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Association of interankle SBP difference with PAD and echocardiographic parameters in CKD

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Background. An interankle systolic blood pressure (SBP) difference has been associated with overall and cardiovascular mortality in hemodialysis. We investigated whether an association existed between this difference and ankle-brachial index (ABI), brachial-ankle pulse wave velocity (baPWV), and echocardiographic parameters in patients with chronic kidney disease (CKD) stages 3-5.

Methods. A total of 495 CKD patients referred for echocardiographic examination were included in the study. The four limb blood pressures were measured simultaneously by an ABI-form device.

Results. We performed multivariate forward analysis for determining the factors associated with an interankle SBP difference ≥ 15 mmHg. The ABI < 0.9 ($P < 0.001$), high baPWV ($P < 0.001$) and increased left atrial volume index (LAVI) ($P = 0.032$) were associated with an interankle SBP difference ≥ 15 mmHg. Besides, the addition of an interankle SBP difference ≥ 15 mmHg to a model of clinical features could significantly improve the value in predicting ABI < 0.9 ($P < 0.001$) and increased LAVI ($P = 0.034$).

Table. Comparison of baseline characteristics between patients with and without an interankle systolic BP difference ≥ 15 mmHg

Characteristics	All patients (n = 495)	Difference < 15 mmHg (n = 401)	Difference ≥ 15 mmHg (n = 94)	P
Interankle SBP difference	6 (3-12)	5 (3-8)	23 (18-39.25)	< 0.001
Interarm SBP difference	3 (2-6)	3 (1-5)	4 (2-6)	0.248
Age (year)	65.9 \pm 12.7	64.5 \pm 12.3	71.9 \pm 12.7	< 0.001
Male gender (%)	52.9	52.1	56.4	0.456
Smoking history (%)	9.7	11.3	3.8	0.054
Diabetes mellitus (%)	35.4	30.9	54.3	< 0.001
Hypertension (%)	75.4	75.1	76.6	0.756
Coronary artery disease	20.6	18.7	28.7	0.031
Mean arterial pressure	98.3 \pm 14.9	98.1 \pm 14.9	99.4 \pm 15.0	0.431
Body mass index (kg/m ²)	25.9 \pm 4.1	25.9 \pm 4.0	25.7 \pm 4.5	0.662
ABI < 0.9 (%)	9.3	3.2	35.1	< 0.001
baPWV (cm/s)	1896.9 \pm 499.4	1851.6 \pm 454.2	2090.1 \pm 625.2	0.001
Laboratory parameters				
Triglyceride (mg/dL)	121.5 (85-184)	119.5 (83-182)	136 (87.75-202.5)	0.974
Total cholesterol (mg/dL)	191.4 \pm 43.9	193.1 \pm 44.7	183.6 \pm 39.7	0.091
eGFR (mL/min/1.73m ²)	43.0 \pm 14.3	43.7 \pm 14.0	40.0 \pm 15.4	0.023
Echocardiographic data				
LAVI (ml/m ²)	37.3 \pm 15.4	36.2 \pm 15.1	42.1 \pm 16.0	0.001
LVMi (g/m ²)	143.1 \pm 47.8	140.9 \pm 46.2	152.1 \pm 53.5	0.065
L VH (%)	66.1	64.6	72.3	0.153
LVEF (%)	61.4 \pm 14.3	61.8 \pm 14.1	59.5 \pm 15.0	0.151
LVEF < 50% (%)	19.8	18.0	27.7	0.034
E/A	0.95 \pm 0.49	0.94 \pm 0.48	0.99 \pm 0.54	0.340
E/Ea	11.1 \pm 5.5	10.8 \pm 5.5	12.1 \pm 5.7	0.048
E-wave deceleration time	211.1 \pm 70.8	207.9 \pm 69.2	224.7 \pm 76.2	0.040

Table 5. Predictive value to ABI < 0.9 and increased LAVI

Parameters	ABI < 0.9		LAVI	
	difference in likelihood ratio	P	difference in adjusted R square	P
Interleg SBP difference ≥ 15 mmHg	35.690	< 0.001	0.007	0.034

Conclusions. Our study demonstrated that ABI < 0.9, high baPWV, and increased LAVI were independently associated with an interankle SBP difference ≥ 15 mmHg. Besides, interankle SBP difference ≥ 15 mmHg could offer an extra benefit in predicting patients with ABI < 0.9 and increased LAVI beyond conventional clinical features. Hence, calculation of interankle SBP difference may provide additional information in identifying patients with peripheral vascular disease and increased LAVI in patients with CKD stages 3-5.

Table 2. Determinants of interankle SBP difference ≥ 15 mmHg in all study patients

Parameter	Multivariate (Forward)	
	OR (95% CI)	P
Diabetes mellitus	1.939 (1.138-3.303)	0.015
ABI < 0.9	12.438 (5.887-26.279)	< 0.001
baPWV (per /s)	1.009 (1.004-1.014)	0.001
LAVI (per 1 ml/m ²)	1.018 (1.001-1.034)	0.032

Table 3. Determinants of interankle SBP difference ≥ 15 mmHg after exclusion of ABI < 0.9

Parameter	Multivariate (Forward)	
	OR (95% CI)	P
Diabetes mellitus	2.180 (1.150-4.133)	0.017
baPWV (per /s)	1.009 (1.003-1.016)	0.006
E-wave deceleration time (per 1 ms)	1.004 (1.000-1.009)	0.046

Table 4. Determinants of interankle SBP difference ≥ 15 mmHg after exclusion of an interarm SBP difference ≥ 10 mmHg

Parameter	Multivariate (Forward)	
	OR (95% CI)	P
Diabetes mellitus	1.911 (1.034-3.051)	0.036
ABI < 0.9	15.669 (6.087-40.335)	< 0.001
baPWV (per /s)	1.012 (1.007-1.018)	< 0.001

