RESPIRATORY ECMO: BENEFITS BEYOND GAS EXCHANGE

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ABSTRACT
A 32 years old male patient was suffering from a severe form of tuberculosis necessitating respiratory support with peripheral veno-venous ECMO through a dual lumen Avalon Elite cannula inserted through the right internal jugular vein into the SVC and IVC. Left pleural effusion was treated with intercostal drain. Over the following 24 hours the patient became profoundly hypotensive, with reduced ECMO flow, and reduced haemoglobin level. Chest radiograph showed complete white out of both lungs with a left chest drain and a deviated right Avalon Elite ECMO cannula. Multidetector computed tomography demonstrated a large left haemothorax adjacent to the chest drain, causing mediastinal shift to the right. The right ventricle was compressed against the chest wall and there was collapse of both lungs. The compression of the right ventricle against right anterior chest wall explained the clinical presentation of extrapericardial tamponade. We stipulate that the presence of the long large bore relatively rigid Avalon Elite ECMO cannula precluded the mediastinum from further displacement and imminent cardiac arrest. The haemothorax was surgically evacuated and after two months ECMO was weaned off.

INTRODUCTION
A 32 years old male patient was suffering from a severe form of tuberculosis necessitating respiratory support with peripheral veno-venous extracorporeal membrane oxygenation (ECMO) through a dual lumen Avalon Elite cannula inserted through the right internal jugular vein into the SVC and IVC. Left pleural effusion was treated with intercostal drain. Over the following 24 hours the patient became profoundly hypotensive, with reduced ECMO flow, and reduced haemoglobin level. Chest radiograph (Figure 1a) showed complete white out of both lungs with a left chest drain (thin arrow) and a deviated right Avalon Elite ECMO cannula (block arrow). Multidetector computed tomography (Figure 1b and Figure 1c) demonstrated a large left haemothorax (white star) adjacent to the chest drain, causing mediastinal shift to the right. Note the close proximity of the right ventricle to the chest wall (notched arrow) and collapse of both lungs (black star).

Pathophysiology
The haematoma in this case displaced the mediastinum into the right hemithorax and the right ventricle was compressed against the anterior chest wall, clinically resulting in extrapericardial tamponade.

We stipulate that the presence of the long large bore relatively rigid Avalon Elite ECMO cannula precluded the mediastinum from further displacement and imminent cardiac arrest.

We conclude that in this case the ECMO cannula not only facilitated gas exchange, but also acted as a stabilizing tool for intrathoracic structures.

Outcome
The haemothorax was surgically evacuated and after two months ECMO was weaned off.
DISCUSSION AND CONCLUSION

ECMO is a supportive measure for patients in severe cardiovascular or respiratory failure. While it is accepted as a mainstream treatment in the paediatric population [1], its use in adults has been less popular until the publication of CAESAR trial [2]. Following this respiratory ECMO has become a popular method of support for adult patients in extreme respiratory failure who are unlikely to survive with conventional mechanical ventilator support [3].

The results, as documented in the ELSO database [4], offer up to 70% survival rates. The use of modern dual lumen cannulae, like Avalon Elite, has become popular due to its simplicity, safety profile, and ease of mobilisation of patients needing long-term support [5]. This cannula offers not only adequate blood flow to allow oxygen flux and carbon dioxide clearance, but it also has the unique property of entering the inferior vena cava through the right atrium and superior vena cava [6]. Hence the cannula provides relative fixation of the mediastinal structures and prevents them from extreme displacement. Large pleural collections are common in patients with severe respiratory failure resulting from tuberculosis [7]. In ECMO supported patients, who are anticoagulated, inserting intercostal drains can occasionally lead to large haemothorax [8]. These haemothoraci can occasionally be so large and expand rapidly that they can cause extrapericardial tamponade [9]. A variety of protective mechanisms for such tamponades causing imminent death have been described [10].

In this case we report the haemothorax was so large that it displaced the mediastinum in the right haemothorax to a degree that the right ventricle was compressed against the right chest wall, thus producing signs of extrapericardial tamponade. We stipulate that if there was not relative splinting of the mediastinum by the ECMO Avalon Elite cannula the right ventricular compression would have lead to a rapid tamponade and cardiac arrest.

REFERENCES