Overview

- Definition
- Epidemiology
- Treatment
- Effects of exercise
- Exercise Testing and Prescription
- Summary
Did you know?

- Did you know that heart disease costs the U.S. $316.4 billion dollars in the year 2010??
- Heart disease is the leading cause of death for most ethnicities in the U.S. (2004)

<table>
<thead>
<tr>
<th>Race or ethnic Group</th>
<th>Percent of death</th>
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</thead>
<tbody>
<tr>
<td>African Americans</td>
<td>25.8</td>
</tr>
<tr>
<td>American Indians or Alaskan natives</td>
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<tr>
<td>Asians or Pacific Islanders</td>
<td>24.6</td>
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<tr>
<td>Hispanics</td>
<td>22.7</td>
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<tr>
<td>Whites</td>
<td>27.5</td>
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<tr>
<td>All</td>
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Pathophysiology

- Coronary artery atherosclerosis (CAD) is a localized accumulation of lipids, macrophages, platelets, calcium and fibrous connective tissue that causes the formation of plaque and narrowing of the lumen.
- Causes obstruction of normal blood flow
- Arthrosclerosis lesions that result in 50% or greater stenosis in a major coronary artery should be considered significant and an indication for possible revascularization.
Epidemiology

- Coronary heart disease caused 425,425 deaths in 2006 and is the single leading cause of death in America today.
- 17,600,000 people alive today have a history of heart attack, angina pectoris or both. This is about 9,200,000 males and 8,400,000 females.
- This year an estimated 1.26 million Americans will have a new or recurrent coronary attack.
- There are about 295,000 EMS-assessed out-of-hospital cardiac arrests annually in the United States.
- From 1996 to 2006 the death rate from coronary heart disease declined 36.4 percent.
Diagnosis

- Exercise stress testing
- Echocardiogram
- Nuclear imaging Coronary Angiogram
Why is Revascularization Done?

- To increase blood flow and oxygen delivery to occluded artery.
- Decrease or possibility of a Myocardial infarction.
- Reduce cardiovascular-related morbidity and mortality.
Two Most Common Techniques

- **Coronary Artery bypass Graft Surgery (CABGS)**
  - Involves passing critically obstructed artery with a saphenous vein.
  - Removed from leg or internal mammary artery

- **Percutaneous Transluminal coronary Angioplasty. (PTCA)**
  - Involves a balloon or double-lumen dilation catheter which is directed to the site of a coronary lesion until it’s within the vascular stenosis.
Coronary Artery Bypass Graft (CABGS)

- Procedure where one or more healthy blood vessels are removed from a part of the body (leg) and grafted into on the hearts surface to BYPASS one or more clogged/ blocked arteries.
- After procedure the heart should receive normal amounts of blood.
- Now performed on more than 170,000 Americans each year
When is Surgery Indicated?

- Patients with severe, disabling angina/or patients whose left main coronary artery is severely diseased.
- Angina occurs when the heart muscle doesn’t get enough oxygen-rich blood. Results in sudden pain or tightness in the chest that can radiate to the arms, neck or back.
- Angina can be treated with drugs: Nitrates, beta blockers, or calcium channel blockers
  - These drugs either increase blood flow to the heart or reduce the hearts oxygen needs.
CABG Procedure

- A graft vessel is harvest from either saphenous vein, or internal mammary or radial artery.
- One end of the graft is sutured to the aorta, the other is sutured to the coronary artery at the location beyond the blockage.
- If the internal mammary artery is used, it is rerouted and attached in the coronary artery, below the blockage.
Benefits from CABGS

- Relieve Anginal symptoms
- Prolong life in clients with left main coronary artery disease
- Preserve left ventricular function in clients with diffuse or left main coronary artery disease.
- Those treated with CABGS have significantly lower rates of death and death from MI than those treated with PTCA
Saphenous Vein Bypass
Internal Mammary and Radial Artery Bypass

http://www.youtube.com/watch?v=bwJCHYeGcU4
COMPLICATIONS from CABGS

- Perioperative infarction in 5-12% of all cases and occurs more frequently in older clients, diabetics, women, obese clients, clients with left ventricular dysfunction and those undergoing emergency bypass surgery.
- Occlusion occurs between 5-8 years after surgery: caused by angina and diminished physical work capacity.
- Internal mammary grafts have 93% 10 year graft patency and are resistant to atherosclerosis.
- Total relief of angina occurs in 70% of clients at 5 years approximately 50% are symptom free after 10 years.
What is PTCA

- Percutaneous Transluminal Coronary Angioplasty
- This procedure improves blood flow by enlarging the opening of a diseased artery.
Percutaneous Transluminal Coronary Angioplasty (PTCA)

- A balloon or double-lumen dilation catheter is directed to the site of a coronary lesion until it lies within the vascular stenosis.
- Inflation of the balloon produces:
  - Plaque compression and redistribution
  - Stretching of the vessel wall with an increase in the overall vessel diameter
- Majority of individuals diagnosed with ischemic heart disease undergo PTCA (>700,000 patients a year)
Qualifications for PTCA

- Patients may have two to three-vessel disease, impaired left ventricle function and acute occlusion during myocardial infarction.
- Must consent to undergo emergency CABGS should dilation fail.
- Recovery period is much shorter than CABGS. PTCA is 1-2 days where as CABGS is 1-2 weeks.
- 30% of clients who undergo PTCA will develop restenosis of the treated vessel with in 6 months of procedure.
PTCA Procedure

- A guiding catheter is positioned from the femoral artery into the coronary artery
- A thin Flexible guide wire is pushed down the vessel and through the narrowing
- The balloon catheter is advanced over the guide wire
- The balloon is positioned next to the plaque
- The balloon is inflated stretching and cracking the plaque
- When the balloon is withdrawn, blood flow is restored through the widened vessel
- A wire mesh stent may be placed in the vessel to hold open.

http://www.youtube.com/watch?v=N7nghr9TpSU
Risks and Complications with PTCA

- Bleeding at the catheter insertion site
- Blood clot or damage to the blood vessel at the insertion site
- Blood clot within the vessel treated by the PTCA with or without the use of a stent
- Infection at the catheter insertion site
- Cardiac dysrhythmias and arrhythmias
- Myocardial infarction
- Chest pain or discomfort
- Rupture of the coronary artery requiring open heart surgery.
- Not a complete cure
- 30% of PTCA patients will develop restenosis of the treated vessel within 6 months.
Benefits from Exercise

- Increase $\text{Vo}_2 \text{ max}$ on an average of 20%
- Will increase HDL cholesterol and decrease LDL cholesterol
- Decreases in patients HR and BP reduces the demands on the myocardium
- Promotes favorable modification of glucose metabolism: decreases insulin resistance
How to Prevent Heart disease

- The key to preventing heart disease is a healthy lifestyle. This includes a nutritious diet, at least 30 minutes of exercise most days of the week, not smoking, and controlling high blood pressure, cholesterol, and diabetes. If you drink alcohol, do so in moderation – no more than one drink a day for women, two drinks a day for men.
Exercise Testing

- 3-5 weeks after surgery for a CABG patient
- PCTA can begin days to a week after surgery
- Treadmill and cycle ergometer are good tools for testing
- Arm ergometer may be used on PTCA patients but NOT CABG patients due to the sternal incision, but may be used after healing is complete
- Measure patients HR, BP, ECG RPE.
Six Minute Walk Test

- Purpose: Objective measurement of exercise tolerance
- Equipment: Rolling distance marker, or walking track, stop watch
- Exclusions: musculoskeletal problems that preclude walking, uncontrolled angina, recent history of cardiac dysrhythmia
6 Minute Walk Protocol

- Prior to walk; resting HR, BP, and ECG will be recorded
- Patients will be asked to walk on a walking track or quiet hallway (at least 100 ft in length), covering as much ground as possible in the 6 minutes
- During the walk, words of encouragement will be given at 1 minute intervals.
- Patients will be told after one minute has elapsed.
- Right after the test patients will be asked to rate their level of perceived exertion (RPE scale)
- Distance covered, HR, BP, and ECG will be recorded
How To Calculate

- Peak VO$_2$= VO2 mL/kg/min= \[0.02 \times \text{distance (m)} \] – \[0.191 \times \text{age (yrs)} \] – \[0.07 \times \text{weight (kg)} \] + \[0.09 \times \text{height (cm)} \] + \[0.26 \times \text{RPP (x 10}^{-3}) \] + 2.45

- M= distance in meters,
- Y=year
- Kg=kilograms
- Cm=centimeters
- RPE=rate of pressure product (HR x systolic BP)
Effects Medication has on Exercise

- Most patients that have undergone CABGS or PTCA will be on medications that will have an effect on the exercise response.
- Some common medications are:
  - Beta Blockers: slow HR which can make it hard for patients to get their HR up above a certain level
  - Calcium Channel Blockers: lower resting BP and may have a positive effect on exercise by increasing exercise capacity
  - Nitrates: reduce angina but don’t treat heart disease
Exercise Prescription

- Goals of exercise
- Increase in aerobic capacity
- Decrease BP and HR response to exercise
- Decrease CAD risk factors
- Increase muscle strength and endurance
- Increase flexibility: decreases risk for injury, also improves Range of Motion in CABG patients
What to Prescribe?

- Mode: Large muscle group activities such as leg and arm ergometry (for patients healed from CABG surgery), walking, circuit training, static stretching
- Intensity: Rate of Precieved Exertion of 12-15
  - 40-80% of VO\textsubscript{2} max, or HRR.
- Frequency/Duration:
  - Aerobic 3 days a week for 20 minutes sessions or as tolerated
  - Strength 3 days a week, 1 set<10 reps (40-50% 1RM)
  - Flexibility 3 days a week, 20s stretches
  - Warm up and cool down before and after each session for 10-15 minutes. RPE <10/20
After Surgery

- No strenuous upper body activity that requires pushing, pulling, bending, or reaching.
- No lifting more than 5-10 pounds
- Keep HR within 30 beats of resting heart rate
- Avoid isometric activities that cause patients to tense body or hold breath
Summary

- CABGS and PTCA are two techniques that are used to treat Coronary Artery Disease.
- CABGS entails bypassing the blocked blood vessel with a new vessel.
- PTCA enlarges the opening in a diseased vessel, and stents may be put in to hold the vessel open.
- Special considerations must be taken when prescribing exercise to patients that have undergone these two procedures.
REFERENCES


