

VV ECMO to the Rescue!

Successful Recovery from Refractory Intraoperative Anaphylaxis Following Redo Sternotomy for Mitral Valve Replacement

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Background

Anaphylaxis is a rare but severe and potentially fatal complication during general anesthesia. Administration of multiple potential triggers during their anesthetic course increases the anaphylaxis potential during surgery. These triggers include the use of muscle relaxants, antibiotics, antifibrinolytics, heparin, protamine, and blood products. Patients with cardiopulmonary risk factors undergoing major cardiac surgery must be carefully monitored for anaphylaxis throughout their perioperative course. However, there is a unique opportunity for patients to receive rapid initiation of mechanical circulatory support through interdisciplinary collaboration.

With veno-venous extracorporeal membrane oxygenation (VV-ECMO), deoxygenated blood from the venous system is drained through an external circuit. This circuit contains a gas-permeable membrane and an oxygenator to remove carbon dioxide and oxygenate the blood, respectively. Blood is then returned to the venous system. The primary indication of VV-ECMO is severe, acute, reversible respiratory failure refractory to optical medical management.

Case Presentation

We present a case of a 65-year-old female with a history of coronary artery bypass and aortic valve replacement undergoing redo sternotomy for mitral valve replacement (MVR). Following an uneventful separation from cardiopulmonary bypass, protamine sulfate was administered, followed by platelets and fresh frozen plasma (FFP). After completion of protamine and in the middle of platelet/FFP transfusion, the patient demonstrated signs of anaphylaxis with elevated peak airway pressures, hypotension, and hypoxia. Epinephrine, steroids, albuterol, magnesium, and nitric oxide were instituted, with minimal improvement.

Following an intraoperative multidisciplinary discussion between the cardiothoracic surgeon and cardiothoracic anesthesiologist, the decision was made to utilize VV-ECMO. Tryptase levels at the time of the reaction were subsequently found to be markedly elevated, supporting the diagnosis of anaphylaxis to either protamine, blood products, or both.

After 24 hours, the patient’s hemodynamics improved significantly. The patient was successfully weaned off ECMO postoperative day (POD) one and extubated POD two.

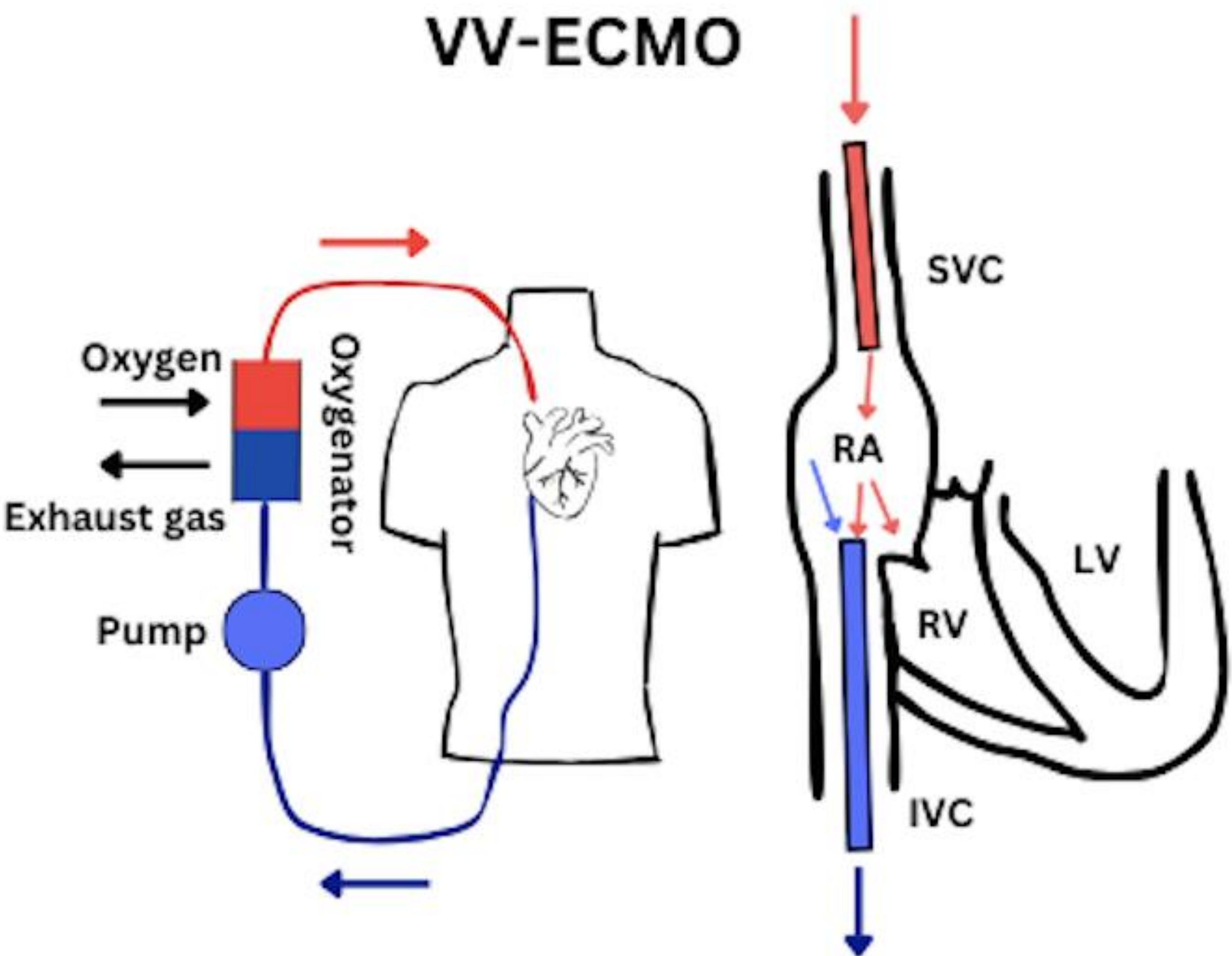


Figure 1. Graphical representation of VV-ECMO. Adapted from icuECMO.ca

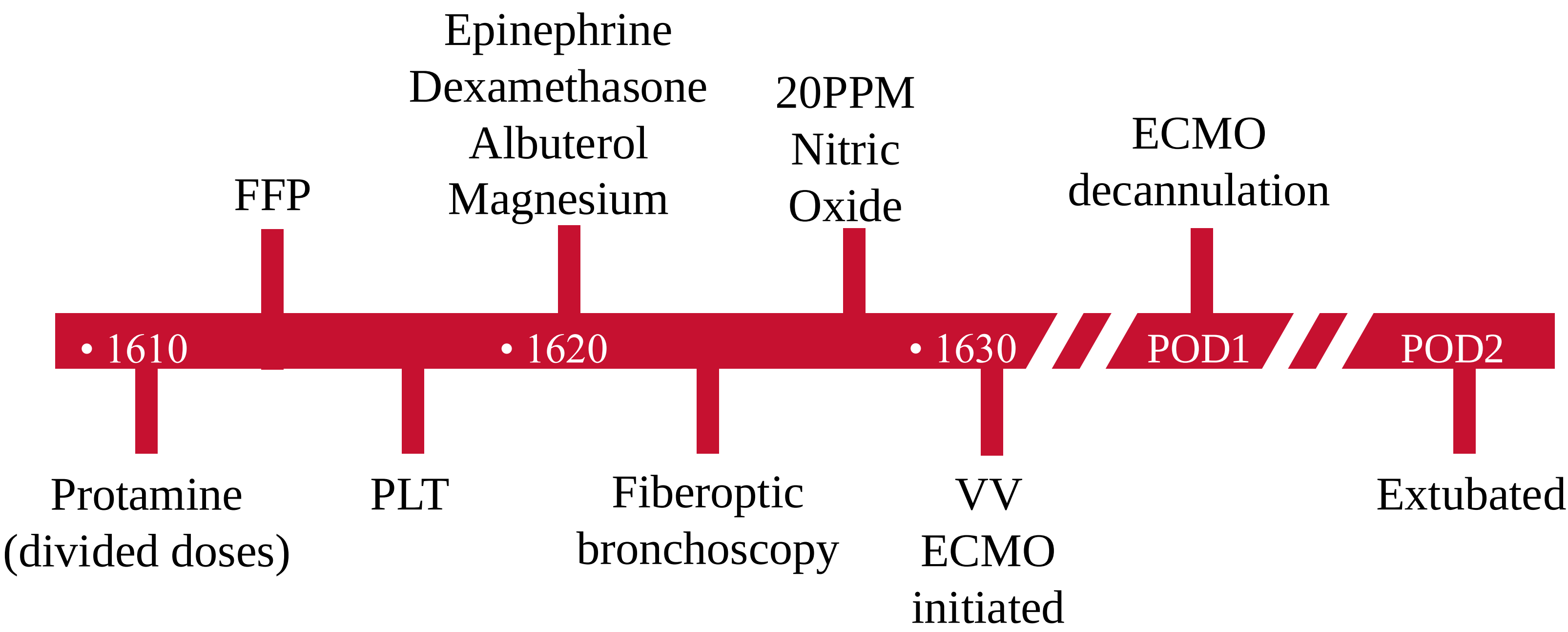


Figure 2. Intraoperative timeline of medication and blood product administration followed by select interventions and perioperative events.

Case Discussion

This report presents the successful use of VV-ECMO in a cardiac surgery patient with refractory respiratory failure and vasodilatory shock caused by intraoperative anaphylaxis in the setting of protamine and blood product administration.

Protamine is administered to reverse the systemic anticoagulant effects of heparin in cardiac surgery while on cardiopulmonary bypass. When administered intravenously, the alkaline protamine reacts with the acidic heparin forming a neutral salt. These protamine–heparin complexes are thought to be responsible for the adverse effects of protamine administration, including anaphylaxis and high pulmonary artery pressures. The incidence of reactions to protamine is believed to vary from 0.06% to 10.6% and ranges from minor hemodynamic changes to complete cardiovascular collapse.

VV-ECMO provides respiratory support to patients with severe respiratory deterioration unresponsive to standard therapies; however, its utilization in patients with anaphylactic shock due to protamine and transfusion-related reactions has only been sparsely reported. In our case of anaphylaxis, the patient’s hemodynamics remained unstable despite the use of conventional therapy. ECMO acts as a bridge to recovery and shows promise as an effective intervention for severe, refractory cases of intraoperative anaphylaxis.

References



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