45. Chronic Kidney Disease and Pulmonary Arterial Hypertension

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Body

Background: Kidney dysfunction is not only an outcome predictor of pulmonary arterial hypertension (PAH), but also is a cause of pulmonary hypertension (pulmonary hypertension Group V). However, chronic kidney disease(CKD) relates to hemodynamics and mortality of pulmonary arterial hypertension remains unclear.

Methods: In this multicenter study, we registered 364 patients from Taiwan Pulmonary Arterial Hypertension National Study (TAIPANS) and included patients with World Health Organization Group I PAH. The patients were classified into CKD and non-CKD groups (CKD defined as eGFR < 60 mL/min/1.73 m2). Baseline characteristics, hemodynamics, exercise test result, risk factors, predictors were determined on the PAH diagnosed day and the difference between CKD and non-CKD group were analyzed. The following hemodyanmic results at least 90 days after diagnosis of Group I PAH were also analyzed.

Results: In this study, the mean ± SD estimated creatinine clearance was 94.6±32.3mL/min in the non-CKD group and 44.7±18.3mL/min in CKD group(p<0.001). The CKD group was significantly older (60.7±16.7 v.s. 45.1±14.9, p<0.001). There was significant difference in hypertension(P<0.001) and diabetes mellitus(p=0.004) between the two groups. Analyzing each subtypes of PAH, there has no significant difference between the CKD and non-CKD groups in right heart hemodynamics and function on the diagnosed day of PAH(Table 1). The NT-proBNP level was significantly higher in the CKD group. In the intermediate to high risk patient, there was no significant difference in the signs of right heart failure. On multivariable analysis, we found age (OR 1.074, 95% CI 1.00 to 1.151, P=0.043) and 6-minutes walking test(6MWT) (OR 0.989, 95% CI 0.979 to 1.00, P=0.042) as the predictors of CKD. After 90-day follow-up, there was no significant difference between the two groups in right heart hemodynamics(Table 2).

Conclusion: CKD prevalence in PAH is not associated with right heart hemodynamics nor subtype of PAH, but associated with aging, decreased 6-minutes walking distance. Age seemed to be a strong risk factor for CKD. CKD did not affect the right heart hemodynamics after 90-day follow-up.

Table 1. Right heart hemodynamic data and pulmonary arterial hypertension prognostic factors

	Non-CKD(84.89%, N=309)	CKD(15.11%, N=55)	P value
Right heart exam on Diagnosed day			
Mean PA pressure, mmHg	46.85 ± 17.11	43.13 ± 15.78	0.16
PA wedge pressure, mmHg	11.73 ± 6.44	12.27 ± 4.28	0.59
Pulmonary vascular resistant, WU	11.56 ± 9.09	10.15 ± 6.38	0.348
Peak TRPG, mmHg	64.4 ± 30.57	66.31 ± 25.78	0.681
6MWD, m	351.65 ± 108.85	265.48 ± 120.99	<0.001
Peak VO2, ml/kg/min	11.32 ± 3.34	10.88 ± 2.87	0.676
VE/VCO2	41.32 ± 15.78	42.435 ± 12.05	0.822
Echo RA area, cm^2	22.79 ± 10.18	23.26 ± 6.38	0.876
RA pressure, mmHg	11.11 ± 8.27	13.90 ± 13.20	0.055
Cardiac index, L/min/m^2	2.79 ± 2.15	2.38 ± 0.96	0.243
SVO2, %	64.62 ± 46.20	57.16 ± 12.70	0.373
PVR, WU	11.96 ± 19.08	10.15 ± 6.48	0.554
Systolic blood pressure, mmHg	121.58 ± 19.43	128.62 ± 27.97	0.023
Heart rate, bpm	83.58 ± 15.50	82.41 ± 15.32	0.609
Percentage of predicted DLCO, %	54.18 ± 22.52	47.84 ± 21.15	0.107
BNP, pg/mL	356.47 ± 565.17	597.16 ± 733.02	0.050
NT-proBNP, pg/mL	1436.39 ± 1916.49	6382.62 ± 9080.88	<0.001

PA, pulmonary artery; RA, right atrium; WU, Wood units; TRPG, tricuspid regurgitation pressure gradient; 6MWD, 6-minute walking distance; VO2, oxygen consumption; VE, minute ventilation; VCO2, carbon dioxide production; SVO2, mixed venous oxygen saturation; PVR, pulmonary vascular resistance; DLCO, diffusion capacity of carbon monoxide; BNP, B-type natriuretic peptide

Table 2. Right heart hemodynamic data after 90-day follow-up

	Non-CKD (81.37%, N=83)	CKD (18.63%, N=19)	P value
Mean aortic pressure, mmHg	87.82 ± 18.99	88.38 ± 20.57	0.945
Systolic PA pressure, mmHg	69.31 ± 26.03	58.63 ± 21.60	0.1
Diastolic PA pressure, mmHg	30.72 ± 14.22	24.84 ± 7.71	0.085
Mean PA pressure, mmHg	43.32 ± 15.58	37.08 ± 11.77	0.1
Mean RA pressure, mmHg	9.40 ± 6.32	8.87 ± 5.57	0.76
Mean PA wedge pressure, mmHg	10.98 ± 4.28	12.78 ± 6.68	0.149
PA saturation, %	65.80 ± 9.29	68.22 ± 7.43	0.346
Pulmonary venous saturation, %	91.45 ± 6.14	91.33 ± 9.81	0.978
Arterial oxygen saturation, %	93.03 ± 4.64	94.83 ± 4.16	0.195
Mixed venous oxygen saturation, %	64.83 ± 8.87	69.00 ± 5.22	0.27
Fick cardiac output, L/min	4.07 ± 1.39	5.69 ± 2.49	0.001
Fick cardiac index, L/min/m2	2.48 ± 0.75	3.11 ± 1.05	0.029
Thermodilution cardiac output, L/min	4.58 ± 1.45	5.31 ± 2.16	0.163
Thermodilution cardiac index, L/min/m2	2.79 ± 0.73	2.80 ± 0.75	0.954
6MWT, m	393.17 ± 119.12	355.40 ± 122.89	0.145
SpO2 rest, %	94.97 ± 4.44	95.04 ± 5.13	0.94
SpO2 nadir, %	88.58 ± 8.58	89.50 ± 7.19	0.616

PA, pulmonary artery; RA, right atrium; 6MWD, 6-minute walking distance

Clinical Implications: determine the association between pulmonary arterial hypertension and chronic kidney disease.