PERICARDIAL EFFUSIONS

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OBJECTIVES

- Describe a pericardial effusion
- Identify the etiology (chronic vs. acute)
- Describe the clinical picture (signs and symptoms)
- Identify diagnostic testing and medical management
- Describe nursing interventions/considerations
PERICARDIAL EFFUSIONS

- A collection of fluid inside the pericardium, the membranous sac surrounding the heart.
PERICARDIAL EFFUSION

Normal heart

Pericardium

Pericardial effusion

Buildup of fluid

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Pericardial fluid is constantly being made and absorbed. Usually those two acts happen congruently to maintain a normal volume. Once the amount of fluid in the pericardial space overcomes the rate of absorption, the pericardial pressure elevates and the patient may develop Tamponade.
When an increase in pericardial fluid raises intrapericardial pressure and impairs diastolic filling

- Elevated intracardiac pressures
- Progressive limitation of ventricular diastolic filling
- Reduction in cardiac output
ETIOLOGY

- Chronic
  - Metabolic: Uremia, myxedema
  - Viral/Bacterial/Fungal Infections
  - Immunologic/Inflammatory syndromes: SLE, RA, Sarcoidosis, Amyloidosis
  - Post Acute myocardial infarction (pericarditis)
  - Malignancy: breast carcinoma, bronchogenic carcinoma
  - Radiation
  - Post OHS
  - Medications
ETIOLOGY

Acute
- Trauma: chest trauma, percutaneous coronary intervention, perforation by indwelling catheters
- Aortic Dissection
- Myocardial Rupture
Chronic vs. Acute

- Chronic effusions are much larger, often measuring 1-2L
THE CURVE IN RED SHOWS THE PERICARDIAL PRESSURE IN HYPERACUTE TAMPONADE (LACERATION OF CORONARY ARTERY) FOLLOWING PERICARDIOCENTESIS. THE BLUE CURVE SHOWS THE PRESSURES DURING PERICARDIOCENTESIS OF A CHRONIC AND MUCH LARGER EFFUSION.
Symptoms:
- Usually asymptomatic
- Constant dull ache/chest pressure
- Dysphagia
- Dyspnea
- Nausea/abdominal fullness
- Peripheral edema
- Fatigue
Symptoms:
- Chest pain
- Mental status change (due to hypotension, cardiogenic shock)
- Dyspnea
CLINICAL PRESENTATION

- Signs/Objective Data
  - Chronic:
    - Beck’s Triad: elevated JVP (elevated CVP, if they have a central line), hypotension, muffled heart sounds
  - Acute:
    - Rapid hemodynamic instability
      - Tachycardia
      - Hypotension
      - Hemodynamic collapse
      - Cardiac Arrest
Tamponade

- Pulsus paradoxus >10mmHg (drop in systolic pressure during inspiration)
LABS/DIAGNOSTIC TESTING

- ECG
  - Low voltage
  - Electrical alternans
LABS/DIAGNOSTIC TESTS

- Chest Radiography
  - Cardiomegaly (if >250cc fluid is present)
*Transthoracic Echocardiogram (TTE)*
- RA/RV diastolic collapse
- Respiratory variation across AV valves (abnormal inspiratory increase across TV flow and abnormal inspiratory decrease across MV flow.

Transesophageal Echocardiogram
- Usually if TTE images are not sufficient

Right Heart Catheterization
- Equalization (within 4mmHG) of right atrial pressure, pulmonary capillary wedge pressure, pulmonary artery diastolic pressure, and right ventricular mid diastolic pressure
Medical Therapy
- Volume expansion
- Inotropic support (Epinephrine, Norepinephrine)
- Avoidance of diuretics or vasodilators
Percutaneous Treatment
- Pericardiocentesis
  - Advantages: can be performed quickly, required minimal preparation, less invasive
  - Disadvantages: can lacerate the heart, coronary arteries or lung
- Percutaneous balloon pericardiotomy (balloon dilation of the pericardium)
PERICARDIOCENTESIS

parasternal approach

subxiphoid approach
Surgical Treatment

- Pericardial Window: *(Subxyphoid Pericardiostomy)* is a minimally invasive procedure in which an opening is made in the pericardium to drain fluid that has accumulated around the heart.
R.M is a 38 year old AA female with a PMH significant for hypertension, diabetes, obesity, fibromyalgia, and OSA. She has also recently quit smoking in mid July. She initially presented to the ED 1 month ago with complaints of productive cough. The cough was associated with chest pain. She was initially treated for bronchitis, placed on antibiotics and home nebulizers. Over the past month her cough has persisted and she now endorses SOB, worsening DOE, vomiting and trouble swallowing.

TTE was completed showing: “There is a very large pericardial effusion seen circumferentially. Significant respiratory variations across the TV (71%). There is inversion of the RA.”
R.M. underwent pericardiocentesis. 1200ml of serous fluid was removed and the drain was left in place. 700ml of fluid drained over the next 24 hrs.
The next day, the drain was removed, a small effusion remained.
She was discharged home on NSAIDS and Colchicine.
J.B. is a 69 year old female with a PMH of recurrent Stage IV ovarian cancer s/p exlap and staging in 2/91 and 88 cycles of doxil. She presented to the CCF ER complaining of abdominal pain, which she believed to be a SBO. A CT scan did not show a SBO but did show a large pericardial effusion.

TTE: “There is moderate to large circumferential pericardial effusion which is largest anteriorly. There is RV diastolic collapse with only brief, late diastolic opening of the TV/MV. There is RA collapse for >1/3 of the cardiac cycle. Patient is tachycardic. While the IVC is not significantly dilated there is evidence of tamponade physiology.”
Given the malignant nature of the effusion, the treatment of choice was a pericardial window. She underwent VATS with pericardial and pleural effusion drainage.
J.K. is a 28 year-old woman with recently diagnosed optic neuritis. She is 25 weeks pregnant and has been receiving steroids and plasmapheresis for her optic neuritis. Over the past 48 hours she has been experiencing pleuritic chest pain, increasing tachycardia and tachypnea. ECG revealed diffuse STE c/w pericarditis and an echocardiogram revealed a small-moderate pericardial effusion with dynamic LV/RV function.

TTE: “There is a circumferential pericardial effusion, largest adjacent to the RV freewall (in subcostal view) with organization. It appears bigger than yesterday. There is significant respiratory variation. IVC is prominent with partial collapse. The RV free wall does not relax completely in diastole.”
Initially, she was given IVF as she was tachycardic and hypotensive. Pericardiocentesis was not initially attempted given the location of the effusion and the hyperdynamic movement of her heart within the pericardium.

On day 3, pericardiocentesis was completed with only 300ml of serosanguinous fluid removed, a large effusion remained.

On day 4 she was taken for a pericardial window for definitive treatment.

Final diagnosis is still not certain but likely SLE.
S.F. is a 64 year old female who presented to the ER with complaints of SOB and orthopnea. She has a known history of recurrent pericarditis following AVR. She was discharged following her AVR on colchicine for symptom relief. She has been non-compliant with the colchicine due to the side effects (diarrhea).

S.F. TTE “There is a moderate pericardial effusion adjacent to the posterolateral left ventricle. IVC measures normal and collapses normally with inspiration. No right sided inversion. No significant respiratory variation across the MV (11.8%). TV inflow Doppler suboptimal trace. Overall, no echo evidence of tamponade physiology.”
S.F. TTE
S.F. TTE
She was continued on NSAIDS and Colchicine
Other causes of recurrent pericarditis were explored (autoimmune pericarditis). Rheumatology was consulted and she had a liver biopsy. She was started on prednisone for potential autoimmune cause.
C.H. is a 66 year old female with PMH of morbid obesity, HTN, DM and AS (s/p AVR 2 weeks ago) who was taken to an OSH from cardiac rehab where she complained of SOB and was noted to be bradycardic with HR in 40s. Upon arriving to OSH, she suffered a bradycardic arrest and was resuscitated. She presented to the CCU in extremis on multiple pressors. A bedside TTE was completed.

TEE: “There is a large loculated pericardial effusion completely compressing the right atrium and right ventricle causing cardiac tamponade.”
C.H. CLINICAL PICTURE

- Labs: Na 132, K 6.8, Cl 96, CO2 17, Bun 36, Cr 2.47, Gl 102, AST 121, ALT 3237
- Trop T 0.260
- INR 5.6
- WBC 19.8, Hgb 9.6, Hct 31.1, Plt 146
- ABG pH 7.06, pCO2 56, PO2 102, HCO3 15
- Lactate 18

- Dopamine at 20 mcg/kg/min, Norepinephrine at 50 mcg/min, Vasopressin at 0.04 units/min
- SG, Arterial line, Dialysis catheter and IABP inserted
Given the patient’s hemodynamic instability, bedside pericardiocentesis was completed, 550cc of blood was removed. The effusion, while smaller, remained.

Initially, the patient’s condition improved, pressors were titrated down, but within 30 minutes she required the same doses again.

She was deemed too high risk for surgery by multiple cardiac surgeons.
C.H. (CONT)

- She suffered a PEA arrest and was resuscitated again, pericardiocentesis was completed again and 1100 cc of blood was removed and autotransfused.
- Medical management was attempted overnight but it was clear this was a surgical problem. After speaking with patient’s family, life support measures were ceased and the patient died.
- Autopsy was performed.
C.H. AUTOPSY

“...Aortic wall defect, transmural (0.5 cm) with pledgeted suture on the adventitia, ascending aorta, located 1.8 cm distal to the aortotomy site. Aortotomy, aortic and right atrial cannulation site with intact sutures. Bovine pericardial bioprosthetic valve in aortic position intact, without paravalvular leak or dehiscence”
Pericardial effusions have multiple causes, both chronic and acute.

Diagnosis can best be made with TTE, but rapid hemodynamic compromise in certain settings (post op OHS, post PCI, post TVPM placement) the diagnosis can be inferred.

Medical management: copious IVF, avoidance of afterload and preload reduction (nitrates) or diuretics.

Percutaneous intervention (pericardiocentesis) can be done rapidly to temporize the patient who needs further intervention (pericardial window) or for final treatment.
NURSING SPECIFIC INTERVENTIONS

- Appropriate IV access
- Appropriate monitoring based on patient’s acuity (arterial line, central line)
- Appropriate placement based on acuity (transfer to ICU)
- Adequate IVF resuscitation
- Assistance with percutaneous procedure