# BIOIMPEDANCE SPECTROSCOPY VOLUME STATUS MONITORING AND HYPERTENSION IN HEMODIALYSIS PATIENTS: A PROSPECTIVE RANDOMIZIED STUDY

**Zoran Paunić[1], Nada Dimković[1], Milica Dekleva-Manojlović[2], Nataša Marković Nikolić[2]**

[1]Zvezdara University Medical Center, Clinical Department for Renal Diseases,
[2]Zvezdara University Medical Center, Clinical department for Cardiovascular Diseases, Belgrade, SERBIA

## INTRODUCTION AND AIMS

- Hypertension in chronic hemodialysis (HD) patients (pts) is volume depended in up to 80% of cases. Volume assessment by bioimpedance spectroscopy (BIS) could be more accurate and better target for the treatment then just clinically assessed dry weight (DW). The studies have shown that the relative overhydration (ROH) of HD pts above 15% of their total body extracellular water (ECW), poses increased mortality risk in this population. The concept of the Active Fluid Management (AFM) has been developed and proposed for better control of ECW and less cardiovascular (CV) complications. It is hypothetised that achieving the pts average weekly ovehydration (AWOH) lesser then 15% of their ECW should diminshed their CV risk.
- This randomized, prospective, blinded, single-center study was aimed to evaluate the impact of active fluid management (AFM) assessed by BIS on hypertension control in HD pts during nine-month period.

## METHODS

- Study included 59 BIS naive HD pts BIS was performed by Body Composition Monitor (BCM). In the 1. (active) group according with AFM concept, this measurement has been done every time when their average weekly overhydration (AWOH) exceeded 15% of their normal extracellular volume (ECW) and their DW was time adjusted according to the finding along with clinical judgment. In the 2. (control) group, BIS has been performed monthly and its results did not influence the clinical assessment of their DW.
- We registered the average blood pressure of 6 successive dialysis measurements before and after dialysis sessions, as well as the number of antihypertensive (AHT) drugs, their equivalent dose (ED) units and N-terminal brain natriuretic peptide (NT-proBNP) at the start and after 9 months.

**Table 1. Blood pressure (BP) at the start and after 9 months**

| BP (mmHg) | 1. group | | 2. group | | Total | | p |
|---|---|---|---|---|---|---|---|
| | Start | End | Start | End | Start | End | |
| systolic BP pre-HD | 133 ± 5 | 131 ± 2 | 131 ± 13 | 134 ± 13 | 132 ± 14 | 132 ± 12 | NS |
| diastolic BP pre-HD | 75 ± 7 | 73 ± 7 | 73 ± 7 | 74 ± 6 | 74 ± 7 | 73 ± 7 | NS |
| MAP pre-HD | 94 ± 10 | 92 ± 8 | 93 ± 9 | 94 ± 7 | 94 ± 9 | 93 ± 8 | NS |
| Δ MAP pre-HD | 3.0 ± 8.0 | | -2.3 ± 8.2 | | 0.4 ± 8.4 | | 0.015 |
| systolic BP post-HD | 120 ± 16 | 122 ± 11 | 118 ± 15 | 122 ± 18 | 119 ± 15 | 122 ± 15 | NS |
| diastolic BP post-HD | 69 ± 9 | 70 ± 5 | 68 ± 7 | 69 ± 9 | 68 ± 8 | 70 ± 7 | NS |
| MAP post-HD | 86 ± 11 | 87 ± 7 | 85 ± 9 | 87 ± 12 | 85 ± 10 | 87 ± 9 | NS |

**Table 2. Antihypertensive (AHT) drugs at the start and after 9 months**

| | 1. group | | 2. group | | Total | | p |
|---|---|---|---|---|---|---|---|
| | Start | End | Start | End | Start | End | |
| number of AHT | 1.9 ± 0,9 | 1.2 ± 1.0 | 1.6 ± 0.7 | 1.7 ± 1.0 | 1.8 ± 0.8 | 1.4 ± 1.0 | 0.047 |
| ED units | 3.5 ± 2.2 | 3.4 ± 2.0 | 2.3 ± 2.1 | 3.5 ± 2.6 | 3.4 ± 2.1 | 2.9 ± 2.4 | 0.057 |
| Δ ED units | 1.2 ± 0.6 | | -0.2 ± 1.2 | | 0.5 ± 1.2 | | 0.000 |
| w/o AHT after 9m | 8 (26%) | | 2 (7%) | | 10 (17%) | | 0.084 |

**Table 3. Laboratory findings at the start and after 9 months**

| | | 1. group | | 2. group | | Total | | p |
|---|---|---|---|---|---|---|---|---|
| | | Start | End | Start | End | Start | End | |
| sp Kt/V | | 1.43 ± 0.28 | 1.50 ± 0.29 | 1.35 ± 0.29 | 1.39 ± 0.17 | 1.39 ± 0.29 | 1.45 ± 0.25 | NS |
| Hgb (g/L) | | 104 ± 16 | 108 ± 14 | 100 ± 16 | 105 ± 15 | 103±16 | 106±14 | NS |
| Albumin (g/L) | | 40.4 ± 2.8 | 38.4 ± 3.5 | 39.9 ± 3.4 | 38.4 ± 3.0 | 40.1 ± 3.0 | 38.4 ± 3.3 | NS |
| NT-pro BNP (pg/mL) | Median (Interquartile range) | 4440 (2126 – 13024) | 4780 (2198 – 10455) | 5274 (3849 – 13854) | 9561 (5081 – 17216) | 4868 (2674 – 13963) | 6484 (470 – 147261) | 0.075 |
| Δ NT-proBNP | Median (Interquartile range) | 136 (-1557 – 2095) | | -2043 (-7007 – 284) | | -164 (-128461 – 177015) | | 0.024 |

**Figure 1. Percent of pts who achieved AWOH < 15% at the end the study**

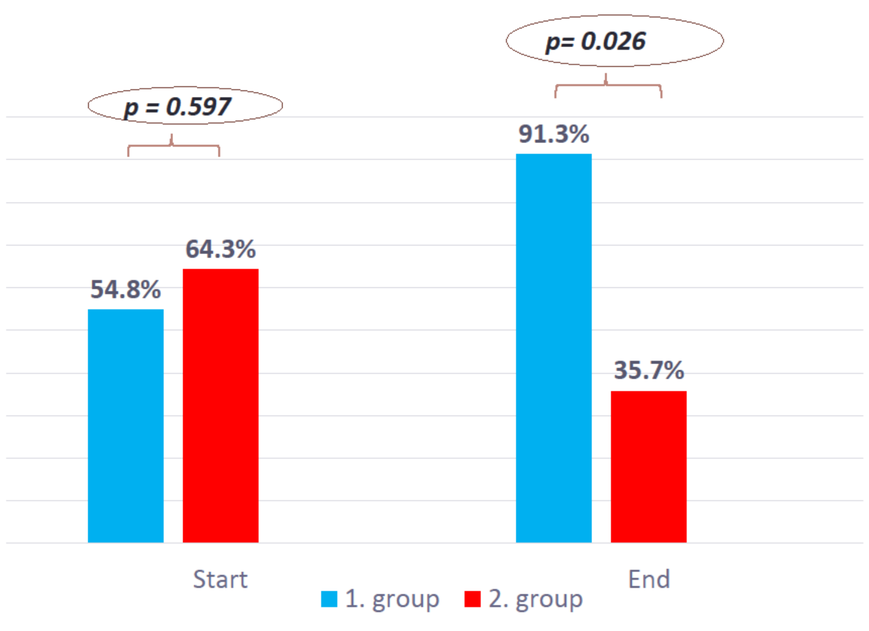
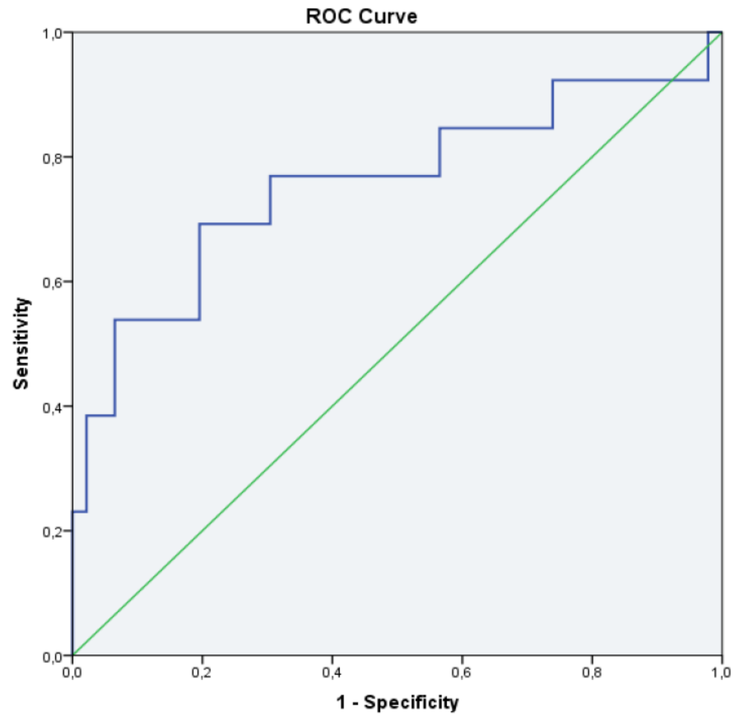



**Figure 2. AWOH > 15% at the end of the study correlates with NT-proBNP worsening for > 1400 pg/mL**




## RESULTS

- There were no significant difference between patients in regard to gender, age, underlying renal disease, residual renal function and HD vintage and number/dose of anti-hypertensive medication at start of the study.
- The pre-HD mean arterial blood pressure (MAP) was significantly lower in the 1. group at the end of the study, as well as the number of AHT drugs and their ED units (Tables 1 and 2).
- 1. group has much lower NT-proBNP values at the end of the study (Table 3).
- At the start of the study AWOH < 15% has 54,8% of 1. group and 64.3% in the 2. group. After 9 months, this target achieved 91.3% pts in 1. group, but only 35.7% in 2. group (Figure 1).
- The AWOH >15% at the end of the study correlated with worsening of NT-proBNP for > 1400 pg/mL (ROC curve, area 0.758; p= 0.005; CI 95% 0.582 – 0.933) (Figure 2).

## CONCLUSION

- **Active fluid management by bioimpedance spectroscopy proved to be an easy and very helpful tool for control of hypertension in HD patients.**


DOI: 10.3252/pso.eu.53era.2016
ePosters supported by F. Hoffmann- La Roche Ltd.