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Effects of erythropoietin on endothelial dysfunction in patients with non-dialysis chronic kidney disease

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Objectives:

Chronic kidney disease patients with or without dialysis have been reported to have endothelial dysfunction. Left ventricular hypertrophy is commonly known as a potential risk factor for cardiovascular events and death in CKD patients. This study aimed to show that administering erythropoietin can improve endothelial dysfunction, left ventricular structure and function in pre-dialysis CKD patients with anemia, thereby reducing cardiovascular risks.

Methods:

This single-center, prospective study included patients with non-dialysis CKD stage 4-5 and with hemoglobin less than 10 g/dL. The subjects visited monthly until the 3rd month of study and laboratory tests were performed monthly. Methoxy Polyethylene Glycol-Epoetin beta (Mircera®) was administered according to KDIGO guideline. The primary outcome was change of flow mediated dilation (FMD) and left ventricular mass index between before and after erythropoietin (EPO) administration within same patients. The secondary outcome was change of left ventricular ejection fraction, left atrial diameter, right ventricular systolic pressure, 6-minute walk test, blood pressure and NYHA class between before and after EPO administration within same patients.

Results: Total 12 patients were enrolled in this study, and one of them dropped out. All patients had a GFR of less than 30 and the average of hemoglobin of them was 8.68 g/dL. FMD significantly increased by 10.59 (1.36 ± 1.91 vs 11.95 ± 8.11) (p 0.001) (Figure 1) and LV mass index reduced by 5.24 (111.24 ± 15.78 vs 105.99 ± 15.01) (p 0.032) 3months after EPO administration. Other echocardiographic findings such as LVEF, LA diameter and e/e' did not significantly change after EPO administration. No significant changes in systolic and diastolic blood pressure were found during the study period (Table 1).

Conclusions:

This is the first study that showed the effect of erythropoietin on endothelial dysfunction. Correcting anemia with erythropoietin improved both endothelial dysfunction and LVH in patients with pre-dialysis chronic kidney disease.

Figure 1. FMD before and after EPO administration

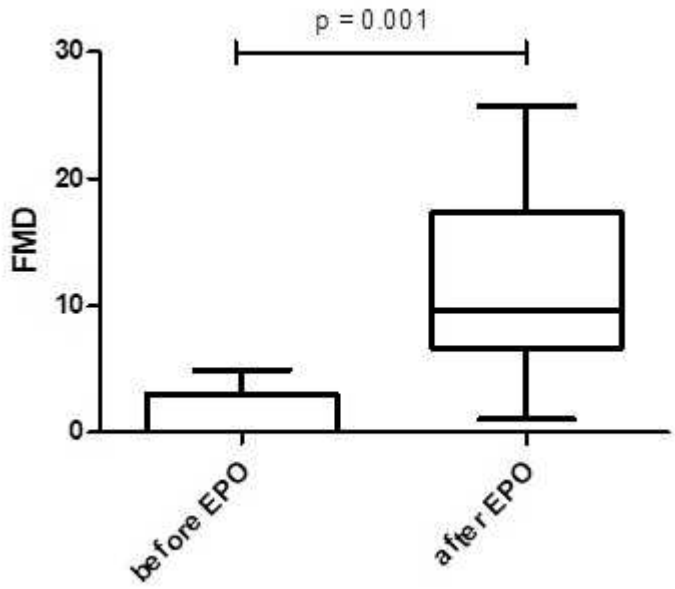

Table 1. Changes in FMD, clinical and echocardiographic characteristics between baseline and 12 weeks after EPO administration

	Baseline (n = 11)	After 3months (n=11)	p v
Hb (g/dL) (SD)	8.68 (0.99)	10.65 (0.79)	0.0
FMD (%)(SD)	1.36 (1.91)	11.95 (8.11)	0.0
LV mass index (g/m²) (SD)	111.24 (15.78)	105.99 (15.01)	0.0
Ejection fraction (%) (SD)	66.45 (5.08)	64.45 (3.88)	0.2
LA diameter (mm) (SD)	42.7 (6.7)	42 (6.9)	0.6
6MWT (m) (SD)	378.00 (117.02)	395.83 (133.43)	0.4
NYHA (class) (IQR)	1.00 (1-1)	1.00 (1-1)	0.3
SBP (mmHg) (SD)	141.54 (19.37)	145.72 (19.75)	0.7
DBP (mmHg) (SD)	71.36 (13.93)	71.09 (15.71)	0.8