Inflammatory Cardiovascular Diseases

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Pericarditis

- Inflammatory process involving the visceral or parietal pericardium
- Multiple causes: MI common cause
  - Acute: Within 7 days of MI related to inflammation and healing
  - Dressler’s Syndrome: 2 weeks or more after MI, thought to be autoimmune
Layers Of The Heart Wall

Pericarditis Causes

- Rheumatoid arthritis
- Systemic lupus erythematosus (SLE)
- Myocardial Infarction
- Uremia
- Radiation
- Infections (bacterial, fungal, TB)
- Cardiac OR

- Other Causes: Viruses
  - Coxsackie A and B
  - Mumps
  - Influenza
  - Epstein-Bar
  - HIV
Signs and Symptoms

- Precordial or left pleuritic sharp/stabbing CP
- Aggravated by inspiration, cough and supine position
- Relieved by sitting up and leaning forward
- Dyspnea, cough, hemoptysis
- Tachypnea, tachycardia, low grade fever

Pericardial Friction Rub

- Lower left sternal boarder
- Patient sitting and leaning forward
- High pitched
- Grating, scratchy, squeaking and leathery
- Louder during in inspiration
- Transient – only 50% of the time present
- Pericardial rub vs. pleural rub
ECG Signs of Pericarditis

- 4 Stages
  - Only 50% experience all 4 stages
  - Stage 1: ST-Elevation with concave upward ST Segments
    - Develops within hours of CP
    - Usually noted in all leads except V1
  - Stage 2: ST-segment returns to baseline with flattening T-wave
  - Stage 3: T-wave inversion without Q-wave formation
  - Stage 4: ECG normalization

Pericarditis
Signs and Symptoms
Classic Pericarditis

Pericarditis Diagnosis

- Labs
  - Elevated Sedimentation Rate
  - CK, Troponin may be elevated
  - Elevated LDH, SGOT
- Echocardiogram
  - Modality of choice to R/O fluid accumulation
  - May appear normal without fluid accumulation
- CT Scan
  - Helpful in ruling out constrictive pericarditis
- MRI
  - Provides more detail without contrast
Pericarditis Treatment

- Pericarditis
  - Non-steroidal anti-inflammatory
    - Indocin, Ibuprofen (not after AMI)
    - ASA
  - Upright position
  - Steroids if no response to NSAIDs or if effusion
  - Narcotics may be necessary
  - D/C anticoagulants (May continue if AMI)

Pericardial Effusion

- Abnormal amount and/or type of fluid in the pericardial space
- Acute or chronic
- Increase capillary permeability due to inflammation may cause fluid leak into pericardial space
  - >120cc can cause tamponade if rapid
  - 2 Liters may not cause tamponade if slow
Pericardial Effusion - Causes

- Idiopathic
- Hydropericardium (HF, Valve Disease)
- Neoplastic disorders
- Infections
- Autoimmune or Connective Tissue disorders (SLE, Rheumatoid Arthritis)
- Trauma
- Uremia
- Post op Open Heart Surgery
- Radiation

Pericardial Effusion - Symptoms

- Chest Pain
- Lightheadedness, syncope
- Palpitations
- Cough, dyspnea, hoarseness
- Hiccoughs
- Anxiety, confusion
Pericardial Effusion - Signs

- Friction Rub
- Tachycardia
- Decreased breath sounds – if subsequent pleural effusions
- Pulsus Alternans
- ECG
  - Diffuse low voltage, ST, PR-segment depression

Pulsus alternans

Pulses have large amplitude beats followed by pulses of small amplitude
Rhythm remains normal
Pericardial Effusion – Diagnosis

- Chest X-ray
  - Enlarged cardiac silhouette
  - Coexisting pleural effusions
- Echocardiogram
  - Diagnostic test of choice
- CT Scan
  - Determine composition of fluid
  - Detects as little as 50 cc of fluid
  - More reliable than echo – however patient’s condition may not support transportation
- MRI
  - Detects as little as 30 cc of fluid
  - Difficult to do in an acute situation
Pericardial Effusion - Treatment

- Determine underlying etiology
  - Corticosteroids / NSAIDs helpful in autoimmune processes
  - Antineoplastic therapy with percardiocentesis reduce recurrence of malignant effusions
  - NSAIDs
    - Not post MI – ASA up to 650mg q 4 hours

Pericardial Effusion - Treatment

- Percardiocentesis
  - Diagnostic as well as treatment
  - Limited benefit
    - 15-45% need further procedures
    - 55% require reintervention
  - Local anesthesia
  - Complications
    - Pneumothorax
    - Cardiac injury - perforation
    - Recurrence of effusion
      - Instillation of sclerosing agent
      - Indwelling catheter
      - Balloon dilatation
Pericardial Effusion - Treatment

- Subxiphoid Pericardiostomy
  - Diagnose effusion of manage tamponade
  - Local or general anesthetic based on stability of patient
  - Prepped in preparation for full sternotomy
  - Subxiphoid incision followed by incision in pericardium
  - Portion of pericardium removed.
  - Drain placed (removed after drainage is < 100 cc/day)

Complications
- Bleeding
- Infection
- Incisional hernia
- Anesthesia complications
- Cardiac perforation
- Low mortality
Pericardial Effusion - Treatment

- Thoracoscopic Pericardiostomy
  - General anesthesia
  - Useful if pleural effusions are present
  - No outcome differences in two procedures

Cardiac Tamponade

- Clinical syndrome caused by accumulation of fluid in the pericardial space
- Results in reduction in ventricular filling and ultimately hemodynamic compromise
Causes

- Postcoronary intervention
- Post cardiovascular surgery
- Trauma
- Infections – HIV, viral bacterial (TB), fungal
- Post MI – free wall rupture, Dressler’s syndrome
- Radiations therapy
- SLE, RA
- Malignancies
- Large pleural effusions

Symptoms

- Same as with pericarditis and pericardial effusion
- Feeling of impending doom
- Beck’s Triad
  - Hypotension, Distended neck veins, Muffled heart sounds
- Equalization of filling pressures (RAP, PAD, PAOP within 5mm of each other)
- Pulses paradoxus
  - Also observed in constrictive pericarditis, severe obstructive pulmonary disease, restrictive cardiomyopathy, PE, and RV infarct with shock.
**Pulsus Paradoxus**

- To measure the pulsus paradoxus, patients are often placed in a semirecumbent position; respirations should be normal. The blood pressure cuff is inflated to at least 20 mm Hg above the systolic pressure and slowly deflated until the first Korotkoff sounds are heard only during expiration. At this pressure reading, if the cuff is not further deflated and a pulsus paradoxus is present, the first Korotkoff sound is not audible during inspiration. As the cuff is further deflated, the point at which the first Korotkoff sound is audible during both inspiration and expiration is recorded. If the difference between the first and second measurement is greater than 12 mm Hg, an abnormal pulsus paradoxus is present.

(Yarlagadda, Chakri, 2005 Cardiac Tamponade. Retrieved 3-22-06 from www.emedicine.com)

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**Cardiac Tamponade- Diagnosis**

- **Chest x-ray**
  - Cardiomegally
- **Echocardiography**
- **ECG**
  - ST
  - Electrical alternans
  - PR Segment depression
Treatment for Tamponade

- Tamponade
  - Oxygen
  - Volume expansion
  - Bedrest with leg elevation
  - Dobutamine (increase pump without increasing SVR)
  - Avoid positive pressure mechanical ventilation (decreases venous return)
  - Pericardiocentesis
    - Percutaneous
    - Surgical window

Constrictive Pericarditis

- Occurs when a thickened fibrotic pericardium, of whatever cause, impedes normal diastolic filling.
- Usually involves the parietal pericardium, although it can involve the visceral pericardium.
- Acute and subacute forms of pericarditis (which may or may not be symptomatic) may deposit fibrin, which may, in turn, evoke a pericardial effusion. This often leads to pericardial organization, chronic fibrotic scarring, calcification, and restricted cardiac filling.
Constrictive Pericarditis

Causes

- Idiopathic
- Infections (TB)
- Radiation Therapy
- Cardiac Surgery
- Neoplasms
- TB
- MI

Constrictive Pericarditis - Diagnosis

- Chest x-ray
  - Cardiac Calcification
- Echocardiogram
  - Used to differentiate between constrictive pericarditis (CP) and restrictive myopathy (RM)
  - Provides information about ventricular filling
- CT Scan
  - Can visualize pericardial thickness
  - Normally 1-2 mm thick
  - 3-4 mm thick considered abnormal
  - Thickening of > 4mm supports CP over RM
- MRI
  - Most sensitive for pericardial thickening
Constrictive Pericarditis

Symptoms

- Dyspnea (most common)
- Fatigue
- Orthopnea
- Chest Pain

Constrictive Pericarditis

Signs

- JVD
- ST
- Apical impulse not palpable, distant or muffled
- Pericardial knock – mistaken for S3
  - Higher frequency
  - Occurs earlier than S3
- Hepatomegaly
- Ascites
- Peripheral Edema
Constrictive Pericarditis

Treatment

◦ Steroids
◦ Avoid Beta-blocks
  ▪ Increased HR is a compensatory measure
◦ Diuretics – failure
  ▪ Watch cardiac output
◦ Treat cause
◦ Pericardectomy
  ▪ Avoid until absolutely necessary
  ▪ Complete resection of pericardium
◦ Mortality is 7-19%
  ▪ Bleeding
  ▪ Atrial and Ventricular arrhythmias
  ▪ Some diastolic filling problems may remain after OR

Myocarditis

• Inflammatory infiltrate of the myocardium with necrosis and/or degeneration of adjacent myocytes
• Etiology:
  ◦ Viral infections
  ◦ Bacterial infections
  ◦ Parasitic infections
  ◦ Fungal infections
  ◦ Radiation therapy to chest
  ◦ Chronic Alcoholism
Myocarditis

- Myocardial Damage in 2 Phases:
  - Acute
    - 1st 2 weeks
    - Direct myocyte destruction
  - Chronic
    - Continued myocyte destruction
    - Autoimmune

Myocarditis

- Signs and Symptoms
  - Look like acute decompensated HF
    - Sudden SOB, orthopnea, PND
  - Tachycardia
  - Gallop
  - Mitral Regurgitation
  - Edema
  - Possible Pericardial Friction Rub
  - Fever
Myocarditis

- Diagnosis
  - Endomyocardial Biopsy

- Treatment
  - Withdrawal of offending agent
  - Decrease myocardial oxygen consumption
  - May need to treat for HF
  - Need to treat cause

Infective Endocarditis

- Infection of the endocardial surface of the heart
- Infection invades the endothelial lining
Infective Endocarditis
Pathophysiology

- Damage to endothelial surface from trauma or hemodynamic abnormality that causes turbulence in blood flow
- Endothelium not no longer intact or turbulence sets up environment for the collection of platelet–fibrin thrombus -nonbacterial thrombotic endocarditis lesions
- Lesions prone to adherence of bacteria introduced by procedures
Infective Endocarditis - Classification

Native Infective Endocarditis
- Abnormal native valves
  - Congenital Valves
  - IV Drug Abusers
- Acute
  - Normal healthy valves
  - Rapid progression
- Subacute
  - Abnormal valves
  - Slow progressive disease

Prosthetic Valve Infective Endocarditis
- Aortic valve most frequently
- Early: infection within 60 days of implant
- Late: >60 days
- Pacemakers

Nosocomial Infective Endocarditis
- Secondary to procedures
- Presents 48 hours to 4 weeks after procedure
Infective Endocarditis - Classification

- **Right Sided Infective Endocarditis**
  - Right side valves
  - Embolization to the lungs
  - More likely to have negative blood cultures
  - Present differently due to hemodynamic changes

- **Left Sided Infective Endocarditis**
  - Left side valves
  - Embolization to brain, spleen, kidneys
  - Greater hemodynamic compromise

Infective Endocarditis

- **Etiology**
  - Valvular Heart Disease
  - Cardiac Surgery
  - Invasive tests / monitoring
  - Skin, bone, or pulmonary infections
  - Poor oral hygiene
  - IV drug use
  - Immunosuppressed state
**Symptoms**

- **Subacute**
  - Fever (low grade)
  - Malaise
  - Fatigue
  - Weight loss
  - Night sweats
  - Back Pain
- **Acute**
  - Rapid onset
  - High grade fever
  - Signs of heart failure - Right sided failure vs. left sided failure
  - Signs based on embolization

**Physical Exam**

- Fever
- New murmur in presence of fever highly suspect
- Peripheral Signs of Infective Endocarditis
  - Petechiae
  - Janeway lesions
    - Non-tender red-purple macules on palms of hands and soles of feet
  - Roth's spot
  - Retinal hemorrhages
  - Osler's Nodes
    - Small tender red-purple raised nodules on pads of fingers and toes
- Findingsassociate with Heart Failure
- Findings Associate with Embolic Events
  - Cerebral, splenic or myocardial infarction
  - Renal emboli
  - Pulmonary emboli
Diagnosis

- **Diagnosis**
- **Blood Cultures**
  - 2 positive cultures over 12 hours apart
  - 3 positive cultures
  - A majority of 4 or more cultures greater than one hour apart
  - Negative cultures
- **Echocardiography**
  - Diagnostic method of choice
  - TEE best for detection of vegetation and emboli

Treatment

- **Prevention**
- **Goals:**
  - Early recognition
  - Eliminate cause
  - Timely surgical interventions
- **Antibiotics**
  - IV 4-6 weeks
- **Anticoagulation**
  - Not indicated
Treatment

- Surgery
  - IE with heart failure that is not responsive to medical treatment (NYHA Class III or IV)
  - Recurrent or persistent infection
  - Large or hypermobile vegetation
  - Acute valvular dysfunction
  - A major embolic event
  - Urgent surgery for severe heart failure with significant aortic regurgitation
  - Any infected prosthetic valve should be replaced.

Nursing Considerations

- Monitor for signs of embolization.
- Strict sterile technique
- Care of indwelling catheters requires meticulous attention.
- Assure good oral hygiene.
- Meticulous skin care
- Bed rest – metabolic demand
- Monitoring temperature - recognize the response to antibiotic therapy.
- Monitor for heart failure
- IV drug abusers
- Emotional support
## Complications

- Valve dysfunction
- Congestive heart failure
- Myocardial (valvular) or septal abscesses
- Metastatic infection
- Embolic events
- Organ dysfunction from embolic events
- Pericarditis
- Myocarditis
- Glomerulonephritis and acute renal failure
- Mycotic aneurysm

## Follow Up Care

- Repeat blood cultures
- Education
- Antibiotic prophylaxis
Outcomes

- Fatal if untreated
- Mortality rate significantly decreased
- Dependent on organism, valve and patient
- Improved outcomes
  - Early diagnosis
  - Young age
  - Penicillin sensitive strep infections
  - Young IV drug abusers
- Increased mortality with
  - Acute cases
  - Heart failure and renal failure
  - Culture negative, gram-negative, fungal
  - Multiple valve involvement
  - Prosthetic valve involvement
  - Left-sided involvement
  - Aortic valve
  - Systemic embolization