Category :**Infections + antimicrobials**

**A108 -** ***Evaluation of the utility of bioelectrical impedance analysis as a bedside tool to monitor the volume of distribution of hydrophilic antibiotics in critically ill patients***

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## Introduction:

Increased distribution volume ($V_d$) of hydrophilic antibiotics may lead to inadequate antimicrobial exposure and potential therapeutic failure in critically ill patients. Covariates accurately describing (variability in) $V_d$ are lacking. Bioelectrical impedance analysis (BIA) has been proposed as a promising tool to monitor $V_d$ in critical illness. Therefore, we aimed to evaluate correlations between BIA-derived fluid estimates and $V_d$ of piperacillin-tazobactam and vancomycin in critically ill patients.

## Methods:

A prospective observational study was conducted in adult patients treated with piperacillin-tazobactam or vancomycin at the intensive care units of UZ Leuven. BIA was performed on consecutive antibiotic treatment days, in conjunction with blood sampling to calculate $V_d$ (one-compartment analysis). Absolute and differential (i.e. changes) values of consecutive BIA-derived fluid estimates and $V_d$ were determined. Correlations between fluid estimates and $V_d$ were expressed as Pearson correlation coefficients.

## Results:

We included 21 patients treated with piperacillin-tazobactam and 7 patients treated with vancomycin. Absolute ($n$=80) and differential ($n$=52) values of fluid estimates and $V_d$ are summarized in Table 1. Overall, correlations were weak and non-significant. A significant correlation with $V_d$ was only observed for absolute intracellular water volumes in patients treated with vancomycin (r=0.44; $p$=0.03). No significant correlations were found for changes in fluid estimates and $V_d$ of the studied antibiotics.

## Conclusion:

This study failed to demonstrate clinically relevant correlations between BIA-derived fluid estimates and $V_d$ of piperacillin-tazobactam and vancomycin, expressed as absolute and differential values. Consequently, we were not able to corroborate the previous suggestion that $V_d$ of hydrophilic antibiotics can be estimated with BIA. Further research on the utility of covariates to reliably monitor $V_d$ in critically ill patients should be encouraged.

**Table:**

| | Piperacillin-tazobactam: median [IQR] (n=55) | Piperacillin-tazobactam: median [IQR] Δ (n=34) | Vancomycin: median [IQR] (n=25) | Vancomycin: median [IQR] Δ (n=18) |
|---|---|---|---|---|
| TBW (L) | 42.3 [36.9;46.7] | -0.4 [-2.1;0.7] | 44.3 [37.6;48.7] | -1.2 [-3.5;0.8] |
| ECW (L) | 20.4 [18.4;23.5] | -0.1 [-1.1;0.3] | 20.2 [19.4;25.7] | -0.3 [-0.9;0.6] |
| ICW (L) | 21.8 [17.9;23.8] | -0.3 [-1.1;0.6] | 23.6* [17.7;27.1] | -0.3 [-1.7;0.1] |

| | | | | |
|---|---|---|---|---|
| FFMH (%) | 78.2 [74.0;80.5] | -0.4 [-1.5;0.6] | 77.2 [76.3;82.6] | -0.4 [-2.7;1.8] |
| Excess fluid (L) | 2.8 [0.2;6.2] | -0.2 [-1.1;0.2] | 3.3 [1.9;6.7] | -0.3 [-1.3;1.4] |
| Vd (L) | 25.5 [16.6;40.1] | -1.1 [-10.7;17.0] | 82.5 [46.2;114.5] | -7.0 [-26.3;16.4] |
| Vd (L/kg) | 0.35 [0.25;0.59] | -0.02 [-0.19;0.23] | 1.10 [0.70;1.55] | -0.09 [-0.36;0.22] |

*Δ differential value, i.e. change between two consecutive inclusion days; * statistically significant ($p<0.05$) correlation with Vd; BIA: bioelectrical impedance analysis; ECW: extracellular water; FFMH: fat-free mass hydration; ICW: intracellular water; IQR: interquartile range; TBW: total body water; Vd: volume of distribution*