Cardiovascular Physiology

Lab #10

Path of Cardiac Excitation

• Sinoatrial (SA) Node
  – pacemaker of the heart
• Atrioventricular (AV) Node
  – Delays conduction to ventricles
• Bundle of His
  – Conducts signal through interventricular septum
• Purkinje fibers
  – Conduct signal up lateral walls of ventricle

Path of Cardiac Excitation

• SA node cells produce APs
• Atrial fibers activated
  – atrial contraction
• APs excite AV node
  – delay (complete atrial contract)
• APs of AV node travel down
  AV bundle to apex of heart
• Signal conducted to Purkinje
  fibers throughout ventricles
• Myocardial fibers activated
  – ventricular contraction

Electrocardiogram (ECG)

• P wave
  – depolarization of atria just before contraction
• QRS wave
  – depolar. of ventricles just before contraction
  – also atrial repolarization
• T wave
  – repolarization of the ventricles

Electrocardiogram (ECG)

• P-R interval
  – Atrioventricular delay
• R-T interval
  – Duration of ventricular systole
• T-R interval
  – Duration of ventricular diastole

ECG Exercises

• Record ECGs before and after exercise
• Measurements
  – Duration of a cardiac cycle (T-T)
  – Measurement of heart rate
  – Measurement of atrial systole and the A-V delay (P-R)
  – Measurement of ventricular systole (R-T)
  – Measurement of ventricular diastole (T-R)
Cardiac Cycle

- contraction (systole) + relaxation (diastole) of ventricles
- lasts 0.8 sec (based on 72 beats/min)

Cardiac Cycle - Heart Sounds

- “lub” = closing of the AV valves
- “dub” = closing of the semilunar valves

Auscultation

- Listen for the heart sounds w/ stethoscope
- Best heard in different positions

Arterial Blood Pressure

- Pressure blood exerts on arterial walls
- Systolic blood pressure – pressure of blood in arteries during ventricular systole
- Diastolic blood pressure – pressure of blood in arteries during ventricular diastole
- Indicates blood flow to the body and work load of the heart

Measure Blood Pressure

- Sphygmomanometer
  - Apply cuff
  - Apply pressure to ~180 mmHg
  - Release pressure slowly
  - Auscultate brachial artery for sounds of Korotkoff

Cardiovascular Fitness

- Regular exercise
  - Increased stroke volume
  - Greater cardiac output
- Can maintain exercise longer
  - Less increase in HR needed to meet blood flow demands
  - Activity of heart muscle itself is lower
- Can recover from exercise more quickly
- Can compensate for changes in blood flow due to positional changes more effectively.
Fitness Activity

1. Measure reclining and standing HRs
   • determine change in pulse rate and score
2. Calculate change in systolic BP as you go from a reclining position to a standing position
3. Perform exercise on stool, (3 seconds each cycle, 5x) record HR (15 sec x4)
   • measure pulse at 30, 60, 90 and 120 sec after completion (15 sec x 4)
   • record time for pulse to return to normal standing rate.
   • subtract normal HR from exercise HR
4. Tally up scores and see how fit you really are!