Overview

- ACS continued
- Heart Failure
- Valvular Disorders and Endocarditis
Diagnosis

- Nuclear stress test - stable angina
- Bloodwork: Troponin, Myocytes
  - UA vs MI
- ECG: ST segment elevation
  - N-STEMI vs STEMI
- Angiography
12 Lead ECG

- Lead = view of the heart
- Bipolar vs unipolar leads
- Different leads of the ECG indicate there is a blockage in different places
N-STEMI vs STEMI

**ST Segment**
- Normal ECG
- ST Depression
- ST Elevation
- T Inversion
Diagnosis through 12 lead ECG

- Inferior: II, III, AVF
- Anterior: V1-V4 (Septal V1-2)
- Lateral: I, AVL, V5, V6
Angiography

- Allows visualization of blockages in the coronary arteries
- Catheter inserted into wrist or groin - fed up to coronary arteries through the aorta
- Dye injected into different vessels to look for blockages
- If blockages are accessible from this view, angiography will be performed
Treatment

Medical and Lifestyle Management

Angioplasty and Stent insertion

Coronary Artery Bypass Grafting
Medical Management

- Thrombolytics: Clot busting drugs
- Aspirin
- Anti-platelet agent
- Beta-blocker
- Anti-hypertensive
- Cholesterol Lowering medication
Lifestyle factors

- Modifiable risk factors play an important role in patient recovery:
  - Reduce salt and saturated fat intake
  - Routine light exercise and resistance training
  - Quit smoking
  - Manage stress
Angioplasty

- During angiography - opening of a blocked vessel
- Fresh clot - can be aspirated
- Hardened vessels - diamond drill may be used
- Balloon used to inflate a stent inside the affected artery

Video:
- [https://www.youtube.com/watch?v=gVMi4j6v1E4](https://www.youtube.com/watch?v=gVMi4j6v1E4)
Coronary Artery Bypass

- If blockages are not accessible via angioplasty or vessels are too heavily calcified
- Arteries/veins are grafted onto the aorta to bypass the blockages
  - Venous vs arterial grafts
- Most invasive procedure: mid sternotomy required
- Most grafts will need to be replaced after 10 years
Complications - Myocardial Infarction

- If a myocardial infarction is not treated in a timely and effective method, heart tissue death will result.
- Arrhythmias
- Weakened heart muscle - heart failure
- Mental Health conditions
Summary of CAD

- Narrowing of the coronary arteries
- Modifiable and non-modifiable risk factors
- Symptoms are different in men and women
- Angina - Stable, unstable, prinzmetal
- STEMI vs N-STEMI
- Treatment/management depends on the location
- Lifestyle modifications are important in order to avoid reinfarction
Heart Failure

- Inability for the heart to pump blood effectively
- Cardiac Output = Stroke Volume $\times$ Heart Rate
- Heart tries to compensate in order to maintain appropriate cardiac output
  - Heart stretches to try and hold more blood
  - Heart becomes more muscular to try and pump harder
  - Heart pumps faster to try and get more blood out
  - Vessels narrow their diameter
Causes of Heart Failure

- Coronary Artery Disease
- Hypertension
- Valvular Disorders
- Cardiomyopathy
- Congenital Disorders
Left Heart Failure

- Systolic vs diastolic
  - Failure to pump vs failure to relax
- Generally precedes Right Heart Failure
- Symptoms seen in the ‘L’ungs
Left sided Heart Failure symptoms

- Paroxysmal Nocturnal Dyspnea
- Elevated Pulmonary Capillary Wedge Pressure
- Pulmonary Congestion
  - Cough
  - Crackles
  - Wheezes
  - Blood-Tinged Sputum
  - Tachypnea
- Restlessness
- Confusion
- Orthopnea
- Tachycardia
- Exertional Dyspnea
- Fatigue
- Cyanosis
Right sided Heart Failure Symptoms

- Fatigue
- ↑ Peripheral Venous Pressure
- Ascites
- Enlarged Liver & Spleen
- May be secondary to chronic pulmonary problems
- Distended Jugular Veins
- Anorexia & Complaints of GI Distress
- Weight Gain
- Dependent Edema
Pulmonary Edema

- Fluid in the lungs
- Accumulates over time, but can be acute as well
  - Flash pulmonary edema
- Lungs sound wet - difficulty breathing
- Can be deadly if left untreated
Diagnosing Heart Failure

- Cardiac Exam
- Blood tests: Troponin, CK
- Chest X-Ray
- Cardiac Stress Test
- Echo
- ECG
- CT/ MRI
Treating Heart Failure

- Medication
- Fixing the underlying cause
  - Angioplasty/ CABG, Valve repair, ICD
- Ventricular Assistive Devices
- Transplant
Medication for Treating Heart Failure

- Diuretics
- ACE inhibitors/ Angiotensin Receptor Blockers
- Beta Blockers
- Cholesterol Medications
- Digoxin
- Hydralazine and Nitrates
- *Blood Thinners* if required by underlying condition
Ventricular Assistive Devices (VAD’s)

- Can be used to bridge to palliation, but often used to bridge to transplant
- Extra corporeal pumping chamber vs paracorporeal
  - Outside the body vs inside the body
  - Decision based on patient’s condition/ stability
- Can be for LV (more common), RV, or both!
- Many potential complications with these devices
VAD’s
Heart Transplant

- Surgery takes between 4-8 hours
  - 85-90% survive up to 1 year afterwards
  - Average life expectancy after transplant 9.16 years
- Those with pre-existing health conditions may have increased rates of rejection/comlications
- “Personality” Transplants- no scientific basis
Valvular disorders
Valvular Disorders

- Stenosis - stiffening
- Prolapse - slipping out of place
- Regurgitation - leaking
- Atresia - malformation
Stenosis

- Tricuspid - Atrial enlargement, Ventricular shrinking
- Pulmonic - Ventricular enlargement, poor oxygen delivery
- Mitral - Atrial enlargement, Systemic symptoms
- Aortic - Ventricular enlargement, poor systemic circulation
Prolapse

- **Mitral Valve Prolapse** - Barlow Syndrome/ Leaky valve Syndrome
  - Structural issue
  - “Stretchy” valve tissue
- **Tricuspid, Aortic, or Pulmonic Valve Prolapse**
  - Much less common
  - Similar etiology
Regurgitation

- Tricuspid - atrial enlargement
- Pulmonic - Respiratory symptoms
- Mitral - Systemic and pulmonic symptoms
- Aortic - Ventricular hypertrophy
Atresia

Congenital disorder - valve not properly developed

More often affects the right side of the heart

Symptoms depend on type location of atresia

Tricuspid Valve
Pulmonic Valve

LV: Left ventricle
RV: Right ventricle
LA: Left atrium
RA: Right atrium
AO: Aorta
PA: Pulmonary artery

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Causes

- Congenital Heart Disease
  - Bicuspid Aortic Valve
- Marfan Syndrome
- Age
- Rheumatic Fever
- Radiation Therapy
- Pre-existing cardiac conditions
Diagnosis

- Heart murmur video: https://www.youtube.com/watch?v=Q5-0mSydRR4
- ECG
- Echocardiography
- CT/ MRI

Figure 1: Phonograms from normal & abnormal heart sound
Signs and Symptoms

Heart Valve Disease

Signs and Symptoms

- Fluttering chest sensation
- Rapid weight gain
- Chest pain (angina)
- Lightheadedness or loss of consciousness
- Short of breath
- Coughing
- Fatigue or weakness
- Swollen ankles
- Tired
- Abdominal bloating
Treatment

Medications
- Diuretics
- Anti-Arrhythmics
- Anticoagulants

Valve Repair

Valve Replacement
Valve Repair

- Done for the AV Valves, rather than the semilunar valves
- Surgical options
  - Commissurotomy/ valvulotomy
  - Annuloplasty- ring of braided polyester
- Percutaneous/ Transcatheter options
  - Balloon Valvuloplasty
  - Mitral Valve Clip
Valve Replacement

- Mechanical
  - Pros: long lasting, very durable
  - Cons: increased risk for blood clots, endocarditis
Tissue Valve replacements

- Xenograph: porcine, bovine, human donor
  - +++ studies done re- bovine vs porcine
  - Human grafts very rare
- Pros- similar to intrinsic anatomy
- Cons- require replacement more often than mechanical valves
TAVI

- Trans Aortic Valve replacement
- Percutaneous aortic valve replacement
- For those who are not able to tolerate open heart surgery
  - Older
  - Hemodynamically unstable
- Newer procedure, still being perfected
  - Complications have to do with insertion/migration
Infective Endocarditis

- Formerly known as bacterial endocarditis
- Infection/inflammation of the lining of the heart with formation of masses
  - Affects the valves most often
- Those who have had rheumatic fever and valve replacements more susceptible
  - Migration of oral bacteria
  - Intravenous drug use
Signs and Symptoms

- Fever & Chills
- New heart murmur
- Osler and Janeway Nodes
- Sudden weight loss and flu-like symptoms
Diagnosing Endocarditis

- Echo
- CT/ MRI
- Blood Cultures
Treat ing Endocarditis

- Antibiotics/ Antifungals
- Mass Removal
- Valve Replacement
October 12th

- Pediatric and Congenital Cardiac Disorders

NO CLASS OCTOBER 5TH!