ANALYSIS OF POSTDILUTION ONLINE HEMODIAFILTRATION EFFICACY USING AUTOSUB PLUS SYSTEM WITH HIGHEST BLOOD FLOWS

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INTRODUCTION AND OBJECTIVES

Online hemodiafiltration (OL-HDF) with high convective volumes (CV) has been associated with improved patient survival[1]. Increasing blood flow (Qb) is probably the best option to achieve higher CV. Automatic substitution volume control with AutoSub plus system (FMC®) improves OL-HDF efficacy compared with prior control systems and maximizes the filtration fraction (FF) with low Qb. However, with increasing Qb the FF is progressively reduced[2].

The purpose of this study was to analyze the efficacy of OLHDF using AutoSub plus® with the highest Qb.

METHODS

We collected 39 patients undergoing maintenance post-dilution OL-HDF using 5008 CorDiax dialysis machines, three 4-hour sessions weekly. Dialysis features of the 3 consecutive sessions of a week were analyzed in every patient (117 OL-HDF sessions) including vascular access, dialyzer, Qb, processed blood volume, substitution rates and volumes hourly, ultrafiltration rates and volumes hourly, Kt/V by ionic dialysance – K – and bioimpedance – V –, recirculation by BTM, heparin dose and dialyzer status at the end. In the second session of the week, blood samples were taken to determine pre-dialysis and post-dialysis urea, creatinine, phosphorus, beta-2 microglobulin, cystatin C, myoglobin and prolactin plasmatic levels in order to calculate their reduction rates (RR), as well as hemoglobin, total proteins and albumin plasmatic levels to estimate blood viscosity and hemoconcentration.

RESULTS

Table 1. Dialysis parameters (n 117)

Qb prescribed (ml/min)	454,74 ± 61,68
Effective Qb (ml/min)	434,15 ± 62,22
Dialysate flow (ml/min)	520,98 ± 74,66
Substitution volume (L/session)	28,59 ± 4,40
Ultrafiltration volume (L/session)	2,13 ± 2,37
Convective volume (L/session)	30,71 ± 4,74
Filtration fraction (%)	29,57 ± 3,87
BVM fall (%)	-12,22 ± 9,68
KtV	2,03 ± 0,53
Recirculation by BTM (%)	13,92 ± 4,76
Heparin Dose (UI)	3621 ± 1720

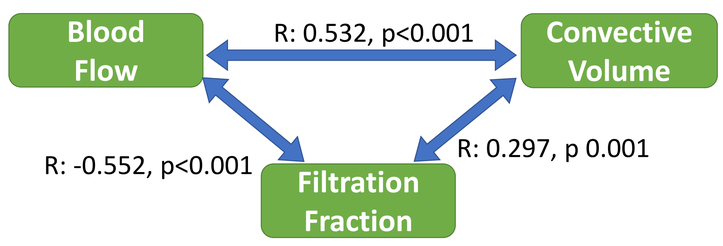
Qb: Blood flow. BVM: Blood volume monitor. BTM: Blood temperature monitor.

Table 2. Patient features (n 39)

Age (years)	53 ± 16,2
Gender: male (%)	61.5%
Vascular access: FAV (%)	81,6%
Predialysis weight (Kg)*	71,46 ± 21,29
Urea distribution volume (L)*	35,45 ± 9,05
Hemoglobin (g/dL)*	11,95 ± 1,22
Hematocrit (%)*	35,71 ± 3,83
Proteins (g/dL)*	6,59 ± 0,57
Gammaglobulins (%)*	17,13 ± 3,45
Albumin (g/dL)*	3,79 ± 0,33

* Predialysis parameters before middle session of the week.

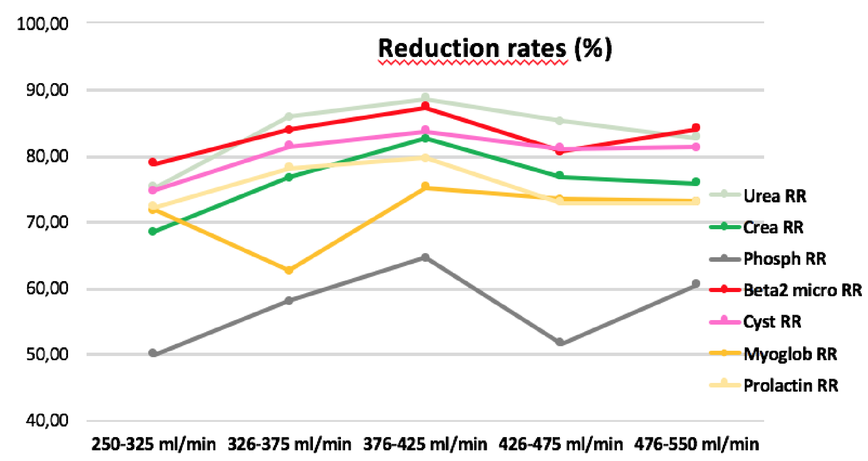
Correlations between Qb, VC and FF



Convective volume was associated with beta-2 microglobulin (0.549,p<0.001), cystatin C (0.560,p<0.001), myoglobin (0.432,p0.006) and prolactin reduction rates (0.333,p0.038).

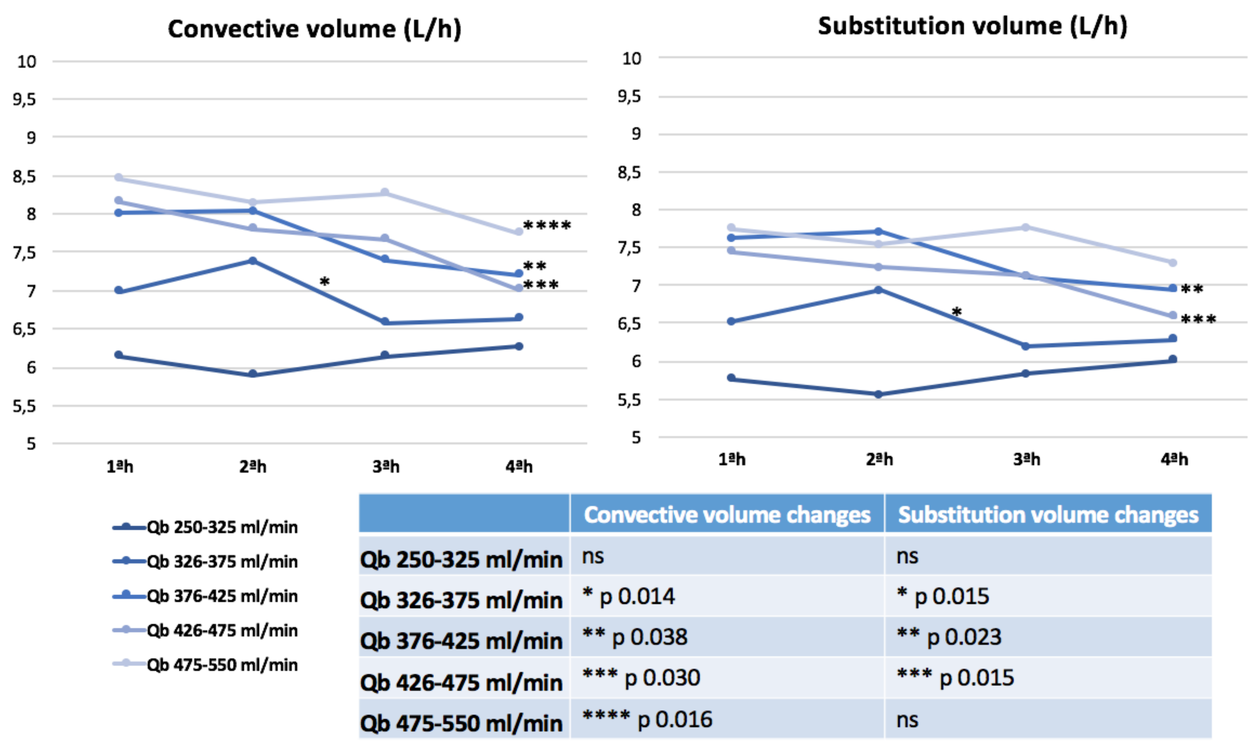
Sessions were classified in 5 groups depending on average Qb. There were no differences in body composition, laboratory data, dialyzers, recirculation (BTM), heparine dose or dialyzer status.

BLOOD FLOW GROUPS	Effective blood flow (ml/min)	Prescribed blood flow (ml/min)
< 325 ml/min	305.4 +- 14.5	320 +- 12.2
326-375 ml/min	354 +- 14.9	376 +- 15.7
376-425 ml/min	399 +- 14.2	423 +-12
426-475 ml/min	455.3 +- 14.8	480 +- 9.9
> 475 ml/min	488 +- 11.7	503 +- 9

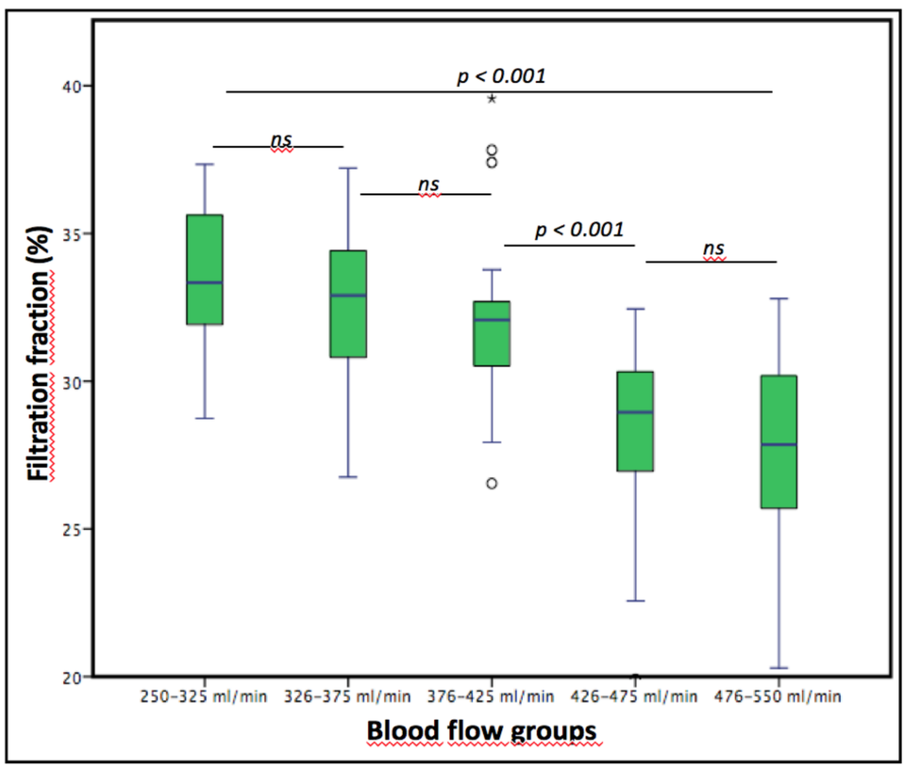


Blood flow	Blood volume processed (L)		Convective volume (L)		Filtration fraction (%)	
	x	SD	x	SD	x	SD
250-325 ml/min	73,3	3,5	24,4	2,0	33,4	2,9
326-375 ml/min	85,0	3,6	27,4	3,4	32,2	3,2
376-425 ml/min	95,8	3,4	30,6	2,8	32,1	3,3
426-475 ml/min	109,3	3,6	31,4	5,6	28,8	5,3
476-550 ml/min	117,4	2,7	32,6	3,9	27,8	3,1
ANOVA test	F	578,55	F	10,753	F	8,729
	p(Sig.)	<0,001	p(Sig.)	<0,001	p(Sig.)	<0,001

There is a progressive reduction in convective volume rate along the session (p<0.001), ultrafiltration rate (p<0.001) due tu BVM control or manual changes, and substitution rate (p 0.002) due to filtration fraction reduction (p<0.001).



	Convective volume changes	Substitution volume changes
Qb 250-325 ml/min	ns	ns
Qb 326-375 ml/min	* p 0.014	* p 0.015
Qb 376-425 ml/min	** p 0.038	** p 0.023
Qb 426-475 ml/min	*** p 0.030	*** p 0.015
Qb 475-550 ml/min	**** p 0.016	ns



Selecting sessions with Qb>375ml/min (82%), there were no association between Qb, VC and solutes reduction rates.

CONCLUSION: With highest blood flows automatic substitution rate control does not significantly improve the efficacy of OL-HDF. Other studies comparing different control systems of substitution flow are required to optimize convective transport.

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. Maduell F, et al. On-line haemodiafiltration with auto-substitution: assessment of blood flow changes on convective volume and efficiency. Nefrologia. 2015;35(1):50-7.

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