OPTIMAL MEROPENEM EXPOSURE MAY BE ACHIEVED WITH STANDARD DOSES IN PATIENTS RECEIVING ECMO

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Introduction: Patients undergoing ECMO for respiratory failure are often diagnosed with or presumed to have viral and/or bacterial pneumonia (Fig 1). A significant proportion of patients also develop infections during ECMO. Currently, there are no guidelines for antibiotic drug dosing during ECMO despite concerns of altered pharmacokinetics (PK) in these complex patients (Fig 2).

Methods: PK sampling for meropenem was performed in 11 ECMO [venovenous (VV) ECMO, n=6; venoarterial (VA) ECMO, n=5] patients and in 10 non ECMO controls. Data related to demographic and severity of illness, organ function and extended daily dialfiltration (EDD-f) were also collected. Meropenem concentrations were determined using validated chromatography. PK analysis was performed using non-linear mixed effects modelling.

Objectives: To compare pharmacokinetics (PK) of standard dose meropenem (1 g 8 hourly) in ECMO patients with critically ill patients not receiving ECMO and with preserved renal function (controls).

Fig 1. Lung recovery may rely on optimal antibiotic therapy

Results: Five out of 11 ECMO (2 VV, 3 VA) patients received EDD-f. ECMO patients had significantly higher volume of distribution (Vd, p<0.05) and lower clearance (CL, p<0.05) when compared to controls who exhibited augmented renal clearance (ARC, p<0.05).

Consequently, the control group only achieved 45% time above minimum inhibitory concentration (T>MIC) for MIC = 2mg/L and 20% for T>4xMIC i.e. 8mg/L. The ECMO patients however, achieved 100% T>MIC for 2mg/L and 80% T>4xMIC. (Fig 3)

Fig 2. Optimal antibiotic dosing is challenging in a critically ill patient on ECMO and RRT

Conclusions: In patients receiving meropenem on ECMO, standard dosing results in optimal drug concentrations. However, the variability is high and clinicians need to consider the presence of ECMO, renal replacement therapy (RRT) and ARC while choosing doses for patients.

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Fig 3. Patients on ECMO achieved 100% T>MIC for 2mg/L and 60% T>4xMIC upon standard dosing