

WHOLE BODY AND RIGHT LUNG BIOIMPEDANCE ARE MORE SENSITIVE THAN PROXIMAL BIOIMPEDANCE AT PREDICTING RESPONSE TO INTRAVENOUS FUROSEMIDE IN PATIENTS WITH ACUTE PULMONARY OEDEMA

MJ Ng Kam Chuen, GYH Lip, RJ MacFadyen, (RE Ferner)

University Department of Medicine, City Hospital, Birmingham, B18 7QH, UK

INTRODUCTION: Bioimpedance (Ω) analysis (BIA) provides a potential measure of body water (1). BIA may predict decompensation in systolic heart failure (2). We tested the utility of BIA in assessing the acute response to intravenous furosemide (ivF) in pulmonary oedema.

METHODS: We studied patients with florid pulmonary oedema treated with ivF (50-150 mg bolus). We compared **Bodystat Quadscan 4000[®]** BIA (extracellular (ECW), intracellular (ICW) and total body water (TBW), Ω at frequencies 5-200 KHz ($\Omega_{5\text{KHz}}$, $\Omega_{50\text{KHz}}$, $\Omega_{100\text{KHz}}$, $\Omega_{200\text{KHz}}$) with electrodes positioned distally (whole body BIA), proximally (proximal BIA) and across the right lung (right lung BIA) 0, 0.5, 1, 2 and 3 hours after ivF.

RESULTS: 34 patients (n=34; male 21, female 13; age 72.1 ± 11.5 , range 30-86; body surface area $1.87 \pm 0.23 \text{ m}^2$, range 1.37-2.36; 25 sinus rhythm, 9 atrial fibrillation; 13 ischaemia, 2 arrhythmia, 4 valvular heart disease, 4 lung disease, 5 renal disease, 2 non-ischaemic cardiomyopathy, 3 hypertension, 1 infection) were studied. TBW, ECW and ICW decreased, and Ω increased in response to ivF (table1). Whole body and right lung Ω were more sensitive indicators of acute response to ivF compared to proximal Ω .

BIA	Whole Body	Proximal	Right Lung
Total body water (%)	n=33; x=54.9±9.2; $\Delta=1.5 \pm 3.9$; <u>p=0.070</u>	n=31; x=50.1±7.3; $\Delta=1.9 \pm 3.4$; <u>p=0.104</u>	Not applicable
Extracellular water (%)	n=33; x=24.5±3.6; $\Delta=1.9 \pm 3.0$; <u>p=0.001</u>	n=31; x=23.7±3.6; $\Delta=2.2 \pm 5.9$; <u>p=0.042</u>	Not applicable
Intracellular water (%)	n=33; x=29.9±4.8; $\Delta=1.7 \pm 7.5$; <u>p=0.324</u>	n=31; x=26.4±4.0; $\Delta=1.7 \pm 5.1$; <u>p=0.371</u>	Not applicable
$\Omega_{5\text{KHz}}$ (Ω)	n=34; x=489±142; $\Delta=3.8 \pm 6.2$; <u>p=0.000</u>	n=33; x=95±24; $\Delta=2.6 \pm 4.8$; <u>p=0.099</u>	n=20; x=50±15; $\Delta=7.8 \pm 13.0$; <u>p=0.010</u>
$\Omega_{50\text{KHz}}$ (Ω)	n=34; x=445±126; $\Delta=3.3 \pm 7.1$; <u>p=0.006</u>	n=33; x=84±21; $\Delta=2.6 \pm 4.8$; <u>p=0.542</u>	n=20; x=42±13; $\Delta=10.5 \pm 18.0$; <u>p=0.006</u>
$\Omega_{100\text{KHz}}$ (Ω)	n=34; x=426±122; $\Delta=3.9 \pm 9.4$; <u>p=0.009</u>	n=33; x=81±20; $\Delta=4.5 \pm 18.9$; <u>p=0.273</u>	n=20; x=40±13; $\Delta=9.7 \pm 19.0$; <u>p=0.039</u>
$\Omega_{200\text{KHz}}$ (Ω)	n=34; x=407±119; $\Delta=4.4 \pm 15.2$; <u>p=0.060</u>	n=33; x=77±19; $\Delta=3.7 \pm 15.1$; <u>p=0.316</u>	n=20; x=38±12; $\Delta=10.2 \pm 18.8$; <u>p=0.023</u>

Table 1: Changes in BIA parameters with time after ivF. n=sample size; x=baseline value; Δ =maximal percentage change from baseline. Significant p values underlined.

CONCLUSION: Whole body and right lung Ω are relative markers of volume response to ivF in patients with acute pulmonary oedema, thus potentially

providing an accurate, practical and non-invasive means of assessing response to treatment in this setting.

REFERENCES: (1) Segal KR. et al. American Journal of Clinical Nutrition 1991; 54: 25-29. (2) Packer M.et al. Journal of the American College of Cardiology 2006; 47: 2245-52.