

A case of successful extracorporeal membrane oxygenation for right ventricular failure following pericardiectomy

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SUMMARY

Extracorporeal membrane oxygenation (ECMO) is a useful but less commonly used technique in right ventricular failure post cardiac surgery in our region. We report a case of successful use of ECMO for right ventricular failure post cardiac surgery. Our patient is a 27-year-old male presented with constrictive pericarditis post completion of treatment for disseminated Tuberculosis. He underwent pericardiectomy that was complicated with acute right ventricular failure. He was placed on extracorporeal membrane oxygenation after few hours post op that lasted for five days. The patient survived to hospital discharge and remained well on follow-up. From our experience, this aggressive management approach is beneficial in right ventricular failure and can be safely utilised in all cardiothoracic centres.

KEY WORDS:

Extracorporeal membrane oxygenation, Right ventricular failure, pericardiectomy

INTRODUCTION

Extracorporeal membrane oxygenation (ECMO) is a developing method of temporary cardiac and respiratory support in medical practice. Lack of training and experience with ECMO may be restricting its use. It is useful in conditions where maximal medical therapy has failed such as in right ventricular failure.¹ Right ventricular failure is an anticipated complication post cardiac surgery, where the mortality is 60-70%. We report a case of successful use of ECMO in a patient who developed right ventricular failure post pericardiectomy. In Malaysia, there are no case reports available in the literature regarding ECMO usage in adult cases. The purpose of this report is to share our experience in using ECMO post cardiac surgery and encourage more utilisation of this technique in our national healthcare setting.

CASE REPORT

A 27-year-old male patient post completion of treatment for disseminated Tuberculosis with pleural, pericardial, lung and abdominal involvement was referred to the cardiologist with symptoms of dyspnoea (New York Heart Association classification stage 3-4). Echocardiography and cardiac magnetic resonance imaging (MRI) assessments showed

impaired right ventricular function due to constrictive pericarditis. The MRI showed focal thickening and slightly irregular pericardium about 4 mm at its maximum thickness involving both the ventricular walls and the apex (Figure 1). The rest of the pericardium was relatively smooth measuring 2-3 mm in thickness.

The case was discussed in multidisciplinary team among cardiologist, pulmonologist and radiologist, thus decided for pericardiectomy. Preoperatively the patient was reviewed by the cardiologist for optimisation of his heart failure medication. Anterior pericardiectomy was performed under off-pump technique via median sternotomy route. Immediate transoesophageal echocardiogram post pericardiectomy revealed improved right ventricular contractility and patient was hemodynamically stable with minimal inotropic support. After few hours post op, the patient's inotropic requirement was increasing, and repeated echo showed poor contractility of the right ventricle.

Diagnosis of right ventricular failure was made during a discussion among surgeons and cardiac anaesthesiologist thus decided to use extracorporeal membrane oxygenation. ECMO was established through veno-arterial route via femoral cannulation and activated clotting time was maintained at 200 sec. Regular blood investigations were monitored and corrected. During ECMO, ventilator settings and inotropic requirements were slowly weaned down. Repeated transoesophageal echocardiogram showed dilated right ventricle and right atrium with mild improvement of contraction. On day three post surgery, we managed to wean down ECMO to half flow and assessment showed marked improvement of right ventricle contractility. On day five post surgery it was weaned down further and removed. Before removal, hemofiltration was performed to reduce right ventricle volume overload. Post removal, patient was hemodynamically stable with low inotropic support and maintained a good cardiac index. Liver function test showed a rise of alanine transaminase level and indirect bilirubin most probably secondary to haemolysis. Ultrasound of the hepatobiliary system showed liver congestion secondary to right heart failure. On day seven post surgery, moderate pleural effusion at right lung was noted, and a chest drain was inserted. Subsequently the patient was extubated on day ten post surgery.

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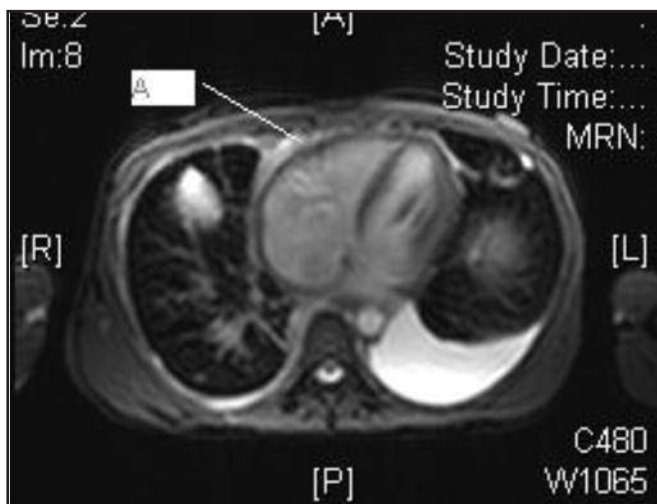


Fig. 1: MRI showed focal thickening and slightly irregular pericardium about 4mm at its maximum thickness.

Patient was discharged well and followed up in clinic. His pericardial biopsy report showed mild inflammation and no evidence of chronic granulomatous inflammation. During the follow-up patient was asymptomatic and echocardiogram showed improved ventricular function (EF 65%).

DISCUSSION

Constrictive pericarditis is a chronic inflammatory process that leads to progressive pericardial fibrosis encasing the heart in a thickened and fibrotic pericardium. Pericardiectomy remains the only effective surgical treatment available for this disorder. Mortality post pericardiectomy ranges from 10-15%, and the principal cause of mortality in the immediate post operative period was low cardiac output syndrome with right ventricular failure.²

Medical management is usually not satisfactory in this state, so invasive method like extracorporeal membrane oxygenation is preferable to rest the heart until it can adapt to the new environment. There are many dilemmas as in when to initiate it and its indications. ECMO should be initiated after discussion among surgeons and anaesthesiologist, based on variation from case to case basis. In our case, ECMO was initiated few hours post-surgery due to late deterioration of ventricular function. Role of prophylactic ECMO initiation immediately after surgery in high-risk cases are still not clear.

Decision of the route for extracorporeal membrane oxygenation plays an important part in term of adequate oxygenation and achieving full support. As per initial experience, veno-arterial route allows bypassing of the pulmonary bed, therefore, relieves the right ventricular pressure overload and does not cause further elevation of the pulmonary pressures.³

According to literature, overall mortality of extracorporeal membrane oxygenation method was 54%, with 45% of fatal events occurring during ECMO and 13% after it.⁴ The common complications are renal failure requiring continuous veno-venous haemofiltration (occurring in 52%), followed by bacterial pneumonia (33%), bleeding (33%), oxygenator dysfunction requiring replacement (29%), sepsis (26%), haemolysis (18%), liver dysfunction (16%), leg ischaemia (10%), venous thrombosis (10%), central nervous system complications (8%) and gastrointestinal bleeding (7%). According to Extracorporeal Life Support Organization registry the bleeding is generally due to thrombocytopenia, thrombocytopathia, and fibrinolysis rather than heparinisation per se, so reversing heparin with protamine is rarely helpful.

The most important decision in managing ECMO is when to start weaning down. Although extracorporeal membrane oxygenation is widely used as a temporary circulation support, there are no reports of direct parameters indicating cardiac recovery to determine the timing of weaning off.⁵ Extracorporeal Life Support Organization registry protocol suggest that with the evidence of improved aortic pulsatility and contraction on echocardiography, the flow can be reduced to 50%, then 25% of adequate cardiac output. During this crucial period sustainability of cardiac output with low flow will reflect recovery and decanulation should be considered.

CONCLUSION

This is a good example of a successful utilisation of extracorporeal membrane oxygenation post cardiac surgery in an adult patient. This will further improve survival rate in right ventricular patients post cardiac surgery. However more utilisation, experiences and understanding of the indications and handling methods is of need.

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