Data Article

Cardiac Abnormalities in Patients with End-Stage Chronic Kidney Disease

I. ABSTRACT

Cardiac involvement is the leading cause of mortality and morbidity in patients undergoing chronic hemodialysis. Therefore, echocardiography is the preferred diagnostic test. Our study aims to describe the different cardiac lesions observed on transthoracic echocardiography and identify the associated risk factors. This was a single-center cross-sectional study that included adult patients who had been on hemodialysis for over a year and had undergone transthoracic echocardiography at the Casablanca University Hospital during 2021. Our descriptive and analytical study focused on analyzing demographic, clinical, biological, and echocardiographic data. We collected data from 65 hemodialysis patients, including 33 men (50.7%) and 32 women (49.3%), resulting in a male-to-female ratio of 1.02. The average age of the patients was 45.45 years ± 14.29 [18.82]. The average duration of hemodialysis treatment was 15.65 ± 9.445 years [1.34]. Among the patients, 47.7% were hypertensive (n=31), 58.5% were anemic (n=38), and 46.2% had hyperparathyroidism (n=30). The echocardiographic findings revealed that the most common abnormalities were left ventricular hypertrophy (LVH), observed in 67.7% of patients (n=44), and valvulopathies, observed in 66.2% (n=43) of patients. Valvular calcifications were noted in 12.3% of cases (n=8), pericarditis in 6.2% of cases (n=4), and left ventricular dilatation in 3.1% (n=2) of cases. Echocardiography remains the preferred examination due to its non-invasive nature, enabling accurate diagnosis of cardiac abnormalities and assessment of cardiovascular risk.

Key word: Hemodialysis, Echocardiography, Chronic Kidney Disease.

II. INTRODUCTION

Among the main causes of mortality and morbidity in chronic hemodialysis patients, cardiac involvement ranks first, thus echocardiography is the diagnostic examination of choice. The frequency of cardiac involvement in chronic hemodialysis patients depends on several risk factors which may be intertwined, namely arterial hypertension, anemia, chronic inflammation, hyperparathyroidism and many others. In addition, intensive treatment of the risk factors of LVH allows a clear regression of the mass of the left ventricle and therefore reduces all causes of cardiovascular mortality.

The aim of our study is to describe the various cardiac lesions on transthoracic echocardiography and to identify the risk factors.

III. METHODS

Monocentric cross-sectional study including adult patients on hemodialysis for more than a year and having benefited from transthoracic echocardiography during the year 2021. For each of our patients, we analyzed the demographic, clinical, biological andechocardiographic. The clinical data were collected from the patients' records and include: age at the time of the study, sex, duration of hemodialysis expressed in months, initial nephropathy, systolic (SBP) and diastolic blood pressure (PAD), the characteristics of the vascular approach.

IV. RESULTS

IV.1 Demographics :

65 hemodialysis patients were collected, 33 men (50.7%) and 32 women (49.3%), a sex ratio M/F of 1.02. 95,6% patients having 4-hour HD sessions per week. The average age of the patients was 45.45 years ± 14.29 [18.82] the average seniority in hemodialysis was 15.65 ± 9.445 years [1.34]

IV.2 Causative nephropathy

Undetermined nephropathy was present in 35 patients, accounting for 51.5% of the total sample. Diabetic nephropathy was observed in 4 patients, representing 5.9% of the sample. Chronic glomerulonephritis was present in 8 patients, accounting for 11.8% of the cohort. Lupus nephropathy was observed in 5 patients, representing 7.35% of the total sample. (Table 1)

Causative nephropathy	**Number of patients**	**Pourcentage**
Undetermined nephropathy	35	51,5%
Diabetic nephropathy	4	5,9%
Chronic glomerulonephritis	8	11.8%
Lupus nephropathy	5	7,35%

Table 1 : Causative nephropathy

IV.3 Comorbirdites

47.7% of patients were hypertensive (n=31) 58.5% of patients were anemic (n=38) and hyperparathyroidism in 46.2% of cases (n=30).

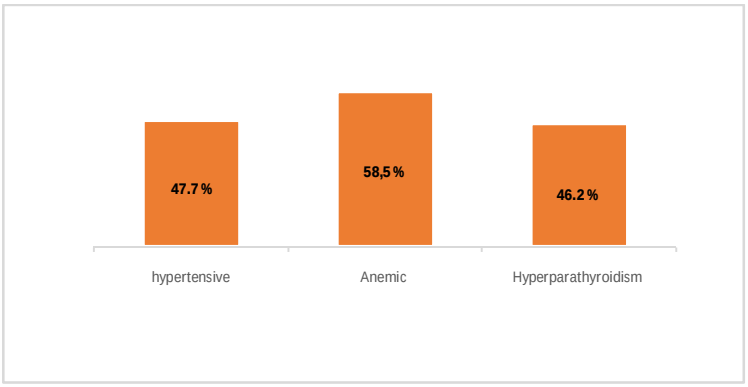


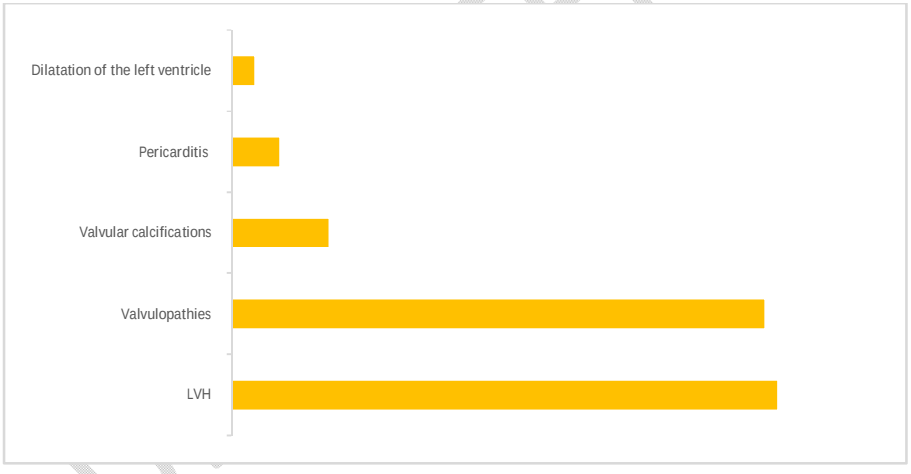
Figure 1 : Comorbirdites

IV.4 The echocardiographic abnormalities

The echocardiographic abnormalities found were dominated by left ventricular hypertrophy (LVH) in 67.7% of patients (n=44) and valvulopathies in 66.2% (n=43). Valvular calcifications were noted in 12.3% of cases (n=8), pericarditis in 6.2% of cases (n=4) and dilatation of the left ventricle in 3.1% (n=2).

Statistical analysis of variance of the different anomalies shows that left ventricular hypertrophy is positively correlated with arterial hypertension (p = 0.0001).

Fig .2 Variance of the different anomalies



V. DISCUSSION

Heart conditions are a significant contributor to morbidity and mortality among patients with chronic kidney disease undergoing dialysis treatment [1]. Extensive research has shown a high prevalence of left ventricular hypertrophy (LVH) in this population. The prevalence of LVH is estimated to be between 16% and 31% in individuals with a GFR > 30 ml/min; it increases to 60-75% prior to the initiation of renal replacement therapy and reaches 90% after the onset of dialysis [2]. Foley et al. [3] followed 596 incident hemodialysis patients without a history of cardiac disease to determine whether the incidence of LVH correlated with dialysis duration. After 18 months of dialysis, the authors reported that 62% of the patients had

increased left ventricular mass index and 49% of them developed overt LV dysfunction. These observations raise the question of whether dialysis therapy contributes to LVH development in patients with ESRD [4]. In the same series, the prevalence of LVH in dialysis patients was reported to be 73.9% [5], which aligns with the findings from a London series where LVH was found in 75% of the patients [6]. In our series, the results were comparable, revealing a prevalence of LVH at 67.7%.

The increased frequency of heart diseases in chronic hemodialysis patients can be attributed to various risk factors specific to this population. These factors include hypertension, arteriovenous fistula, anemia, and fluid and sodium retention. In our series, similar to several other studies [7], we observed a notable association between the presence of systolic or diastolic arterial hypertension and the development of LVH in chronic hemodialysis patients.

The presence of hypertension, particularly in the context of chronic hemodialysis, poses a significant risk for LVH. Elevated blood pressure levels and prolonged exposure to volume overload contribute to cardiac remodeling and thickening of the left ventricular wall. Furthermore, the presence of an arteriovenous fistula, a common access point for hemodialysis, can lead to hemodynamic changes and contribute to the development of LVH.

" The pathophysiological factors involved in LVH in patients with CKD and ESRD have generally been divided into three categories" [8,9,10]: those related to afterload, those related to preload, and those unrelated to afterload or preload. Factors in the first category are represented by increased systemic arterial resistance, high blood pressure, and reduced compliance of large vessels [11] partly related to aortic "calcification," which is typical in CKD patients. "All of these factors result in thickening of myocardial cells and concentric remodeling of the left ventricle, often associated with activation of the intracardiac renin-angiotensin system" [12,13].

It is essential to recognize these risk factors and their implications in order to effectively manage and prevent cardiac complications in patients with chronic kidney disease undergoing hemodialysis. Close monitoring of blood pressure levels, optimization of fluid balance, and early intervention for hypertension are crucial in mitigating the risk of LVH and improving cardiovascular outcomes in this patient population.

VI. CONCLUSION

Echocardiography remains the most commonly used diagnostic tool due to its non-invasive nature, enabling accurate detection of cardiac abnormalities and assessment of cardiovascular risk.

Overall, the non-invasive nature of echocardiography, combined with its ability to provide detailed and precise diagnostic information, makes it an indispensable tool in modern cardiology. Its widespread use allows healthcare professionals to promptly identify cardiac abnormalities, initiate appropriate treatment strategies, and monitor patients' cardiovascular health over time.

Ethical Approval:

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

Consent

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author(s).

Disclaimer:

The abstract of this manuscript was previously presented and published in the poster presentation. Web Link of the presentation : https://www.kireports.org/action/showPdf?pii=S2468-0249%2823%2900767-2

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