

A STUDY OF AETIOLOGY, CLINICAL FEATURES, ECG, ECHOCARDIOGRAPHIC FEATURES OF CARDIAC TAMPONADE

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ABSTRACT

BACKGROUND

Cardiac tamponade is a life-threatening, slow or rapid compression of the heart due to the pericardial accumulation of fluid, pus, blood, because of effusion, trauma or rupture of the heart. It was an observational study and included 40 patients with cardiac tamponade. We looked for incidence of Beck's triad and pulsus paradoxus, electrocardiographic presence of electrical alternans, echocardiographic evidence of cardiac tamponade and aetiology of cardiac tamponade.

MATERIALS AND METHODS

This was a single-centre observational study that included 40 patients diagnosed with cardiac tamponade between January 2014 and January 2015. All patients were assessed concerning the clinical features, aetiology, electrocardiographic details and echocardiographic findings and quantification.

RESULTS

Total 25 patients were females; 34 (85.0%) patients presented with pulsus paradoxus. Malignancy (42.5%) was the most common aetiology for cardiac tamponade. Paradoxical hypertension was noted among five patients. Cardiac tamponade due to hypothyroidism was present in 7 patients. 39 patients presented with electrical alternans on ECG. Most of the patients had large pericardial effusion (50.0%). All patients were treated with pericardiocentesis and there was no in-hospital complication or mortality.

CONCLUSION

It can be concluded that malignancy is increasing as an aetiology for cardiac tamponade (42.5%) followed by tuberculosis. Hypothyroidism as an aetiology for cardiac tamponade is not that rare (17.5%). Beck's triad is not seen in all cases. JVP is raised in all patients. Hypertension at the time of presentation doesn't rule out cardiac tamponade. Both ECG and echocardiography can be efficiently used in the diagnosis of cardiac tamponade. Pericardiocentesis is a noteworthy method for treatment of cardiac tamponade.

KEYWORDS

Cardiac Tamponade, Echocardiography, Electrocardiography, Malignancy, Pericardiocentesis.

HOW TO CITE THIS ARTICLE: Reddy YVS, Oतिकunta AN, Nuthakki V, et al. A study of aetiology, clinical features, ECG, echocardiographic features of cardiac tamponade. J. Evid. Based Med. Healthc. 2017; 4(4), 205-208. DOI: 10.18410/jebmh/2017/39

BACKGROUND

Cardiac tamponade is progressive or rapid compression of the heart chambers due to the pericardial accumulation of fluid, pus, blood, clots or gas, because of effusion, trauma or rupture of the heart, which consecutively impairs the diastolic filling of the ventricles.^{1,2} Maybe acute or subacute

variants include low pressure and regional cardiac tamponade.

Clinically, cardiac tamponade can be described as moderate or large pericardial effusion that leads to elevated systemic venous pressure, pulsus paradoxus, dyspnoea and tachycardia and relief of venous hypertension and tachycardia by pericardial fluid drainage.² The incidence of cardiac tamponade has been poorly documented, but is allied with significant mortality rates.³ Presence of even small pericardial effusion has been associated with increased one year mortality from 11 to 26%.⁴

The heart chambers become gradually smaller and myocardial diastolic compliance gets lowered, cardiac inflow becomes limited, eventually leading to similar mean diastolic pericardial and chamber pressures.⁵ The physiologic consequences of fluid in the pericardial space depend both on the volume and rate of fluid accumulation. A slowly

Financial or Other, Competing Interest: None.
Submission 11-12-2016, Peer Review 20-12-2016,
Acceptance 10-01-2017, Published 12-01-2017.

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DOI: 10.18410/jebmh/2017/39



expanding pericardial effusion can become quite large (>1000 mL) with little increase in pericardial pressure, whereas rapid accumulation of even a small volume of fluid (50 to 100 mL) can lead to a marked increase in pericardial pressure.

There have been various causes behind the occurrence of cardiac tamponade. The most common causes are infections, inflammatory and autoimmune disorders, malignancies, trauma and metabolic disturbances.^{3,6} During diagnosis, the common features of cardiac tamponade are tachycardia, tachypnoea, elevated venous pressure and cardiomegaly on chest x-ray.^{5,7} Echocardiographic diagnosis has been the central procedure to quantify pericardial effusion to evaluate its tolerance and to guide the treatment.³ Electrocardiogram abnormality related with cardiac tamponade involves electrical alternation 22, which may affect any or all (23) electrocardiographic waves or only the QRS.¹ The patients with cardiac tamponade have been managed with volume resuscitation, catecholamines, pericardiocentesis and surgical pericardiectomy.³ The objective of this study was to report the aetiology, clinical features, electrocardiographic and echocardiographic findings in patients with cardiac tamponade.

MATERIALS AND METHODS

This was a single-centre observational study that included 40 patients diagnosed with cardiac tamponade between January 2014 and January 2015. All patients were assessed concerning the clinical features at presentation, i.e., Beck’s triad and pulsus paradoxus; aetiology relating to the clinical presentation; electrocardiographic alterations; echocardiographic findings and quantification. All patients were treated and in-hospital outcomes were evaluated.

The Beck’s triad constituted hypotension, raised jugular venous pressure and a quiet heart.⁸ Pulsus paradoxus is characterised by fall of systolic blood pressure of >10 mmHg during the inspiratory phase.⁹ The size of the pericardial effusion by echocardiography was graded as moderate (1 to 2 cm), large (2 to 3 cm) or massive (>3 cm) depending on the amount of fluid between the visceral and parietal pericardium. Echocardiographic signs of tamponade included right atrial abnormality or right ventricular diastolic collapse, exaggerated respiratory variation in mitral and tricuspid inflow. Electrocardiographic signs included presence of electrical alternans.

Statistical analysis was performed using Microsoft Excel 2010. Continuous variables were expressed as counts and percentage.

RESULTS

Of 40 patients, 25 patients were females. 34 (85.0%) patients presented with pulsus paradoxus, jugular vein pressure was raised in all patients, 18 (45.0%) were hypotensive and 21 had muffled heart sounds (Table 1). Hypertension at time of presentation with cardiac tamponade was present in 5 patients (4 of them were known hypertensives), highest recorded reading was 210/100 mm of Hg. Various aetiologies of cardiac tamponade in patients

included in this study have been detailed in Table 2. Malignancy (42.5%) was the most common aetiology for cardiac tamponade followed by tuberculosis (32.5%). 38 patients had exudate type of effusion and 2 had transudate type of effusion. 39 patients presented with electrical alternans on ECG. Most of the patients had large pericardial effusion (50.0%) followed by massive effusion (37.5%) (Table 3). Figure 1 shows 2D echocardiogram of right atrial collapse. A 2D echocardiogram apical 4 chamber view showing pericardial effusion is demonstrated in Figure 2. Figure 3 depicts echocardiogram-Doppler flow showing exaggeration of respiratory variation of mitral flow. All the patients were treated with pericardiocentesis and there was no incidence of in-hospital complication or mortality.

Characteristics	N=40 Patients
Female, n (%)	25 (62.5%)
Clinical Presentation, n (%)	
Pulsus paradoxus	34 (85.0%)
Beck’s triad	
Raised jugular vein	40 (100%)
Hypotension	18 (45.0%)
Muffled heart sounds	21 (52.5%)

Table 1. Baseline Characteristics

Aetiology	Total, n (%)	Male, n	Female, n
Tuberculosis	13 (32.5%)	8	5
Bacterial infection	1 (2.5%)	1	0
Malignancy	17 (42.5%)	5	12
Carcinoma lung	6 (15.0%)	3	3
Carcinoma breast	3 (7.5%)	0	3
Carcinoma cervix	1 (2.5%)	0	1
Lymphoma	2 (5.0%)	1	1
Carcinomatous lymphangiomatosis	1 (2.5%)	0	1
Carcinoma oesophagus	2 (5.0%)	0	2
Mesothelioma of omentum	1 (2.5%)	1	0
Thymoma	1 (2.5%)	0	1
Hypothyroidism	7 (17.5%)	0	7
Friedreich’s ataxia	1 (2.5%)	1	0
Connective tissue disease	1 (2.5%)	0	1

Table 2. Aetiology of Cardiac Tamponade

Type of Effusion, n (%)	
Exudate	38 (95.0%)
Transudate	2 (5.0%)
Electrical Alternans on ECG, n (%)	
Present	39 (97.5%)
Absent	1 (2.5%)
Pericardial Effusion Quantity, n (%)	
Massive (>3 cm from posterior wall)	15 (37.5%)
Large (2-3 cm)	20 (50.0%)
Moderate (1-2 cm)	5 (12.5%)

Table 3. Details of Diagnosis



Figure 1. 2D Echocardiogram Showing Right Atrial Collapse

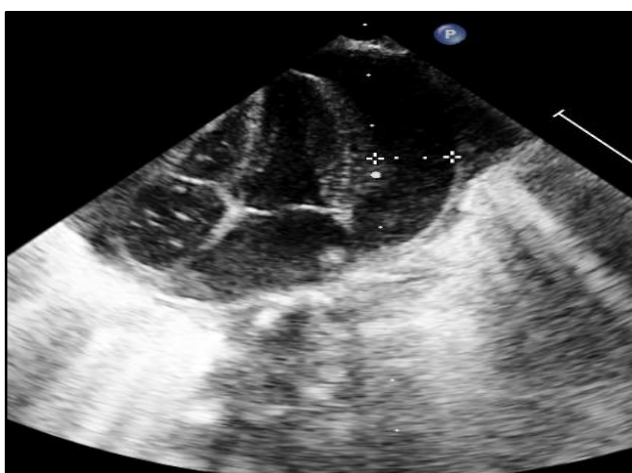


Figure 2. 2D Echocardiogram Apical 4 Chamber View Showing Pericardial Effusion

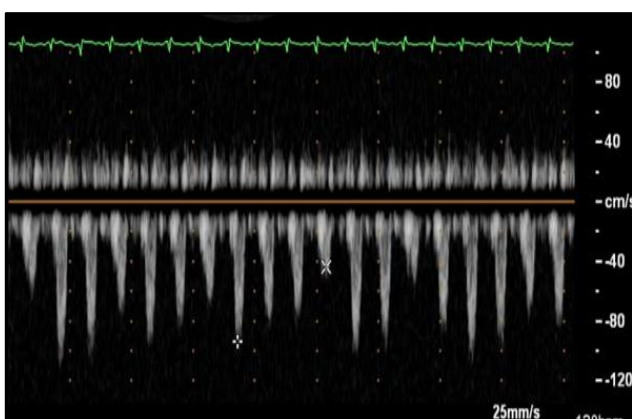


Figure 3. Echocardiogram-Doppler Flow Showing Exaggeration of Respiratory Variation of Mitral Flow

DISCUSSION

We present a study that investigates 40 patients with cardiac tamponade based on the aetiology, clinical presentation and diagnosis with ECG and echocardiography. The clinical presentation of cardiac tamponade mainly rests on Beck's triad and pulsus paradoxus. In present study, all patients had raised jugular venous pressure, but only 18 patients were hypotensive and 21 patients had muffled heart sounds. Similarly, a previous study also reported that out of total 56

patients in the study most patients did not have muffled heart sounds and blood pressure was often well maintained.¹⁰ It is also stated that hypertensive cardiac tamponade may also occur in patients with high or very high blood pressures (even over 200 mmHg).¹¹ Likewise, in this study also, there were 5 patients with hypertensive cardiac tamponade.

Previously, idiopathic pericarditis was considered the most recurrent cause of cardiac tamponade. However, some recent data^{12,13} propose that specific causes, particularly malignancy have been more frequent, which was found to be accountable for 15% of pericardial effusion and 6% of acute pericardial disease.¹⁴ In present study, malignancy was found to be the cause in 42.5% patients involving majorly lung (15.0%) and breast (7.5%) carcinomas followed by tuberculosis (32.5%). In accordance with our study, another series also confirmed the neoplastic cause as the prevalent one with lung and breast tumours as the most frequent.¹⁵ Similar results were noted in study done by Ben Horin et al, whereas a study by Cunningham L et al reported that most common cause of cardiac tamponade in 134 patients included in their study was procedure-related (34%) followed by malignancy (27%).¹⁶ Hypothyroidism as an aetiology for cardiac tamponade is not that rare (17.5%). All these patients had massive effusions. Only 2 patients had known hypothyroidism. All of them were females. It's important to rule out hypothyroidism especially in patients with cardiac tamponade without tachycardia at presentation.

Echocardiography plays a chief role in diagnosis of cardiac tamponade through evaluation of the size of pericardial effusion, assessment of the distribution of pericardial effusion, detection of intrapericardial adhesions, diagnosis of intrapericardial clot, assessment of the suitability for pericardiocentesis, assist in monitoring pericardiocentesis and diagnosis of effusive constrictive pericarditis.¹⁷ In this study, majority of patients (50.0%) had large pericardial effusion, followed by massive (37.5%) and moderate (12.5%) effusions. Correspondingly, a recent study stated 89.29% of patients with large effusion and 10.71 with moderate effusion.¹⁸

Literature suggests that electrical alternans has been characteristically observed only in patients with large effusion.¹⁹ However, an ECG has been largely used to rule out other causes of hypotension than to confirm the diagnosis of cardiac tamponade.²⁰ In present study, electrical alternans was present in almost all (97.5%) patients. A recent study reported only 22.67% patients with presence of electrical alternans.¹⁸

The management of cardiac tamponade in all patients included in our study was done by pericardiocentesis. Moreover, there was no in-hospital complication or mortality in any of the patients. On contrary, literature states that pericardial aspiration has been associated with high complication rate with mortality and technical complication rate as high as 6% and 50%, respectively.^{21,22} However, Bodson L et al have stated that among various available treatments, pericardial drainage remains the only effective treatment for cardiac tamponade.³ Thus, the choice of

treatment in patients with cardiac tamponade must be based on patient's condition and characteristics.

CONCLUSION

In the light of these results, it can be concluded that predominant cause of cardiac tamponade is shifting towards malignancy from tuberculosis even in India where tuberculosis is very common disease. Hypothyroidism as an aetiology for cardiac tamponade is not that rare (17.5%). Beck's triad is not seen in all cases. JVP is raised in all patients. Hypertension at the time of presentation doesn't rule out cardiac tamponade. Both ECG and echocardiography can be efficiently used in profound diagnosis of cardiac tamponade. Pericardiocentesis is a noteworthy method for treatment of cardiac tamponade.

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