CITRATE vs. ACETATE DIALYSATE-REINFUSATE IN ON-LINE POSTDILUTIONAL HAEMODIAFILTRATION (OL-HDF)

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INTRODUCTION / AIM

A previous paper showed that plasma acetate (Ac) increase up to 5-6 times the normal limits in the course of OL-HDF using AC in dialysis fluid, and returned to basal values 2 hours after the end of the session. Moreover, there was a tendency to a greater increase of plasma interleukin-6 within 2 hours after the conclusion of OL-HDF session with AC [1]. Therefore, the sharp increase of plasma AC, even though transient, could induce the release of proinflammatory mediators, considered to be responsible for vascular disease [2, 3].

In order to avoid any possible source of bioincompatibility, such as low dialysate-reinfusate Ac concentrations, Ac (3mmol/l) was substituted by Citrate (Cit, 1 mmol/l) as an acidifier in high UF OL-HDF.

The **Aim** of this study was to compare the clinical effect of Ac (Ac-HDF) and Cit (Cit-HDF) in one single session.

METHODS

A cohort of 18 pts on long-term OL-HDF (with TMP Ultracontrol, AK 200, Gambro) and on clinical steady-state was selected for the present study (table I). In these pts Ac dialysate (Softpac, Gambro) was substituted with Cit dialysate (SelectBag Citrate, Gambro), while keeping unchanged for each patient the remaining clinical parameters (Table II), as well as the therapy involved in Calcium balance (Table I), which can be influenced by Citrate. The following pre-post dialysis parameters were evaluated during a single session for each patient using either acetate or citrate dialysate: small and middle molecules, arterial pressure (AP), clotting parameters, serum Albumin (sAlb), PTH and CRP. In addition, total and ionized calcium (sCa and sCa++), as well as bicarbonate (sHCO3-) and citrate (sCit), were evaluated on serum.

Statistics: The descriptive analysis was based on the mean ± standard deviation. Inferential statistics included two tailed t-test for paired data, considering a probability value of less than 0.05 as significant.

Characteristic	Value (N=18)
Gender	F=7 / M=11
Age (years)	70±8
HD Vintage (mo)	51±66
Calcitriol (ug/week)	1.2±0.4 (7 pts)
Cinacalcet (mg/day)	35±15 (4 pts)
$CaCO_3$ (g/day)	2.9±1.4 (9 pts)
Sevelamer (mg/day)	3500±1900 (4 pts)
EPOα (Binocrit, U/week)	5000±2300 (10 pts)
Hb (g/dL)	11.5±1.3
Albumin (g/dL)	4.2±0.4

Table I: *Study population*

Parameters	Ac-HDF	Cit-HDF
Dialyzer	Polyflux 210H	Polyflux 210H
Qb (ml/min)	350 – 400	350 – 400
Qd (ml/min)	500	500
Treatment Time (min)	260±18	260±18
dNa (mmol/l)	133±2	133±2
$dHCO_3$ (mmol/l)	31±1	31±1
dCa (mmol/l)	1.5	1.5
dMg (mmol/l)	0.5	0.5
dAcetate (mmol/l)	3.0	-
dCitrate(mmol/l)	-	1.0

Table II: *Technical parameters of the two treatments*

RESULTS

- No significant difference between AC-HDF and CIT-HDF was found about technical parameters (eKt/V, reinfusion volume) and the removal of small and middle uremic toxins (creatinine, phosphorus, homocysteine, beta2-microglobulin; see table III).
- On Ac-HDF sCa and sCa++ increased significantly and sPTH decreased significantly, whereas on Cit-HDF sCa and sPTH increased, although not significantly, and sCa++ decreased significantly (tab.IV). Citrate and Ca balance are shown in Poster MP 409 [4]. sMg was not different between the two techniques; while postdialytic sHCO3 was significantly lower on Cit-HDF than on Ac-HDF (table IV).
- According to sCa++ reduction, the post-dialytic Systolic and Diastolic Pressure were significantly lower in Cit-HDF (see table V).
- CRP were similar between the two techniques (Ac-HDF: from 0.7±0.5 to 0.8±0.6 mg/dL; Cit-HDF: from 0.8±0.5 to 0.8±0.6 mg/dL, p=n.s.)
- Serum Citrate remained stable during Ac-HDF, whereas it increased significantly during Cit-HDF, as expected (TABLE VI)
- Fibrinogen was not significantly different between the two techniques (fig.1A), while the postdialytic aPTT was significantly higher on Cit-HDF (fig.1B) and the Platelets count decreased, although not significantly, on Ac-HDF, whereas it remained stable on Cit-HDF (fig.1C)

		ACETATE	CITRATE	p
Reinfusion volume (l/session)		24.2 ± 3.5	24.5 ± 2.5	NS
eKt/V		1.65 ± 0.36	1.76 ± 0.38	NS
sCreat (mg/dl)	start	8.3 ± 1.8	8.6 ± 1.8	
	end	2.2 ± 0.8 (73%)	2.3 ± 0.8 (73%)	NS
sPi (mg/dl)	start	4.7 ± 1.2	4.8 ± 0.9	
	end	1.9 ± 0.4 (60%)	1.9 ± 0.5 (60%)	NS
$s\beta_2M$ (mg/l)	start	27 ± 2	27 ± 3	
	end	6 ± 2 (78%)	6 ± 2 (78%)	NS
sHCy (mmol/l)	start	25 ± 7	23 ± 7	
	end	11 ± 2 (56%)	11 ± 2 (52%)	NS

Table III: *Pre vs post-dialysis changes on small and middle uremic toxins (RR=reduction rate)*

sCreat=creatine, sPi=Phosphorus, $s\beta_2m$=Beta2-microglobulin, sHCy=homocystein

		ACETATE	CITRATE	p
sCa (mg/dl)	start	9.3 ± 0.5	9.5 ± 0.5	NS
	end	10.6 ± 0.4*	9.7 ± 0.4	0.0001
sCa^{++} (mmol/l)	start	1.12 ± 0.05	1.12 ± 0.06	NS
	end	1.22 ± 0.03*	1.07 ± 0.03*	0.0001
sPTH (pg/ml)	start	254 ± 186	266 ± 178	0.6
	end	132 ± 94*	326 ± 180	0.0001
sMg (mg/dl)	start	2.1 ± 0.2	2.2 ± 0.2	NS
	end	1.8 ± 0.1*	1.8 ± 0.1*	NS
$sHCO_3^-$ (mmol/l)	start	23 ± 1.7	23 ± 1.8	NS
	end	28 ± 0.1*	26 ± 1.1*	0.0001

Table IV: *Pre vs post- dialysis changes on Electrolytes and Parathormones values.*

** p<0.05 pre vs post-dialysis value*

		ACETATE	CITRATE	p
BW (kg)	start	83 ± 15	83 ± 16	NS
	end	81.2 ± 15	81 ± 16	NS
Systolic Pressure	start	125 ± 20	123 ± 18	NS
(mmHg)	end	120 ± 15	112 ± 13	0.038
Diastolic Pressure	start	70 ± 12	70 ± 8	NS
(mmHg)	end	69 ± 9	62 ± 8	0.02

Table V: *Pre vs Post-dialysis changes on Blood Pressure and Body weight*

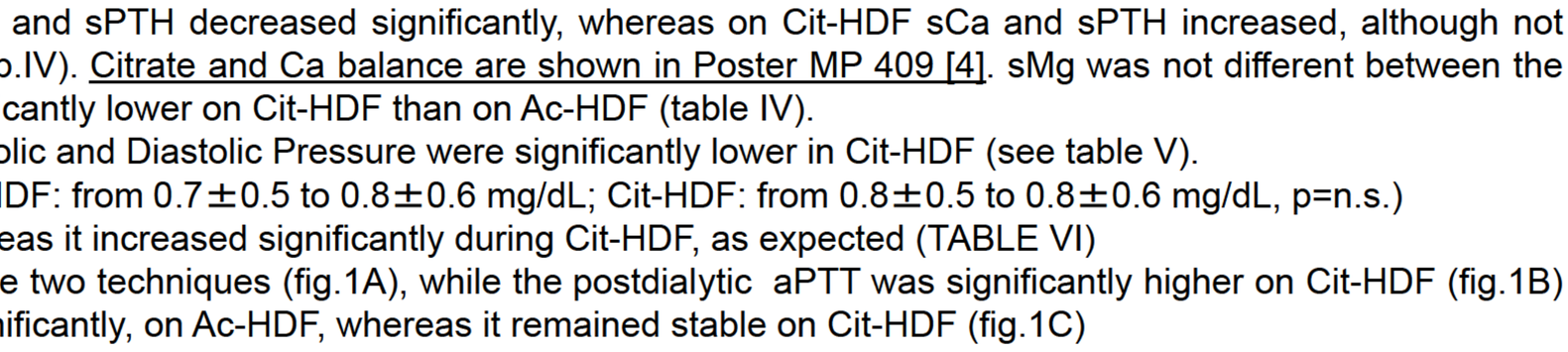

Figure 1: *Changes of anticoagulant parameters (panel A: Fibrinogen, panel B: aPTT, panel C: platelet count) pre and post-dialysis in Ac-HDF (blue columns) and Cit-HDF (orange columns)*

CONCLUSIONS

The increase of aPTT and the stability of platelet count on Cit-HDF suggests a reduced trombogenicity in the extracorporeal circuit. By using Citrate dialysate with Ca of 1.5 mmol/l in postdilution high volume OL-HDF results in a sPTH increase during the session in most of the patients. If a negative Ca balance is unwanted, different strategies may be taken into account, such as increase of dCa or increase of oral Ca salts supplements and/or of Vitamin D derivates. These procedures will be taken into account in further investigations

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416--SP
Clinical nephrology - miscellaneous
Giovanni Calabrese
DOI: 10.3252/pso.eu.50era.2013
Poster presented at: ERA-EDTA 50th Congress Istanbul Turkey May 15-21, 2013
PosterSessionOnline.com