

Category : **Sepsis: biomarkers**

## **A134 - Bioelectrical impedance analysis as a bedside tool to estimate volume of distribution of hydrophilic antibiotics in critically ill patients**

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### **Introduction:**

Increases in distribution volume ( $V_d$ ) have been suggested to be responsible for subtherapeutic exposure to hydrophilic antibiotics in critically ill patients with sepsis. Until today, no simple and accurate tool has been found to quickly quantify the  $V_d$  of antibiotics. Therefore, the primary aim of the present study was to explore the correlation between bioelectrical impedance analysis (BIA) estimated fluid volumes and the  $V_d$  of several hydrophilic antibiotics in critically ill patients. Furthermore, the relationship between BIA measurements and the sequential organ failure assessment (SOFA) score and cumulative fluid balance was evaluated.

### **Methods:**

A prospective observational study was carried out in patients treated with amoxicillin/clavulanic acid, meropenem, piperacillin/tazobactam or vancomycin, admitted to the intensive care unit (ICU) of UZ Leuven. BIA measurement was performed during the same dosing interval as the collection of blood samples to calculate the  $V_d$  of the administered antibiotic.  $V_d$  was calculated using non-compartmental analysis.

### **Results:**

In total, 68 patients were included. As shown in Table 1, significant correlations between  $V_d$  and BIA measurements of body water were found for amoxicillin/clavulanic acid ( $r > 0.78$ ; strong), meropenem ( $r > 0.43$ ; moderate) and piperacillin/tazobactam ( $r > 0.51$ ; moderate). When all antibiotics were pooled, correlation remained significant, albeit weak ( $r > 0.32$ ). No significant correlation was found with the  $V_d$  of vancomycin. Patients with an abnormal BIA estimated hydration status appeared more severely ill (i.e., higher SOFA scores). No association with cumulative fluid balance was found.

### **Conclusion:**

This study demonstrated the existence of a significant positive correlation between BIA assessed fluid status and the  $V_d$  of antibiotics at the ICU. However, correlations were not as strong as expected and absolute BIA measurements were not found to be useful in clinical practice.

### **Table:**

Antibiotic	TBW (L)	ECW (L)	ICW (L)	ECW (%)
Amoxicillin/Clavulanic acid (n=10)	45.85 ± 11.02; r = 0.90* [0.66;1.00]	22.84 ± 6.31; r = 0.78* [-0.003;1.00]	23.01 ± 5.31; r = 0.88* [0.55;1.00]	49.55 ± 4.07; r = -0.042 [-0.80;0.81]
Meropenem (n=21)	44.05 ± 9.78 ; r = 0.47* [0.03;0.76]	22.49 ± 6.35 ; r = 0.43* [0.03;0.71]	21.56 ± 3.65 ; r = 0.50* [0.21;0.71]	50.43 ± 3.47 ; r = 0.25 [-0.21;0.59]
Piperacillin/Tazobactam (n=16)	39.90 ± 8.78 ; r = 0.34 [-0.22;0.73]	19.33 ± 4.56 ; r = 0.51* [0.13;0.76]	20.56 ± 4.48 ; r = 0.16 [-0.4;0.62]	48.31 ± 2.66 ; r = 0.57* [0.04;0.86]

Vancomycin (n=21)	40.87 ± 11.89 ; r = 0.28 [-0.22;0.70]	20.06 ± 6.45 ; r = 0.20 [-0.30;0.61]	20.81 ± 5.78 ; r = 0.29 [-0.20;0.67]	48.90 ± 3.46 ; r = - 0.21 [-0.66;0.28]
Total – all antibiotics pooled (n=68)	42.36 ± 10.45 ; r = 0.33* [0.10;0.55]	21.05 ± 6.05 ; r = 0.32* [0.09;0.53]	21.31 ± 4.78 ; r = 0.33* [0.10;0.52]	49.33 ± 3.42 ; r = 0.12 [-0.16;0.39]

*Results of correlation between BIA estimated fluid volumes and the volume of distribution of several antibiotics (separate and all antibiotics pooled). Values are represented as mean ± SD. ECW = extracellular water; ICW = intracellular water; r = correlation coefficient [95% confidence interval]; TBW = total body water. \* p <0.05*