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INTRODUCTION

Cardiovascular involvement remains one of the leading causes of morbidity and mortality in children with Chronic Kidney Disease on Renal Replacement Therapy. Left ventricular hypertrophy, aortic calcifications, arterial stiffness, hypertension and fluid overload have been recognized as important risk factors for sudden death in pediatric patients with end-stage renal disease. This study is designed to assess the relationship between the End Stage Renal Disease and Left Ventricular Mass and Diastolic Dysfunction.

Methods:

Single center, 2 years, prospective study including 23 subjects with End Stage Renal Disease and 25 controls.

Left Ventricular Mass was assessed by Echocardiography, transthoracic, in M mode, measuring the End-Diastolic Diameter of the Left Ventricle (LVEDD), the Thickness of the Interventricular Septum (IVSEDD) and the Thickness of the Posterior Wall in Diastole (PWEDD), and calculated by the formula: $0.8 \times \{1.04[(LVEDD + PWEDD + IVSEDD)^3 - (LVEDD)^3]\} + 0.6$ g. A 38 g/m² mass of the Left Ventricle, corresponding to the 95th percentile in the pediatric population, was considered the upper limit.

Diastolic Dysfunction was assessed by Doppler Echocardiography, measuring the E/A ratio, early to late ventricular filling velocities. Normal E/A ratio was considered between 0.9 and 1.5, under 0.9 relaxation disorder, and over 2, restrictive disorder.

We also analyzed the plasmatic levels of hemoglobin (Hb), calcium (Ca), phosphate (P), intact-parathyroid hormone (i-PTH), C reactive protein (CRP), serum creatinine and urea. Other Cardiovascular parameters were: Fluid overload, Blood Pressure, Cardiac Frequency.

Bivariate Pearson Coefficient and Independent Sample T test were used for statistical analysis.

Results:

From the 23 children (14 boys and 9 girls) in the study population 12 were on hemodialysis (HD) and 11 on peritoneal dialysis (PD). Median age in the study group was 15±2.12 years and 14.76±2.14 years in the controls. Dialysis vintage was 46±36 months. Liquid overload was clinically assessed and it had a median value of 1.9±1.2 liters. Median Systolic Blood pressure was 139±24 mmHg versus 112±13 mmHg.

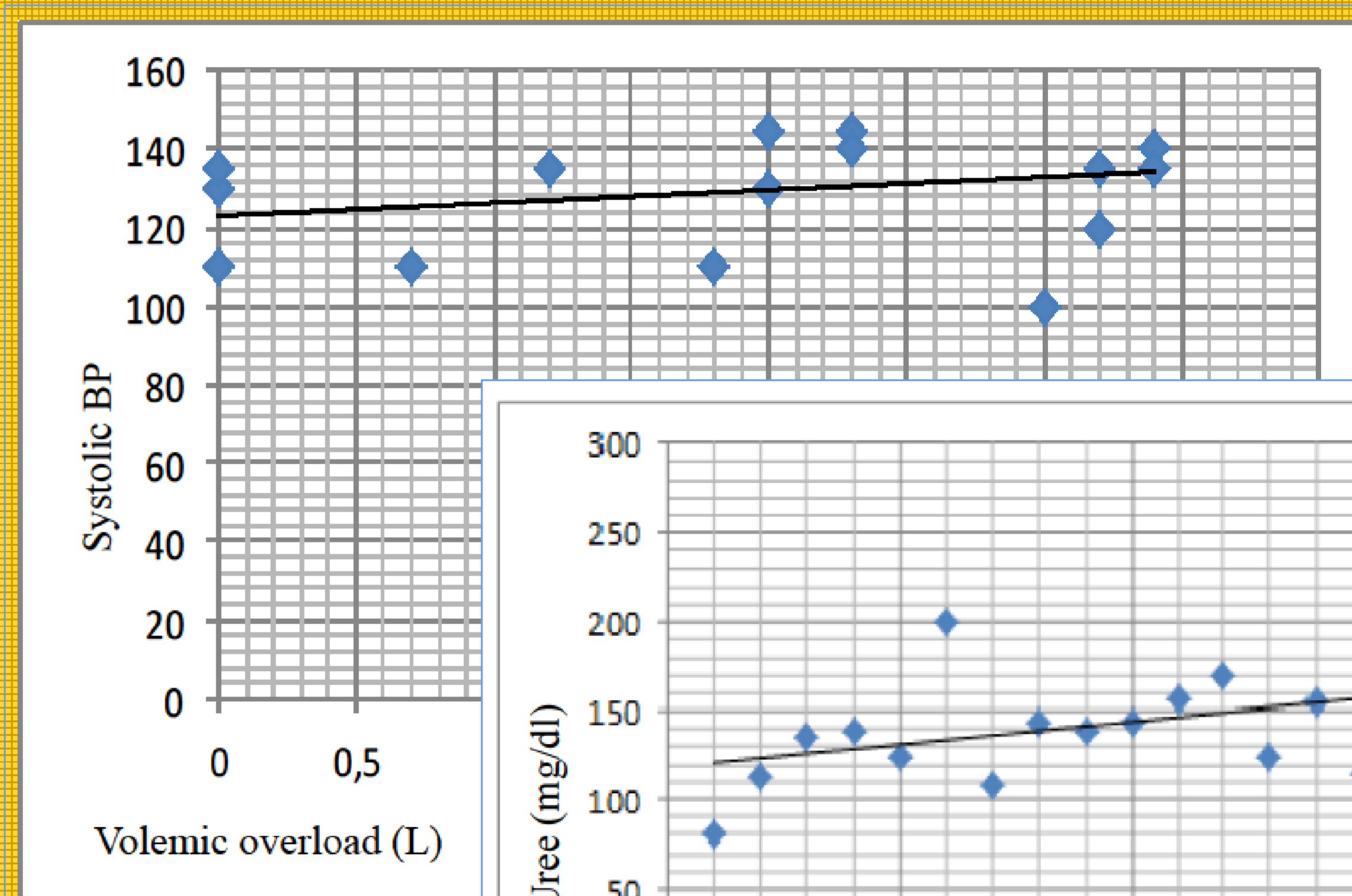
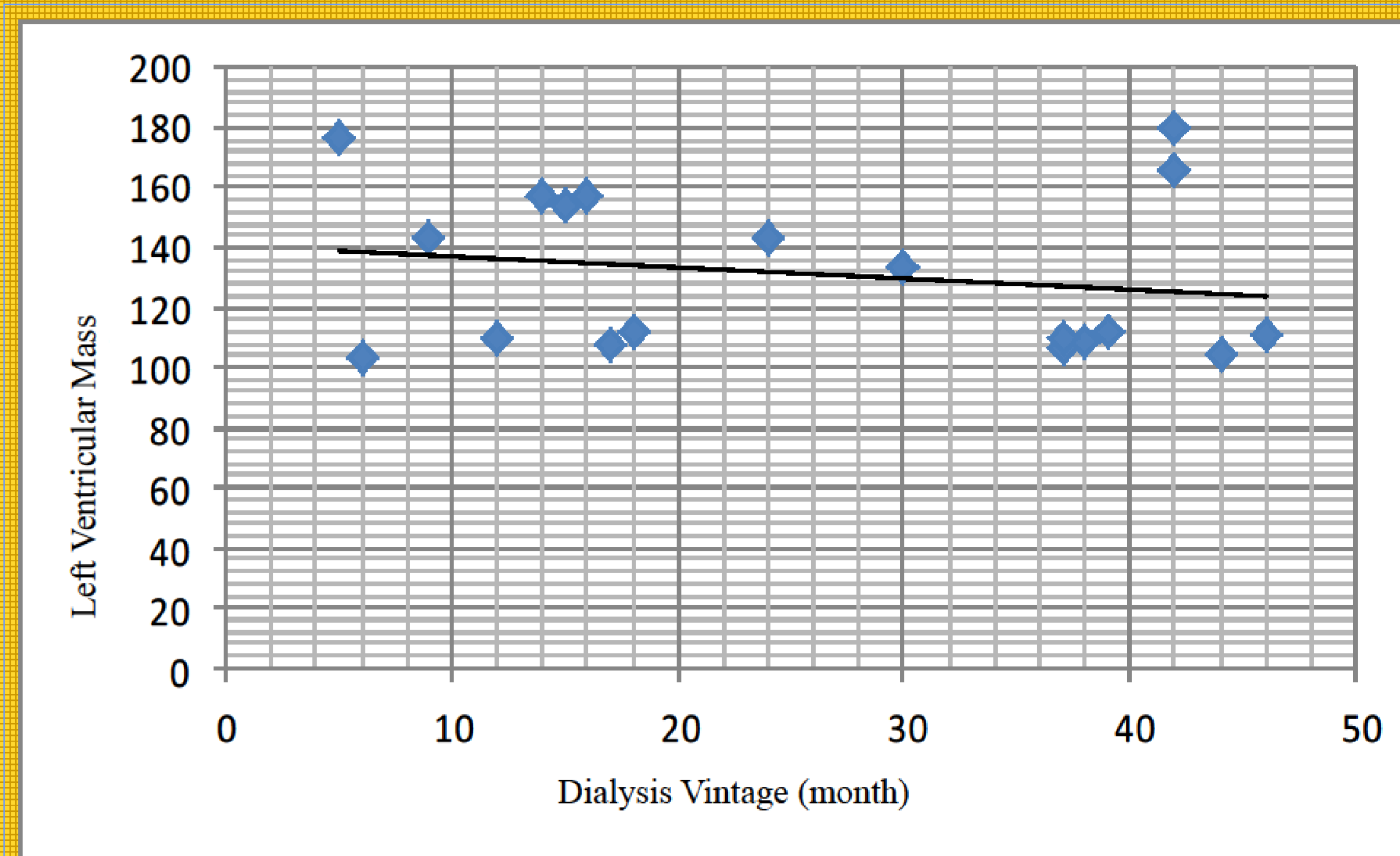
All the patients included in our study had high levels of i-PTH, with secondary increase of calcium and phosphate product (CaxP).

Median value of LVM in controls was 29.3±6 g/m² versus 46.2±18.1 g/m² in dialyzed children. There were no statistical significant differences between HD and PD.

Left Ventricular Hypertrophy, was positively correlated with a high Systolic Blood Pressure (R²=0.62, p<0.005), volume overload (R²=0.51, p<0.005), the period of time on renal replacement therapy (R²=0.423, p<0.005). We could not find any significant correlation with iPTH (R²=0.0023, p=0.51) and CaxP (R²=0.23, p=0.023)

The Control Group had an E/A of 1.7 (1.2-2.0) versus 1.1 (0.8-2.6) in the study group (p<0.05, CI=95%). From the 23 patients in the study group 5 had normal diastolic function, 14 had relaxation disorder and 4 had restrictive disorder.

Diastolic Dysfunction was negatively correlated with Systolic Blood Pressure values (R²=-0.432, p=0.038), volume overload (R²=-0.42, p=0.005) and dialysis vintage (R²=-0.487, p=0.027).



Dialysis vintage positively correlates with left ventricular mass. The volemic overload is an important factor influencing the blood pressure and Left Ventricular Mass

E/A waves fraction was correlated with urea levels, Systolic Blood Pressure values and volume overload. Cardiac frequency had a positive correlation with the volume overload and a negative one with Hemoglobin levels

Conclusions:

- Left Ventricular Mass is directly related to the degree of systolic blood pressure, volume overload and Dialysis Vintage.
- Also Diastolic Dysfunction is present in a large proportion of pediatric patients on dialysis.
- Drastic reduction of volume overload in children on dialysis, the strict control of hypertension and the necessity of early Kidney Transplantation are important targets for a patient with End Stage Renal Disease.

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