Assessment of echocardiographic derived LVM and LVMI in end stage renal disease patients in Babylon province

Evaluación de LVM e LVMI derivadas de ecocardiografía en pacientes con enfermedad renal terminal en la provincia de Babylon

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Abstract

End-stage renal disease is a worldwide distribution with a high mortality rate and cardiac complication, one of the most common causes of death of these patients. An evaluation was done to investigate the prevalence of LVH and its types among patients with a chronic renal disease with end-stage and the role of LVM and LVMI in the detection of cardiac dysfunction. A cross-sectional study was performed in Merjan teaching hospital with 34 patients with end-stage renal disease were enrolled in this study. Anthropometric data like weight and height were recorded. Echocardiographic measurements include ejection fraction (EF), stroke volume (SV) and left ventricular mass (LVM) which was indexed by body surface area to yield left ventricular mass index (LVMI). Percentage of abnormal LVM, LVMI and the more predominant type of left ventricular hypertrophy was assessed. Correlation studies between LVM and LVMI with EF and SV were done. Prevalence of LVM and LVMI above the normal level was 75%,78% respectively, with a predominant type of concentric LVH (70.9%). Correlation study between EF and LVM showed non-significant correlation (r= 04, p>0.05) and non-significant negative correlation of EF and LVMI (r= - 02, p>0.05). This study showed a positive correlation of stroke volume and LVM, LVMI (r= 0.5, r= 0.67 respectively, p<0.05). Left ventricular hypertrophy one of the common findings in patients with chronic renal disease and reflects the presence of cardiac involvement and the development of LV dysfunction. Therefore, assessment of LVM and LVMI could be of a valuable role for treatment strategy and for follow up.

Keywords: echocardiographic derived LVM and LVMI, end-stage renal disease, Babylon province.

Resumen

La enfermedad renal en etapa terminal tiene una distribución mundial con una alta tasa de mortalidad y las complicaciones cardíacas son una de las causas más comunes de muerte de estos pacientes. Se evaluó la prevalencia de HVI y sus tipos en pacientes con enfermedad renal crónica en etapa terminal y el papel de la MVI y la IMVI en la detección de disfunción cardíaca El estudio transversal se realizó en el hospital universitario de Merjan con 34 pacientes con enfermedad renal en etapa terminal que se inscribieron en este estudio. Se registraron datos antropométricos como peso y altura. Las mediciones ecocardiográficas incluyen la fracción de eyección (FE), el volumen sistólico (SV) y la masa ventricular izquierda (LVM) que se indexó por área de superficie corporal para producir el índice de masa ventricular izquierdo (LVMI). Se evaluó el porcentaje de LVManormal, LVMI y el tipo más predominante de hipertrofia ventricular izquierda. Se realizaron estudios de correlación entre LVM e LVMI con FE y SV. La prevalencia de LVM e LVMI por encima del nivel normal fue del 75%, 78% respectivamente con el tipo predominante de HVI concéntrica (70,9%). El estudio de correlación entre FE y LVM mostró correlación no significativa (r=04, p>0,05) y correlación negativa no significativa de FE e IMVI (r= - 02, p> 0,05). Este estudio mostró una correlación positiva de volumen sistólico y LVM, LVMI (r=0.5, r=0.67 respectivamente, p<0.05). La hipertrofia ventricular izquierda es uno de los hallazgos comunes en pacientes con enfermedad renal crónica y refleja la presencia de compromiso cardíaco y el desarrollo de disfunción del VI. Por lo tanto, la evaluación de LVM y LVMI podría tener un papel valioso para la estrategia de tratamiento y para el seguimiento.

Palabras clave: LVM e LVMI derivados de ecocardiografía, enfermedad renal en etapa terminal, provincia de Babilonia.

Introduction

One of the worldwide diseases is chronic renal disease with its end-stage sequel[1]. The high death rate of chronic disease contributed mostly to cardiac complications (e.g.) ischemic heart disease, cardiac dysfunction and conduction abnormalities, this also termed "cardiorenal syndrome". Cardiac cause of death in these patients constitute about 50%[2]. Previous studies mentioned the presence of an increased left ventricular mass in these patients with chronic renal disease, and several factors lead to this increment of cardiac mass[3,4], from these factors are: volume over- load, increased arterial blood pressure and the presence of toxins due to renal dysfunction[5]. Some studies represent that cardiac events of these patients with chronic renal disease can happen unrelated to the severity of renal disease or the glomerular function[6]. Some studies noticed the duplicate threat of cardiac events in the presence of left ventricular hypertrophy[7]. Zoccali et al. [8] also discuss the correlation between the increase of cardiac mass and rate of death from cardiac complication among those patients with chronic renal disease. Volume overload one of the factors that increase the cardiac mass and cause the eccentric LVH, so during peritoneal dialysis, reasonable adjustment of the volume is mandatory to avoid volume overload to preclude worse outcome of the patient. Aim of the study: evaluation of the prevalence of LVH and its types among patients with a chronic renal disease with end-stage and the role of LVM and LVMI in detection cardiac dysfunction.

Materials and methods

A cross sectional study involved 34 patients with end-stage renal disease on peritoneal dialysis twice per week;we could not increase sample size because of the pandemic of Coved 1, their main age 52±13 year signed. Consent and approval from the ethical committee at Babylon College of medicine had been taken from these patients. Weight and height measured for everyone to measure body surface area according to Mosteller equation. "VIVID 9 GE" did transthoracic echocardiographic measurements with 3.5 MHz probes. Measurement of ejection fraction was done by Teicholz formula from M-Mode at the left parasternal long-axis view. Evaluation of stroke volume was also done as stroke volume one of the important parameters for the left ventricular systolic function. LVM can be calculated either by M-Mode or 2-D modalities. M-mode type is of high frame rate that decides of the edge of endocardium more easily, especially with the presence of normal shape ventricle. 2D- guided M-Mode applied with cursor perpendicular above of papillary muscle level at parasternal long-axis view is commonly used during the evaluation of LVM, and it is valuable. LVM calculated according to Devereux and colleagues[9]:

LVmass(ASE): 0.8 (1.04 ([LVIDD + PWTD + IVSTD]^3-[LVIDD]^3))+0,6 g

Where: LVIDD = Left Ventricular Internal Diameter in Diastole

PWTD = Posterior Wall Thickness in Diastole

IVSTD = Interventricular Septum Thickness in Diastole

LVM is affected by body size[10], so for standardization, we indexed LVM to body surface area to yield LVMI.

Relative-wall-thickness (RWT) is obtained from the following equation[10]:

RWT = 2*PWT /LVDD Where PWT=posterior wall thickness

LVDD=Left ventricular end-diastolic dimension

Statistical Analysis: All echocardiographic parameters expressed as mean ± SD. Percentage of abnormal values were measured. Pearson correlation study was used for evaluating the links between different parameters. P-value < 0.05 was considered statistically significant.

Results: Parameters measured in this study and expressed as mean ± SD are shown in (table-1).

Parameters	mean ± SD
Left ventricular mass (LVM)gm	255±89
Left ventricular mass index (LVM)gm/m2	156±56
Ejection fraction (EF%)	67.6±8.3
Stroke volume(ml)	85.7±12.66

Prevalence of LVM and LVMI above the normal level was 75%, 78% respectively. Percentage of concentric LVH (Rwt > 0.42) was 70.9% and eccentric LVH (rwt <0.42) was 29%. Figure 1

Figure 1. percentage of abnormal values of left ventricular mass and mass index (LVM, LVMI), concentric and eccentric LVH.

Correlation study between EF and LVM showed non-significant correlation (r= 04, p>0.05) and non-significant negative correlation of EF and LVMI (r= - 02, p>0.05), figures 2,3.

Figure 1

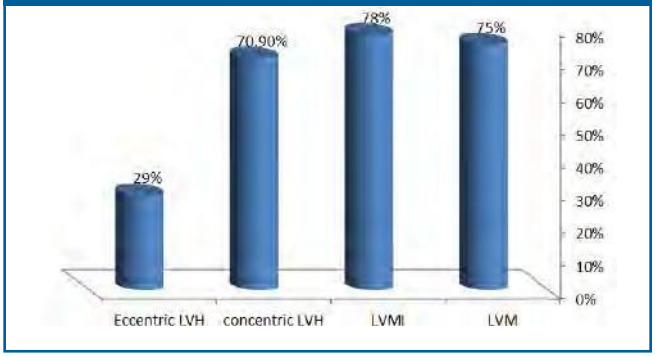


Figure 2. Correlation study of left ventricular ejection fraction (EF) andleft ventricular mass (LVM) in end-stagerenal disease.

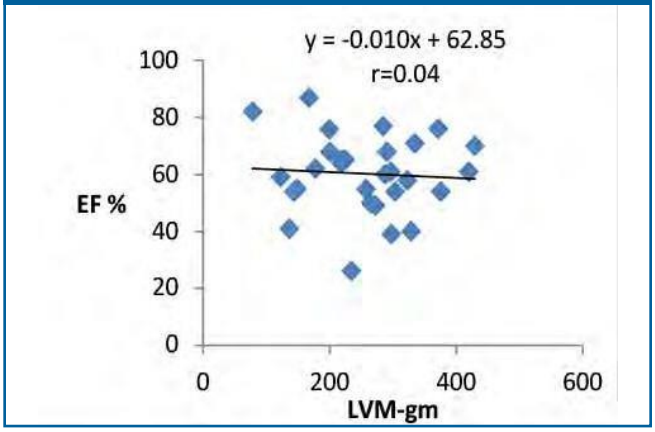
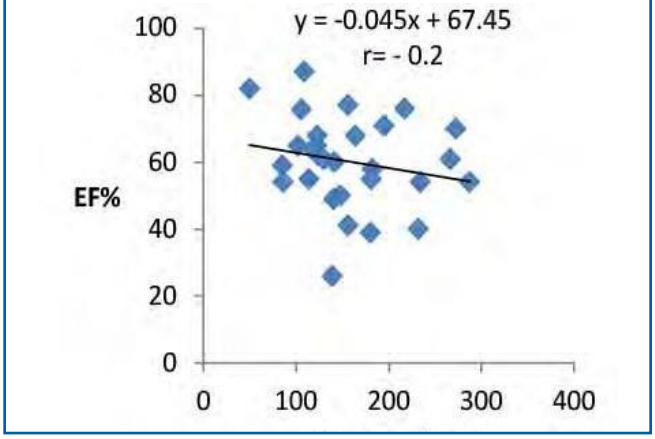


Figure 3. Correlation study of left ventricular ejection fraction (EF) and left ventricular mass index (LVMI) in end-stage renal disease.



This study showed a positive correlation of stroke volume and LVM, LVMI (r= 0.5, r= 0.67 respectively, p<0.05) figures 4, 5.

Figure 4. Correlation study of stroke volume (SV) and left ventricular mass (LVM) in end-stage renal disease.

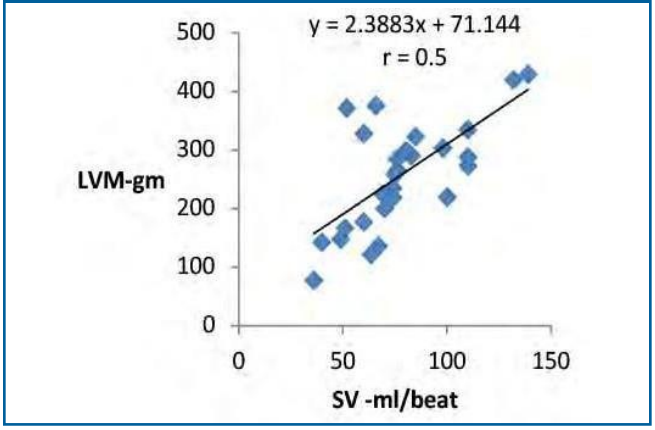
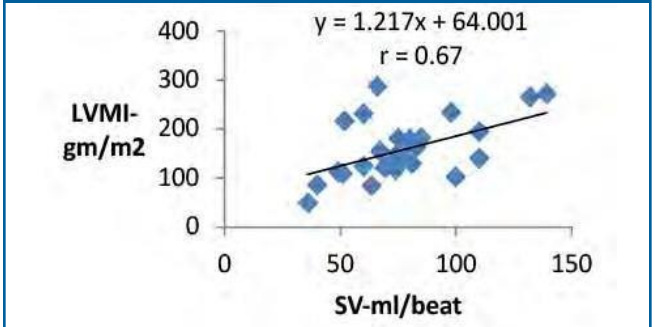


Figure 5. Correlation study of stroke volume (SV) and left ventricular mass (LVMI) in end-stage renal disease.



Discussion

One of the common finding of patients with chronic renal disease that reached end-stage is left ventricular hypertrophy[11]. Foley et al. found that LVH constitutes about 70% of these patients with renal disease that came dialysis[12]. Di Lullo et al., the study also showed that LVH constituted about 70% and increased to 90% after starting dialysis[13]. Concentric and eccentric LVH was present in our study with a higher percentage of concentric one, and this finding matched with other studies like Cafka et al., who found that concentric LVH is the predominant type[14]. This could be attributed to the underlying causes that participate in the development of LVH in those renal disease patients[6]. Some studies classified these factors as correlated with afterload, preload and others[15-17]. Increase in afterload reflected by systemic hypertension or reduction in elasticity of blood vessels[15-18]; these cause concentric LVH. Preload factors related to volume overload as for example, from secondary anemia or other factors[19], and this lead to the development of eccentric LVH. Ronco C showed that more than 50% of patients with peritoneal dialysis had volume overload[20] and fluid, which is hypertonic that

is, used in this dialysis is one of the factors for volume overload[21]. Stroke volume depends on two factors: cardiac contraction and the amount of preload volume. The higher level of stroke volume the more cardiac mass as a compensatory mechanism this reflected by a significant positive correlation between SV and (LVM, LVMI). The present study discovered the relation between a high cardiac mass and the low LV systolic function by the negative correlation between EF and LVMI. Indeed, this finding is compatible with the results of other studies approving that assessment of cardiac mass was a decisive parameter for the evaluation of cardiovascular events and prognosis[22]. Luca et al. considered that LVH is an important reflector for systolic and diastolic dysfunction of the heart[6]. Hassan et al. also mentioned that LVH is a valuable risk factor in the cardiac assessment as patients on peritoneal dialysis mostly deteriorate due to cardio-vascular complications[23]. For more focusing on the importance of this index, we can review previous studies that showed the link between this index and mortality, for example, Foley et al. demonstrated the significant correlation between this parameter and death[24]. Zoccali et al. also study the predictor value for LVMI for mortality among patients on dialysis[25]. Moreover, London et al. concluded that a reduction in LVM level would lead to a considerable decrease in cardiovascular complications[26]. One of the methods for reverse remodelling of the heart is by good management of hypertension and anemia[27]. Van Biesen et al. mentioned that after starting PD, roughly half of patients remain volume overloaded[28]. Therefore, we can suggest that it is essential to measure the LVMI for every patient with a renal disease that can give an idea about the cardiac condition and for follow up this index during the period of treatment.

Conclusions

Left ventricular hypertrophy one of the common findings in patients with chronic renal disease and reflect the presence of cardiac involvement and the development of LV dysfunction .and so highlights the importance of evaluation LVM and LVMI for every patient with a chronic renal disease that helps in treatment strategy that could decrease cardiac function deterioration.

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