compliance of the right ventricle.

