

EFFUSIVE CONSTRICTIVE PERICARDITIS: HOW TO DIFFERENTIATE WITH CARDIAC TAMPONADE

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Abstract

Constrictive-effusive pericarditis (ECP) is a rare syndrome but is gaining increasing attention in the classification of pericardial diseases. The aim of this research is to identify the differences in clinical symptoms between constrictive pericardial effusion and cardiac tamponade, such as chest pain, shortness of breath, blood pressure, heart rate, and other symptoms. We report the case of a 67-year-old man who had exertional dyspnea, lack of energy, fatigue, and pleuritic chest pain for the past 6 months. X-rays showed pericardial effusion and pericardial thickening with calcification indicating constrictive pericarditis. Echocardiographic examination also revealed similar findings. The patient then underwent pericardiectomy, during which the pericardial effusion was evacuated. However, after this procedure, cardiac contractions were still limited, underlying the constrictive process. This case illustrates the complexity in differentiating constrictive pericarditis from cardiac tamponade and the importance of accurate diagnosis in the management of this pericardial disease. In this case report, we discuss the clinical findings, diagnostic measures, and management implications in a patient with overt constrictive pericarditis.

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INTRODUCTION

Constrictive pericarditis and cardiac tamponade are two serious conditions that affect the pericardium, the thin membrane lining the heart. Constrictive-effusive pericarditis (ECP) is a rare syndrome but is gaining increasing attention in the classification of pericardial diseases. In the first globally applicable guidelines on pericardial disease, hemodynamic ECP was defined as "no pressure drop after pericardial fluid is evacuated," and one of its explicitly mentioned causes was tuberculous pericarditis. However, in the update of the guidelines, the description of chronic permanent constrictive pericarditis became more complex as it recognizes certain variations of the constrictive syndrome, including transient narrowing of the pericardium and highly exaggerated constrictive forms (Maisch, 2018).

Cardiac tamponade is a medical condition that results from an increase in fluid volume that reaches a critical level in the pericardial cavity, blocking the flow of blood into the ventricles of the heart (Madhivathanan et al., 2020). It is important to immediately detect and treat cardiac tamponade in the presence of life-threatening pericardial effusion. In the management of pericardial effusion, it is necessary to consider the underlying cause of this condition. The act of pericardiosynthesis, which is the removal of fluid from the pericardial cavity, should only be performed by individuals skilled in the procedure (Zurwida & Gani, 2019). Although both involve the pericardium and can have similar symptoms, the difference between constrictive pericarditis and cardiac tamponade is crucial for proper diagnosis and management.

Proper distinction between these two conditions can be a clinical challenge, especially as the symptoms can be similar. Therefore, this study aimed to examine diagnostic approaches that are effective in differentiating exaggerated constrictive pericarditis from cardiac tamponade (Kim et al., 2018). With a better understanding of how to identify and differentiate between these two conditions, it is hoped to improve patient management and clinical outcomes (Vindegard & Benros, 2020).

The aim of this research is to identify the differences in clinical symptoms between constrictive pericardial effusion and cardiac tamponade, such as chest pain, shortness of breath, blood pressure, heart rate, and other symptoms. Additionally, the study also aims to analyze diagnostic findings that may help differentiate between the two conditions, such as physical examination results, electrocardiogram (EKG) findings, echocardiography, or blood tests. Furthermore, the research will discuss strategies or diagnostic criteria that can be used by medical professionals to distinguish constrictive pericardial effusion from cardiac tamponade.

RESEARCH METHODS

This case involved a 67-year-old male patient. The patient had difficulty breathing during physical activity, such as walking, and reported feeling a lack of energy and prolonged fatigue. In addition, he complained of pleuritic chest pain, which lasted for about 6 months. Radiographic examination revealed pericardial effusion, which is a buildup of fluid around the heart, and thickening of the pericardium, accompanied by calcification. This indicated constrictive pericarditis, a medical condition involving inflammation and thickening of the pericardium leading to restriction of heart movement. On follow-up examination using echocardiography, the same findings were confirmed. The patient then underwent pericardiectomy, which is a surgical procedure to remove the pathologically altered pericardium or heart lining. After the pericardial effusion was evacuated, the patient still experienced limitations in heart contraction, which is the basis of the constriction process. This indicates a disturbance in heart movement caused by constrictive pericarditis.

RESULTS AND DISCUSSION

The pericardium is a pouch that encloses the heart and consists of two layers, the visceral and parietal layers. These two layers are separated by a potential space that normally contains 15-35 mL of serous fluid. The pericardium serves mechanical protection and infection protection for the heart. Diseases of the pericardium may include pericarditis (acute, subacute, chronic, relapsing), pericardial effusion, cardiac tamponade, and pericardial tumors (Hoit, 2017). Infectious injury to the pericardium can result in two different types of reactions. Injuries caused by viruses will result in a transient pericardial reaction that will generally resolve on its own. Fast-growing organisms such as *Mycobacterium tuberculosis* may cause a mononuclear pericardial reaction, which may eventually result in severe fibrous thickening of the pericardium (Underwood et al., 2015). Pyogenic organisms, on the other hand, can cause a polymorphonuclear reaction that also has the potential to progress to fibrous thickening and constriction (Yacoub et al., 2018).

Histopathological examination of the constricted pericardium will show fibrotic thickening, organized fibrin deposition, and non-specific inflammation (Roden & Camus, 2018). Pericardial mesothelial cells will proliferate along with this thickening. The types of effusion that can occur include serous effusion (associated with conditions such as congestive heart failure, hypoalbuminemia, viral infections, and radiotherapy), hemorrhagic effusion (may occur in situations such as acute myocardial infarction, aortic rupture or dissection, cardiac surgery, anticoagulant use, chronic kidney disease, and cancer), chylous effusion (found in injuries to the thoracic duct), or purulent effusion (associated with infection). In addition, adhesions between the two pericardial layers may form, resulting in a loss of potential space between them. These adhesions may occur as part of the healing process following serous injury, radiotherapy, infection, idiopathy, or connective tissue disorders (Selvarajah et al., 2020).

However, when the pericardium becomes inflamed or infected, the condition is known as pericarditis. There are two complications of pericarditis that occur if this heart defect is not treated immediately including constrictive and cardiac tamponade can occur. Constrictive pericarditis is caused by inflammation of the pericardium that lasts for a long time with an intermittent condition that results in the appearance of scar tissue. As a result, the pericardium becomes stiff and cannot stretch normally and inhibits the work of the heart and blocks heart movement (Andrés-Delgado & Mercader, 2016). Constrictive pericarditis involves scarring and loss of elasticity of the pericardium surrounding the heart, leading to impaired filling. The etiology is similar to constrictive pericarditis, as both conditions can be caused by heart surgery and tuberculosis. The symptoms of this syndrome resemble those of heart failure and volume overload. The condition is chronic, and treatment is mostly surgical, although, in some patients, treatment of the underlying cause may reverse the effusion and constriction. Constrictive-effusive pericarditis (ECP) is a rarer syndrome, which involves narrowing of the visceral pericardium and effusion causing a tamponade-like effect on the heart (Yacoub et al., 2018).

Cardiac tamponade is a serious condition that results from the sudden and/or excessive accumulation of fluid in the pericardial space (Purwowiyoto & Effendi). Cardiac tamponade is a life-threatening condition that needs to be detected and treated quickly. Suspicion of cardiac tamponade is often based on Beck's triad (increased jugular venous pressure, hypotension and distant heart sounds), paradoxical pulsus and persistent hypotension with no apparent source of bleeding (Imazio & De Ferrari, 2021). Tamponade physiology occurs due to disruption of hemodynamics due to increased intra pericardial pressure, which interferes with filling the heart chambers. Tamponade may result from the presence of a sizable volume of effusion or the formation of effusion over a short period of time. Keep in mind that a large effusion may not cause tamponade if it accumulates gradually, allowing the pericardial cavity to stretch and adapt (Ariani & Soesanto, 2013).

The clinical condition of cardiac tamponade patients is not only influenced by the volume of pericardial fluid, but also the time of onset. A rapid, even slight, increase in fluid volume can cause significant clinical changes, whereas in chronic conditions compensation occurs through progressive distension of the pericardium, so that the filling of the heart chambers is less likely to be compromised. Rapid stretching of the pericardium will compress the heart chambers, leading to decreased diastolic compliance. This impedes blood flow into the heart. The atrium and right ventricle will collapse. This risks causing shock due to the heart's inability to compensate for the decrease in cardiac output. Shock is characterized by decreased blood pressure and peripheral perfusion. Hypotension is the final sign before cardiac arrest (Tunggal et al., 2023).

Traditionally, the diagnosis of cardiac tamponade (ECP) is based on invasive hemodynamic examination, i.e. measurement of pressure within the heart and blood vessels. The diagnosis of ECP was made if the right atrial pressure did not fall below 10 mmHg or $\geq 50\%$ after pericardiocentesis, a medical procedure to remove fluid from the pericardial space (Janus & Hoit, 2021). However, with the advancement of echocardiography technology, the diagnosis of ECP can be made without invasive hemodynamic examination. Echocardiography is an examination that uses sound waves to view the structure and function of the heart. In patients with ECP, echocardiography may show narrowing of the pericardial space, increased blood flow velocity in the mediastinum and a shift in the respiratory septum. In addition, pericardial effusion in ECP patients is more often localized and fibrinous, indicating a more complex effusion (Van der Bijl et al., 2016).

In studies of constrictive pericardial effusion (ECP), decreased pericardial compliance rates occur simultaneously with the presence of pericardial effusion which has a significant hemodynamic impact. In typical cardiac tamponade conditions, right atrial pressure returns to normal levels after pericardiocentesis. This suggests that significant pericardial effusion may lead to decreased elasticity or compliance of the pericardium, which in turn affects the pressure within the heart and impairs its hemodynamic function (Gilpin & Mahmoudi, 2022). This is manifested by the persistence of elevated right atrial pressure after pericardiocentesis, which is a hemodynamic feature of ECP (Syed et al., 2013).

Although cardiac tamponade and ECP are both pericardial disorders that cause abnormal filling of the heart, their pathophysiology is quite different. In tamponade, early diastolic filling is significantly impaired due to increased intrapericardial pressure. Systemic venous pressure increases and adrenergic tone increases to overcome the decreased cardiac output. If tamponade persists and the compensatory mechanisms are overwhelmed, shock will occur unless pericardiocentesis is performed. In contrast, in ECP, early diastolic filling occurs - the increased filling pressure due to the inelastic pericardium promotes increased ventricular filling in early diastole. However, as pericardial reserves are depleted in mid to late diastole, ventricular filling is greatly decreased. This discrepancy causes the classic hemodynamic features, the blunted y-derivative in tamponade and the deep, rapid ventricular filling wave in ECP (square root sign or dip-and-plateau pattern (Miranda & Oh, 2017)).

CONCLUSION

Constrictive-effusive pericarditis is a medical condition that may be overlooked or difficult to diagnose in some patients who present with symptoms similar to cardiac tamponade. In these cases, it is important to use echo-Doppler features in the hemodynamic examination of the patient. This examination can indicate the presence of pericardial constriction (thickening and hardening of the pericardial lining) even before the pericardial fluid is evacuated or drained. Thus, echo-Doppler examination can play an important role in suspecting constrictive pericarditis early, leading to a more precise diagnosis and better management of the patient. This underscores the importance of a deep understanding of the symptoms and clinical features of pericarditis, allowing for earlier identification of this condition and the provision of appropriate treatment.

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