

Management of Refractory Differential Hypoxia on Hybrid V-AV ECMO with VV-AA Reconfiguration as a Bridge to Lung Transplant

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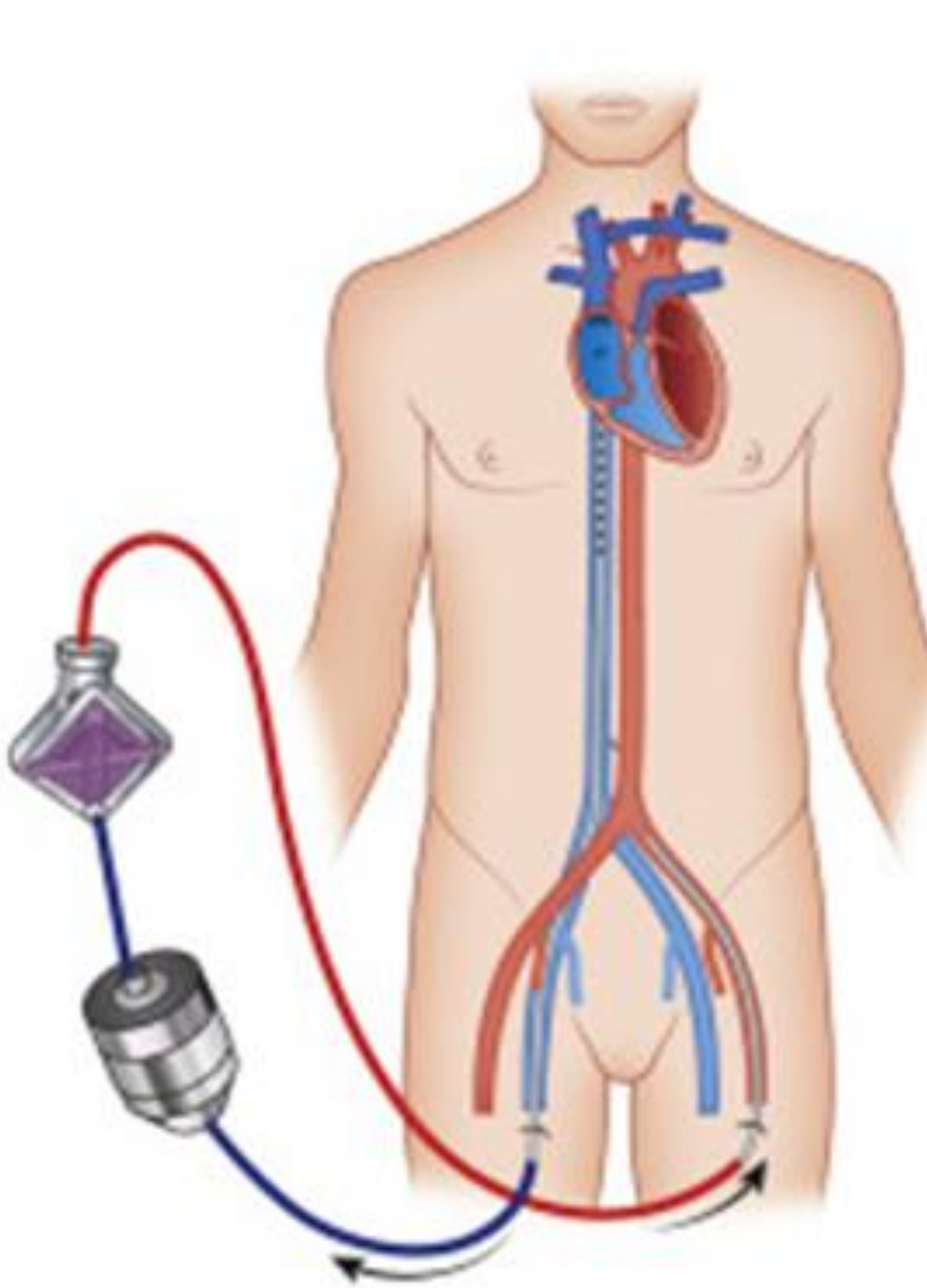


Introduction

In patients with isolated cardiac or combined cardiopulmonary failure, Veno-Arterial Extracorporeal Membrane Oxygenation (VA ECMO) is the preferred support. Patients who are on VA ECMO and have respiratory failure leading to North-South syndrome, may require the addition of a venous return cannula, in order to switch to a veno-arterio-venous (V-AV) ECMO. If a change in cannulation strategy is required, conversion to a central cannulation may be considered.

Case Report

A 42-year-old man with end-stage familial pulmonary fibrosis, listed for lung transplantation, presented in acute on chronic respiratory failure. His course was complicated by mixed distributive and cardiogenic shock, requiring emergent VA ECMO followed by conversion to V-AV configuration due to presumed differential hypoxia. Despite cardiac recovery and weaning off inotropes and pressors, the patient had persistent, refractory differential hypoxemia and marked pulsatility, despite on full-flow V-AV ECMO support, inhaled nitric oxide and resting ventilator settings. Oxygenation slightly improved by limiting flow through the arterial outflow cannula, maintaining a minimum of 2 LPM to prevent stasis. Trials of beta-blockade and diuresis provided minimal benefit. Given ongoing hypoxemia, the decision was made to proceed with central arterial cannulation and reconfigure to VV-AA ECMO as a bridge to lung transplantation. After twelve days of ECMO support, the patient underwent successful bilateral orthotopic lung transplantation.

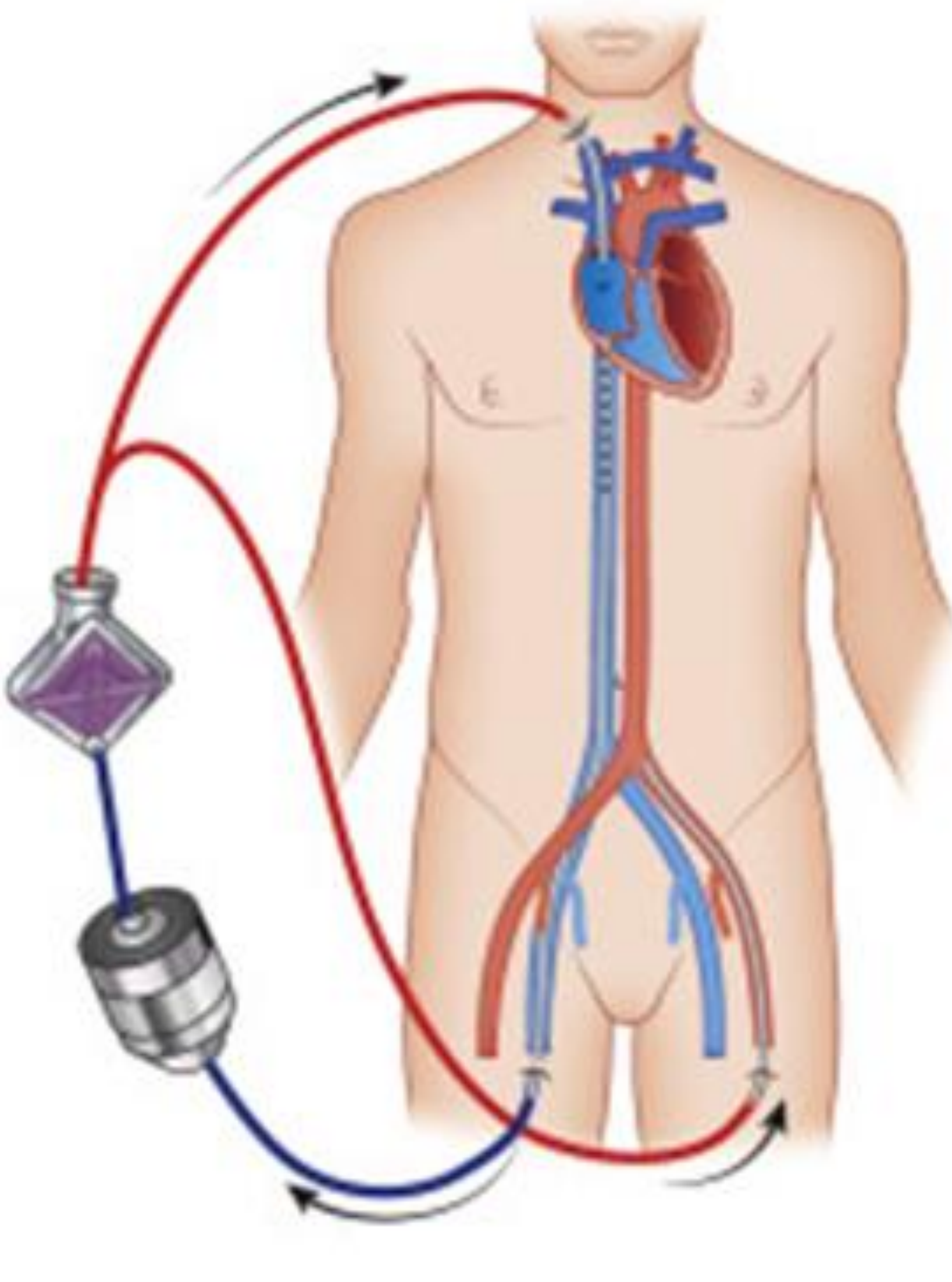


Peripheral VA ECMO

RCFV 27Fr drainage cannula

RCFA 21 Fr reinfusion cannula

7Fr SFA distal perfusion cannula

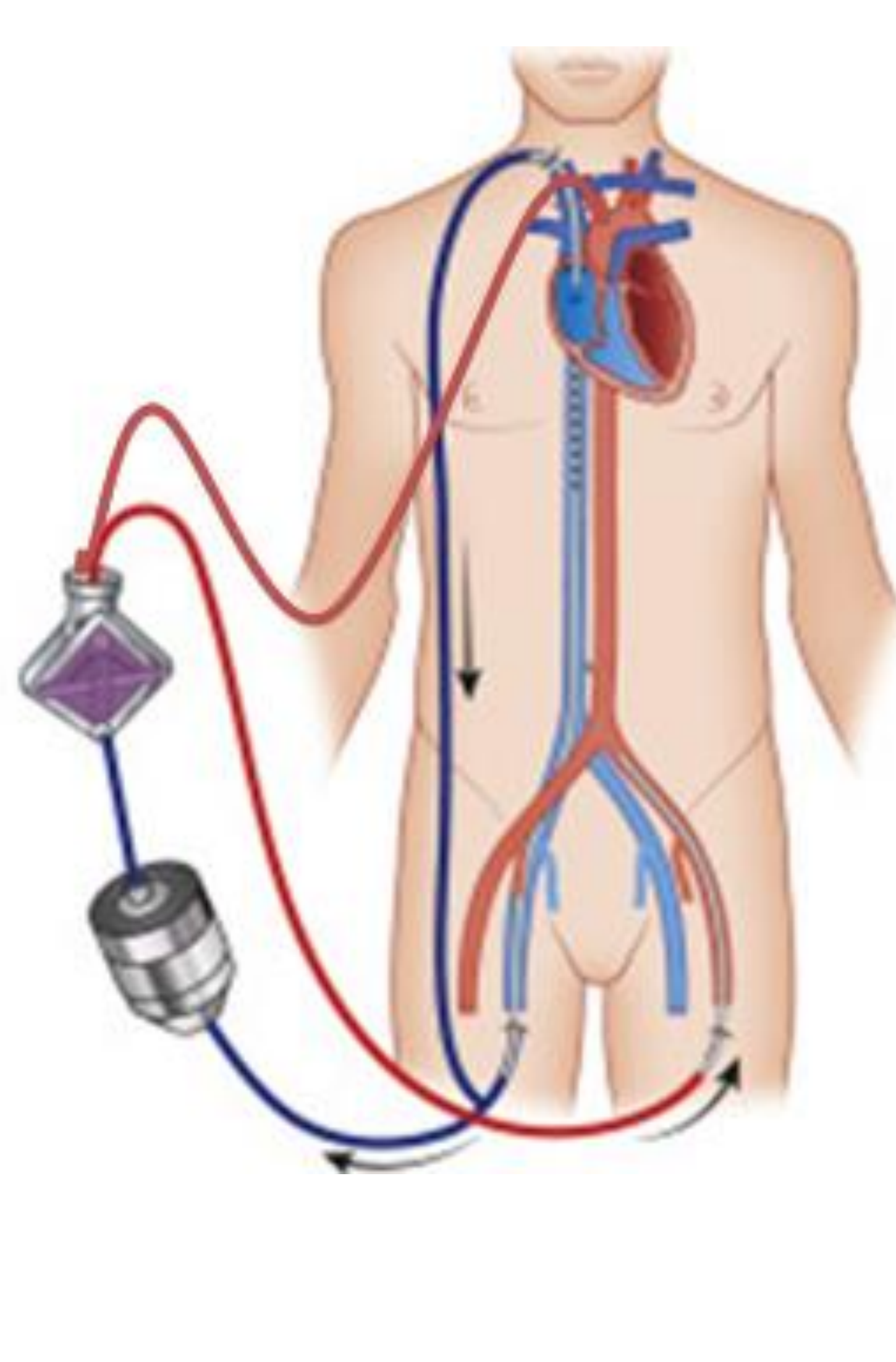


Hybrid V-AV ECMO

RCFV 27Fr drainage cannula

RIJ 19Fr reinfusion cannula
RCFA 21 Fr reinfusion cannula

7Fr SFA distal perfusion cannula



Central VV-AA ECMO

RCFV 27Fr drainage cannula
RIJ 19Fr drainage cannula

Ascending Aorta 20Fr reinfusion
cannula
RCFA 21 Fr reinfusion cannula

7Fr SFA distal perfusion cannula

Discussion

In patients on isolated VA ECMO, conversion to a hybrid or parallel ECMO strategy may prove beneficial if support is insufficient. Data show that less than 1% of adults supported for respiratory or cardiac failure are supported with a hybrid circuit strategy.

In patients with refractory differential hypoxemia on VA ECMO, a venous return cannula can be added to the circuit either via the right internal jugular vein or the femoral veins, allowing for the return of oxygenated blood to the right circulatory system and can be helpful in the setting of North-South syndrome. Access and positioning of the cannula is no different from positioning a venous return cannula in a patient supported on isolated VV ECMO, or an arterial return cannula in a patient support on isolated VA ECMO, respectively. In either case, the cannula is connected to the existing ECMO circuit with a Y-connector from the return limb of the circuit.

As an alternative to VAV ECMO configuration or in cases of refractory hypoxia despite VAV ECMO, central VA ECMO should be considered.

Conclusion

Strategic hybrid ECMO reconfiguration can effectively address refractory differential hypoxemia and bridge patients to definite therapy.