



**Wisconsin Chiropractic Association
December 1, 2018**

**Practical Cardiology Tips for the Sports
Chiropractic Office**

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In addition to the seminar presentation, a practitioner should personally investigate the following topics to gain a greater and more in depth understanding of the material. This information is intended to update and maintain their professional expertise.

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- In Some areas of the country Chiropractors are functioning as primary care providers. This trend will most likely continue to rise. As the population continues to age, Chiropractors will have greater responsibilities. Cardiopulmonary examinations is one of the areas that need special attention.



- The cardiopulmonary examination is required and arguably the most important piece of a properly performed preparticipation physical evaluations (sports physicals) and DOT physicals (department of transportation).



- According to the Population Reference Bureau, in 2011 40 million people in the U.S. are aged 65 or older, this number is projected to more than double to 89 million by 2050.

Key Points for Auscultation

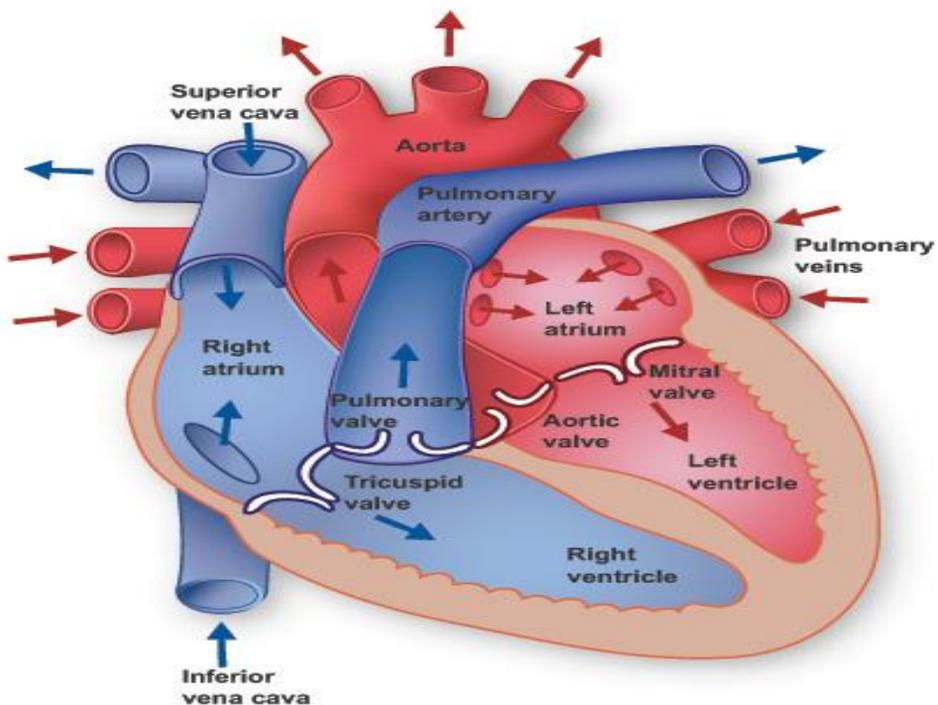


- Always use the same sequence when auscultating the heart.
- Only listen to one sound at a time then move on to the next.
- Always listen to all areas in three different positions: supine, sitting and left lateral recumbent (S3 can be heard the greatest in this position).
- Stethoscope should always be placed directly on skin.
- Examine patient from the right side of body, as this decreases the chance of the tube becoming compressed.
- Make sure the examination room is warm. If the person shivers, it will cause abnormal sounds.

Stethoscope

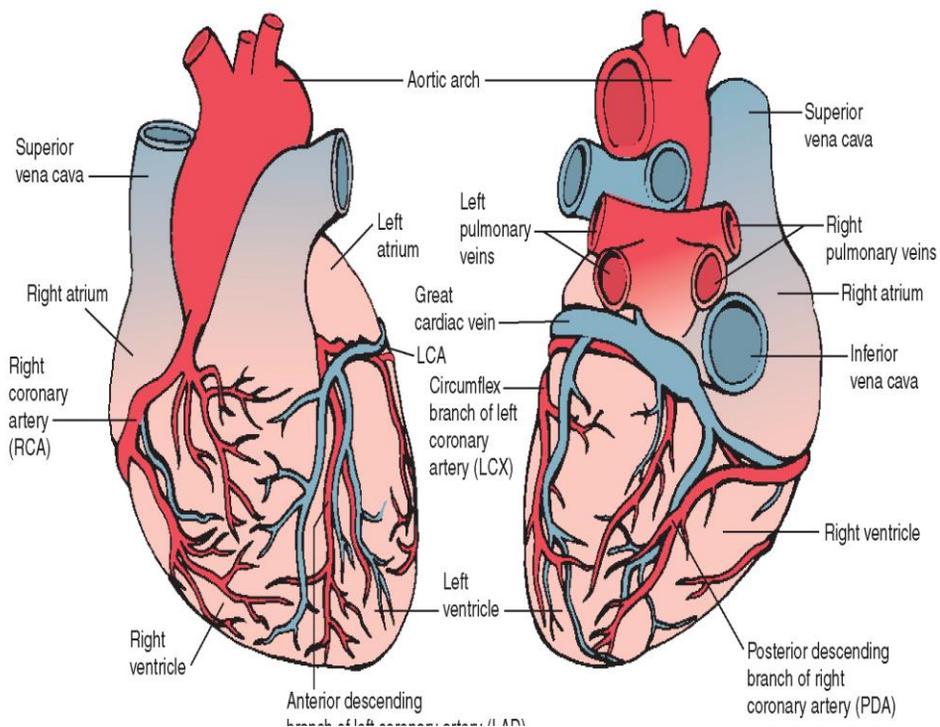


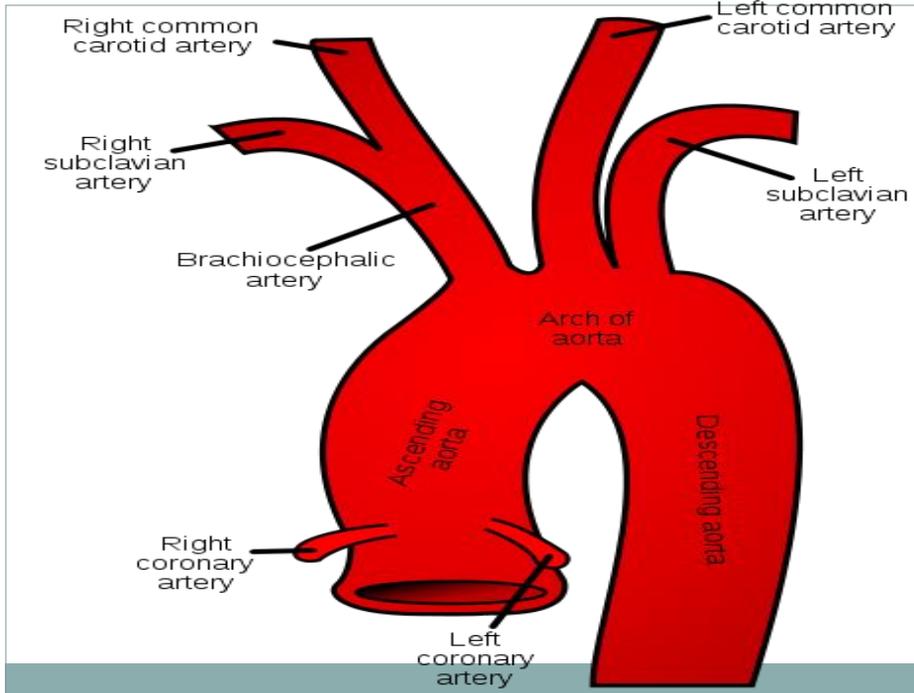
- Diaphragm should be used for high frequency sounds.
- The bell should be used for low frequency sounds.
- All areas of auscultation should be listened to with both the diaphragm and the bell.
- Greater compression of the bell can pick up high frequency sounds.
- Advanced stethoscopes have the capability of picking up both sounds at the same time.



Coronary Arteries

- The right coronary artery supplies the blood to the right ventricle and part of the left ventricle. This artery supplies about 35% of the blood to the myocardium.
- The left coronary artery supplies the blood to the front, top and back of the left ventricle. This artery supplies about 65% of the blood to the myocardium. This artery has two branches, the left anterior descending and the left circumflex.





Area's of Auscultation



- A. Base Right (Aortic Area)**
Right 2nd intercostal space; sounds of aortic valve are heard best.
- B. Base Left (Pulmonic Area)**
Left 2nd intercostal space; sounds of pulmonic valve are heard best.
- C. LLSB (Lower Left Sternal Border)**
Left 4th Intercostal space; sounds of tricuspid valve and the right heart are heard best.
- D. Apex**
Left 5th intercostal space (mid-clavicular line); sounds of mitral valve are heard best.
- E. Erb's Point**
Left 3rd interspace along the LLSB; listen here if a murmur is heard; some murmurs are heard downstream.

PMI (Apex Beat or Point of Maximal Impulse)



- PMI is the palpable cardiac impulse. It may also be referred to as the most lateral and inferior prominent cardiac pulsation. Examination of this cardiac impulse can give valuable clues into the diagnosis of certain cardiac diseases.
- In children, the PMI may present itself at the left 4th intercostal space lateral to the mid-clavicular line.
- In adults, the PMI will be at the left 5th intercostal space just medial to the mid-clavicular line.

Cardiac sound relationship



- S1; beginning of ventricular systole.
- S2; end of ventricular systole.

The period between S1 and S2 represents ventricular systole and the period between S2 and S1 represents ventricular diastole.

S1



- The first heart sound results from the mitral and tricuspid valves closing (beginning of ventricular systole).
- High frequency sound.
- When M1 and T1 are separate, it is a “split”, which is common in children and only heard in 50% of adults. Normal splits need to be high frequency and heard close together. Breathing changes do not affect a S1 split sound.
- M1 is heard best at the apex. T1 is heard best at the LLSB.
- S1 is louder than S2 at apex and LLSB.

S2



- Second heart sound, resulting from the closure of the aortic and pulmonic valves.
- High frequency sound.
- S2 is always louder than S1 at the two bases.
- If M1 and P1 are heard separate, it is known as a “physiological split”. It is heard on inspiration and becomes single on expiration.
- As a person ages, the frequency of hearing a split decreases.
- Hearing a split on expiration is abnormal.

S3



- A low frequency diastolic sound, that is heard just after the S2.
- S3 is heard with the bell and resembles cantor of a horse.
- It is the result of decreased ventricular compliance or increased ventricular volume.
- Left S3 is heard best at the apex and right S3 is heard best at the LLSB.
- S3 is heard farther apart than a split S2 and a split S2 does not sound like a gallop or cantor.
- S3 may be normal in children and young adults. S3 after the age of 40 is associated with cardiac disease.
- Conditions associated with S3 include: coronary artery disease, cardiomyopathy, and incompetent valves.
- S3 is the first clinical sign of congestive heart failure.
- Having a patient move from sitting to supine, self grip hands, coughing, left lying recumbent, and exercise can all make S3 easier to hear.

S4



- A low frequency late diastolic sound, heard just before the S1.
- S4 is heard with the bell and resembles cantor of a horse.
- Left S4 is heard best at the apex, right S4 is heard best at the LLSB.
- Result of decreased ventricular compliance or increased ventricular volume.
- Conditions associated with S4 are severe hypertension, aortic stenosis, myocardial disease, anemia and thyrotoxicosis.
- S4 is the hardest of the sounds to hear, turning to left side lying bring the heart closest to the wall.

Palpitations



- Sudden awareness of one's own heart beat.
- When exercise initiates more frequent palpitations, it is likely to be cardiac in nature and requires further investigation. They are usually benign if exercises decreases them.
- Non-cardiac causes may include: stress, medications, depression, metabolic disorders, illicit drugs, diabetes and ingestion.

Bruits



- A bruit is an abnormal sound that can be a sign of cardiovascular disease. Most commonly restricted blood flow through a artery.
- It is very common in the later years to have bruits present. Must correlate with other clinical findings.
- Listen for rushing or blowing over the carotids, abdominal or femoral arteries, while the patient is holding their breath.
- Be careful not to confuse with heart or lung sounds.
- Bruit are often evaluated by a ultrasound or other advanced imaging.

Murmurs



- Murmurs are sustained noises that are heard during systole, diastole or both.
- The six characteristics of identifying a murmur.
 1. Location: where will valve be heard the best.
 2. Intensity: 1-6 grading scale.
 3. Frequency: low, medium or high.
 4. Quality: blowing (high -F), harsh (mid-F) rough (mid-F) or rumble (low- F).
 5. Timing: systolic or diastolic or continuous
 6. Radiation: is the murmur heard somewhere else such as downstream?

Murmurs



- Murmurs that are in the early and mid systolic may be significant if other cardiac abnormalities are present but normal if no other factors are present.
- Early to mid systolic murmurs if grade 3 or less lessens your suspicions of a serious pathology.
- Grade 3 or higher systolic murmurs are more likely indicative of a greater likelihood cardiac disease.
- Although the intensity is important value to consider the length of the murmur is more predictive of the severity of the murmur.

Murmurs



- Therefore, murmurs that are late systolic, holosystolic and/or diastolic must be considered pathologic until proven otherwise.
- Other associated physical findings, signs and symptoms, ECG, chest x-ray and a echocardiogram results will help determine the severity of the possible underlining murmur.

Where is the murmur heard best?



Valve:

mitral

tricuspid

pulmonic

aortic systolic

aortic diastolic

Heard Best:

apex

LLSB

base left

base right

erb's point (3rd)

intercostal, LLSB

Auscultation Intensity Grades



- Grade 1: barely heard
- Grade 2: easily heard but faint
- Grade 3: loud
- Grade 4: loud
- Grade 5: loud with chest piece tilted
- Grade 6: heard with the chest piece slightly off the chest wall.

Examination Flow



- Listen to each of the five auscultation locations with the bell and diaphragm.
- Listen to each location in the supine, sitting forward and left side lying positions.
- Pay special attention to inspiration and expiration as it relates to each sound.
- Listen to S1 and S2
- Is there a split S1 or S2 present? These sounds will be faint and close to S1 or S2.

Examination Flow



- Is S3 or S4 present? These sounds will be truly extra sounds and sounds like a horse cantor.
- Is there a murmur present? Determine if it is in systole or diastole.
- Note where the murmur is located. Early, mid, end or the entire interval.
- Remember early to mid-systolic many times are functional. Diastolic, late systolic and holosystolic murmurs more times than not are pathologic.

Murmurs



Systolic Murmurs

Innocent Murmur

Aortic Stenosis

Mitral Regurgitation

Mitral Valve Prolapse

Hypertrophic Cardiomyopathy

Diastolic Murmurs

Aortic Regurgitation

Pulmonic Regurgitation

Mitral Stenosis

Tricuspid Stenosis

Innocent (Functional)Murmur



- This type of murmur (early –mid systolic) is seen with non-cardiac conditions such as pregnancy, fever, elderly, children, hyperthyroidism, exercise and anemia. When these are treated appropriately the systolic murmur disappears.
- Up to 50% of children will have an innocent murmur.
- The murmur is heard in early- mid systole, is of short duration and has a soft intensity usually grade 1 or 2. In general, other murmurs are of long duration.
- It is best auscultated in the pulmonic area and increases in intensity with inspiration. It can be heard with either the bell or diaphragm. It is heard best in the supine position and diminishes when sitting. Positional changes rarely alter a pathologic murmur. A innocent murmur will diminish when a Valslava maneuver is performed.
- Murmurs occurring only during diastole are always pathologic.

Innocent (Functional)Murmur



- A Still's murmur may be present. A Still's murmur has a buzzing, vibratory, or musical sound.
- It is common to have normal splitting of S1 or S2.

Aortic Stenosis Murmurs



- **Mid Systolic (ejection):** can be caused by a narrow or irregular valve. They are usually heard best at the right upper sternal border, and diminish with a valsalva maneuver.
- Many times it gives a musical sound and is best heard when sitting forward.
- Usually caused by a congenital defect, atherosclerosis and rheumatic heart disease.
- It is one of the more common causes of sudden death during exercise.
- Chest pain, fainting and shortness of breath may accompany AS.

Mitral/Tricuspid Regurgitation Murmurs



- **Pansystolic or holosystolic murmurs:** This type of murmur is heard throughout the entire phase of systole.
- Heard best at apex.
- Caused by rheumatic fever, myocardial infarction and rupture of chordae.

Mitral Valve Prolapse



- Ehlers-Danlos Syndrome, marfan syndrome, polycystic kidney disease, graves disease and pectus excavatum are conditions that are closely associated with MVP.
- May sound similar to HCM.
- MVP has a mid-systolic click followed by a late systolic murmur, usually heard at the Apex. Hand grip increases MVP and decreases with HCM
- Heard better in the upright position and is hard to hear in the supine position.

Hypertrophic Cardiomyopathy



- (HCM) accounts for about 1/3 of the SCD (sudden cardiac death) in the US in athletes younger than 30 years of age.
- Prevalence can be as high as 1:1000 in competitive athletes.
- The majority of HCM occurrences are asymptomatic. Only 21% had any symptoms prior to death.
- Of those 21%, the most common symptoms were exertional chest pain, dyspnea, light-headedness or syncope.

Hypertrophic Cardiomyopathy



- HCM is an abnormal thickening of the intraventricular system, therefore impeding blood flow to the aorta.
- 25% of athletes with HCM will have a murmur present. The murmur typically is a harsh systolic ejection murmur. This murmur is best heard at the right upper sternal border.
- This murmur is best identified with positions that encourage decreased venous return, valsalva or in a standing position. It will typically decrease with squatting.
- An ECG will be abnormal in up to 95% of cases. The athlete may have a lateral displacement of the PMI, which indicates hypertrophy and failure of the left ventricle.
- May present with holosystolic murmur at the heart apex.

Hypertrophic Cardiomyopathy



- Sound is similar to the murmur of aortic stenosis. Valsalva maneuver will decrease with AS and increase with HCM
- The carotid pulse may be jerky with HCM and will be normal in AS.

Innocent vs. HCM

	Innocent	HCM
Sitting	↓	—
Standing	—	↑
Squatting	—	↓
Valsalva	↓	↑
Hand Grip	—	↓
Inspiration	↑	—

Murmurs

- **DIASTOLIC MURMURS**: Evaluating practitioner should always assume that these murmurs are pathological in nature. A referral to a cardiologist is indicated.
- There are three main causes of diastolic murmurs:
 1. Aortic or pulmonic valve incompetence (blood falls back into the ventricles).
 2. Mitral stenosis or tricuspid stenosis (blood is forced into the ventricles).
 3. Increased blood flow across mitral or tricuspid valves.

Murmurs



- **Early diastolic murmur:** Begins with S2; aortic or pulmonic valve regurgitation.
- **Mid diastolic murmur:** Mitral and tricuspid stenosis. This murmur has a rumbling sound as well as a low frequency sound.
- **Late diastolic murmur:** Same as diastolic
- **Pan diastolic murmur:** Heard best at the base left (pulmonic area) with the bell. Patent ductus arteriosus is associated with this murmur. S1 and S2 many times are hard to hear.

Aortic Regurgitation Murmur



- The murmur is best heard at Erb's Point and can be accentuated by having the patient sitting up and leaning forward holding his breath after expiration.
- May have an S3 or S4 sound
- Caused by rheumatic fever, endocarditis, Marfan syndrome, syphilis, ankylosing spondylitis, cardiac trauma and dissection

Pulmonic Regurgitation Murmur



- Resembles a aortic regurgitation murmur.
- PR has a lower frequency sound of the pulmonic area and AR has a high-pitched blowing sound.

Mitral & Tricuspid Stenosis Murmur



- These murmurs occur when the blood is forced into the ventricles through stenotic valves, during ventricular diastole.

Pericardial Friction Rub



- When heard it signifies pericarditis.
- Heard best when the patient is sitting and leaning forward with the breath held in deep expiration. As the lungs expand the sound will likely worsen.
- Usually heard throughout the cardiac cycle.
- Sounds like grating, leathery, scratching, or rasping.

Pericardial Friction Rub



- Pain associated with pericarditis is worse when lying down and is relieving while sitting.
- Condition is usually self-limiting and is usually treated with anti-inflammatories.
- These noises will continue regardless of holding breath.

Valsalva and other maneuvers



- Certain maneuvers can help differentiate sounds.
- Valsalva: increases intrathoracic pressure and decreases venous return to the right side of the heart. Most murmurs decrease during valsalva.
- Exercise: increases blood flow, which may increase the intensity of the murmur.
- Respiration: overall brings the heart closer to the chest wall, therefore certain heart sounds will be heard better.
- Hand grip: This move increases peripheral vascular resistance, blood pressure, heart rate and cardiac output.

Inspiration and expiration effects



- Inspiration increases venous return to the heart.
- The majority of right-sided heart sounds and murmurs will increase with inspiration. This occurs because with a increased venous return there is more blood, and murmurs increase with greater blood volume.

Lung Sounds



- Rales (crackles) are produced from fluid in the airways or air pushed through a narrowed airway passage.
- Crackles, previously termed rales, can be heard in both phases of respiration. Early inspiratory and expiratory crackles are the hallmark of chronic bronchitis, pneumonia, CHF, or atelectasis.

Lung Sounds



- Wheezes are caused by narrowing of the airways. These are high pitched in nature and sound like musical sounds. Often heard best at the 2nd interspaces and on the anterior chest wall.
- Often associated with lung disease. Asthma is the most common. Lung cancer can also produce a wheeze.

Pleural friction rub



- May sound similar to a pericardial friction rub.
- The sounds are similar but when it involves the pleura, it continues throughout inspiration and expiration.
- Pleural rubs stop when holding your breath.

Sources and Links



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Thank You

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