ARTERIAL STIFFNESS MISMATCH IN PREDIALYSIS CHRONIC KIDNEY DISEASE

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Background and Objective

- The loss of physiological stiffness mismatch between aorta and peripheral arteries contributes to development of heart failure with reduced ejection fraction and was strongly and independently associated with increased mortality in adult dialysis population.
- The aim of this pilot retrospective study was to evaluate if the reversal of arterial stiffness mismatch was present in patients with pre-dialysis chronic kidney disease (CKD)

1. Catherine Fortier et al. Hypertension 2014 1:
2. Mihai S. Utescu et al. Hypertens. 2013 07;

Material and Methods

Inclusion criteria

✓ Patients with treated arterial hypertension
✓ Known CKD IIIa - IV stages (n=112)

Methods

- Central pulse wave analysis (PWA) and pulse wave velocity (PWV) measurement was done by SphygmoCor (AtCor Medical, Australia)
- PWV was measured at two levels
  - carotid-femoral PWV (aortic PWV)
  - carotid-radial PWV (peripheral PWV)
- Stiffness mismatch between aorta and peripheral arteries was evaluated as PWV ratio
  - PWV ratio = carotid–femoral PWV/carotid-radial PWV

Statistic analysis

- $p<0,05$ was considered significant for between group difference
- Multivariate logistic regression was applied to reveal determinants of aortic and peripheral PWV and PWV ratio

Study Population

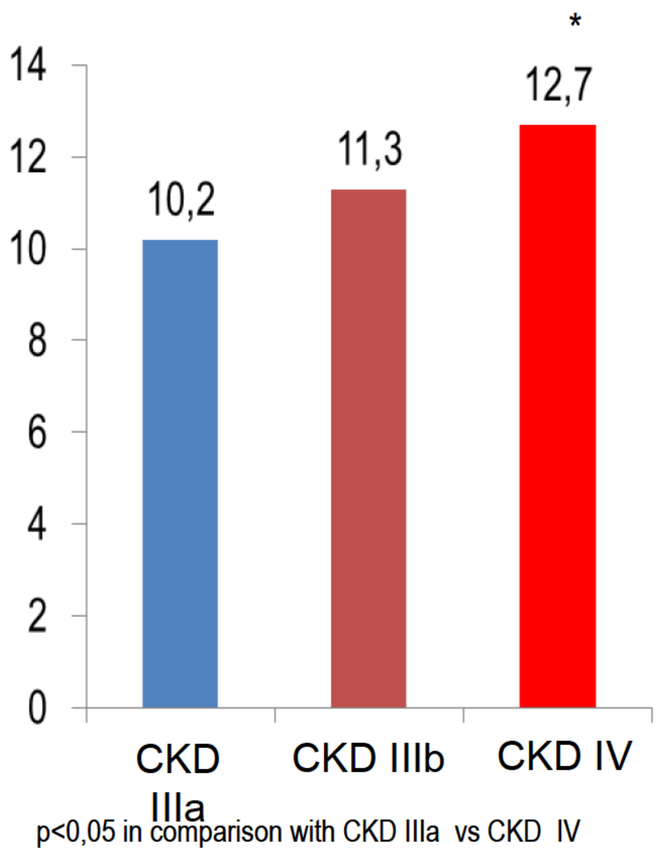
Parameters	CKD IIIa (n=54)	CKD IIIb (n=35)	CKD IV (n=23)
Male, n (%)	46,3	45,7	43,4
Age, years	59,5±8,4	60,2±7,8	57,3±10,2
Smoking,n (%)	12 (22,2)	8 (22,9)	6 (26,0)
Diabetes mellitus, n (%)	10 (18,5)	7 (20,0)	6 (26,1)
Brachial BP, mm Hg	149,6±10,3/85,8±9,8	152,5±12,5/86,4±10,2	156,1±14,3/92,8±12,4
Brachial PP, mm Hg	64,2 ±5,7	65,6 ±6,2	65,7 ±6,8
Aorta PP, mm Hg	52,8 ±4,7	54,3 ±6,1	55,6 ±6,2
Aorta BP, mm Hg	138,1±9,4	141,0±10,3	144,7±11,0
Amplification of PP,%	124,1±10,2	119,2±11,4	112,2±10,7*

P<0,5 companity to groupe

Results

1. Subgroups by CKD stages were similar by age, gender, smoking and diabetes mellitus status, brachial and aortic BP (see Study Population section). PP amplification was decreased in CKD IV vs CKD IIIa.
2. Figure 1 shoes significant increase of aortic PWV from CKD IIIa to CKD IV. Increased aortic stiffness (aortic PWV>10 m/s) was observed in 55,6%, 62,9% and 73,9%, respectively.
3. Figure 2 illustrates absence of peripheral arterial stiffness increase along CKD stages
4. Aortic to peripheral PWV ratio increased from CKD IIIa to CKD IV indicating loss of aortic-peripheral arterial stiffness mismatch (Figure 3)
5. For the whole study population (n=112) multivariate analysis revealed independent significant correlation between aortic PWV and glomerular filtration rate (GFR) $\beta=-0,36$ ($p<0,05$), PWV ratio and GFR $\beta=-0,32$ ($p<0,05$), PWV ratio and age $\beta=0,44$ ($p<0,05$).

Figure 1. Aortic PWV by CKD stages



p<0,05 in comparison with CKD IIIa vs CKD IV

Figure 2. Peripheral PWV by CKD stages

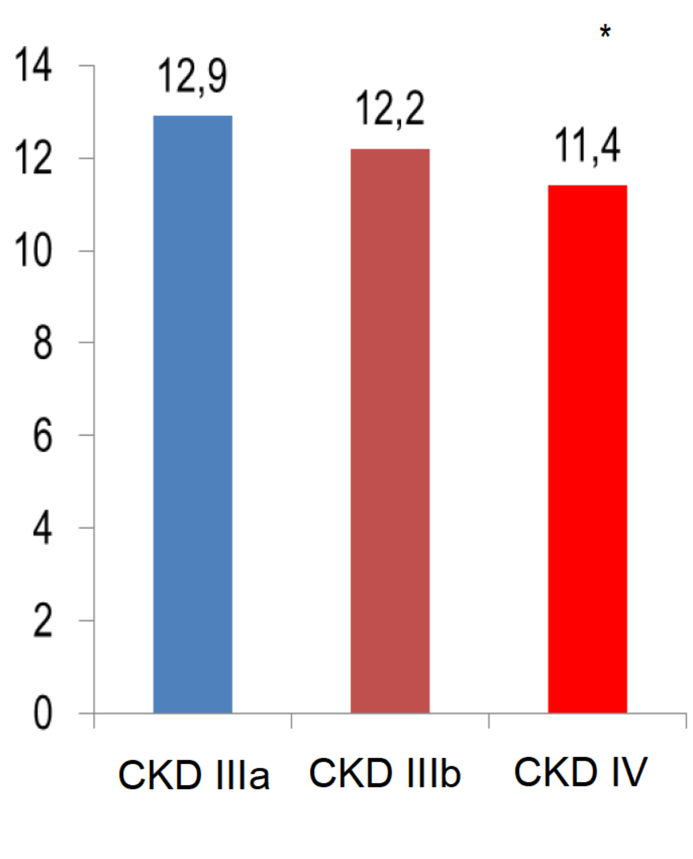
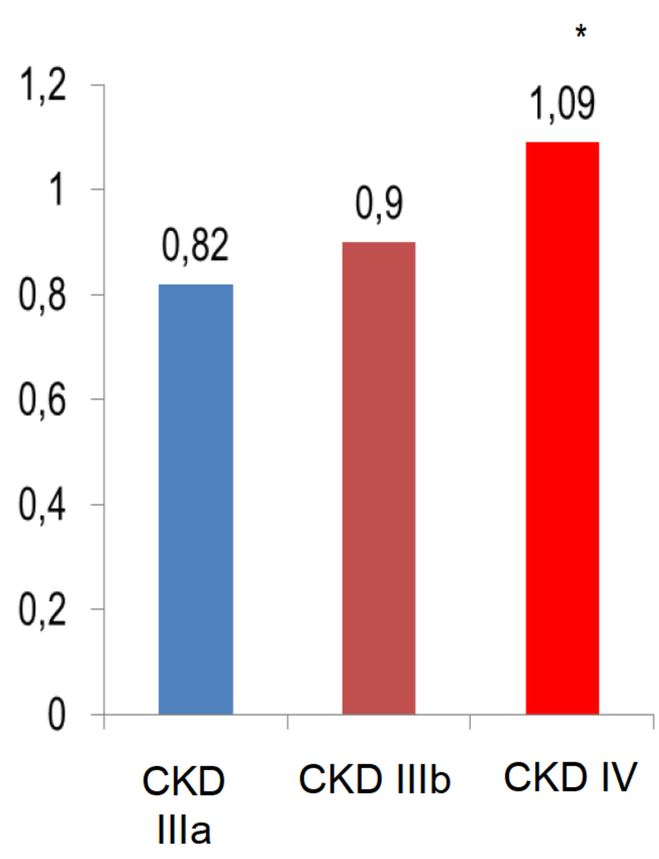


Figure 3. PWV ratio by CKD stages



Conclusions

- In the pre-dialysis hypertensive CKD patients worsening of kidney function was associated with discordant changes in aortic and brachial artery stiffness indicating the reversal of the physiological stiffness mismatch.
- The loss of this physiological mismatch may promote kidney damage through increased forward pressure wave transmission into the microcirculation.
- PWV ratio evaluation (in addition to traditional aortic PWV measurement) may be useful for better evaluation of arterial stiffness in pre-dialysis CKD patients

Disclosure: None

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