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## Case Report

# Subacute effusive-constrictive pericarditis: Echocardiography-guided diagnosis and management

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### ABSTRACT

A 49-year-old man presented with flu-like symptoms of two weeks. Electrocardiogram showed diffuse ST elevation. Blood samples revealed severe renal failure and moderate inflammatory results. Echocardiogram showed large pericardial effusion, dilated inferior vena cava, but no right ventricular collapse. The patient underwent hemodialysis, after which he developed clinical signs of cardiac tamponade with echocardiographic features of collapse of the right ventricle. Pericardial drainage was then performed revealing purulent fluid of 800 ml. *Streptococcus agalactiae* was found in the cultures of urine, blood, and pericardial fluid.

Despite removal of the pericardial fluid, echocardiogram failed to show any improvement in dilated inferior vena cava and estimated right atrial pressure remained elevated. Thus, a diagnosis of subacute effusive-constrictive pericarditis was made. Following antibiotic treatment for purulent pericarditis, early pericardiectomy was performed under transesophageal echocardiographic monitoring which successfully guided surgeons to careful removal of thick and adhesive visceral pericardium as well as an additional Waffle procedure resulting in significant clinical and hemodynamic improvement.

Echo-guided approach is most practical in establishing the diagnosis of effusive-constrictive pericarditis and also most helpful in obtaining successful surgical results.

<Learning objective: Diagnosis of effusive-constrictive pericarditis is difficult and is not often made because of mixtures of clinical findings associated with effusion/tamponade and constriction. Echo-guided approach is most practical in establishing the diagnosis by detecting absence of normalization in dilatation of the inferior vena cava after pericardial drainage. Also, since careful removal of visceral pericardium is mandatory, transesophageal echocardiographic monitoring during pericardiectomy plays an essential role in obtaining successful surgical results.>

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## Introduction

The concept of effusive-constrictive pericarditis was first established by Hancock in 1971 [1], defining the disease as a distinct clinical and hemodynamic condition in which constriction of the heart by the visceral pericardium (epicardium) occurs in the presence of tense pericardial effusion. The hallmark of effusive-constrictive pericarditis is persistently elevated right atrial

pressure after normalizing intra-pericardial pressure by removal of pericardial fluid. However, the diagnosis of effusive-constrictive pericarditis remains difficult because this condition is uncommon even in patients with cardiac tamponade who may undergo pericardial drainage and also the diagnosis requires invasive intra-pericardial and intra-cardiac hemodynamic monitoring before and after pericardial drainage [2]. Although no non-invasive imaging has been thought to be reliable in establishing the diagnosis of effusive-constrictive pericarditis with certainty [3], careful echocardiographic examination performed at the time of pericardial drainage as well as pericardiectomy may provide helpful guidance not only in the diagnosis but also in the management of effusive-constrictive pericarditis.

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## Case report

A 49-year-old man with diabetes and chronic hepatitis C for which he was receiving treatment with peginterferon alfa-2a and ribavirin presented with flu-like symptoms for the previous two weeks. Physical findings were unremarkable without any abnormal vital signs. Electrocardiogram revealed sinus rhythm at a rate of 75 beats/min and diffuse ST elevation in all leads except aVR (Fig. 1A). Blood samples showed severe renal dysfunction (blood urea nitrogen 96.6 mg/dl, creatinine 5.3 mg/dl) and moderate inflammatory results (white blood cells 9100/ $\mu$ l, C-reactive peptide 15.1 mg/dl). The plasma level of B-type natriuretic peptide was 293 pg/ml. Echocardiogram on admission showed large pericardial effusion, dilated inferior vena cava (IVC; 29 mm), but no features of right atrial (RA) or right ventricular (RV) collapse (Fig. 1B). A contrast computed tomography (CT) also showed large pericardial effusion without significant pericardial thickening or calcification (Fig. 1C). A diagnosis of acute renal failure associated with large pericardial effusion was made. The patient underwent hemodialysis, after that he developed clinical signs of cardiac tamponade with severe hypotension and echocardiographic features of RV collapse. Surgical pericardial drainage was performed revealing sero-sanguinous purulent fluid of 800 ml. *Streptococcus agalactiae* was found in the cultures of urine, blood, and pericardial fluid.

Despite removal of most of the pericardial fluid which means significant decrease of intra-pericardial pressure, echocardiogram failed to show normalization in IVC diameter as well as restoration of normal respiratory changes. Estimated RA pressure remained elevated (>20 mmHg). Thus, a diagnosis of subacute effusive-constrictive pericarditis was made. Echogenic two-layer pericardial space behind the postero-lateral left ventricular wall was present and was associated with abnormal movement of the interventricular septum (“septal bounce”) and significant respiratory variation of mitral as well as tricuspid inflow Doppler pattern (Fig. 2). Following antibiotic treatment for purulent pericarditis for two weeks, it was decided to proceed to early pericardiectomy

under transesophageal echocardiographic (TEE) monitoring. Despite removal of thick parietal pericardium, TEE failed to show any improvement in his echocardiographic patterns of constrictive physiology. Non-compliant central venous pressure (CVP, 28 mmHg) and pressure contour of a predominant diastolic “y” descent ( $x < y$ ) were also indicative of persistent constriction. It was only after the careful removal of adhesive and constricted visceral pericardium when a significant reduction in CVP was seen (Fig. 3) together with apparent improvement of cardiac motion. However, since echocardiographic “dip and plateau” pattern of constriction remained, the Waffle procedure was added to the right ventricle, resulting in further improvement of RV wall motion with normalization of CVP (12 mmHg).

The patient remained well six months after surgery without clinical and echocardiographic evidence of significant constrictive pericarditis.

## Discussion

As demonstrated in this case, echo-guided approach at the time of removal of tense pericardial fluid is most helpful in establishing the diagnosis of effusive-constrictive pericarditis by detecting the absence of normalization in IVC dilatation immediately after pericardial drainage, even without invasive intra-pericardial and intra-cardiac pressure measurement. Remaining abnormal/paradoxical movement of the interventricular septum (“septal bounce”) and significant respiratory variation of the mitral and tricuspid inflow Doppler pattern may indicate residual constrictive physiology [4]. Moreover, since careful removal of adhesive and constricted visceral pericardium is mandatory, TEE monitoring during pericardiectomy plays an important role in obtaining satisfactory clinical and hemodynamic improvement.

It was known previously that pericardial effusion coexists with a visceral constrictive pericarditis (constrictive epicarditis) [1,5]. Many isolated case reports were published with various etiologies including tuberculosis, radiation therapy, cardiac surgery, malignant tumor, and idiopathic causes. The concept of

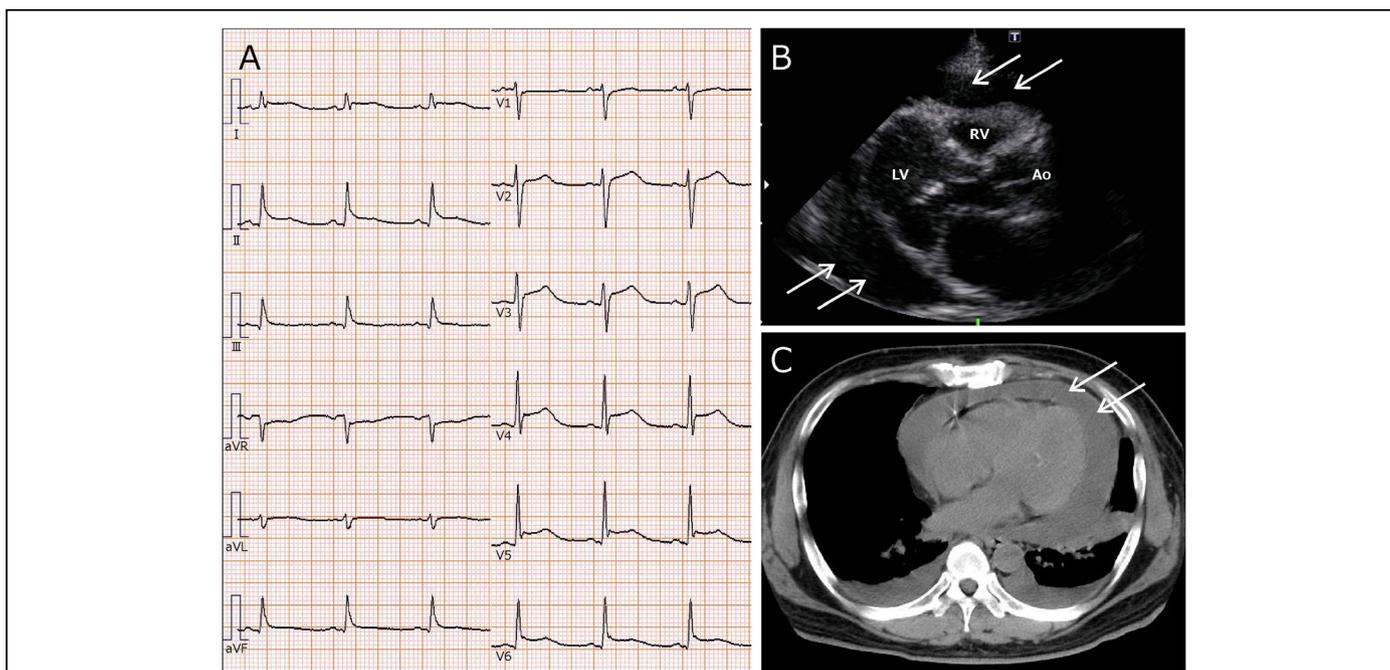


Fig. 1. (A) An electrocardiogram on admission showing significant ST elevation in all leads except aVR. (B) An echocardiogram on admission showing large pericardial effusion (arrows). (C) Contrast computed tomography showing large pericardial effusion (arrows) without significant pericardial thickening or calcification. Ao, aorta; LV, left ventricle; RV, right ventricle.

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