Surgical ventricular reconstruction and subendocardial resection for the treatment of refractory ventricular tachycardia

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ABSTRACT

We describe a case of 64-year-old female patient with ventricular tachycardia intractable to medical treatment and acute heart failure following myocardial infarction. Emergency surgical ventricular reconstruction and subendocardial resection was undertaken. We discuss the option of surgical intervention in this difficult and unusual clinical scenario.

KEYWORDS

Ventricular tachycardia – Heart aneurysm – Myocardial infarction – Reconstructive surgical procedures

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Case History

A 64-year-old female lifelong smoker with no previous cardiac history presented with a 4-day history of dyspnoea on minimal exertion (New York Heart Association class III). Electrocardiography showed broad complex monophasic ventricular tachycardia (VT) and troponin T was elevated. She was treated initially with intravenous amiodarone and adenosine with no sustained effect.

Transthoracic echocardiography showed a severely dilated left ventricle (LV) with a large aneurysm and severely impaired ventricular function. The ejection fraction was less than 10%. Coronary angiography showed a long segment of moderate to severe disease in the left coronary system and a small right coronary artery with no flow limiting disease. Recurrent intermittent episodes of VT became persistent and intractable. Direct current cardioversion was attempted on at least 20 separate occasions, resulting in only transient amelioration of arrhythmia. Percutaneous coronary intervention was undertaken successfully to the left anterior descending artery to reduce ischaemic burden. Multiple defibrillations were required during the procedure. Intra-aortic counterpulsation balloon pump and transvenous pacing were inserted owing to increasing haemodynamic instability of the patient and VT unresponsive to medical treatment.

The patient underwent emergency remodelling of the LV combined with subendocardial resection of the arrhythmogenic scar tissue. LV remodelling was accomplished by insertion of an elliptical patch of porcine pericardium at the junction of the normal myocardium and scar tissue.

The operation was guided by three-dimensional transoesophageal echocardiography (TOE).

The immediate postoperative TOE showed an ejection fraction of 67.2% (10% preoperatively) and estimated LV stroke volume of 58.2ml. The patient made an uneventful recovery from surgery with complete resolution of VT. She was discharged home ten days later.

Discussion

LV aneurysm is defined as a distinct area of abnormal left ventricular diastolic contour with dyskinesia or local expansile paradoxical wall motion. It results generally from transmural myocardial infarction. In postinfarction LV aneurysm, the fine trabecular pattern of the inner wall is replaced by fibrous scar tissue, giving a characteristic well delineated transmural fibrous scar. Given the pathology of LV aneurysm, the most common presenting symptoms are angina and dyspnoea. However, up to a third of patients present with ventricular tachycardia, which may become intractable to medical treatment, leading inevitably to death.

Subendocardial resection for the treatment of arrhythmia was explored in the 1970s. It was guided by time consuming intraoperative mapping, used to target the place of origin of the abnormal electrical activity.¹ Surgical treatment of VT was largely abandoned owing to high mortality and medical advances in implantable cardioverter defibrillators.

Surgical ventricular reconstruction (SVR) has been practised to treat LV aneurysm since the mid 1980s.² It consists of surgically creating a smaller LV with a normal shape using an endoventricular circulo-plasty technique.

Figure 1 Intraoperative three-dimensional transoesophageal echocardiography showing preoperative diastole (top left) in comparison with postoperative diastole (bottom left) and preoperative systole (top right) in comparison with postoperative systole (bottom right)

Expert guidance of intraoperative TOE is valuable in this procedure.

From the surgical aspect, SVR is limited to anterior wall dysfunction because of the presence of papillary muscles elsewhere in the LV. SVR has a role in the treatment of patients with ischaemic cardiomyopathy. This was explored

in detail in the STICH (Surgical Treatment for Ischaemic Heart Failure) trial. Initial results did not show any advantage of SVR combined with revascularisation over revascularisation alone.⁵ The most up-to-date analysis suggested benefit of the procedure if the LV end-systolic volume was reduced to $\leq 70 \text{ ml/m}^2$.⁴ It also appears that it is probably most appropriate in patients with concomitant VT. Resection of the arrhythmogenic tissue is likely to prevent further episodes of VT, and, at the same time, reconstruction of the dilated LV reduces wall tension and myocardial oxygen demand.

Conclusions

Our report presents an emergency case of intractable VT and acute heart failure following myocardial infarction, which was treated successfully with surgical intervention. Owing to the rarity of the condition, decision making and the timing of the operation is challenging.

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