Case report

Use of mechanical circulatory support in acute circulatory collapse at immediate risk of death after endomyocardial biopsy

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Abstract

There are various indications for a mechanical circulatory support (MCS) devices implantation. We report a case of the use of the MCS in a 39 year old male with acute circulatory collapse and at immediate risk of death after endomyocardial biopsy in order to keep the patient alive until intrinsic cardiac function recovers sufficiently to remove the MCS.

The patient underwent an implantation of the left ventricular assist device according to progressive decline of the cardiac function due to a heart muscle disease. With successful regression of heart failure symptoms and reverse remodeling of LV, the device was explanted after four month. Evidence of myocardial reverse remodeling and functional improvement during MCS in our patient proved the use of mechanical ventricular unloading as a therapeutic strategy aimed at cardiac recovery, allowing removal of the MCS device instead of extending his use as a bridge to heart transplantation.

Keywords

Mechanical circulatory support • Endomyocardial biopsy • Circulatory collapse
Introduction

There are various indications for a mechanical circulatory support (MCS) devices implantation [1]. We here report a rare case of the use of mechanical circulatory support (MCS) in a patient with acute circulatory collapse and at immediate risk of death after endomyocardial biopsy to keep the patient alive until intrinsic cardiac function recovers sufficiently to remove the MCS.

Materials and methods

We have analyzed our patients’ medical records and present them in this case report. The examination and treatment results submitted in this case report are based on the latest examination and treatment guidelines for a patient with similar clinical presentation.

Results

The 39 year old male, a skilled worker at a factory, was admitted to the Dept of Pulmonology and Immunology because of the suspected diagnosis of pneumonia and left pleuritis. He presented with an acute new onset shortness of breath for 1 week duration, accompanied by fatigue, low grade fever (37,1ºC) and left lateral chest pain. Pneumonia of the right lower lobe was confirmed by neutrophilic leucocytosis (WBC 11,5x10⁹/l), CRP – 70,6 mg/l and typical infiltration on chest X-ray. The patient denied any previous cardiovascular disease. His electrocardiogram showed sinus tachycardia with a heart rate 110 b.p.m., incomplete left bundle branch block (QRS 112 ms) and complex forms of ventricular premature beats: polymorfic, allorhythmic, R/T.

Transthoracic echocardiography revealed dilated cardiomyopathy phenotype: left ventricular diastolic diameter (LVEDD) 94 mm; left ventricular diastolic diameter index (LVEDDi) 42,2 mm/m²; left ventricular myocardial mass index (LV MMI) 245 g/m²; left atrium (LA) 52mm; spontaneous echocontrast in LV cavity, severe systolic dysfunction – LV ejection fraction (LVEF) 16%; and normal right ventricular function – tricuspid annular plane systolic excursion 25 mm.
Infection resolved (CRP 2.3g/l), and the patient was transferred to the Dept of Cardiology because of decompensated heart failure of NYHA IV functional class and complex arrhythmias. Coronary angiography performed targeting differential diagnosis and revealed no stenotic lesions. That led to endomyocardial biopsy (EMB) in order to prove/exclude acute myocarditis since there was a new-onset HF of 2 weeks’ duration associated with severe dilatation of LV and hemodynamic compromise – I class B level recommendation [2].

While performing endomyocardial biopsy, the patient experienced circulatory collapse. Urgent echocardiography was undertaken, and pericardial tamponade diagnosed. A cardiac surgeon was called, sympathomimetics, fentanyl i.v., artificial lung ventilation started, and the patient was transferred to the Dept of Cardiac Surgery, and urgent cardiac surgery was performed. Blood from the pericardium was removed, coronary sinus injury near the basis of left atrium auricula repaired with 6.0 Prolene and an intra-aortic balloon pump (IABP) inserted due to persisting hemodynamic compromise.

Early respiratory failure necessitated extracorporeal membrane oxygenation (ECMO). Pulmonary function recovered successfully, and the ECMO was removed after 10 days. Despite timely performed successful repair of the artificial lesion, hemodynamic status deteriorated in the setting of IABP and high doses of inotropic support, therefore 1 day later the patient underwent an implantation of the left ventricular assist device (Thoratec PVAD) according to the INTERMACS 2 level indication - progressive decline of the function [3].

Following 5 weeks, the LV function improved: LVEDD from 94 mm reduced to 52 mm, LVEDDi from 42.2 mm/m² reduced to 22.2 mm/m², LVEF increased from 16% to 38%. During his chronic treatment the patient was taking: prestarium 2.5 mg, bisoprolol 2.5 mg, spironolactone 25 mg and also torasemide 10 mg, cordarone 200 mg, warfarin 5.0 mg, aspirin 100 mg and some magnesium – potassium supplements.

With successful regression of heart failure symptoms and reverse remodeling of LV, the device was explanted after four month. Echocardiography showed a normal-sized LV and
significantly improved systolic function: LVEF increased up to 40%. Functional capacity reached efficiency of 470 m at 6 minutes walk test.

Discussion

Our 39 year old male patient experienced new-onset heart failure (HF) which could be provoked by infective myocarditis following pneumonia or long standing dilated cardiomyopathy with acute decompensation due to infection. In that case, EMB was indicated to confirm the diagnosis, but the procedure was not completed because of the unexpected complication.

There were several indications for MCS device implantation: bridge to decision because of circulatory collapse and at immediate risk of death or as a bridge to transplantation due to dilative phenotype and major advantages: improved survival, functionality and quality of life; and also as a bridge to recovery to keep the patient alive until intrinsic cardiac function recovers sufficiently to remove the MCS keeping in mind possible acute myocarditis.

According to Holzmann M. analysis of 2050 retrospective and 543 prospective major complications during EMB, there was 0.08 % risk of pericardial tamponade with pericardiocentesis [4].

Intra-aortic balloon pumps (IABP) or other devices may be initiated when acute or acute-on-chronic hemodynamic instability requires urgent intervention to avoid permanent end-organ dysfunction or death [5]. Selection to implant IABP for the described patient was cardiogenic shock due to dilated cardiomyopathy or suspected myocarditis.

According to Krabatsch T. and his colleagues who conducted a study with 387 patients with idiopathic dilated cardiomyopathy who underwent LVAD implantation at the German Heart Institute Berlin, LVAD removal due to myocardial recovery was performed with long-term stable cardiac function in 34 patients (weaning rate 8.8%), and the remaining 343 patients did not reach weaning criteria (initial weaning incidence – 10.8%) [6].
Dandel M. and his colleagues indicate that the proportion of patients with non-ischaemic cardiomyopathy who were weaned from ventricular assist devices reached 18%, whereas that of patients with ischaemic cardiopathy was only <1% [7].

**Conclusion**

Evidence of myocardial reverse remodeling and functional improvement during mechanical circulatory support in our 39-year-old male patient proved the use of mechanical ventricular unloading as a therapeutic strategy aimed at cardiac recovery, allowing removal of the mechanical circulatory support device instead of extending its use as a bridge to transplantation.

**Statement on ethical issues**

Research involving people and/or animals is in full compliance with current national and international ethical standards.

**Conflict of interest**

None declared.

**Author contributions**

A.K., E.R. and L.J. prepared the manuscript and analyzed the data, E.R. drafted the manuscript, A.K. read and met the ICMJE criteria for authorship. All authors read and approved the final manuscript.

**References**


