BODY COMPOSITION DETERMINES THE ELIMINATION OF HIGH MOLECULAR WEIGHT AND PROTEIN-BOUND TOXINS IN ONLINE HEMODIAFILTRATION

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INTRODUCTION AND OBJECTIVES

Online hemodiafiltration (OL-HDF) with high convective volumes (CV) has been associated with a reduction in mortality compared with conventional hemodialysis[1]. This benefit may be explained by better uremic toxins removal using high convective transport mechanisms. Prior studies have shown that CV have variable efficacy in molecules elimination depending on patients features, and total body water (TBW) and its distribution predicts the efficacy of OLHDF in low molecular weight (MW) and medium sized uremic toxins elimination[2].

The aim of this study was to assess the role of body composition in the elimination of high-MW and protein-bound uremic toxins with post-dilution OL-HDF.

METHODS

Demographic and clinical data, corporal composition parameters with bioimpedance spectroscopy and post-dilution OL-HDF characteristics were collected in in 40 different four-hour postdilution OL-HDF sessions in 13 patients.

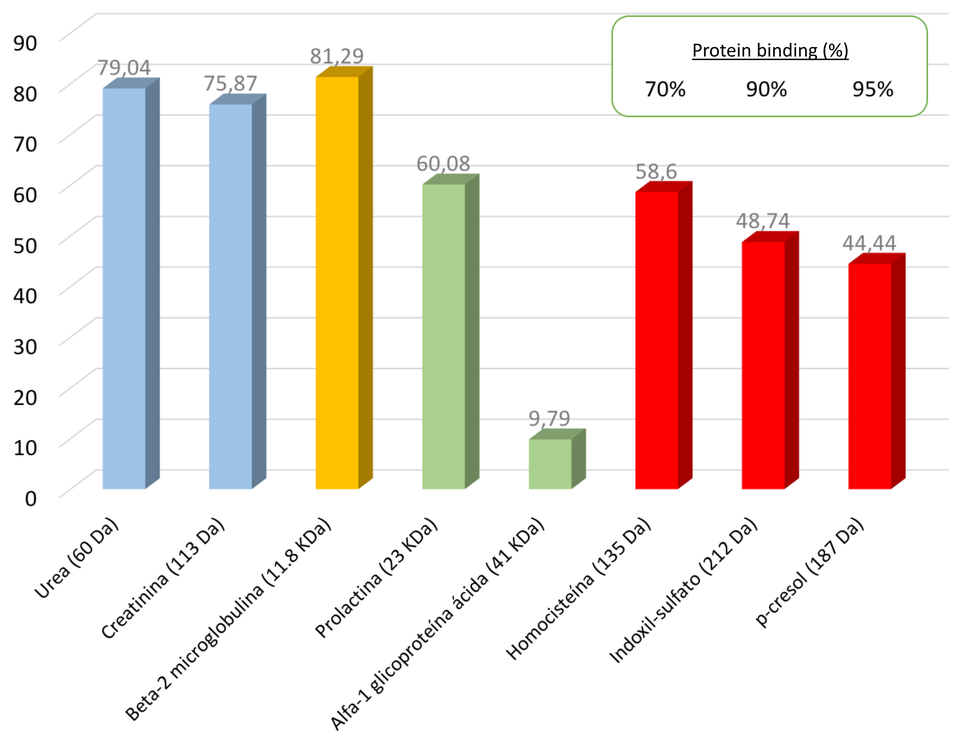
The reduction rates (RR) of low molecular weight (MW) solutes (urea –60 Da –, creatinine – 113 Da –), middle molecules and high-MW toxins (beta-2 microglobulin [B2m] –11.8 KDa –, myoglobin – 17.2 KDa –, prolactin –23 KDa –, alpha-1 glycoprotein acid [a1GPA]– 41 KDa –) and protein-bound toxins (p-cresyl sulphate, indoxyl sulphate and homocysteine) were analyzed to assess the possible influence of body composition.

RESULTS

Table 1. Patient and dialysis features

Age (years)	39.4 ± 26
Gender: male (%)	87
Predialysis weight (Kg)	75.3 ± 13.5
Total body water (L)	42.3 ± 9.8
Body surface area (m^2)	1.86 ± 0.21
Vascular access: AV fistulae (%)	85
Blood flow (ml/min)	426 ± 70
Arterial pressure (mmHg)	-190 ± 21
Venous pressure (mmHg)	170 ± 21
Ultrafiltration (L/session)	1.95 ± 0.98
Convective volume (L/session)	28.3 ± 5
CV / TBW	0.72 ± 0.26
CV / ECW	1.59 ± 0.51
CV / Weight (L/Kg)	0.4 ± 0.16
CV / 1.73m^2 BSA (L/1.73m^2)	26.8 ± 6.75
Urea RR (%)	79 ± 23.1
Creatinine RR (%)	75.9 ± 7.8
Beta-2 microglobulin RR (%)	81.3 ± 6.4
Myoglobin RR (%)	60 ± 11.5
Prolactin RR (%)	60.1 ± 14.3
Alpha-1 glycoprotein acid RR (%)	9.79 ± 9
p-cresyl sulphate RR (%)	44.4±16
Indoxyl sulphate RR (%)	48.7±14
Homocystein RR (%)	55.5±9

Figure 1. Reduction rates of different uremic toxins



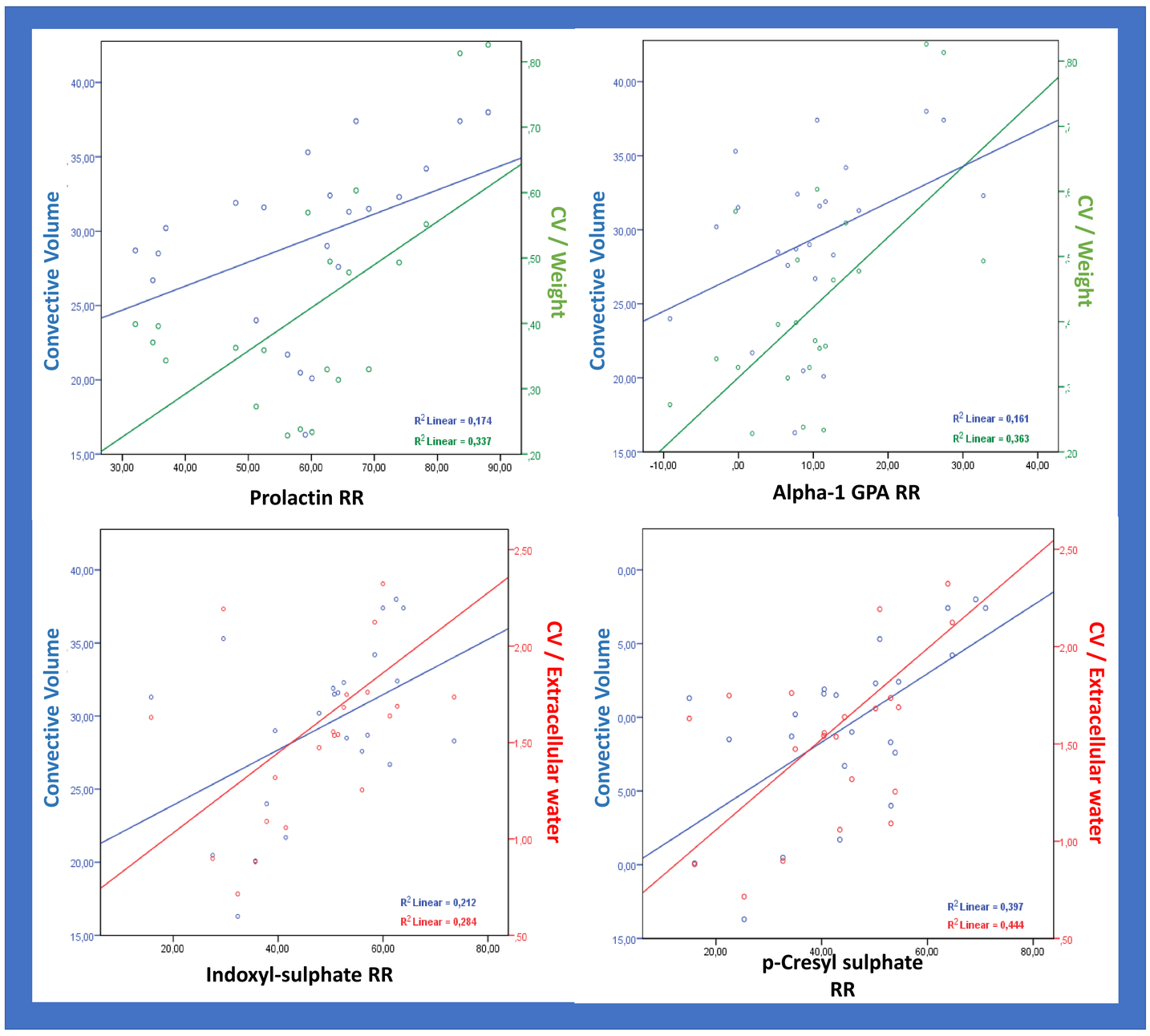
Low MW solutes and middle molecules elimination were negatively correlated with various body composition parameters (weight, BSA, body water and its compartments, lean tissue and body cellular mass), but TBW and extracellular water (ECW) got the strongest negative significant correlations.

Prolactin and alpha-1GPA RR got negative correlation with weight, BSA and ECW.
p-cresyl sulphate and indoxyl sulphate RR got negative correlation with weight, BSA, TBW, ECW, intracellular water (ICW), lean tissue and body cellular mass.

The standardization of CV with body composition got higher correlation with RR than CV unstandardized. Table 2 shows associations of CV high-MW and protein-bound toxins RR.

Table 2. Association of high-MW and protein-bound toxins reduction rates with unstandardized and standardized convective volume.

	CV (sig.)	CV/ECW (sig.)	CV/Weight (sig.)	CV/BSA (sig.)
Prolactin RR	.395 (p.013)	.492 (p 0.001)	.561 (p<0.001)	.509 (p 0.001)
a1GPA RR	.401 (*p 0.058*)	.492 (p 0.017)	.603 (p 0.002)	.561 (p 0.005)
Homocystein RR	.468 (p 0.005)	-	-	-
Indoxyl-SO_4^{2-} RR	.461 (p 0.027)	.533 (p 0.009)	.464 (p 0.026)	.433 (p 0.009)
p-cresyl-SO_4^{2-} RR	.630 (p 0.001)	.677 (p<0.001)	.671 (p<0.001)	.653 (p 0.001)



CONCLUSION: Body composition influences the efficacy of OL-HDF in the elimination of different MW and protein-bound uremic toxins. Higher amounts of total body or extracellular water determines less uremic toxins reduction, finding that stands out the importance of OL-HDF adequacy. The standardization of CV with TBW or ECW allows to monitor the efficacy of OL-HDF and could help to prescribe individualized therapies.

REFERENCES
1. Maduell F, et al; ESHOL Study Group.. High-efficiency postdilution online hemodiafiltration reduces all-cause mortality in hemodialysis patients. J Am Soc Nephrol. 2013 Feb;24(3):487-97.
2. Macías N, et al. Importance of Body Water in the Efficacy of Convective Solute Transport in Online Hemodiafiltration. Ther Apher Dial. 2017 Feb;21(1):88-95.

DOI: 10.3252/pso.eu.54ERA.2017