


# Pericardial waffle for effusive-constrictive pericarditis

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## Abstract

We present the case of a 55-year-old female marathon runner who presented with progressive exercise intolerance and was diagnosed with effusive-constrictive pericarditis. Stereotypical findings of this challenging diagnosis are shown by transthoracic echocardiographic and right heart catheterization. We treated the patient with a parietal pericardiectomy and pericardial waffle procedure to relieve a thick and constrictive epicardium.

**Keywords** Constrictive pericarditis; Pericardial effusion; Pericardiectomy; Pericardial waffle

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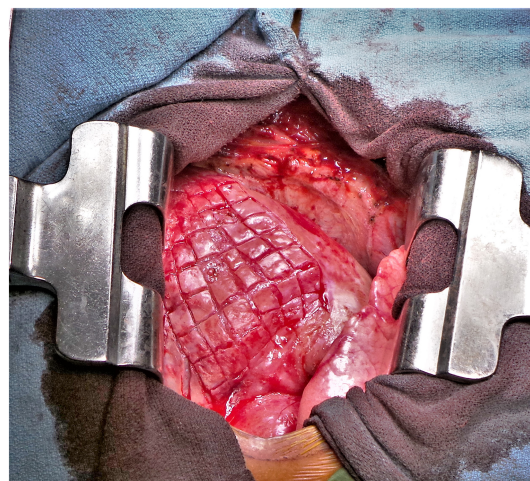
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## Case report

A 55-year-old female runner was referred to the outpatient clinic for 6 months of progressive exercise intolerance. Her half-marathon time had increased by 30 min to 2 h, 30 min. The physical examination showed signs of right heart failure, including marked bilateral pedal oedema, a jugular venous pulse 15 cm above the sternal angle, and Kussmaul's sign. A small-to-moderate circumferential pericardial effusion with features of constrictive pericarditis was shown by a transthoracic echocardiogram (Supporting Information, *Figure S1* and *Videos S1* and *S2*). A dip and plateau sign, ventricular interdependence, and diastolic equalization of all chambers (21 mmHg) were shown by a simultaneous left and right heart catheterization (Supporting Information, *Figure S2*). Effusive-constrictive pericarditis was diagnosed. The patient underwent a conventional parietal pericardiectomy that yielded little intraoperative haemodynamic improvement; therefore, a *pericardial waffle procedure* was performed to relieve a thick and constricted epicardium (*Figure 1* and Supporting Information, *Video S3*). This resulted in immediate haemodynamic improvement (cardiac index 1.9 to 3.1 mL/min/m<sup>2</sup> and right atrial pressure 25 to 8 mmHg). The patient recovered and returned to running.

In rare cases of pericardial constriction, the epicardium (i.e. visceral pericardium) is thickened and calcified. A conventional pericardiectomy removes the parietal pericardium. This procedure may not alleviate constrictive physiology if the

**FIGURE 1** Intraoperative image of a *pericardial waffle procedure* for epicardial constriction, whereby crosshatched incisions are made into a thickened and calcified epicardium across the surface of both ventricles to segment and relieve epicardial scar, allowing for ventricular dilation and filling.



heart remains constricted by the epicardium. A *pericardial waffle procedure* is performed to relieve the epicardium by creating crosshatching incisions across the entire surface of both ventricles. These incisions segment epicardial scar, thereby relieving constriction and enabling ventricular dilation and filling. The evidence for this procedure is limited but encouraging.<sup>1,2</sup>

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## Conflict of interest

None declared.

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## Authorship statement

All authors have read and approved the manuscript. None of the contents of the manuscript have been published previously.

## Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

## References

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**Figure S1.** Transthoracic echocardiography images of a 55-year-old female showing (A) a dilated inferior vena cava with <50% respiratory variation, (B) a septal mitral annular e' velocity of 9.5 cm/sec, (C) mild diastolic reversal of the hepatic vein with expiration not meeting diagnostic criteria, and (D) a leftward ventricular septal shift with inspiration and a diastolic septal shudder by M-mode imaging of the ventricular septum. These findings suggest constrictive pericarditis.

**Figure S2.** Simultaneous hemodynamic pressure tracings of the left and right ventricles showing classic findings of constrictive pericarditis. These findings include elevated end-diastolic pressures (21 mmHg), a *dip and plateau sign* of rapid early diastolic filling followed by an abrupt cessation of late diastolic filling, and *ventricular interdependence* whereby inspiration is associated with an increase in RV pressure and decreased in LV pressure.

**Video S1.** Transthoracic echocardiogram (apical 4-chamber view) of a patient with effusive-constrictive pericarditis showing a small-to-moderate circumferential pericardial effusion and a thick and hyperechoic epicardium.

**Video S2.** Transthoracic echocardiogram (subcostal view) of a patient with effusive-constrictive pericarditis showing a dilated inferior vena cava with spontaneous echo contrast minimal variation of the diameter with respiration.

**Video S3.** A pericardial waffle procedure performed in a patient with effusive-constrictive pericarditis by creating crosshatched incisions in the epicardium to relieve epicardial constriction, enable ventricular dilation, and allow LV filling.