J R Coll Physicians Edinb 2020; 50: 387–91 | doi: 10.4997/JRCPE.2020.407 BRIEF RESEARCH PAPER

Cardiac Tamponade: experience from a Malaysian district hospital

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Abstract

Background Cardiac tamponade is a medical emergency. This study was carried out to determine the etiologies of cardiac tamponade and review the management and outcomes.

Methods We retrospectively analysed case records of patients who underwent pericardiocentesis for cardiac tamponade during the two consecutive years (1 January 2018 to 31 December 2019) at Hospital Sultanah Nora Ismail, Batu Pahat, in Johor, Malaysia.

Results There were ten patients (eight males, two females; age range 20 to 70 years old, mean age 36 years old) who underwent pericardiocentesis for cardiac tamponade during the said period. Malignancy (40%), tuberculosis (30%), idiopathic (20%), and bacterial (10%) were among the common causes of the pericardial effusion in this center. The commonest symptoms were breathlessness (90%), chest pain (60%), cough (50%), and unexplained fever (20%). Pulsus paradoxus was the most specific sign (100%) for the presence of echocardiographic feature of cardiac tamponade. Two of the patients with tuberculous pericarditis had retroviral disease; one patient had bacterial pericarditis due to salmonella typhi.

Conclusion This study has confirmed that there are many etiologies and presentation of cardiac tamponade; clinicians should be alert as urgent pericardiocentesis is lifesaving.

Keywords: cardiac tamponade, idiopathic, malignancy, outcome, pericardiocentesis, tuberculosis

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Introduction

Pericardial effusion occurs as a result of accumulation of pericardial fluid and it could potentially lead to cardiac tamponade when it compresses on the cardiac chambers leading to impaired cardiac filling causing reduced preload and hemodynamic instability.[1] Beck's triad describe the classical presentation of pericardial tamponade including raised jugular venous pressure, muffled heart sounds, and hypotension.[2] Availability of transthoracic echocardiography at all emergency departments and cardiac coronary units help clinicians in diagnosing cardiac tamponade with ease and proceed with urgent pericardiocentesis if indicated.[3] In this brief paper, we report etiologies and outcomes of patients who required pericardiocentesis for cardiac tamponade.

Methods

This was a retrospective analysis of case records from Hospital Sultanah Nora Ismail (HSNI), Batu Pahat, Johor, Malaysia. The study protocol was approved by the Medical Research and Ethics Committee, Ministry of Health, Malaysia. Medical records of all cardiac tamponade patients who had pericardiocentesis performed between 1 January 2018 and 31 December 2019 were reviewed. A standard questionnaire were used to record the demographic, pericardial effusion aetiology, approach in pericardiocentesis and patients' outcome.

The inclusion criteria were: a) age above 12 years old, b) diagnosis of cardiac tamponade confirmed by transthoracic echocardiography, c) admitted and received treatment in HSNI, d) pericardiocentesis performed during the same admission at HSNI.

Patient interventions

The routine practice in managing patients with cardiac tamponade in our center after diagnosis or referrals involves an urgent review by the medial officer and specialist

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Table 1 Characteristics of patients with pericardial tamponade and their clinical presentation, treatment and outcome

Case	Age	Sex	Clinical picture	Transthoracic Echocardiography Finding	Pericardiocentesis Approach	Etiology	Outcome
1	60	Male	Dyspnea, fever, poor oral intake	4 cm pericardial effusion at apex with collapsed of right atrium in diastole	Apical approach	Salmonella pericarditis	Recovered
2	20	Male	Dyspnea, chest discomfort, fever	5 cm pericardial effusion at apex with collapsed of right atrium/ventricle in diastole	Apical approach	Malignant pericardial effusion (Germ cell tumor)	Recovered
3	21	Male	Dyspnea, fever, night sweats	4.5 cm pericardial effusion at apex with collapsed of right atrium/ventricle in diastole	Apical approach	Tuberculous pericarditis	Recovered
4	53	Male	Dyspnea, chest discomfort	3.5 cm pericardial effusion at apex with collapsed of right atrium/ventricle in diastole	Apical approach	Malignant pericardial effusion from advanced lung adenocarcinoma	Succumbed 1-month post procedure due to lung cancer
5	70	Female	Chest discomfort, loss of weight and appetite	4 cm pericardial effusion at apex with collapsed of right atrium in diastole	Apical approach	Idiopathic pericardial effusion	Recovered
6	36	Male	Dyspnea, chest discomfort, End stage renal failure	5.5 cm pericardial effusion at apex with collapsed of right atrium/ventricle in diastole	Apical approach	Uremic pericardial effusion	Succumbed 1-day post procedure
7	57	Female	Dyspnea, chest discomfort, Bilateral breast cancer	5 cm pericardial effusion at apex with collapsed of right atrium/ventricle in diastole	Apical approach	Malignant pericardial effusion from bilateral breast cancer	Recovered
8	30	Male	Dyspnea, intermittent fever	5 cm pericardial effusion at apex with collapsed of right atrium/ventricle in diastole	Apical approach	Tuberculous pericarditis	Recovered
9	29	Male	Dyspnea, intermittent fever with weight lost	4.5 cm pericardial effusion at apex with collapsed of right atrium/ventricle in diastole	Apical approach	Tuberculous pericarditis	Recovered
10	55	Male	Dyspnea, chest discomfort, Lung adenocarcinoma	5 cm pericardial effusion at apex with collapsed of right atrium/ventricle in diastole	Apical approach	Malignant pericardial effusion from advanced lung adenocarcinoma	Recovered

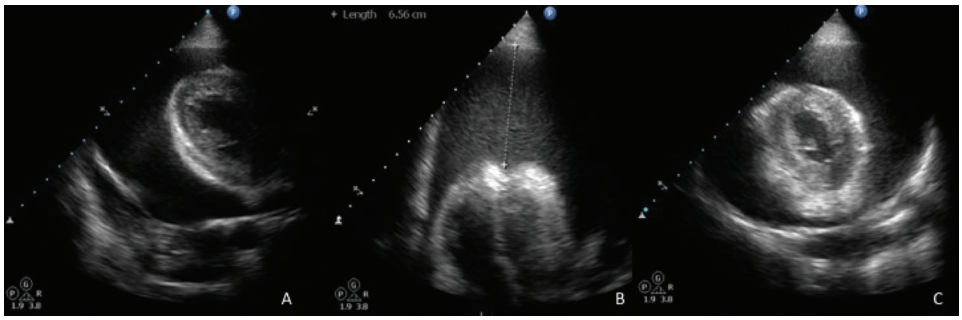

Figure 1 Transthoracic echocardiographic images of cardiac tamponade
A Long parasternal view.
B Apical 4 chamber view
C Short axis view at mid left ventricle level

and confirmation via transthoracic echocardiography. Once the diagnosis of cardiac tamponade is confirmed, urgent pericardiocentesis will be performed either in the emergency department or intensive care units (ICU) under echocardiography guidance. The procedure indications and possible complications will be conveyed to the patients and family members; consent for the procedure will be taken and the medical specialist will supervise the procedure. After the pericardiocentesis, patients will be admitted to the coronary care unit for close observation for at least 24 hours.

Data collection

Patient demographics (age, gender, race), clinical presentation and risk factors, investigations (echocardiography, pericardial fluid investigations), procedure approach and the patients' outcome were recorded. Baseline tests include echocardiography, electrocardiography and vital signs were recorded. Full blood count and coagulation profile were not routinely performed due to the urgency of the procedure.

Results

Of the evaluated records, a total of ten patients were diagnosed with cardiac tamponade. Majority of patients in this cohort were male (80%). The age of patients ranged from 20 to 70 years old, and the mean age of presentation was 36 years. The most prevalent symptom was dyspnea which was found in all our patients (100%). Other common clinical features observed include i) chest pain, ii) dyspnea, iii) syncope or pre-syncope, iv) peripheral edema. The duration of symptoms prior to admission ranged from one week to one month. The admission blood pressure was hypotensive in only 20% of the patients. All patients had their transthoracic echocardiography performed during the same admission at the emergency department or intensive care unit. All patients had evidence of cardiac tamponade with collapsed right atrium during diastole. Table 1 summarises the characteristic of cardiac tamponade patients in our cohort including their clinical presentation, treatment and outcome.

The diagnosis of cardiac tamponade was confirmed with transthoracic echocardiography in all ten patients by means of demonstrating collapsibility of right atrium during diastole and haemodynamic instability. Pericardiocentesis was performed using echocardiography guidance where the largest pool of pericardial effusion was approached. Interestingly, the apical approach was used in all our procedures as it was deemed the safest and nearest approach by the operators. During the pericardiocentesis procedures, continuous vital signs and electrocardiography monitoring were performed. Pericardial fluid aspirated were sent for diagnostic investigation. All patients had hemorrhagic pericardial effusion upon aspiration. They were monitored closely in the intensive care unit or coronary cardiac unit post pericardiocentesis for at least 24 hours. Thirty per cent of the patients had tuberculosis pericarditis which was confirmed via microbiological investigation. Antituberculosis medication was initiated during the same admission and they all made an uneventful recovery. One patient had bacterial salmonella pericardial effusion and recovered with antibiotic therapy. He was later found to have prostatic cancer which lead to his immunocompromised state. Malignant pericardial effusion was found in 40% of cases and remained one of the most common etiology of cardiac tamponade in our cohort. Lung adenocarcinoma was the main etiology causing 50% of the malignant cardiac tamponade cases seen in our cohort.

In this study, there were no statistical association found between patients' age, duration of symptoms and echocardiography findings with the final outcomes.

Discussion

Cardiac tamponade may occur acutely or sub-acutely and is characterised by the accumulation of pericardial fluid under pressure.[4] In cardiac tamponade, the cardiac filling is impaired by an external force and thus limits preload. The normal pericardium has some degree of elasticity; it stretches to accommodate the physiological changes in cardiac volume and after the reserved volume is exceeded, the pericardium will be markedly stiffen.[5] As cardiac tamponade progresses, the cardiac chambers become smaller and the chamber diastolic compliance reduces. There are progressive changes in systemic venous return as cardiac tamponade become more severe, venous return is progressively shifted to systole as the peak associated with early diastole filling reduces.[6] In cases of severe cardiac tamponade, the cardiac chambers can shrink and cardiac output fall leading to hypotension.[5] Respiratory variation in venous return is also observed where in cardiac tamponade the rigid pericardium prevents the free wall from expanding.[5,6] The ensuing distension of the right ventricle is limited to the interventricular septum which along with relative underfilling of the left ventricle causes the septum to bulge to the left, hence reducing left ventricular compliance and leading to decrease in filling of the left ventricle during inspiration.[5]

Table 2 Etiology of cardiac tamponade

Diagnosis	n (%)	Ethnicity (n)	
		Malay	Chinese
Malignancy	4 (40)	3	1
Tuberculosis	3 (30)	3	0
Bacterial	1 (10)	1	0
Idiopathic	1 (10)	1	0
Uremic	1 (10)	0	1

Table 3 Primary etiology of malignant pericardial effusion

Malignancy	n (%)
Germ cell tumor	1 (25)
Lung adenocarcinoma	2 (50)
Breast	1 (25)

In this study, the characteristic of cardiac tamponade was consistent with previous studies reported in the literature. The aetiology of pericardial tamponade includes idiopathic pericarditis, neoplastic, tuberculous or purulent pericarditis. It is also seen rarely in patients with acute myocardial infarction post fibrinolytic therapy.[2] In patients with type A aortic dissection, they may present with pericardial tamponade.[3] Procedure related complications such as catheter ablation for atrial fibrillation can lead to cardiac tamponade.[4] The clinical presentation of cardiac tamponade were closely related with the length of time taken for pericardial fluid accumulation. In acute cardiac tamponade, often due to trauma or rupture of myocardium, aorta or invasive procedure, a patient may present with cardiogenic shock requiring urgent pericardiocentesis and surgery. Subacute cardiac tamponade occur over days to weeks and is usually associated with malignancy, tuberculosis, uraemia or idiopathic pericarditis. Their symptoms include dyspnoea, chest pain or fullness, and reduced effort tolerance. The findings of Beck's triad consisting of hypotension, dilated neck veins and muffled heart sounds were present only in a minority of cases in our cohort. Common physical findings such as sinus tachycardia may indicate hemodynamic compromise from cardiac tamponade even in the absence of hypotension. There was no Kussmaul sign observed in our cohort of cardiac tamponade case series.

Patients with suspected cardiac tamponade should be evaluated with an electrocardiogram, chest radiograph and echocardiography.[7] In hemodynamically unstable patients with high suspicion for cardiac tamponade, urgent echocardiography should be performed. In our cohort, the commonest electrocardiography seen in our cardiac tamponade patients were low voltage QRS complexes and sinus tachycardia. Electrical alternans was seen in 40% of cases with alterations in beat to beat in the QRS complexes. Echocardiography findings of hemodynamic compromised include reversal of right atrial and ventricular diastolic transmural pressure.[9] We observed that cardiac chamber collapse occur before clinical hypotension or hemodynamically compromised takes place. Collapsed right atrium is a highly sensitive and specific marker for cardiac tamponade.[10,11] Right ventricular collapse in diastole is less sensitive for the presence of cardiac tamponade than right atrium diastolic collapse as it may not occur if the right ventricle is heavily hypertrophied or the diastolic pressure is raised.[9] Respiratory variation of mitral and tricuspid flow velocities are increased in cardiac tamponade.[11] We observed that all ten patients in our local cohort had inferior vena cava dilatation and plethora.

The definitive treatment of cardiac tamponade with hemodynamic compromise is achieved via a timely pericardiocentesis thereby relieving the elevated pericardial pressure.[8] Supportive care with fluid resuscitation and inotropic support may have transient benefits but should not substitute pericardiocentesis.[8] In our centre, an indwelling catheter is generally left in the pericardial space until the fluid return is less than 20 ml per day. There was no pericardial decompression syndrome (PDS) seen in our cohort with the mean amount of effusion drained 1200 ml ± 450 ml. The minimum drained pericardial effusion was 500 ml. In view of the absence of cardiothoracic service in our district hospital, surgical drainage will be the last modality pursued in the treatment of cardiac tamponade. Surgical drainage offers the advantage of allowing pericardial biopsies or pericardiectomy to be performed. In traumatic hemopericardium or purulent pericarditis, surgical drainage is the preferred option.

This small study of urgent pericardiocentesis performed among patients presenting with cardiac tamponade to a district hospital demonstrated a favourable outcome among 90% of patients. The commonest presenting complaints were dyspnoea and chest discomfort. Risk factors include underlying malignancy or tuberculosis. Initial echocardiography was able to diagnose all cases and expedite pericardiocentesis as a lifesaving procedure.

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