INFLUENCE OF VENOVENOUS EXTRACORPOREAL MEMBRANE OXYGENATION ON THE PHARMACOKINETICS OF VANCOMYCIN IN ADULTS: CAN AN OPTIMAL PHARMACODYNAMIC TARGET BE ACHIEVED?

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Background

Patients undergoing extracorporeal membrane oxygenation (ECMO) may present significant changes in antibiotics pharmacokinetics (PK).

Purpose

To describe the PK of vancomycin in ECMO patients and the achievement of a therapeutic pharmacokinetics/pharmacodynamics (PK/PD) target.

Material and methods

Retrospective PK study in adult critically-ill patients treated with vancomycin with therapeutic drug monitoring (TDM) and undergoing venovenous ECMO in a university hospital from July 2017-October 2021.

TDM samples (steady state): before dose and 2h after the intravenous infusion (intermittent infusion) or at any time (continuous infusion). PK parameters and area under the curve in plasma (AUC24h) estimated by a Bayesian software.

Data collected: demographics, clinical, microbiological and PK/PD parameters: AUC24h, minimum inhibitory concentration (MIC), clearance (Cl), elimination half-life (t1/2), volume of distribution (Vd) and dosage recommendation. Infratherapeutic, therapeutic or supratherapeutic PK/PD target defined: AUC/MIC <400, 400-600 and >600, respectively.

Results

Ten episodes of treatment from 7 patients: median(range): 58.5(35-68) years, 6(85.7%) men. Infections type: respiratory 8(80%) and bacteremia 2(20%); directed treatment in 6(60%); most frequent pathogens: *S. epidermidis* 3(50.0%)(MIC:1, 2 and 2 mg/L), MSSA 2(33.3%)(MIC:0.5 mg/dL) and *S. haemolyticus* 1(16.7%)(MIC:1 mg/L).

Table 1.PKPD data

	BW (kg)	eGFR (ml/min)	Dose (mg/kg/day)	Cmin/Cmax or Css (mg/L)	AUC0-24h (mg*h/L)	AUC/MIC	t1/2 (h)	VdCl (L/kg)	Dose Action (L/h)
1	83	106	24.1mg/kg/24h	12.1	291	145.5	7.2	0.7	6.6 Increase
2	60	101	16.6mg/kg/8h	12.8/25.9	500	500	6.7	0.7	5.6 Maintain
3	50	133	30.0mg/kg/24h	18.4	441	882	7.2	0.7	4.0 Increase **
4	50	121	20.0mg/kg/12h	13.9/44.5	640	1280	7.9	0.6	3.0 Reduce
5	80.5	95	43.5mg/kg/24h	17.8	672	672	6.4	0.6	5.6 Reduce
6	80.5	104	37.3mg/kg/24h	22.6	542	271	8.5	0.7	4.6 Increase
7	85	132	35.3mg/kg/24h	25.9	620	620	8.6	0.7	5.3 Reduce
8	83	34*	24.1mg/kg/24h	29	696	696	21	0.8	2.4 Reduce
9	123	25*	16.3mg/kg/24h	28.8	691	691	27.5	0.6	2.1 Discontinue
10	123	50*	10.2mg/kg/24h	27.6	660	660	48.2	1.1	2.0 Reduce

*Continuous-Renal-Replacement-Therapy (CRRT)
**MIC 0.5mg/L but considered a value of 1mg/L.

Conclusions

- A high interindividual variability in vancomycin PK and need for dose adjustments was observed in critically ill patients with ECMO, which highlight the need for close therapeutic monitoring.
- ECMO and CRRT patients were more likely to have supratherapeutic plasma concentrations requiring dose reductions.

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