Evaluation of ambulatory blood pressure measurement in a cohort of patients affected by chronic kidney diseases

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Background

Patients affected by chronic kidney disease (CKD) have a high cardiovascular risk. Blood pressure (BP) is one of the principal factors to control to reduce cardiovascular mortality. Several studies have reported that ambulatory blood pressure measurement (ABPM) have a higher accuracy and sensitivity in detect hypertensive patients than office blood pressure (OBP) in general population. The aims of our study are to evaluate, in a cohort of CKD patients undergone at two timepoints, T1 and T2 (median time between the two evaluation 17 mths) to ABPM: 1) the relation between office blood pressure (OBP) and ABPM blood pressure; 2) the clinical and biochemical factors correlated with ABPM parameters and with dipping; 3) the prevalence of the different category of dipping and its modification between T1 and T2.

Material and Methods

150 patients (age 72±9 yrs – 67% males – 54% diabetics – 98% hypertensive) affected by CKD stages I-IV were enrolled and undergone at T1 and T2 to ABPM (table I). At the same time points clinical, blood and urinary evaluations were performed (table II). The following parameters of ABPM were evaluated: 24h systolic and diastolic blood pressure (SBP-24 and DBP-24 respectively), day and night systolic and diastolic blood pressure. All the ABPM parameters were examined in univariate analysis to identify variables for the multivariate analysis in which only SBP-24 was considered as dependent variable. Dipping categories considered both for SBP-24 and DBP-24: nocturnal reduction of blood pressure more than -10%: dipper (SBP-24-di/DBP-24-di); more than -20%: extreme dipper (SBP-24ed/DBP-24ed); -9%-0%: not dipper (SBP-24-nd/DBP-24-nd); >0%: reverse dipper (SBP-24-rd/DBP-24-rd).

Renal function was estimated using CKD-EPI formula (eGFR) and by the quantification of urinary protein excretion of 24h (Prot-U).

Patients (n)	150
Gender (M/F)	109/49
Age (yrs)	74±9
Hypertension (%)	98
Diabetes (%)	54

Table I: anamnestic characteristics of our cohort

Results

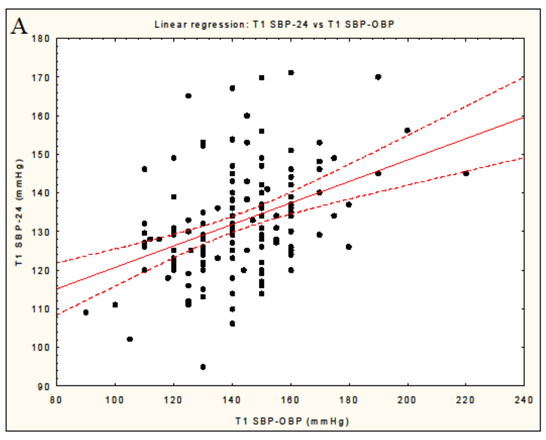
At T1 and at T2 either for systolic and diastolic BP a significant and direct correlation between OBP and ABPM parameters was demonstrated ($p<0.0001$ – figure 1 A and B). All the ABPM parameters resulted directly correlated each other ($p<0.0001$). SBP-24 resulted influenced by age (T1 p=0.04 – T2 p=0.01), eGFR (T1 p=0.41– T2 p=0.007), Hb (T1 p=0.04 – T2 p=0.007) and Prot-U (T1 p=0.03 – T2 p=0.01). Age was the only parameter able in influence DBP-24 (T1 p=0.04 – T2 p=0.01). At T1 and T2, SBP-24-ed were 2% and 5% resp., SBP-24-di 24% and 17% resp., SBP-24-nd 57% and 50% resp. and SBP-24-rd 17% and 28%, DBP-24-ed were 13% and 12% resp., DBP-24-di 34% and 30% resp., SBP-24-nd 44% and 43% resp. and DBP-24-rd 9% and 15%. Both at T1 and T2 SBP-24-di resulted younger than SBP-24-nd (p=0.02) and only at T1 having higher eGFR (T1 p=0.007), whereas DBP-24-di were only younger than DBP-24- at T1 (p=0.03). At T2, 54% of patients showed a worse in dipping category. Nevertheless, no significant differences between them and the other patients were found.

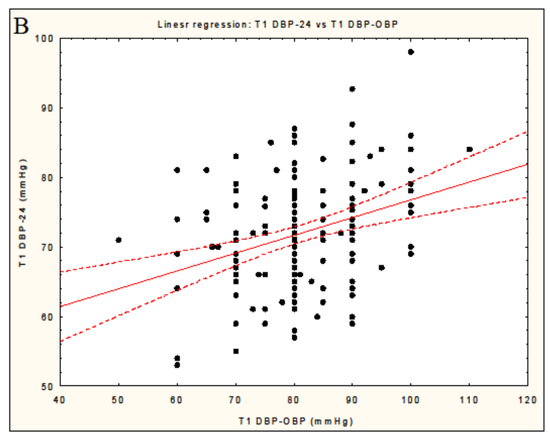
Parameter	*T1*	*T2*	*p*
SBP-OBP (mmHg)	141±19	137±17	0,03
DBP-OBP (mmHg)	81±10	78±12	0,08
SBP-24 (mmHg)	132±14	131±11	0,61
DBP-24 (mmHg)	72±8	71±8	0,59
SBP-DAY (mmHg)	134±13	133±10	0,42
DBP-DAY (mmHg)	74±8	73±8	0,34
SBP-NIGHT (mmHg)	127±16	127±18	0,90
DBP-NIGHT (mmHg)	74±8	73±9	0,34
SBP -24 (%) (dipper/extreme dipper/ not dipper/reverse dipper)	24/2/57/17	17/5/50/28	<0,0001
DBP-24 (%) (dipper/extreme dipper/ not dipper/reverse dipper)	34/13/44/9	30/12/43/15	<0,0001

Parameter	*T1*	*T2*	*p*
BMI (kg/m^2)	27±4	27±4	0,72
Blood Glucose (mg/dL)	115±34	118±35	0,22
Urea (mg/dL)	75±28	78±32	0,20
Creatinine (mg/dl)	2,04±0,75	2,09±0,91	0,19
eGFR (ml/min)	34±16	34±17	0,94
Stage CKD (1/2/3/4/5) (%)	1/7/47/39/8	1/8/44/38/9	<0,0001
Albumin (g/dL)	4,25±0,36	4,06±0,50	<0,0001
Ca (mg/dL)	9,38±0,59	9,33±0,51	0,35
P (mg/dL)	3,50±0,69	3,41±0,68	0,04
PTH (pg/dL)	102±91	84±61	0,005
25(OH)D (ng/dL)	26±17	29±14	0,23
ProtU/24h (g/24h)	0,25 [0,14-0,55]	0,62 [0,16-0,70]	0,30

Table II: Characteristics of the cohort.: SBP-OBP: Office systolic blood pressure, DBP-OBP: Office -diastolc blood pressure; SBP-24: 24h systolic blood pressure; DBP-24: 24h diastolic blood pressure; SBP-DAY: diurnal systolic blood pressure; DBP-DAY: diurnal diastolic blood pressure; SBP-NIGHT: nocturnal systolic blood pressure; DBP-NIGHT: nocturnal diastolic blood pressure; PTH: Parathormone eGFR: glomerular filtration rate estimated with CKD-EPI formula

Figure 1: linear regression*, A) T1 SBP-24 and T1 SBP-OBP (p<0,0001 r=0,40) and B) T1 SBP-24 and T1 DBP-OBP (p<0,0001 r=0,33)*





Conclusions

In a cohort of patients affected by CKD, OBP and ABPM parameters are correlated. Renal function (eGFR and urinary protein excretion) is related and seems able to influence the values of systolic blood pressure and the nocturnal BP reduction.

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