ABSTRACT

Cardiac tamponade is a serious condition in which the fluid build up and accumilates in the sac surrounding the heart and puts pressure that causes impaired cardiac function. As compression of the heart increases, it may cause decreased cardiac output, muffled heart sounds, and narrowed pulse pressure. The primary goal of the management of cardiac tamponade includes the early diagnosis using physical examination, echocardiography, or other imaging studies and providing proper care to the patient.

Cardiac tamponade is a medical emergency and life-threatening condition requires immediate intervention. The treatment can be done at the bedside or in the operating room. Initial stabilization typically includes intravenous fluids and when necessary inotropic support to maintain cardiac output .The definitive treatment involves relieving pressure on the heart which is often done by draining the fluid through a procedure called pericardiocentesis.

ABBREVIATIONS

- CT - Cardiac tamponade
- MI - Myocardial infraction
- ECG – Electrocardiogram
- CXR – Chest X-ray
- IVF – Intravenous fluids
- PC – Pericardiocentesis
- BP – Blood pressure
- HR – Heart rate
- TTE – Transthoracic echocardiography
- NSAIDS – Non steroidal anti-inflammatory drugs

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INTRODUCTION

Cardiac tamponade is the compression of the heart that occurs when blood or fluids builds up in the space between the myocardium and pericardium and impair diastolic filling. It is a life-threatening, slow or rapid compression of the heart due to the pericardial accumulation of fluids, pus, blood, clots or gas as a result of effusion, trauma, or rupture of the heart. Hemodynamic of pericardial tamponade, constriction, and restrictive physiology governed by complex interactions between transmyocardial pressure gradients, diastolic coupling of cardiac chambers, pericardial restraint or pericardial contact pressure. Normally 10 – 50 ml of pericardial fluid will be present. 100ml of pericardial fluid can cause circumferential effusion. If the volume raises up to 300-600ml it may lead to the development of tamponade.

Cardiac tamponade develops as the pericardial effusion increases in volume. The main cause of cardiac tamponade include percutaneous cardiac interventions, infections ,malignancies, and other cardiac conditions. This results in compression of the heart. The speed of fluid accumulation affect the severity of clinical manifestations. Cardiac tamponade can be occur acutely or subacutely. The patient with cardiac tamponade may report chest pain and is often confused, anxious, and restless. As the compression of the heart increases, there is decreased cardiac output, muffled heart sounds, and narrowed pulse pressure. The patient develops tachypnea and tachycardia. Neck veins are usually markedly distended because of increased jugular venous pressure.

The management of cardiac tamponade requires a swift and accurate clinical assessment. Initial diagnosis is often based on a combination of clinical presentation, echocardiography, and other diagnostic tools like chest X-ray and electrocardiogram. Once diagnosed immediate intervention should be done to relieve the pressure on the heart often a procedure called pericardiocentesis. It is a procedure in which a needle is used to remove the excess fluid.

REVIEW OF LITERATURE

Cardiac tamponade is a serious life-threatening condition in which compression of heart occur due to the accumulation of fluid, pus, blood, clots, or gas as a result of effusion, trauma, or rupture of the heart. It is a pericardial syndrome characterized by An impairment of diastolic filling of the ventricles causing reduction of the cardiac output , usually producing signs and symptoms of Cardiac arrest.

The acute cardiac tamponade occurs within minutes due to trauma, rupture of the heart, or aorta or complication of invasive diagnostic or therapeutic procedure. It require urgent reduction in the pericardial pressure.

The subacute cardiac tamponade occurs over days to weeks and can be associated with infective, neoplastic, uremic Or idiopathic pericarditis.

The cardiac tamponade occurs mainly due to two types of causes,that are penetrating trauma causes and non-trauma causes.

The penetrating trauma causes includes,

- Gunshot or stab wounds
- Blunt trauma to the chest from accident
- Accidental perforation after cardiac catheterization, angiography or insertion of a pacemaker
- Recent invasive heart procedures
- Ruptured aortic aneurysm
- Pericarditis

The non-trauma causes includes,

- Dissecting aortic aneurysm
- End stage lung cancer
- Heart attack
- Heart surgery
- Pericarditis caused by bacterial or viral infections
- Kidney failure
- Systemic lupus erythematosus
- Hypothyroidism

Pathophysiology of cardiac tamponade,

When the pericardial space fills up with fluid faster, the sac will stretch. If the amount of fluid increases slowly the pericardial sac can expand to contain a litre or more of fluid prior to tamponade occurring. If the fluid occurs rapidly as a little as 100ml can causes tamponade.

The outer pericardium is made of fibrous tissue which doesn't easily stretch. Once fluid begins to enter the pericardial space, pressure starts to increase. If fluid continues to accumulate results each successive diastolic period less and reduce the blood that enters the ventricles. This causes decreased cardiac output and shock. If left untreated cardiac arrest may occur.

If in case of heart surgery, the chest tubes are placed to drain blood prone to clot formation. When the chest tube become occluded or clogged, the blood that should be drained can accumulate around the heart leading to tamponade.

Common clinical signs of cardiac tamponade are,

- Blood pressure may fall when the person inhales deeply
- Breathing may be rapid
- Heart rate may be over 100
- Heart sounds faint during examination with stethoscope
- Neck veins may be abnormally distended but the blood pressure may be low
- Anxiety, restlessness
- Chest pain -radiating to neck, shoulder, back, jaw -sharp, stabbing, worsened by deep breathonig Or coughing
- Dyspnea, orthopnea
- Pedal oedema
- Friedreich's sign -increase jugular venous pressure with sharp rise and descent
- Kussmaul's sign -raise JVP or increased neck vein distention during inspiration.
- Beck's triad -
  Hypotension
  Jugular venous distension
  Muffled heart sounds

The diagnostic measures or evaluations of cardiac tamponade includes,

- History collection and physical examination
- Echocardiogram -to find out sinus tachycardia, reduction in QRS voltage, non-specific ST-T Changes
- Chest X-ray-to identify cardiomegaly (pear shaped, water bottle appearance)
- Coronary angiography- to find out coronary involvement
- Echo – to identify severity of pericardial effusion.

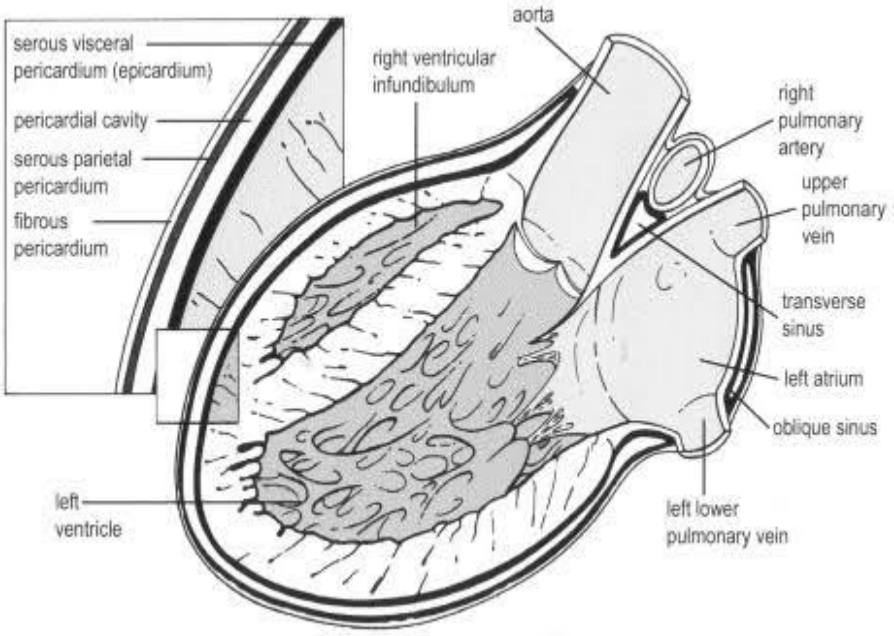
Treatment or management of cardiac tamponade are,

- The initial management is mainly focuses on the stabilization of the patient. It includes the administration of oxygen, treatment of the underlying cause and administration of normal saline, blood, plasma, dextran for hypotension.
- The main treatment is the drainage of the excess fluid through a procedure called pericardiocentesis . It is a technique to drain the pericardial fluid by percutaneous route. It is a safe technique. In this a needle is inserted to drain the excess fluid guided by echocardiography or fluoroscopy Under local anaesthesia. Before doing this procedure the assessment of INR(international normalized ratio) and platelet count should be done, because any change in this values are considered as contraindications for this procedure. It is typically performed emergently in patients with hemodynamic instability.
  In some cases the pericardiocentesis can cause
  Cardiac injury
  Pneumothorax
  Haemorrhage
  Arrhythmias
  Infection
  Post pericardiocentesis syndrome

- Surgical interventions – if the tamponade is recurrent or due to any malignancy surgical interventions may be necessary. It includes the pericardiectomy or Pericardial window.
  Pericardiectomy- it is the removal of part of pericardium to relieve pressure on the heart.
  Pericardial window- it is procedure that is used to drain fluid from the pericardial sac especially in patients with chronic or malignant pericardial effusion.
  Thoracotomy -allows the drainage of blood or blood clots around the heart.

The complications of cardiac tamponade includes,

- Decreased cardiac output
- Shock
- Arrhythmias
- Pulmonary oedema
- Death



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AIMS AND OOBJECTIVES

Aims

- To identify the challenges in managing cardiac tamponade, especially in severe conditions
- Explore the different management strategies for cardiac tamponade including both immediate and long term treatment.
- Evaluating how diagnostic measures or tools helps to guide treatment and timely interventions
- Assess the effectiveness of current treatment
- Identify the current advancements in treatment and how it helps to improve patient outcome.

Objectives

- The main goal or objective of the treatment is to reducing the pressure on heart , improving its function and stabilize the patient.
- Evaluate the chances of effectiveness and possible complications before doing pericardiocentesis. Also look for the success rate of this procedure in each age group.
- Explore the surgical management options and it's effectiveness like pericardial wwindow
- Identify and prevent the complications like arrythimias, infections and recurring tamponade.
- Examine the patient outcome and prognosis.

MATERIALS AND METHOD

Materials

1. Diagnostic tools
    - Echocardiogram
    - Electrocardiogram
    - Chest X-ray
    - CT or MRI
2. Treatment materials
    - Pericardiocentesis kit
      Needles-thin, long needles(16-18G)
      Catheters
      Syringes
      Local anaesthesia
      Sterile dressing
    - Surgical materials for pericardial window
      Scalpel and surgical blade
      Sutures
      Surgical retractor
      Drains
3. Resuscitation materials
    - Intravenous fluids
    - Oxygen therapy equipment
    - Medications (inotropes , Analgesics)

Methods

- Initial assessment – it include the symptom analysis and evaluation and imagine studies to assess the severity of disease and it's effect on heart function
- Fluid resuscitation and oxygen therapy to stabilize the patient
- Definitive treatment – it include the pericardiocentesis to remove the excess fluids and pericardial window
  - Pericardiocentesis-
    - use sterile techniques
    - Prepare the patient and administer local anaesthesia
    - Identify the optimal site for needle insertion and do the procedure by ultrasound guidance
    - Aspirate the excess fluids from the pericardial sac
    - After the procedure monitor the patient carefully.
  - Pericardial window- it is a surgical procedure in which a part of the pericardium is removed To create a permanent drainage path. It is done in patients with recurring tamponade and in case of malignancies.

OBSERVATION AND RESULTS

1) Pre-treatment observations
   - Clinical signs –
     - Hypotension
     - Jugular venous distension
     - Muffled heart sounds
     - Tachycardia
     - Tachypnea
   - Diagnostic findings –
     - Echocardiography -shows fluid accumulation around the heart
     - Chest X-ray – shows enlargement of the heart or cardiomegaly
     - Electrocardiogram -low voltage QRS complex
2) Management and results
   - Initial management (oxygen therapy and IV fluids) – results immediate stabilization and helps to prevent worsening of the tamponade
   - Pericardiocentesis – results in an immediate improvement in hemodynamics and reduce symptoms and discomforts
   - Surgical interventions – permanent drainage or removal of portion of pericardium to prevent reoccurrence.
3) If it is not treated, which results in complications like
   - Shock
   - Organ dysfunction
   - Pulmonary oedema
   - Arrhythmias
   - Death

CONCLUSION

Cardiac tamponade is a pericardial syndrome characterized by an impairment of the diastolic filling of the ventricles causing reduction in the cardiac output, usually producing symptoms of cardiac arrest if untreated. The main causes of cardiac tamponade include infections, malignancies, percutaneous cardiac interventions, aortic dissection or other heart related disorders. The patient with cardiac tamponade may report chest pain and is often confused and restless. As the compression increases there is changes in the cardiac output and heart sounds may occur. The patient develops tachycardia and tachypnea. Neck veins are usually markedly distended because of increased jugular venous pressure. Cardiac tamponade is a life threatening condition that require immediate management by pericardiocentesis. It is a procedure in which a needle is inserted into a pericardial space to remove the fluids for analysis and to relieve heart pressure. In some cases surgical interventions like pericardial window or pericardiectomy may be preferred

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