

# Pericardiocentesis in massive pericardial effusions due to hypothyroidism

F H Nainggolan<sup>1</sup>, N N Dalimunthe<sup>1</sup>, S Harahap<sup>1</sup>, R Isnanta<sup>1\*</sup>, T Realsyah<sup>1</sup>, Z Safri<sup>1</sup> and R Hasan<sup>1</sup>

<sup>1</sup>Division of Cardiology, Department of Internal Medicine, H. Adam Malik General Hospital/Medical Faculty, Universitas Sumatera Utara, Medan, Indonesia

\*Corresponding author: rahmadisnantadr@gmail.com

**Abstract.** Pericardial effusion is the accumulation of abnormal fluid in the pericardial cavity. The symptoms are not specific and associated with the underlying disease. It was reported that a 53-year-old male patient entered the Emergency Room with a shortness of breath, and getting worse during activity and position. There was weight loss and smoking history. The history of diabetic, hypertension and malignancy were denied. On physical examination showed the enlarged right and left heart border and weakened heartbeat sheer off is found and edema pretibial and normal the other. The laboratory results; blood routine, renal and liver function within normal; lipid profile: *hypercholesterolemia*; viral marker is non-reactive. *Rontgen* thorax suggests cardiomegaly, but there was no infiltrate or nodules. Electrocardiogram (ECG) showed a *low voltage*. Echocardiography examination showed *massive pericardial effusion*. *Pericardiosynthesis* performed produces 750 cc of clear yellow liquid and showed *transudate*. Other laboratory tests such as ANA test, *anti ds-DNA*, *cyfra* were a normal impression. Thyroid function: *hypothyroid*, Mantoux test is negative. Finally, the patient is a massive pericardial effusion caused by hypothyroidism. The pericardiocentesis took, and the hypothyroid drug of *euthirax* is administered. The patient was well done and continued for re-control.

## 1. Introduction

Pericardial effusion is an abnormal accumulation of fluid in the pericardial cavity. The liquid may be transudate, exudate, piopericardium, or hemopericardium. Pericardial effusion is the result of a clinical course of a disease. The symptoms are not specific and associated with the underlying disease.

## 2. Case Report

A 53-year-old male patient entered the Emergency Department at General Hospital of Haji Adam Malik with a shortness of breath. It is experienced by patients since  $\pm$  1 month before hospitalization (BATH) and getting worse in 1-week BATH. Shortness of breath is not related to the weather, but complained by the patient at any time, and getting worse during activity. Shortness of breath is also felt in the supine position and slightly decreased with sleep position to the left. History of chest pain such as pricked, chest pain that gets worse when coughing or breathing is not present. A cough experienced by the patient since last 1 month but only occasionally, cough without sputum, and history of a bloody cough not found, History of fever not found. Patients experienced weight loss 5 kg in 1 month. History of anti-tuberculosis drug consumption is not present. Weak bodies are often complained of by patients during illness. Five years ago the patient had been treated at the local



hospital and said to have heart disease and the presence of fluid in the heart but the patient refused to be referred and only went to the local internal medicine doctor to overcome the shortness of breath. A week ago the nurse has treated again at the local hospital where the patient was living due to shortness of breath he suffered and was referred to the General Hospital of Haji Adam Malik. A history of long-term use of drugs is not found. There was no history of chest trauma. There was no the history of diabetes mellitus, there was no the history of hypertension. There was no the history of the tumor disease. The smoking history is positive for approximately 15 years with two packs of cigarettes per day. Defecation and urination are normal. On a physical examination there is a palpation of the enlarged right heart border (Linea axillary anterior dextra) and an enlarged left heart border (ICS VI, Linea mid axillary sinistra) and on auscultation of the heart, a weakened heartbeat suggesting sheer off is found. In the inferior extremity, there is edema in the legs. However, other physical examination results are normal limits.

The laboratory results of the initial treatment it is found that blood routine; Hb 14.1 g%, leukocytes 8.190 / mm<sup>3</sup>, platelets 280.000 / mm<sup>3</sup> (normal impression); renal function, liver function, and electrolytes within normal limits; lipid profile: total cholesterol 250 mg/dl, triglycerides 155 mg/dl, HDL cholesterol 24 mg/dl, LDL cholesterol 200 mg/dl (suggesting hypercholesterolemia); viral marker of HBsAg is non-reactive. Anti-HCV: non-reactive, anti-HIV (Rapid I): non-reactive. Liver function: SGOT 53 U/L, SGPT 61 U/L. Albumin of 3.0 g/dl (suggesting normal). Blood sugar level (randomly) 146 mg/Dl (normal impression). Blood Gas Analysis: pH 7.450, PCO<sub>2</sub> 33.0 mmHg, PO<sub>2</sub> 19.0 mmHg, HCO<sub>3</sub> 22.9 mmol/L, total CO<sub>2</sub> 23.9 mmol/L, BE: -0.5 mmol/L, saturation O<sub>2</sub> 100.0 % (suggesting normal). The urinalysis results are within normal limits.

Photos of thorax suggest that cardiomegaly exists but Cardiothoracic Ratio (CTR) is hard to assess and there is no evidence of infiltrating or nodules in both lungs. In the electrocardiogram (ECG) a low voltage picture is found. Echocardiography examination is performed on patients with results systolic function of LV is normal, EF of 55% and diastolic function of LV is good, E / A > 1. Wall motion: global normokinetic. Valves: MR mild, TR mild. Cardiac space dimension: RA is a collapse, contractility of RV is normal, TAPSE of 17 mm, Massive pericardial effusion, swinging heart (+).

Patients were with massive pericardial effusion caused by tuberculosis with hypothyroid, dyslipidemia. The pericardiocentesis action is performed on the patient and aspiration is performed which produces as much as 750 cc of clear yellow liquid. During patient care, aspiration is performed on the pericardial fluid that produces as much as 200 cc per 12 hours. Then administration of IVFD NaCl 0.9% 10gtt/micro, cardiac diet III, ranitidine injection 50mg/12 hours/IV, digoxin 1x0.25 mg and simvastatin 1x40mg were provided. The results of examination of pericardium fluid showed that: color: clear yellow, total protein: 6.1 g/dl, LDH: 153 U/L, glucose: 136 mg/dl, pH: 8, WBC count: 0.009, RBC: 0.000, calculation of cell type: MN cell: 66.7% and PMN cell: 33.3%. Other laboratory tests consist of ANA test: 37, anti-ds-DNA 15.3, cyfra -21: 3.45 and thyroid function: total T<sub>3</sub>: 0.26 ng/ml, total T<sub>4</sub>: 1.04 µg/dl, and TSH: 18.86 µIU/ml, and Mantoux test is negative. Patients were finally with pericardial massive effusion caused hypothyroid and taking hypothyroid drugs in the form of euthyrox 2 x 100 mg. On the day of treatment, the patient can be treated on an outpatient basis with clinical improvement and is recommended for re-control.

### 3. Case Discussion

#### 3.1 Anatomy and Physiology of the Pericardium

The pericardium consists of two layers, the pericardium visceral and the parietal pericardium. The visceral pericardium is an inner layer directly related to the epicardium. Meanwhile, parietal pericardium is an outer layer that is directly a connection to the chest wall. Between the parietal and visceral pericardium layers, there is a pericardial cavity, containing 15 - 50 ml of fluid secreted by mesothelial cells. The shape of the pericardium fibrous layer is like a bottle and is adjacent to the diaphragm, sternum and costal cartilage. The visceral layer is thinner and is adjacent to the surface of

the heart. Pericardium serves as a barrier to protect against infection or inflammation of surrounding organs.[1]

Accumulation of fluid in the pericardium cavity if exceeding normal is called pericardial effusion, the amount may be more than 1000 ml and cause an increase in pericardial pressure. Furthermore, such accumulation may cause increased pericardial pressure (normal: -5 mmHg to +5 mmHg), decreased cardiac output, and hypotension (cardiac tamponade).[2]

The three factors that cause pericardial effusion with clinical symptoms of heart suppression are the amount of fluid, the speed of fluid accumulation, and the ability of the pericardium to accommodate the pericardium fluid. Cardiac tamponade occurs when the pericardium pressure exceeds the pressure inside the heart cavity, resulting in failure in the filling of the heart.[1,3]

### 3.2 Pericardial Effusion

**3.2.1 Definition.** Pericardial effusion is the abnormal accumulation of fluid in the pericardium cavity. The liquid may be transudate, exudate, piopericardium, or hemopericardium. Pericardial effusion is the result of a clinical course of the disease. The symptoms are not specific and associated with the underlying disease.[2,4]

**3.2.2 Etiology.** Etiology of pericardial effusion[1] infection: Viral pericarditis, bacterial, tuberculosis.[2] malignancy: Metastasis (lymphoma, melanoma), direct expansion (pulmonary cancer, breast cancer), heart tumor[3] inflammation: Post-myocardial infarction (*Dressler's syndrome*), uremia, post-cardiac surgery, disorders of vascular collagen.[4] relationship of the pericardium with intracardium: Chest trauma, post-catheterization procedures (electrophysiological, valvuloplasty, coronary intervention), left-ventricle rupture post myocardial infarction[5] other: Myxedema (hypothyroid condition), autoimmune disease, radiation therapy, drugs.

**3.2.3 Pathogenesis.** The mechanism by which effusions occurs part of a generalized polyneuropathy. The increased permeability of capillaries leads to extravasations of mucopolysaccharides accounting for exudative effusions. Furthermore, there is decreased lymphatic drainage and increased salt and water retention. The amount of effusions accumulated is directly related to the duration and severity of the hypothyroid status. In addition to the pericardial cavity, exudates can collect in the pleura, peritoneum, joints, uvea, and scrotum.[5]

**3.2.4 Clinical Manifestations.** Clinical manifestations of pericardial effusion arise due to two things, namely decrease in cardiac output and increase in systemic venous pressure. The decrease in cardiac output causes hypotension, fatigue, weight loss and reflex tachycardia.[6,7] While the increase in pressuring of the right atrium and systemic veins cause a systemic venous occlusion that is characterized by edema, swelling and abdominal discomfort from ascites, and hepatomegaly. If left and right heart pressures rise higher, symptoms of pulmonary occlusion such as a cough, dyspnoea on effort, and orthopnoea will occur. Severe shortness of breath occurs when there is a heart tamponade. If cardiac tamponade occurs suddenly, then hypotensive symptoms may occur including decreased consciousness.[8]

**3.2.5 Physical Examination.** Symptoms of pericardial effusion are signs of right heart failure, such as jugular venous distension, hepatomegaly, ascites, and peripheral edema. It is due to an increase in right atrial diastolic pressure due to increased intrapericardial pressure, thus inhibiting venous return.[7,9] Cardiac tamponade is suspected when there is severe shortness of breath, systemic hypotension, tachycardia, alternant pulses and weak heart sound in auscultation. Pulsus paradoxus is a major sign of cardiac tamponade, i.e., a decrease in systolic blood pressure greater than 10 mmHg during inspiration.[7,9]

### 3.2.6 Supporting Therapy

**3.2.6.1 Electrocardiography.** Electrocardiographic features are not specific. If there is pericarditis without a massive effusion then the electrocardiographic features usually show the elevation of the ST segment at 2 or 3 limb and pericardial leads. The QRS complex does not show any significant change except for a decrease in voltage. Electrocardiographic features of pericardial mass effusion or cardiac tamponade are tachycardia, low QRS complex of voltages, and alternans.[7,9]

**3.2.6.2 Photo of Thorax.** In the lung, infiltrates or calcifications due to pulmonary tuberculosis are visible. The heart is enlarged with a configuration of water jars but can also be normal. It is found that 70% of patients with cardiothoracic ratio > 55%, but only 6% had a cardiothoracic ratio > 75%.[10] In the study that uses corticosteroids in patients with tuberculosis pericarditis, and of the 19 samples studied over 14 years there were 42% of patients with pleural effusions and infiltrated in the photo of the thorax.[11]



**Figure 1.** Pericardial effusion in photo thorax and echocardiography.

**3.2.6.3 Echocardiography.** Echocardiography is the preferred and sensitive diagnostic tool for diagnosing pericardial effusion and cardiac tamponade.[12,13] Echocardiography can differentiate between cardiac tamponade and other causes of low cardiac output (left ventricular dysfunction).[13,14] Cardiac tamponade with features of moderate (the boundary between visceral and parietal pericardium is 0.5-2 cm) to severe (> 2 cm) pericardial effusion may cause physiological changes in echocardiography and Doppler examination.

**3.2.6.4 Computed Tomography Scanning.** CT-Scan shows pericardial thickening and irregular shape with pericardial fluid. Pericardial effusion of tuberculosis can be detected through enlarged mediastinal lymph nodes.[15,16] It shows that patients with tuberculosis have enlarged mediastinal lymph nodes that can be by using CT scans.

**3.2.6.5 Laboratory.** T3 is more rapidly metabolized and has a more rapid effect than T4. It may be used in severe hypothyroid states when a quick response is required. T4 alone is the usual treatment for hypothyroid is used to replenish the thyroxine pool. It has a half-life of 7 days compared with the 1-day half-life of T3. Hence the rationale behind the use of T3 as an initial treatment because the conversion of T4 to the more active form of T3 is impaired in the critically ill patient. Adverse side effects of T3 may be limited by withdrawing the drug promptly due to its short half-life.[5]

## 4. Complications

### 4.1 Cardiac Tamponade

This condition is a fatal complication of pericarditis with clinical features depending on the rate of pericardial fluid accumulation; fluid accumulation can lead to compensation, such as tachycardia, an increase in peripheral vascular resistance and increased intravascular volume to help inadequate circulatory systems. Heart tamponade is almost always accompanied by anxiety, severe shortness of breath in an upright position. There is decreasing if the patient bends, jugular venous pressure increases, tachycardia, pulsus paradoxus (decrease in systolic pressure >10 mmHg at inspiration),

systolic pressure <100 mmHg, pericardial friction rub, weakening heart sound (the sound of the heart being heard away).[17,18]

Clinical symptoms of cardiac tamponade are influenced by the speed of accumulation of pericardial fluid. Slow accumulation provides an opportunity for better cardiac compensation, i.e. tachycardia, an increase in peripheral vascular resistance within days or weeks. However, rapid accumulation is fatal within minutes.[18,19]

**4.1.1 Management.** Pericardial effusion therapy consists of:

**4.1.1.1 Non-specific or symptomatic therapy**

**4.1.1.1.1 Pericardiocentesis.** Pericardiocentesis is an invasive action to remove fluid from the pericardial cavity. Massive pericardial effusion and cardiac tamponade need that action. Discharge of pericardial fluid can be done by making a small incision below the end of the sternum or between the ribs on the left side of the thorax; the pigtail catheter can be for 2-3 days. This pericardial drainage is maintained for several days until the amount of fluid is less than 50 ml/day. This period gives the opposition and adhesion time between the visceral and parietal pericardium. The recurrence rate is about 6-12%. Complications of pericardial functional action are a pneumothorax, laceration of the ventricular wall, and laceration of the internal mammary artery.

**4.1.1.1.2 Pericardial Window.** This action requires thoracotomy and drainage is made from the pericardium cavity to the pleural cavity. The recurrence rate is about 5-20%.

**4.1.1.1.3 Pericardiodesis.** Administration of tetracycline, thiopeta or bleomycin into the pericardial cavity is used to attach the pericardium. Tetracycline 500 mg in 25 ml of normal saline is inserted in 2-3 minutes or bleomycin 45 mg in 20 ml normal saline

**4.1.1.2 Specific therapy.** Addressing the cause of the effusion.

**4.1.1.3 Pericardiectomy.** Pericardiectomy is a pericardial tissue resection of thoracic wall surgery. It is a surgical procedure to open the pericardium to drain fluid. Resection may include almost all or part of the pericardial tissue.[6] Indications of pericardiectomy are the pericardial effusion of tuberculosis with cardiac tamponade that cannot be a solution with pericardiocentesis, and chronic constrictive pericarditis<sup>20</sup>, pericardial biopsy, pacemaker installation. Contraindications: infectious pericarditis, infection, malignancy.[21,22]

Pericardiectomy is important an early stage as a rescue or recurrent cardiac tamponade. In advanced circumstances, pericardiectomy is performed when on monitoring there is an increase in systemic venous pressure. Pericardiectomy is also recommended in patients with cardiac compression, no response to pericardiocentesis, or worsening after 6-8 weeks of administration of drugs.[24]

## 5. Conclusion

The patient was finally with a pericardial massive effusion caused by hypothyroidism, and pericardiocentesis action was the best solution for him, and the hypothyroid drug of euthyrox 2 x 100 mg was administered. On patient daycare, he can be treated on an outpatient basis with clinical improvement and is for re-control.

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