CONTROL OF VOLUME OVERLOAD BY BIOIMPEDANCE SPECTROSCOPY (BCM) IS RELATED TO REDUCTION IN BLOOD PRESSURE

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INTRODUCTION

Cardiovascular disease is the main cause of death among hemodialysis (HD) patients. Fluid overload and its effects involve a fundamental risk factor. BCM (Body Composition Monitor, Fresenius Medical Care) is an easy and useful tool which helps us to control and improve the hydration state of patients.

AIM

Early monitoring of Hydration and Malnutrition markers in HD patients reduces Blood Pressure and use antihypertensive (AntiHTA) drugs.

METHOD

We included 1.316 hemodialysis patients whose hydration status was measured monthly with BCM, among 3.719 patients from Fresenius Medical Care Spanish Centres. We excluded those patients hospitalized during the monitoring period and patients with amputation or wearing a unipolar pacemaker. Technically wrong measurements by BCM defined as those with Quality (Q) less than 80 were also excluded. Also were excluded those patients with less than five measurements by BCM.

At their first BCM measurement (Baseline) we registred: age, gender, renal disease, comorbidities and Charlsson Index adjusted to age, HD vintage, predialysis systolic (SBP) and diastolic (DBP) blood pressure, BCM parameters: Relative OverHydration (ROH), Lean Tissue Index and Fat Tissue Index, C Reactive Protein (CRP), Hemoglobin (Hb), Ferritin, Transferrin Saturation Index (TSAT), Albumin, AntiHTA treatment and Erythropoietin Stimulating Agents (ESA) consumption and Erytropoietin Resistance Index (ERI).

We divided patients into three groups (tertiles) according to their ROH at baseline in order to describe patient. Being by increasing order, the 1st tertile is the one with patients with lower ROH. **Figure 1** and **Table 1**.

Then we selected only those patients who decrease their ROH from their respective Baseline to last BCM measurement in the following 3 months,

looking for any clinic improvement of all parameters recorded.

The analysis was performed with the SPSS computer program, version 19. P< 0.05 was considered to indicate statistically significant.

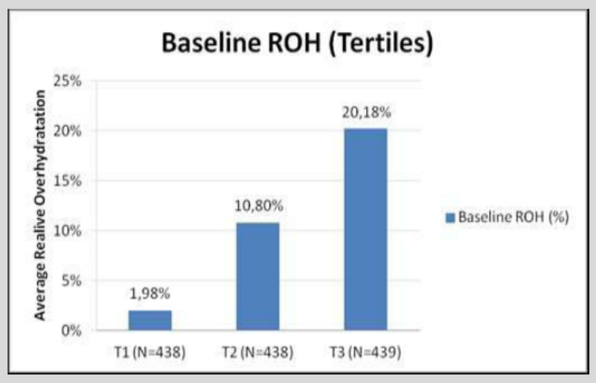

Figure 1: Tertiles of baseline Relative Overhydration

PARAMETER	TERTIL 1	TERTIL 2	TERTIL 3	ANOVA (p-value)
Average Relative Overhydration (ROH, %)	1,98	10,8	20,18	
Minimum Av ROH (%)	-29	7,4	14,15	
Maximum Av ROH (%)	7,4	14,14	43,86	
Number of patients	N=438	N=439	N=439	
Diabetes Mellitus (%)	21,9	29,2	26,4	0,047
Age (years)	66,72	69,55	67,68	0,012
HD Vintage (months)	35,16	34,46	47,77	0,000
I.Charlson (age adjusted)	4,91	5,34	4,95	0,001
Gender (% male)	56,62	62,64	68,56	0,001
Systolic Blood Pressure preHD (mm Hg)	132,8	136,47	140,46	0,00
Dyastolic Blood Pressure preHD (mm Hg)	66,73	66,13	68,2	0,05
Hypotensive drugs (num./month)	56,15	59,63	74,88	0,00
C Reactive Protein (mg/dL)	10,73	10,48	16,5	0,018
Hemoglobin (g/dL)	11,77	11,6	11,42	0,00
Ferritin (µg/l)	520,65	473,25	515,42	ns
TSAT (%)	30,58	31,09	29,45	ns
Iron ev (mg/month)	276,39	260,02	300,52	0,057
Erythropoiesis Stimulating Agents (UI/Kg/week)	83,78	96,81	118,09	0,00
Erythropoietin Resistance Index (ERI)	7,53	8,38	10,75	0,00
Lean Tissue Index (Kg/m²)	11,82	11,42	11,09	0,00
Fat Tissue Index (Kg/m²)	17,24	14,7	12,04	0,00
Albumin (mg/dl)	3,89	3,86	3,75	0,00

ns: without statistical significance

***Table 1**: Characteristic of patients in different groups (tertiles) of ROH.*

PARAMETER	Time-0	Time-3	p-value
ROH (%)	14,95	7,49	0,000
Systolic Blood Pressure (mm Hg)	137,73	131,51	0,000
Diastolic Blood Pressure (mm Hg)	67,35	65,28	0,000
Antihypertensive drugs (unit/month)	64,69	63	ns
C Reactive Protein (mg/dL)	10,69	10,8	0,18
Haemoglobin (g/dL)	11,42	11,98	0,000
Ferritin (µg/l)	496,17	526,12	ns
ISAT (%)	29,96	32,75	ns
Iron ev (mg/month)	291,07	285,13	ns
Erythropoiesis Stimulating Agents (UI/Kg/week)	109,37	92,59	0,000
Erythropoiesis Resistance Index (ERI)	9,89	8,14	0,000
Lean Tissue Index (Kg/m²)	11,36	11,6	0,001
Fat Tissue Index (Kg/m²)	13,92	13,96	ns
Albumin (mg/dl)	3,79	3,83	0,000

***Table 2:** Comparison of characteristics of patients after three months of using the BCM to adjust its dry weight.*

RESULTS

We found 68.6% of males at the third tertile of ROH vs 56.6% at first group (p:0.001). The literature describes that Fluid Overload (ROH) is correlated with pro-inflammatory status, which is associated with higher CRP and refractory anemia. Our results follow this pattern with higher CRP, ESA and ERI values at third tertile vs first ROH tertile. Also, we see lower albumin accompanied with lower lean tissue index and fat tissue index. And a higher SBP at third group even receiving more amount of hypotensive drugs.

Then, we selected only 33% of the patients whose ROH decreased more intensely during the 3 month period follow-up. (**Table 2**).

The decrease of volume overload is associated with lower SBP, higher hemoglobin, less ESA consumption, lower ERI and better nutritional parameters.

CONCLUSIONS

- Adjusting the hydration status of patients using BCM allow us to control blood pressure even decreasing the number of antihypertensive drugs.
- The correlation between albumin and Lean/Fat Tissue Index, allow us consider LTI and FTI as good markers of nutritional status. While the survival analysis that must accompany any good marker of malnutrition is pending.

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