

Should heart failure patients be left to fate? Temporary implementation of veno-arterial extracorporeal membrane oxygenation for haemodynamic support during excision of rectal carcinoma in an end-stage biventricular heart failure patient

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Abstract

Management of end-stage heart failure patients requiring major general surgery is not well defined. Due to poor cardiorespiratory reserve, perioperative morbidity and mortality are excessively high. We report a case of temporary implementation of veno-arterial extracorporeal membrane oxygenation for haemodynamic support during excision of rectal carcinoma in an end-stage heart failure patient and describe perioperative management.

Keywords

Heart failure, carcinoma, mechanical circulatory support

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Introduction

End-stage heart failure patients requiring major general surgery are at high risk for perioperative morbidity and mortality.¹ Poor cardiorespiratory reserve and volume shift predispose patients to severe haemodynamic instability and potentially fatal acute heart failure. We describe a case of successful temporary implementation of veno-arterial extracorporeal membrane oxygenation (ECMO) for haemodynamic support during excision of rectal carcinoma in an end-stage biventricular heart failure patient, including perioperative management. Written informed consent to publish this report was obtained from the patient.

Case report

A 63-year-old male Caucasian with end-stage heart failure due to ischaemic cardiomyopathy and a history of recurrent cardiac decompensation despite optimal medical therapy according to the guidelines of the European Society of Cardiology for treatment of chronic heart failure² was admitted for surgical treatment of a rectal adenocarcinoma. A colonoscopy performed due to haematochezia during hospitalization revealed

an apparently malignant tumour at 8 cm from the sphincter. Histological examination of the specimen showed an invasive, ulcerated, poorly differentiated transmural adenocarcinoma.

Echocardiographic examination revealed dilation (left ventricular end-diastolic diameter: 47 mm, right ventricular longitudinal diameter: 85 mm, mid-right ventricular diameter: 85 mm) and severe systolic dysfunction of both ventricles (left ventricle: ejection fraction 15%, global longitudinal strain: -3.9% /right ventricle: tricuspid annular plane systolic excursion: 8 mm). Right heart catheterization documented severe pulmonary hypertension (mean pulmonary artery pressure: 54 mmHg) and compromised cardiac output

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(cardiac index: 1.8 L/min/m²). Functional state at admission was reduced (New York Heart Association (NYHA) stage IIIb). Exercise capacity was severely restricted with the patient requiring assistance during routine activities. The patient and his relatives were informed of the necessity to implement temporary mechanical circulatory support during excision of the rectal carcinoma and possibly total artificial heart therapy as destination therapy should weaning from veno-arterial ECMO support fail.

Levosimendan preconditioning (0.1 µg/kg/min) was performed 24 h prior to surgery to increase right ventricular contractility and decrease cardiac afterload. Intraoperatively, following introduction of the arterial cannula over a 10-mm Dacron graft in the axillary artery, percutaneous venous cannulation of the right jugular vein and a single administration of 50 U/kg unfractionated heparin, partial ECMO support (Bio Console 560; Medtronic Minnesota, USA) was initiated with pump flow of 1.5 L/m²/min. Mesorectal excision of the carcinoma and temporary ileostomy were then performed in a state of full haemodynamic stability. Histologic examination showed an invasive, ulcerated, poorly differentiated transmural adenocarcinoma with locoregional lymph-node metastases (tumour classification: G3 pT3 N2a(6/14) R0 L1).

In order to prevent bleeding complications, we did not administer continuous systemic anticoagulation with intravenous heparin during ECMO therapy. The patient was successfully weaned from ECMO support 22 h later and from mechanical ventilation on postoperative day 2. He was discharged from hospital on postoperative day 13 and has to date, 55 days after surgery, experienced no adverse events. The tumour board rejected adjuvant chemotherapy on the basis of the patient's cardiac state. End-stage heart failure (NYHA IIIb) still limits the patient's quality of life. Ileostomy closure is planned after general recovery without ECMO, depending on the cardiac state.

Discussion

Management of end-stage heart failure patients during major general surgery poses a significant challenge to treating physicians and is still not well defined. During preoperative preparation, special care should be taken to optimize cardiac function. We preconditioned our patient with levosimendan, a calcium sensitizer with positive inotropic as well as vasodilatory effects in the systemic and pulmonary circulation, which improved cardiac output and decreased mean pulmonary artery and atrial pressure.³ Due to the long half-life of its active circulating metabolite OR-1896, a single preoperative infusion of levosimendan is still effective during the prognostically crucial early postoperative course.³ In the intra- and postoperative setting, the focus must be on anticipating technical or surgical complications that could potentially compromise cardiac

function and therefore impede weaning from ECMO support. Cannulation of the axillary artery and the jugular vein facilitates any positioning of the patient that is necessary to optimally expose the surgical site without the risk of cannula kinking. The use of heparin-coated circuits and centrifugal pumps allows delayed initiation and as in our case even short-term withdrawal of systemic anticoagulation.⁴ The implementation of only partial ECMO support in combination with the lasting effects of preoperative levosimendan therapy proved to be helpful in maintaining a high degree of pulsatility and facilitating early weaning in a patient who according to current criteria has no myocardial recovery potential.⁵

Conclusion

This case demonstrates that safe performance of major general surgery in end-stage heart failure patients is feasible, provided that special care is taken to optimize cardiac function before surgery and to avoid technical complications in the operative setting. Perioperative application of a calcium sensitizer stabilizes cardiac function and due to its long half-life facilitates early weaning from temporary mechanical circulatory support. Intraoperative cannulation of the axillary artery and the jugular vein facilitates proper positioning of the patient without the risk of cannula kinking.

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Ethical approval

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Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

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