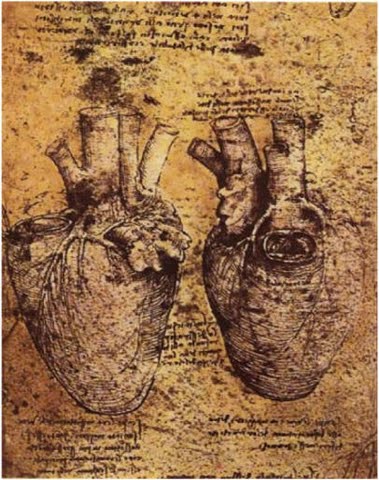
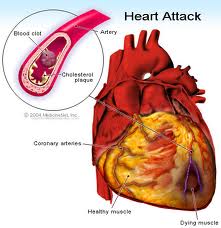
**Clinical Cardiac A & P**  
**Dr. Gary Mumaugh**

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**Coronary Artery Disease**

* **Pathophysiology**
  + Atherosclerotic disease and coronary artery disease accounts for 45% of all USA deaths
  + 50% of female deaths are cardiovascular
  + Etiology includes the presence of plaques lining the coronary arteries with plaque rupture and coronary artery spasm
  + Result is ischemia, angina or MI, cell death and or electrical dysfunction
  + 3 Elements of atherogenesis is plaque formation, plaque rupture, vasoregulation creating atherosclerotic disease
* **CAD risk factors**
  + Older age
* Family history
* Socioeconomic factors
* Overweight with trunk fat depostition
* Blood pressure
* Smoking
* Personality and psychological factors
* Glycemic control
* Increased LDL and triglycerides
* Poor dental hygeine
* Chronic infections
* With several risk factors the risk could be up to 20X
* **Preventative therapy to reduce heart attacks**
  + Specific therapy for those with pre-clinical CAD
    - Lovastatin and strict diet control
    - Proper diabetic control
    - Antihypertensives
    - Folic acid for high homocysteine
    - Temporary antibiotics
    - Maintenance of good oral hygiene
  + General therapy for all adults
    - Low dose ASA
    - Smoking cessation & stress management
    - Folic acid, Vitamin C and E, omega-3 fatty acids
    - Increasing aerobic exercise

**Coronary Artery Occlusion with MI**

* **Incidence**
  + 1,100,000 American had MI, with 650,000 being the first attack and 450,000 instant deaths
* **S & S**
  + Crushing chest pain with diaphoresis, dyspnea, weakness, palpitations, vomiting
* **Diagnosis**
  + Patient presentation with ECG and blood tests
* **Treatment**
  + Admission to CCU has best survival
  + Oxygen, beta blockers, heparin, tPa
  + Pacemaker insertion or CABG surgery
* **Famous Cardiac Caveats**
  + In all men or older women with acute physical distress of any kind, always think, “Is this a myocardial infarction?”
  + When a young man complains of pain in his heart, it is usually his stomach. When an old man complains of pain in his stomach, it is usually his heart.
  + Such thought has saved thousands of lives

**Hypertension**

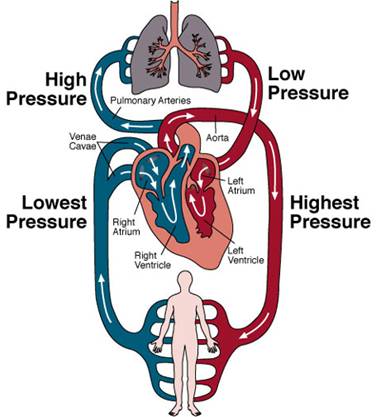
* Up to 50 million in the USA
* **95% diagnosed as essential** 
  + Essential means preventable or likely due to diet, obesity, inactivity, stress and alcohol
* **Conventional treatment** with lifestyle modifications work well with integrative care
  + According to the 6th Joints Commission of Hypertension, even with a BP of 140/90, the main intervention is lifestyle intervention before starting medication.
  + This includes weight loss, decrease sodium and alcohol and moderate exercise for one year before starting medication.
* **Causes of essential hypertension**
  + Heredity
  + Obesity
  + Salt intake
  + Stress
  + Alcohol
* **Three diagnostic components of essential HTN**
  + Careful history, family history, organ system review, lifestyle evaluation
  + Thorough physical examination
  + Lab studies



* **Treatment of essential HTN**
  + Lifestyle changes
    - Weight, exercise, smoking, salt restriction, stress reduction, DASH diet
  + Medication (only after lifestyle modification)
    - Diuretics
    - Calcium channel blockers
    - ACE inhibitors
    - Alpha blockers
    - Beta-blockers
    - Angiotensin II receptor blockers
* **Causes of secondary hypertension**
  + “white coat hypertension”
  + Medical noncompliance
  + Exogenous drug usage
    - Oral contraceptives, weight control drugs, NSAIDs, steroids, sympathomimetic cold remedies
  + Renal disease
  + Aldosteronism
  + Endocrine diseases
  + Sleep apnea
  + Congenital stenosis of the aorta
* **Treatment of secondary HTN**
  + Remove the cause and the HTN is gone

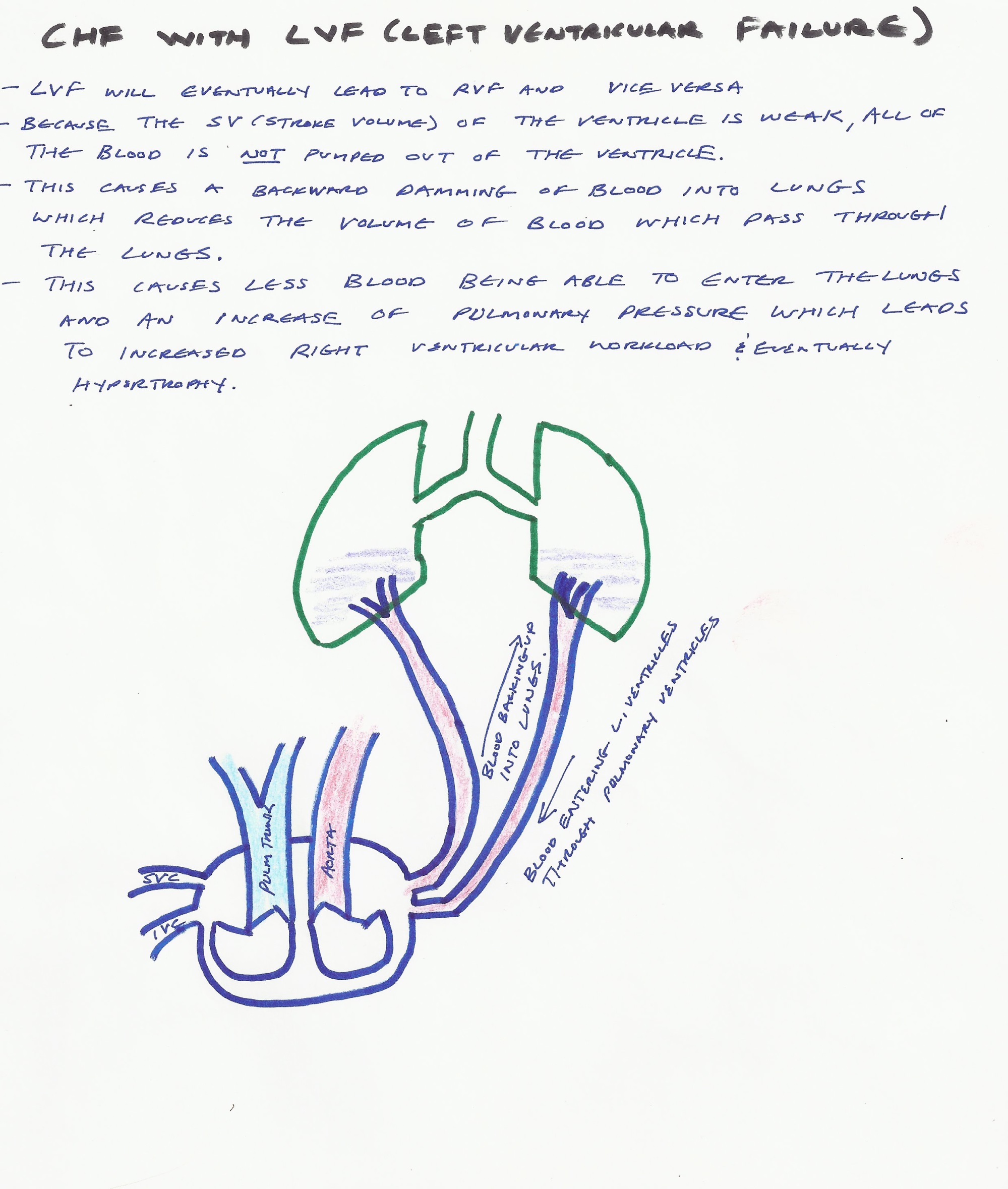
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**Congestive Heart Failure**

* **CHF Incidence**
  + In the USA, 3 million hospitalizations per year
  + 30-40% are readmitted with six months
  + 4-5 millions current cases
  + 500,000 – 600,000 new cases per year
  + 250,000 deaths per year
  + Half of all CHF diagnosis die within 5 years
    - 10% die in year one
  + Twice as common in African-Americans
  + USA yearly treatment cost - $21 billion
* **Causes of CHF**
  + Coronary artery disease
  + Hypertension
  + Aortic stenosis and insufficiency
  + Mitral regurgitation
  + Atrial fibrillation, flutter or tachycardia
  + Viral myocarditis
  + Septicemia
  + Hyperthyroidism or hypothyroidism
  + Alcohol abuse
  + Chemotherapy
  + Congenital or rheumatic heart disease
  + Chagas’ disease – parasitic heart infection
* **Pathophysiology of CHF**
  + The pumping action of the heart becomes less and less powerful
  + Despite its misleading name, in heart failure the heart doesn't suddenly stop working
  + Heart failure develops slowly as the heart muscle gradually weakens
  + The "failure" refers to the heart's inability to pump enough blood.
  + Blood and fluid do not move efficiently through the circulatory system, and starts to "back up“
  + Eventually, parts of your body (lungs, abdomen, and lower limbs) hold blood and fluid that your heart isn't circulating very well
  + This is called "becoming congested," and is why this condition is called "congestive heart failure"
* **Left sided vs. Right sided Heart Failure**
  + Can involve the heart's left side, right side or both sides, though CHF much more affects the left heart
  + Left-sided heart failure
    - Fluid collects in the lungs - this extra fluid in the lungs ("congestion") makes it more difficult for the airways to expand as you inhale
    - Presents with dyspnea, pulmonary edema, and orthopnea
  + Right-sided heart failure
    - Due to failure of the right ventricle
    - Fluid collects in other body tissues especially the lower extremities – pitting edema, liver enlargement

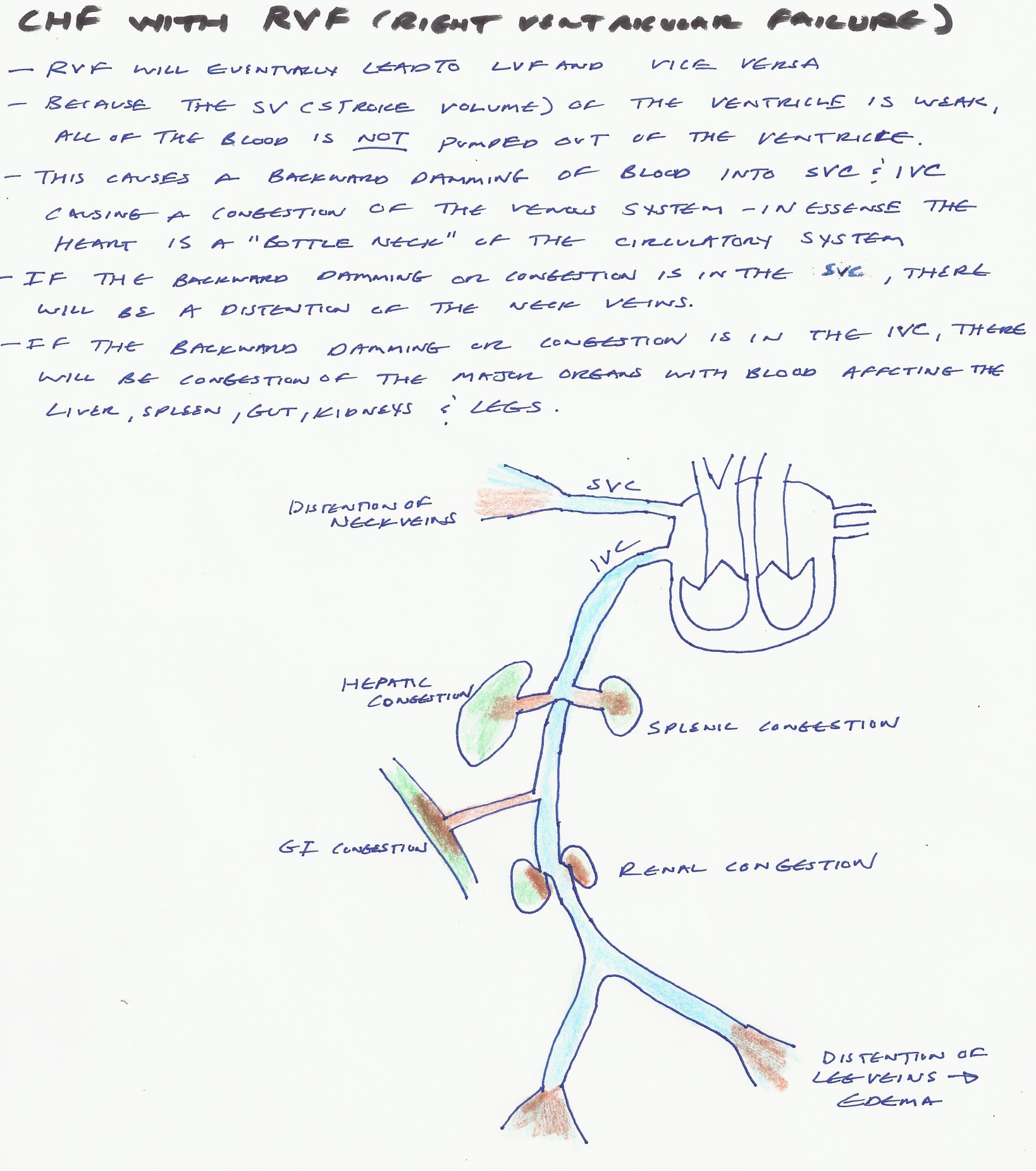
**Left Sided Congestive Heart Failure**

* LVF will eventually lead to RVF and vice versa
* Because the Stroke Volume (SV) is weak, all of the blood is NOT pumped out of the ventricle
* This causes a backward damming of blood into the lungs which reduces the volume of blood which pass through the lungs
* This causes less blood being able to enter the lungs and an increase of pulmonary pressure which leads to increased right ventricular workload and eventually hypertrophy

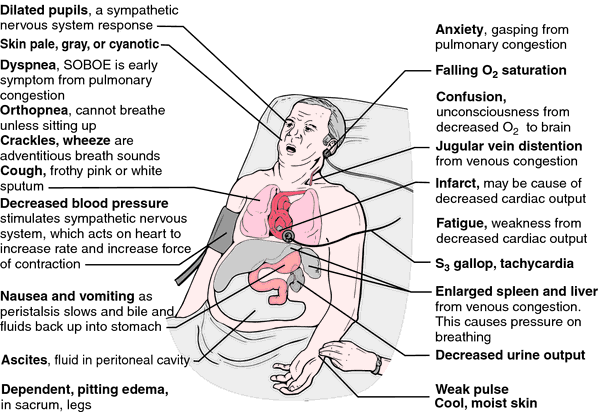
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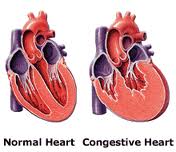
**Right Sided Congestive Heart Failure**

* RVF will eventually lead to LVF and vice versa
* Because the Stroke Volume (SV) of the ventricle is weak, all of the blood is NOT pumped out of the ventricle
* This causes a backward damming of the blood into the superior and inferior vena cava causing congestion of the venous system
* In essence the heart is a “bottle neck” of the circulatory system
* If the backward damming is in the SVC, there will be distention of the neck veins
* If the backward damming is in the IVC, there will be congestion of the major organs with blood affecting the liver, spleen, guts, GI tract, kidneys and legs

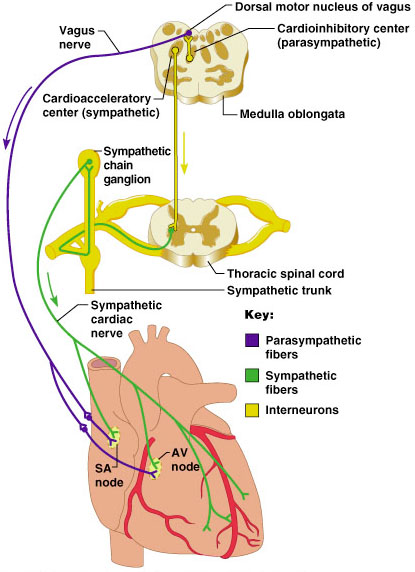


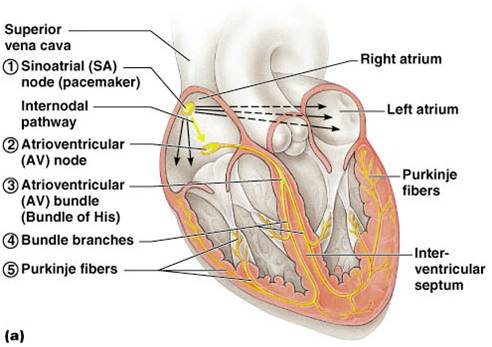
* **CHF Symptoms**
  + Three cardinal symptoms are dyspnea, fatigue and fluid retention
  + Sudden weight gain, despite loss of appetite
  + Swelling in legs, ankles, feet, or abdomen
  + Tired and short of breath when doing things that are normally easy, such as walking
  + Breathing difficulty when lying flat in bed or may wake up with a choking feeling
    - May need to sleep with your head raised up on several pillows
  + Persistent cough, more at night
  + Less frequent urination during the day
  + Irregular heartbeats, feeling of heart pounding
  + Chest pain, pressure or chest discomfort
  + Loss of appetite
  + Dizziness or lightheadedness, inability to concentrate



* **Four Stages of CHF** - New York Heart Association Guidelines
  + Class I (Mild) 35%
    - No limitation of physical activity
    - Ordinary physical activity does not cause symptoms fatigue
  + Class II (Mild) 35%
    - Slight limitation of physical activity
    - Comfortable at rest, but ordinary physical activity results in fatigue, palpitation, or dyspnea
  + Class III (Moderate) 25%
    - Marked limitation of physical activity
    - Comfortable at rest, but less than any activity causes fatigue, palpitation, or dyspnea
  + Class IV (Severe) 5%
    - Unable to carry out any physical activity without discomfort
    - Symptoms of cardiac insufficiency at rest
    - If any physical activity is undertaken, discomfort is increased
* **CHF Diagnosis**
  + Family history
  + Medical history
  + HTN, angina, diabetes, high cholesterol, valve disease, PVD, rheumatic disease, chest radiation
  + Life style
  + Health habits
  + Physical exam
  + Peripheral edema, hepatomegaly, ascites, pallor, tachycardia, jugular venous distension
  + Chest x-ray
  + EKG
  + Echocardiogram
  + Blood work
* **CHF treatment**
  + Aldosterone antagonists
    - Reduce the stress to the heart
    - Weak diuretic effect
  + Angiotensin converting enzyme (ACE) inhibitors
    - Help reduce the stress on your heart
  + Beta blockers
    - Help decrease the heart’s need for blood and oxygen by reducing its workload
    - Help the heart to beat more regularly
  + Digoxin (Lanoxin®)
    - Help increases the strength of the pumping action
  + Diuretics (water pills)
    - Help reduce the amount of fluid in your body

**Extrinsic Innervation of the Heart**

* Heart is stimulated by the sympathetic cardioaccelerator center
* Heart is inhibited by the parasympathetic cardioinhibitory center
* Heart Physiology: Sequence of Excitation
  + Sinoatrial (SA) node generates impulses about 75 times/minute
  + Atrioventricular (AV) node delays the impulse approximately 0.1 second
  + Impulse passes from atria to ventricles via the atrioventricular bundle (bundle of His)
  + Heart Block - the only route for impulse transmission from the atria to the ventricles is through the AV node, and damage to the AV node is called heart block

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**Cardiac Arrhythmias**

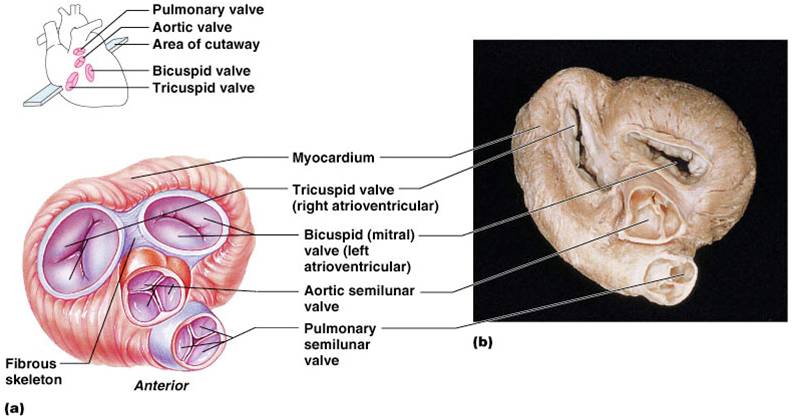
* **Premature atrial contractions (PAC)**
  + Seen in normal people with to much caffeine, anxiety, alcohol, electrolytes, vomiting or diarrhea
* **Premature ventricular contractions (PVC)**
  + Often seen in middle age and of no concern
  + Can also occur with MI, CHF, hypoxia
* **Paroxysmal atrial tachycardia (PAT)**
  + Usually in women 20-25
  + May be congenital and start in first year of life
    - Called Wolf Parkinson White Syndrome which requires a catheter radio-ablation

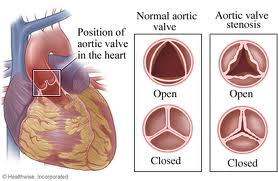
**Cardiac Arrhythmias - continued**

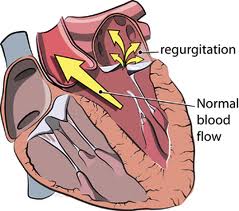
* **Atrial fibrillation and flutter (AF)**
  + Not life-threatening, yet it is a common cause of hospitilization
  + Causes the heart to be sporadically with no rhythmic pattern
  + May be caused by COPD, alcohol, cardiac surgery, hyperthyroidism, or idiopathic
  + The inefficiency of the atrial contraction leads to a potential buildup of clots in the wall of the atria
  + Treated with electrical cardioversion with anticoagulation meds
  + Some are resistant to cardioversion which puts them at risk for strokes, ventricular fibrillation and sudden death
* **Ventricular tachycardia (VT)**
  + A normal response to exercise, stress reactions and sexual activity causing the heart to elevate up to 200/minute
  + In patient’s with structural heart disease, VT can occur without provocation
  + S & S – pounding heart and lightheadedness
  + Treated with electrical cardioversion and beta blockers
* **Bradycardia**
  + Pulse less than 60/min or 46/min for athletes
  + Extrinsic causes by drugs, hypothyroidism, CNS disorders
  + Intrinsic causes by SA or AV node dysfunction
  + Treat the cause, such as a pacemaker
* **Heart block**
  + Often caused by ischemia due to CAD or may be idiopathic
  + Three degrees possible
    - 1st degree – impulses reach the ventricles and slow in the AV node – no treatment needed
    - 2nd degree – impulse slows so that not all beats get through the ventricle, causing bradycardia – may or may not need a pacemaker
    - 3rd degree (complete) – all impulses from the atria to the ventricles are blocked at the AV node – all need external pacemaker
  + Sick sinus syndrome - a wide variety of alternate bradycardia and tachycardia

**Cardiac Valve Disease**

* **Heart valve malfunction** comes in two forms:
  + Valves that do not open well
    - This constricts the flow and is called stenosis
  + Valves that do not close well
    - This causes backwards leakage and is called regurgitation or insufficiency
* **Four most common valve problems**
  + Mitral regurgitation (insufficiency)
    - In the past, was caused by rheumatic fever
  + Mitral stenosis
    - Caused by rheumatic fever, congenital abnormalities, lupus, or tumor
  + Aortic regurgitation (insufficiency)
    - The 3 cusps leak after contraction
    - Caused by rheumatic heart disease, congenital defects, endocarditis or degeneration
    - Causes ventricular enlargement
  + Aortic stenosis
    - Most common valve problem in adults
    - Most caused by arteriosclerosis of flaps – normal aging

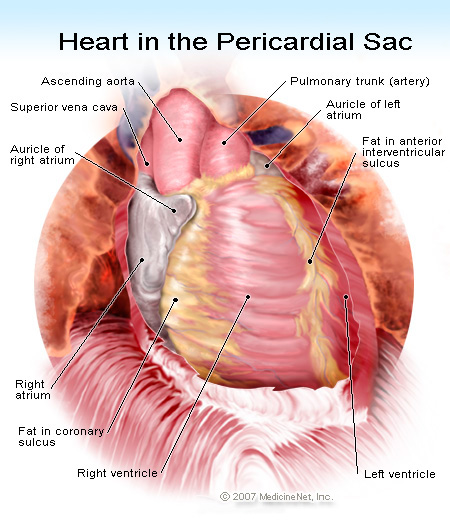


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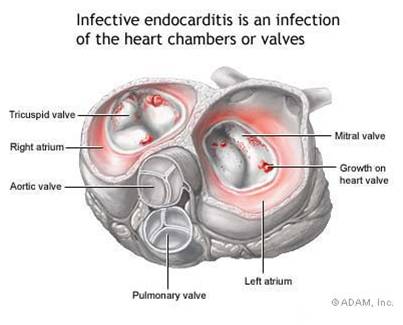
**Pericarditis**

* Has a triad of chest pain, ECG changes and pericardial friction rub – the patient must have 2 of the 3 to make the diagnosis
* **Major causes**
  + Viral infections, myocardial infarction, drug side effect, connective tissue disorders, blunt or penetrating trauma
* **S & S**
  + Chest pain radiating to back or left shoulder
  + Fatigue or dyspnea
* **Diagnosis**
  + High intensity friction rub and ECHO
* **Treatment**
  + NSAIDs and steroids
  + Pericardiocentesis to avoid cardiac tamponade from effusion
    - Tamponade is fatal it not relieved
* **Prognosis**
  + Most resolve in four weeks
  + Some cases become chronic which require surgery to remove the thickened constrictive heart layer

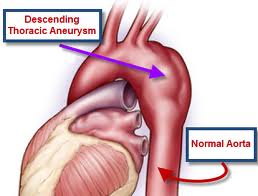
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**Endocarditis**

* Infection of inner heart lining, usually bacterial
  + Can be acute or subacute
  + Usually occur on damaged valves in which the bacteria accumulates and forms blood clots on the valves
    - Bacteria in the bloodstream comes from mouth, dental work, gingivitis, skin infections, medical procedures (*Streptococcus, staphlococcus, enterococcus)*
  + Heart valve vegetations can and easily embolize throughout the body causing satellite abscesses
  + Diagnosis with ECHO and blood culture
    - Consider in any patient with fever heart murmur
  + Treatment – IV antibiotics and possible valve replacement

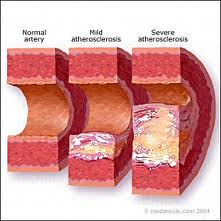
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**Aortic Artery Disease**

* Ruptured aortic aneurysms are responsible for 15,000 deaths per year (half die in surgery)
  + (> 4 cm diameter with normal at 2.5 to 3 cm)
* **S & S**
  + Often no symptoms when they are small
  + When they enlarge, they cause low back pain and powerful abdominal pulse sensation
* **Diagnosis** 
  + Pulsating aneurysm palpated and seen on ultrasound
* **Treatment**
  + Surgical resection > 5 cm diameter

**Peripheral Artery Disease**

* **Arteriosclerosis**
  + Generalized narrowing and stiffening of arteries occurring over 65 years old
* **Atherosclerosis**
  + The process of plaque formations over the age of 35
  + Plaques build up where vessels split and can lead to strokes, gangrene and heart attacks
  + Very common in diabetes
  + Risk factors
    - Tobacco (3-4X), age, HTN, diabetes, cholesterol, sedentary lifestyle, high homocysteine

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**Aortic Artery Disease**

* Ruptured aortic aneurysms are responsible for 15,000 deaths per year (half die in surgery)
  + (> 4 cm diameter with normal at 2.5 to 3 cm)
* **S & S**
  + Blood flow restricted to lower extremities
  + Severe claudication
  + Sharp pain with exercise that stops with lack of movement
* **Diagnosis**
  + Diminished or absent peripheral pulses
  + Doppler flowmeter changes
  + Ischemic limbs have purple-red color
  + Glove-like distribution of nerve loss
* **Treatment**
  + Vasodilators
  + Vascular surgery