POST DIALYTIC ALKALOSIS : HEMODIALYSIS BICARBONATE VERSUS ACETATE FREE BIOFILTRATION AT 84 ‰

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INTRODUCTION AND AIM

The correction of metabolic acidosis by extra renal purification techniques (ERP) represents a therapeutic targets in the treatment of chronic renal failure (CRF). The post dialytic alkalosis may cause deleterious consequences in chronic hemodialysis patients, especially in patients with chronic respiratory failure.

The aim of our study was to evaluate the post dialytic alkalosis comparing hemodialysis bicarbonate (HDB) and acetate-free biofiltration at 84 ‰ (AFB at 84 ‰).

METHODS

Prospective study, cross-over, conducted within the research unit of the dialysis department at the Military Hospital of Tunis, over a period of 24 months, including 30 patients treated periodically by HDB. Each patient had 6 successive sessions of HBD and 6 successive sessions of AFB at 84 ‰. A total of 357 sessions is performed (180 sessions of HDB, 177 sessions of AFB at 84 ‰). The mean age of our patients was 50 ± 14,5 years.

The buffer used was the bicarbonate content in the dialysate (30 mmol/L) for the HDB and a molar solution of sodium bicarbonate at 84 ‰, sterile and apyrogenic, re-injected directly into the venous line with a medium flow 4,28 ml/kg/hour. We practiced for arterial blood gas samples at the arterial line of the extracorporeal circulation at the beginning (H0), the middle (H2) and at the end (H4) sessions.

Table 1: Parameters in dialysis techniques HDB and BSA at 84 ‰

Dialysis parameters		HDB	AFB 84 ‰
Generator		INTEGRA (Hospal Italy)	
Filter		Modified cellulose membrane with low coefficient of hydraulic permeability	
Blood flow	(ml/mn)	300	
Dialysate flow	(ml/mn)	500	
Session duration	(hours)	4 à 6	
Dialysate Ca ++	(mmol/L)	1.5	1.5
Conductivity	(mS/cm)	14.3 à 14.5	13 à 13.5
Dialysate Na+	(mmol/L)	143 à 146	121 à 124
Dialysat HCO3-	(mmol/L)	26 à 30	0
HCO3- substitution debit	(ml/kg/H)	-	4.5 à 4.8
Hourly substitution volume	(ml / h) (ml/H)	-	250 à 300
Total volume of HCO3-	(ml / session)		≤ 1500

RESULTS

Analysis of the results shows a risk of metabolic alkalosis post-dialysis largest in the HDB (51,8% of sessions) versus the FAB 84 ‰ (6,4% of sessions) with a statistically significant difference ($p < 0,05$). The correction of metabolic acidosis has been adequate in the technique AFB 84 ‰ where this correction was fast from the first two hours and was maintained until the end of the sessions without the risk of switching to metabolic alkalosis. At H4, alkaline reserves have not exceeded 27 mmol / L and post-dialysis pH was less than 7,45. However, we found during the technical HDB a tendency to over-correction of metabolic acidosis, even coming at the end (H4) to a hyperbasémie with a pH of 7,48 ± 0,04 and alkaline reserves 27,8 ± 3,7 mmol / L.

Indeed, sodium bicarbonate infusion during the session of the AFB 84 ‰ quickly compensates for the loss of HCO3- in the dialysate and causes the stabilization of plasma bicarbonate levels in a physiologic range without the risk of hyperbasémie. This results from the fact that there is a self-limiting phenomenon which prevents the rise in the plasma concentration of bicarbonate.

Table 2: Variations in per-dialytic of blood gas parameters during technical: HDB and AFB 84 ‰ (cross-over study).

		N	HDB	AFB 84‰	Student Test *(P)*
PH	T0	165	7,397 ± 0,04	7,369 ± 0,04	0.000 (S)
	T2	54	7,417 ± 0,02	7,377 ± 0,03	0.000 (S)
	T4	164	7,477 ± 0,04	7,414 ± 0,03	0.000 (S)
Δ PH		164	0,082 ± 0,05	0,045 ± 0,04	0.000 (S)
HCO3- (mmol/L)	T0	164	21,745 ± 3,57	19,529 ± 2,97	0.000 (S)
	T2	54	23,687 ± 2,19	20,661 ± 2,12	0.000 (S)
	T4	163	27,787 ± 3,61	23,305 ± 2,39	0.000 (S)
Δ HCO3		163	6,082 ± 3,04	3,309 ± 3,17	0.000 (S)
PaCO2 (mmHg)	T0	163	34,432 ± 4,40	32,605 ± 4,37	0.000 (S)
	T2	58	35,896 ± 2,83	34,136 ± 3,86	0.004 (S)
	T4	162	36,983 ± 4,34	34,501 ± 4,31	0.000 (S)
Δ PaCO2		162	2,566 ± 3,95	1,895 ± 3,94	0,093 (NS)
PaO2 (mmHg)	T0	161	103,541 ± 11,54	104,100 ± 13,66	0.576 (NS)
	T2	61	93,895 ± 16,11	91,886 ± 15,05	0.320 (NS)
	T4	162	96,405 ± 14,27	97,756 ± 14,39	0.244 (NS)
Δ PaO2		161	- 6,966 ± 14,72	- 6,312 ± 11,48	0,616 (NS)

N: sessions number; ΔpH = pHT4 - pHTO ; ΔHCO-3 = HCO-3 T4 - HCO-3 TO ; ΔPaCO2 = PaCO2 T4 - PaCO2 TO ; ΔPaO2 = PaO2 T4 - PaO2 TO

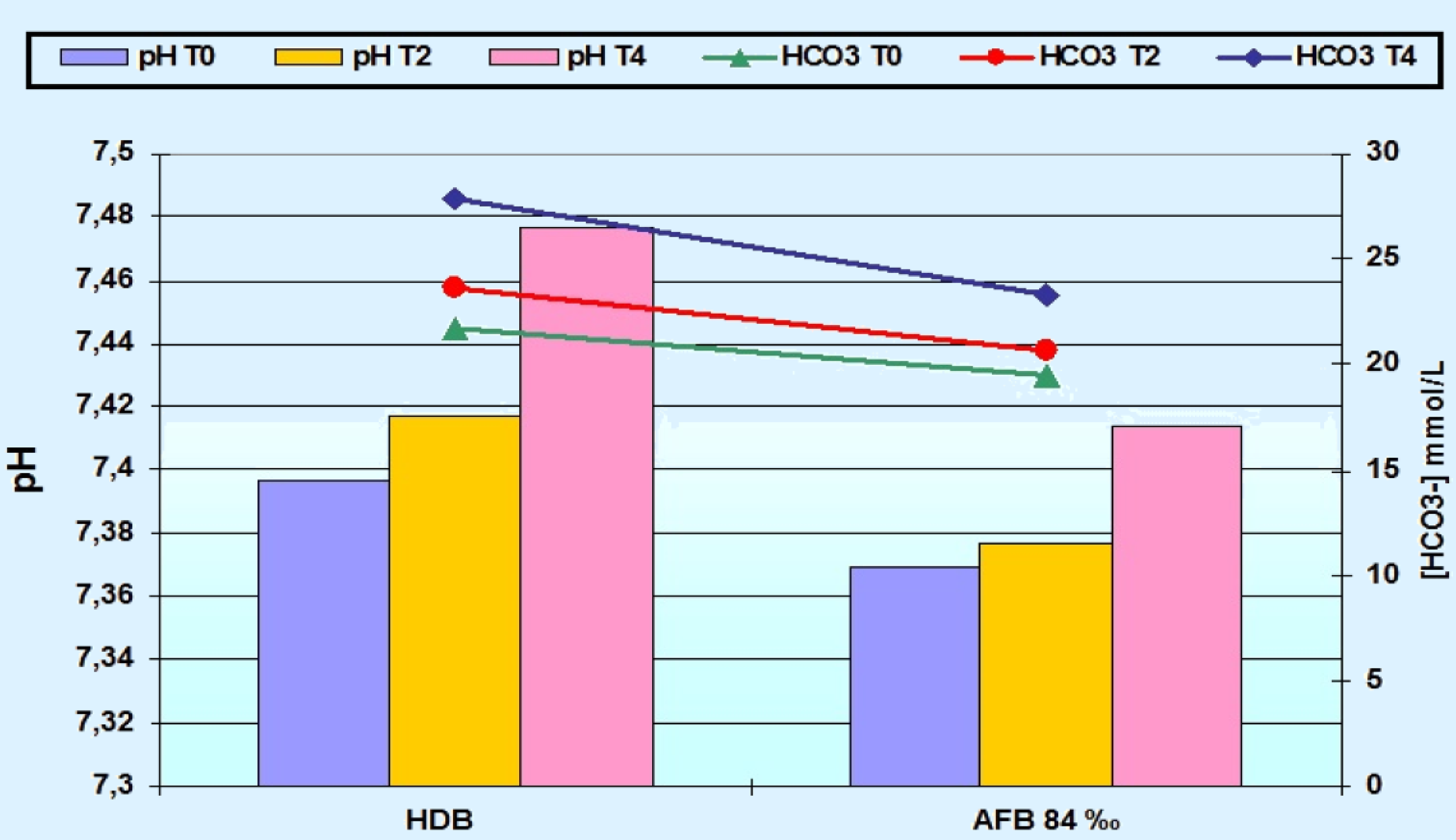

Figure 1 : Per-dialysis variation in pH and alkaline reserves in the HDB and AFB at 84 ‰.

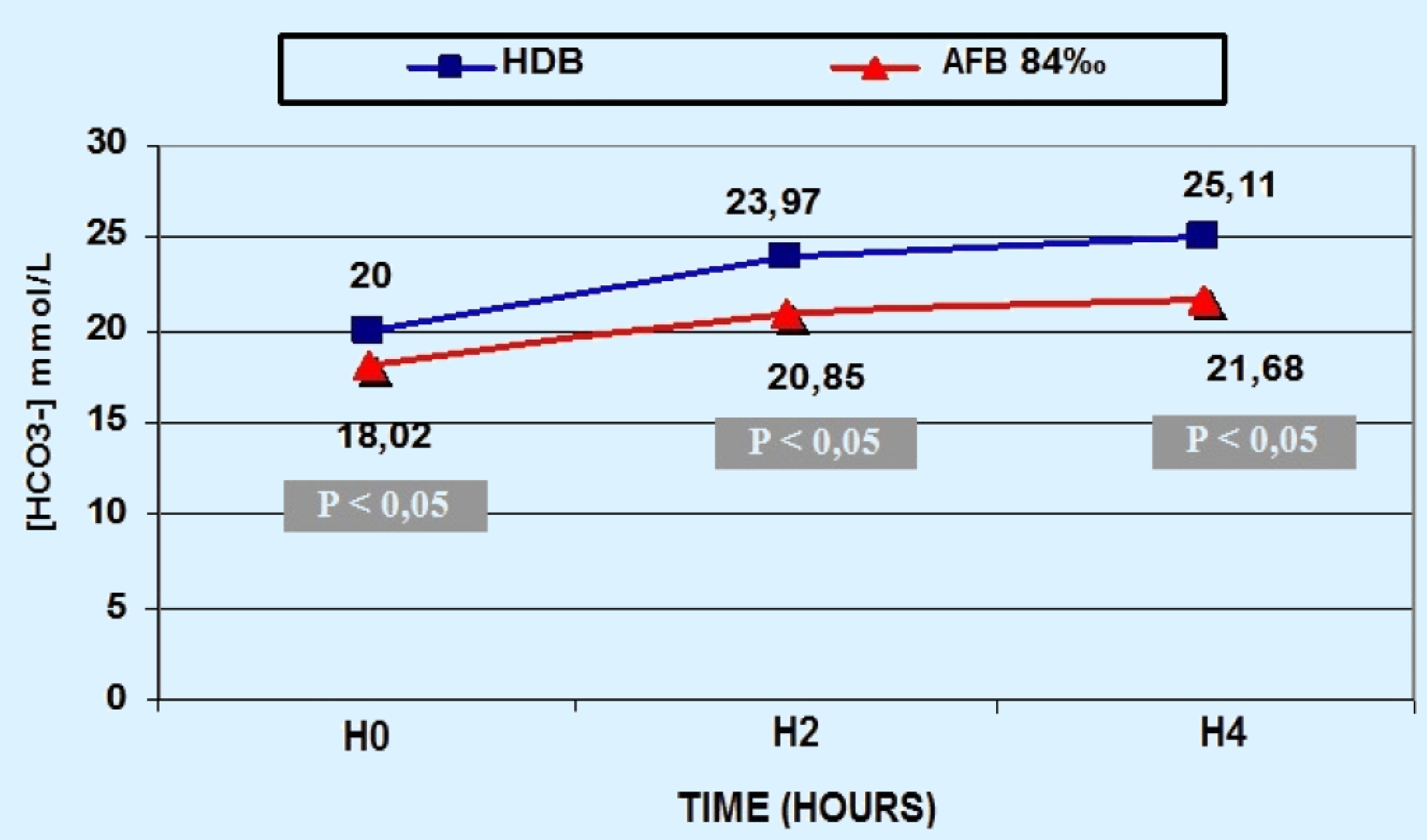

Figure 2 : Variation in alkaline reserves (HCO3-) during the sessions of HDB and AFB at 84 ‰.

CONCLUSION

The AFB at 84‰ provides good correction of metabolic acidosis in chronic dialysis patients with less risk of post-dialysis alkalosis. This technique shows its superiority in dialysis patients intolerant of HDB and with acute failure of the cardiovascular system.

references

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52 ERA
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L1) Dialysis. Extracorporeal dialysis: techniques and adequacy.
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DOI: 10.3252/pso.eu.52era.2015