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BACKGROUND

Parathyroid hormone (PTH) is implicated on endothelium-dependent vasodilation and coronary microvascular dysfunction. Parathyroidectomy (PTx) seems to improve cardiovascular outcomes and blood pressure control. However, the effect of PTx on hemodynamic changes during hemodialysis (HD) is still overlooked.

This study accessed the effects of PTx on cardiovascular performance in patients under HD.

METHODS

In this prospective observational cohort we studied 30 end-stage renal disease (ESRD) patients on HD.

Finger pulse contour analysis (Finometer monitor) was used to access hemodynamic parameters immediately pre and post HD sessions.

Patients who had undergone PTx were matched to the patients who did not have PTx by age, sex, dialysis vintage, hemoglobin, albumin, serum calcium, ultrafiltration rate and hypotensive drugs use.

RESULTS

Table 1. Pre and post dialysis hemodynamic and biochemical variables in PTx and Non-PTx groups

Variable	PTx	Non-PTx	p
Δ Systolic Blood pressure (mmHg)	-13.8 ± 15	-10.2 ± 15	0.701
Δ Diastolic Blood pressure (mmHg)	-2.7 ± 8.6	2.0 ± 6.6	0.097
Serum Calcium, mg/dl	9.0 ± 0.9	9.2 ± 0.7	0.598
Serum phosphate, mg/dl	5.4 ± 2.6	5.5 ± 1.0	0.929
PTH, pg/ml	15 (7, 65)	564 (478, 727)	0.0006
Pre HD stroke volume (ml)	84.5 ± 30.1	92.7 ± 26.2	0.449
Post HD stroke volume (ml)	68.2 ± 34.3	64.4 ± 26.8	0.739
Δ HD stroke volume (ml)	-16.0 (-28.7, -4.6)	-23.5 (-37.1, -16.5)	0.182
Pre HD cardiac index (L/min/m ²)	3.6 ± 0.6	4.1 ± 1.0	0.122
Post HD cardiac index (L/min/m ²)	3.2 ± 0.9	3.2 ± 0.8	0.928
Δ cardiac index (post-pre HD) (L/min/m ²)	-0.40 (-0.62, -0.01)	-0.83 (-1.38, -0.40)	0.048
Pre HD PAR (dyn.s/cm ⁵)	1227 ± 374	1302 ± 464	0.662
Post HD PAR (dyn.s/cm ⁵)	1256 ± 328	1696 ± 700	0.072
Δ HD PAR (dyn.s/cm ⁵)	17.6 (-127.4, 243.2)	298.8 (174.7, 511.3)	0.012

There was no difference regarding Ca dialysate content (CaD) when comparing patients on PTx and non-PTx group (p=0.121).

Cardiac index (CI) variation and peripheral arterial resistance (PAR) variation were lower in PTx group (Table 1).

Figure 1. Two-way ANOVA plot for the effect of PTx and CaD on PAR variation during HD.

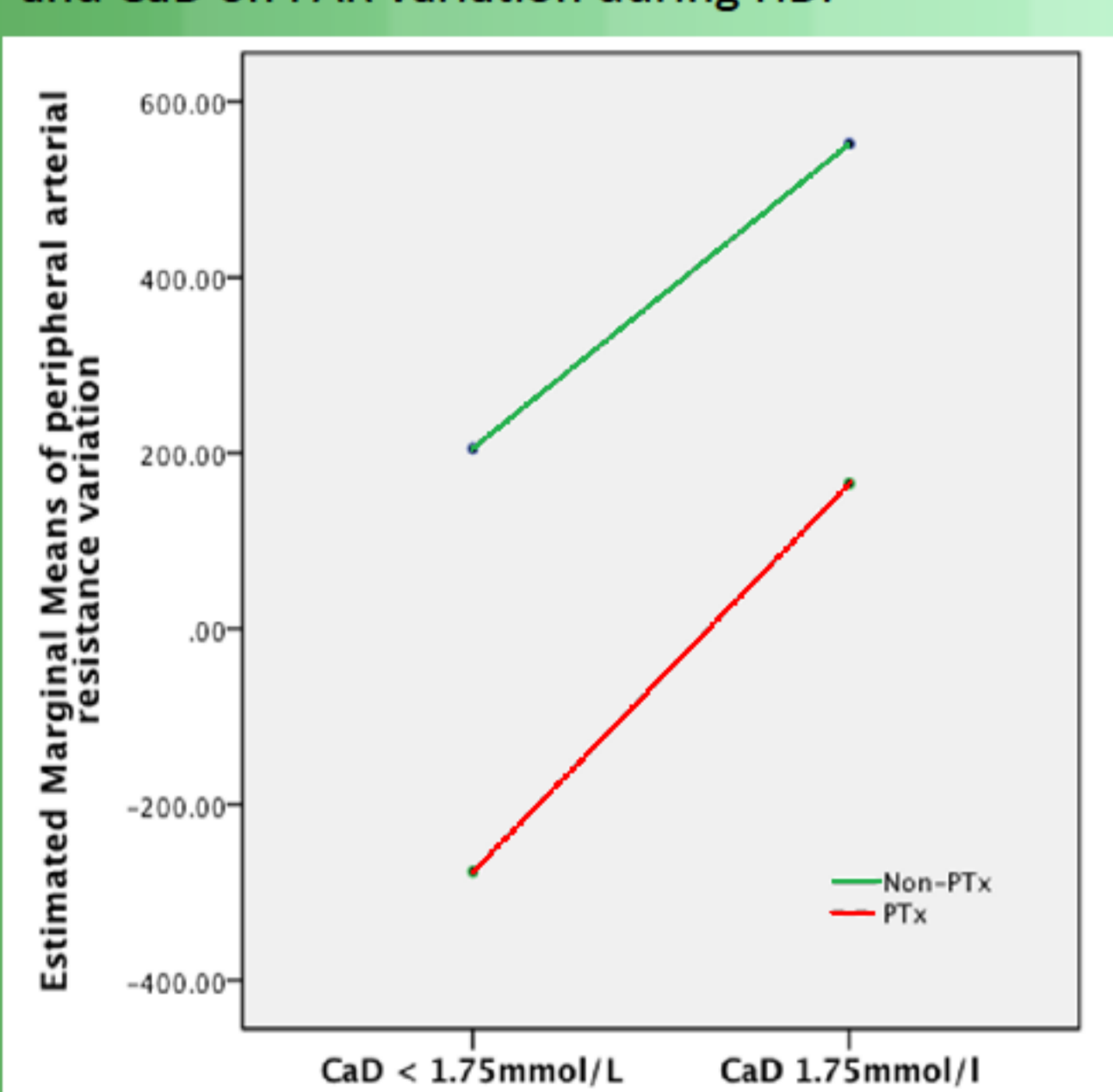
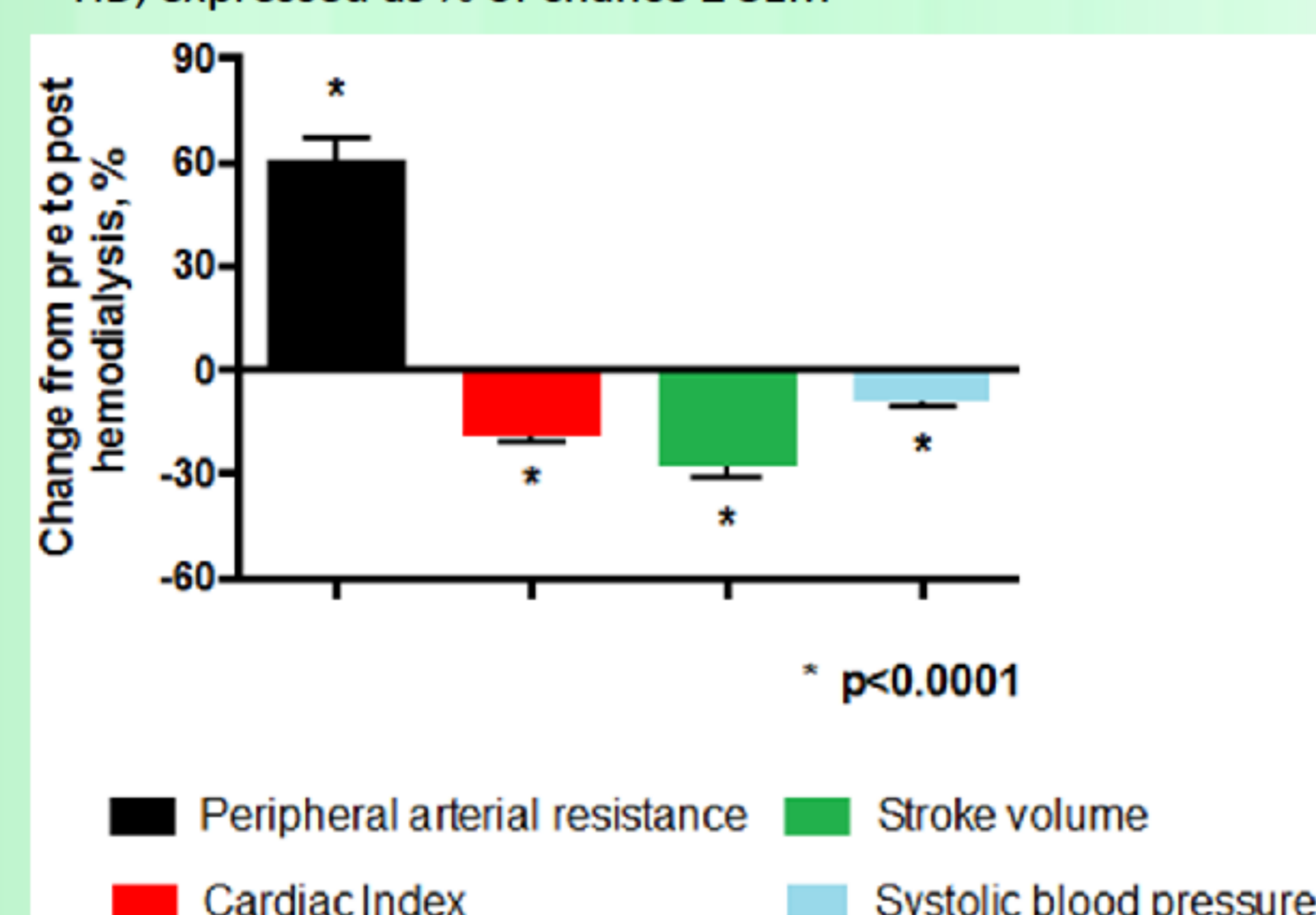


Figure 2. Changes in hemodynamic from pre to post HD, expressed as % of change ± SEM



By two-way analysis of variance, both conditions, PTx and CaD, were associated to PAR behavior (p=0.024 and 0.039, respectively) (Figure 1). There was no effect of bicarbonate content and there was no interaction among factors.

Two-way analysis of variance was applied to examine the influence of PTx status (yes vs. no), bicarbonate dialysate content (< or > than 38mEq/l) and CaD (1.75 mmol/L or < 1.75mmol/L) on peripheral arterial resistance (PAR) variation, which was the most prominent hemodynamic change observed (figure 1 and table 2).

Table 2. Stepwise multiple linear regression analysis between delta in peripheral arterial resistance (ΔPAR) and independent variables.

Independent Variable	Beta coefficient	Partial correlation	p
Dependent ΔPVR			
PTx	-0.518	-0.529	0.003
Dca < or ≥ than 1.5 mmol/l	0.492	0.510	0.005

PTx, parathyroidectomy, Dca, dialysate calcium.

Entire model: r=0.605, adjusted r²=0.319, p=0.002. Other variables in this model: ultrafiltration rate.

Multiple stepwise regression analysis shows that PTx and CaD remained independently associated to PAR variation, even adjusted for ultrafiltration rate (adjusted r²=0.319, p=0.003 and 0.005, respectively) (Table 2).

CONCLUSIONS

Physiologic increase in PAR secondary to ultrafiltration seems to be impaired in patients who underwent PTx, which directly influences cardiac performance during HD procedure, by compensatory increase in cardiac output in order to sustain BP.

CaD of 1.75mmol/L was associated to better PAR behavior during dialysis.

Further investigation to better elucidate the effect of PTx on vascular resistance is still pending

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