Localized constrictive pericarditis after Gore-Tex pericardial substitution

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1. Introduction

Pericardial reaction and constriction or pericarditis secondary to pericardial substitution has been reported for various materials [1, 2], but not yet with expanded polytetrafluoroethylene (ePTFE) membrane. Here we report a case of localized constrictive pericarditis 12 years after pericardial substitution with an ePTFE membrane.

A 43-year-old patient with ventricular septal defect (VSD) and aortic regurgitation underwent VSD closure and aortic valve replacement with a 25 mm perimount bioprosthesis. Ten years later, he underwent aortic prosthesis replacement with a new 25 mm perimount valve, and at that time an ePTFE membrane was used as a pericardial substitution. This membrane, approximately 7×13 cm, was set under both sternal borders with 5-0 polypropylene suture, in order to cover the anterior and diaphragmatic aspects of the heart. Between the diaphragm and the heart the membrane was not anchored. Twelve years later, the patient presented with a two-years’ history of worsening right heart failure. Physical examination revealed moderate fatigue and dyspnea, distention of the jugular vein, peripheral edema and hepatomegaly, all of which were incompletely regressive with diuretic therapy. Echocardiography revealed impairment in ventricular diastolic function predominating on the right ventricle (RV). The mean trans-aortic prosthesis gradient was 18 mmHg, with no intra- or periprosthetic regurgitation. Both ventricular systolic functions were preserved. At this point, there were no arguments for cardiac constriction. A haemodynamic study was carried out under difficult conditions; its interpretation was not reliable. Computed tomographic and magnetic resonance imaging (MRI) revealed a slightly thickened membrane anterior to the heart, with nascent calcifications. At that time (2004), assessment of ventricular coupling with real time cine MRI was not available to differentiate constrictive pericarditis from restrictive cardiomyopathy. Radionuclide ventriculography showed abnormal ventricular filling on both left and right ventricular volume curves: the early peak filling rates (TPFRs) were greater, and the time to peak filling rates (TPFRs) were shorter in this patient, compared to control patients matched by age and heart rate (Fig. 1). Left ventricular filling parameters and restrictive volume curve pattern were similar to those observed in patients with pericardial constriction [3]. A diagnosis of postoperative constrictive pericarditis was proposed, and the patient was operated on to relieve the constriction. A tissue-free space was found between the sternum and the pericardial substitute. Underneath the ePTFE membrane, and strictly limited to it, the underlying epicardium showed white, slightly thickened fibrous adhesions (Fig. 2). Nascent soft calcifications were limited to the membrane which was easily removed. On incision of the epicardium there was no bulging of the heart, indicating that the epicarditis on the anterior free wall of the RV was not engendering constrictive pericarditis. Radionuclide ventriculography revealed a slightly thickened membrane anterior to the heart, with nascent calcifications. At that time (2004), assessment of ventricular coupling with real time cine MRI was not available to differentiate constrictive pericarditis from restrictive cardiomyopathy. Radionuclide ventriculography showed abnormal ventricular filling on both left and right ventricular volume curves: the early peak filling rates (TPFRs) were greater, and the time to peak filling rates (TPFRs) were shorter in this patient, compared to control patients matched by age and heart rate (Fig. 1). Left ventricular filling parameters and restrictive volume curve pattern were similar to those observed in patients with pericardial constriction [3]. A diagnosis of postoperative constrictive pericarditis was proposed, and the patient was operated on to relieve the constriction. A tissue-free space was found between the sternum and the pericardial substitute. Underneath the ePTFE membrane, and strictly limited to it, the underlying epicardium showed white, slightly thickened fibrous adhesions (Fig. 2). Nascent soft calcifications were limited to the membrane which was easily removed. On incision of the epicardium there was no bulging of the heart, indicating that the epicarditis on the anterior free wall of the RV was not engendering constrictive pericarditis.
tion. However, a sort of epicardial fibrous strap between the anterior free wall and the diaphragmatic portion of the RV seemed to restrict RV diastolic expansion. This bridle along with the epicardial adhesions, from the vena cavae on the right to the left phrenic nerve on the left, was removed. The aortic bioprosthesis showed very few signs of deterioration, but was changed anyway with another 25 perimount. Finally, an absorbable anti-adhesion membrane, Seprafilm (Genzyme, Framingham, MA, USA), was inserted. Immediate postoperative haemodynamic changes were modest, with a slightly decreased right atrial pressure, and mild increase in cardiac index. Histopathology of the removed epicardium showed non-specific chronic inflammation and fibrous reaction. Microbiological studies of both adhesions and membrane were negative. The postoperative course was uneventful and the patient was discharged on postoperative day nine. Subsequent clinical improvement was dramatic, with complete resolution of right heart failure symptoms without the need for antifailure therapy. This symptom-free clinical state has persisted up to the latest follow-up, two years after surgery. Three months after the operation radionuclide ventriculography showed normalization of the left and right ventricular curve patterns with decrease of early PFRs and increase of TPFRs, demonstrating a return to normal values compared to control subjects (Fig. 1).

2. Discussion
Constrictive pericarditis is a classic but rare complication following cardiac surgery, with an estimated incidence of 0.2–0.3% [4]. Diagnosis is not always easy, echocardiography being frequently falsely negative [4]. In our case, a multi-disciplinary approach was necessary and the decision-making process was long and difficult. The main argument for constrictive pericarditis and thus reoperation relied upon radionuclide ventriculography, as other imaging modalities were misleading or non-contributory. This method was particularly useful in differentiating constrictive pericarditis from restrictive cardiomyopathy [3], and it also showed postoperative normalization which was consistent with the clinical evolution. A surprising point was the localized nature of the constriction. It may be related to the special setting of the ePTFE membrane between the anterior free wall and diaphragmatic portion of the RV. The absence of bulging goes against a diffuse epicarditis-related constriction. If the membrane had been directly responsible for the constriction, the patient would have become symptomatic immediately after membrane insertion. Instead, the patient became symptomatic several years after ePTFE insertion, and the localized fibrous pericardial reaction was most probably responsible for the constriction. We have encountered several cases of dense fibrous epicardial reaction underneath an ePTFE membrane but the present report was the first case in which a constriction was encountered. A multi-institutional study of 1085 patients with congenital heart disease who had an ePTFE insertion at the initial operation showed no complications related to the use of the ePTFE membrane during follow-up, although in reoperated patients the underlying epicardium and coronary vessels were sometimes obscured by a film of fine adhesions [5]. This case indicates that even if very rare, a delayed onset of constriction is possible in patients who undergo pericardial substitution with an ePTFE membrane. This prompts us to use it only in patients with a high-risk of reoperation,
and the membrane should not wrap the heart on both its anterior free wall and diaphragmatic surface.

Acknowledgements

To Ian Findlay, for his help in the revision of this manuscript.

References