

Case Series

Role of 2-D echocardiography in detecting cardiovascular abnormalities in chronic kidney disease patients: Case series of 50 chronic kidney disease patients


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Abstract

Background: Chronic kidney disease is a major public health problem worldwide with continuously increasing incidence and prevalence. Diabetes and hypertension are the leading causes of chronic kidney disease worldwide, whereas hypertension is a cause as well as effect of chronic kidney disease.

Objectives: To evaluate and analyze the echocardiographic changes in the end stage renal disease patients on maintenance haemodialysis by the help of 2-D echocardiography.

Materials and methods: End stage renal disease (ESRD) patients who were on maintenance haemodialysis for at least 3 months, in MG hospital were included in the study. We performed 2-Dechocardiography in 50 ESRD patients during inter-dialytic period. Patients with clinical evidence of coronary artery disease, previous history of hypertension, valvular heart disease, congenital heart disease and pericardial effusion were excluded from this study.

Results: out of 50 chronic kidney disease patients, echocardiography revealed LVH in 29 (58%) patients, LVDD in 25(50%) patients, pericardial effusion in 10 (20%) patients, pulmonary hypertension in 23(46%) patients, dilated left atrium in 14(28%) patients, dilated left ventricle in 4 (8%) patients and regional wall motion abnormalities in 3 (6%) patients. Hypertension was present in

46 (92%) out of 50 CKD patients out of which LVH was in 29 patients. Severe Anaemia was present in 10 (20%) patients.

Conclusion: LV diastolic dysfunction and left ventricular hypertrophy were the most common and significant echocardiographic findings among 50 CKD patients. There was statistically significant correlation between anaemia and the presence of left ventricular hypertrophy and positive correlation between presence of hypertension and left ventricular hypertrophy.

Key words

CKD (chronic kidney disease), ESRD (end stage renal disease), MHD (maintenance hemodialysis), LVH (left ventricular hypertrophy), LVDD (left ventricular diastolic dysfunction).

Introduction

Volume and composition of body fluids play a very important role in our body and kidneys are the major organ for fluid and electrolyte homeostasis. Our kidneys also play role of many metabolic, endocrine and hematopoietic functions as well. Chronic kidney disease (CKD) is a pathophysiological disease with variable etiologies leading to attenuation of nephron number and function which ultimately leads to End Stage Renal Disease (ESRD).

End stage renal disease is a pathophysiological process which is characterised by irreversible loss of endogenous renal function sufficient enough to render patient permanently dependent on renal replacement therapy.

Cardio-vascular diseases are now emerging as the most common cause of death in patients with End stage renal disease. The age adjusted cardiovascular complications and mortality is about 30-35 times higher in End stage renal disease patients as compared to general population [1].

Pre transplant cardiovascular diseases are a major risk factor for post transplant cardiovascular deaths. Besides major risk factors like age, gender, etc there are many risk factors particularly important for chronic kidney diseases like anemia, hyperparathyroidism, hyper-homocysteinemia, proteinuria, hypoalbuminemia which also are big risks for cardiovascular diseases.

Angina pectoris, myocardial infarction, arrhythmias, heart failures, stroke and peripheral vascular diseases are also common in End stage renal disease patients [2]. Cardiomyopathy is an independent risk factor for cardiovascular morbidity and mortality [3]. Natural history studies [3-7] suggest that- cardiomyopathy predisposes to heart failure and also to ischemic heart diseases whereas ischemic heart diseases may also contribute to cardiomyopathies in many ways.

Diabetes and hypertension are the leading causes of chronic kidney disease worldwide; also hypertension is the cause and result of Chronic kidney diseases. Recent studies of hypertension are suggesting the role of G protein coupled receptors and calcium dependent kinase in blood pressure homeostasis [8].

Anemia and hypertension are the most consistent causes of heart failure that causes 2/3rd of all the mortalities of End stage renal disease patients who are on haemodialysis. End stage renal disease patients do have a myriad of structural cardiac abnormalities like left ventricular hypertrophy, depressed LV function, regional wall motion abnormalities, pericardial effusion and valvular calcifications.

Hemodialysis is a form of renal replacement therapy in which metabolic waste products are removed and nutritional status, mental and physical well being is maintained as shown by extensive study by Noor Ul Amin, et al. [9].

It is now apparent that individuals with chronic kidney disease are more likely to die from cardiovascular disease than to develop end stage renal disease [10].

Renal function impairment indicated by reduced estimated glomerular filtration rate (eGFR), is a powerful prognostic predictor of mortality and hospitalizations [11].

Compared to the age adjusted CVD mortality in the general population, cardiovascular deaths are 15 to 30 times higher [12].

The understanding of pathophysiology of cardiovascular diseases in chronic kidney disease enables prevention, early diagnosis and prompts interventions to delay the complications.

Materials and methods

The study was conducted in patients with chronic kidney disease in Mahatama Gandhi Medical College and Hospital, Jaipur during the period august 2015 to September 2016 and the type of study conducted was Hospital Based Observational Study. The sample size taken was 50 patients who were known case of chronic kidney disease.

Inclusion criteria

- Patients who were known chronic kidney disease patients.
- Patients who are symptomatic for 3 months or more.
- Patients with serum creatinine more than 3 mg% and creatinine clearance < 30 ml/min.
- Patients with bilateral contracted kidneys on abdominal ultra-sonography or with lost cortico-medullary differentiation or with bilateral renal medical disease.

Exclusion criteria

- Patients who were known valvular heart disease.
- Patients who were known hypertensives even before onset of chronic kidney disease.

- Patients above 50 years of age.
- Patients who were alcoholics.
- Patients who underwent dialysis for the first time after admission.

Results

The study included 50 patients with chronic kidney disease which included 11 females and 39 males and overall mean age was 40.7 years.

Most common presenting symptoms were shortness of breath, vomiting and anasarca. Severe anemia with Hb less than 7 g% was present in 10 patients. 45(90%) patients had serum creatinine levels more than 5 mg/dl.

All patients had albuminuria with 6 (12%) patients had severe grade +3 albuminuria. All patients had hypertension with mean systolic blood pressure was 157.6 mm hg and mean diastolic blood pressure was 89.2 mm Hg. 29 (58%) patients had concentric left ventricular hypertrophy. 14 (28%) patients had dilated left atrium. 4 (8%) patients had dilated left ventricle. 17 (34%) patients had systolic dysfunction with ejection fraction less than 60%. 10 (20%) patients had pericardial effusion. 25 (50%) patients had left ventricular diastolic dysfunction.

LVH and diastolic dysfunction were the two most significant and common abnormalities found in our study of 50 CKD patients with the help of 2D echocardiography (**Table – 1, Graph – 1**).

Conclusion

Cardiac structural as well as functional abnormalities are common in patients with end stage renal disease and chronic kidney disease, more so in patients having anaemia and hypertension.

Echocardiography is easily performed, non-invasive, cost effective, safe, reproducible and accurate in early assessment of cardiac function in chronic kidney disease which is important for risk stratification and early preventive measures.

Echocardiography also detected those cardiovascular abnormalities which were asymptomatic like left ventricular hypertrophy, minimal pericardial effusion, mild pulmonary hypertension and mild grades of diastolic dysfunction.

Left ventricular hypertrophy and diastolic dysfunction were the commonest abnormalities in chronic kidney disease patients in our study and both of these were more marked in uncontrolled hypertensive and severely anaemic patients.

Table – 1: Summary of all echocardiography abnormalities in CKD patients.

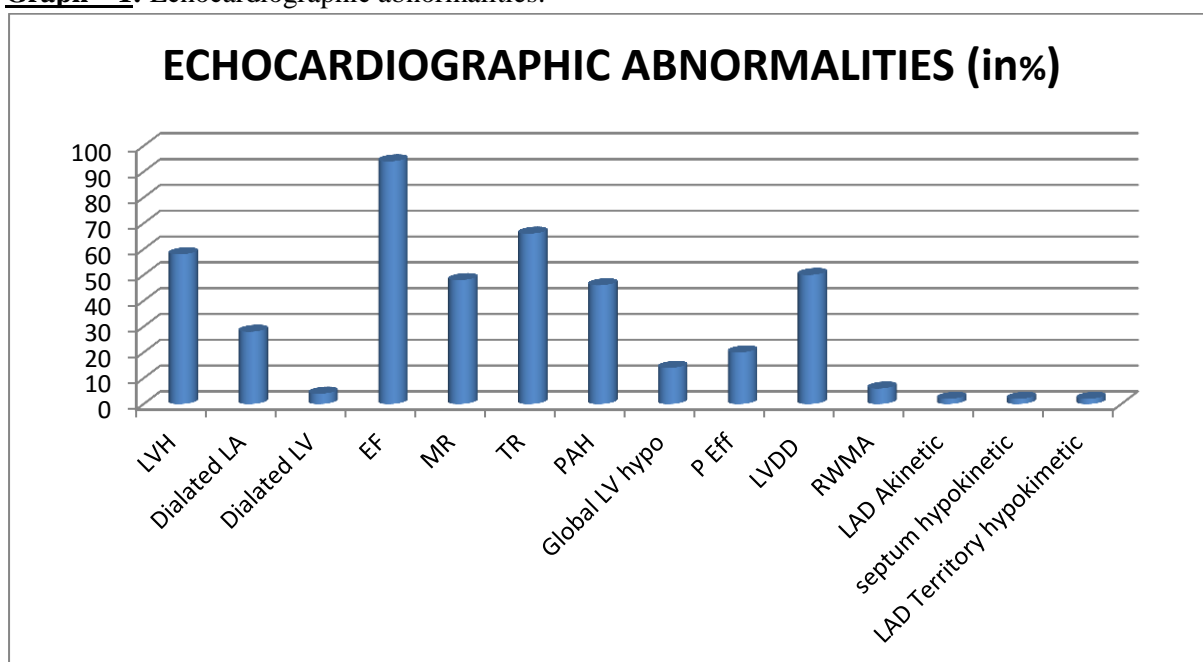
Abnormalities	No. of patients (N=50)	%
LVH	29	58
Dilated LA	14	28
Dilated LV	4	8
EF less than 65%	47	94
MR	24	48
TR	33	66
PAH	23	46
Global LV hypo	7	14
Pericardial Effusion	10	20
LVDD	25	50
RWMA	3	6
LAD Akinesia	1	2
septum hypokinesia	1	2
LAD Territory hypokinesia	1	2

Echocardiography also detected even asymptomatic cardiovascular abnormalities like left ventricular hypertrophy, minimal pericardial effusion, mild PAH, diastolic dysfunctions as well that permits us to do timely prevention and stop further progression of the diseases.

The diagnosis of Left ventricular abnormalities by two dimensional echocardiography is an important step for the characterization of individuals with higher cardiovascular risk, prognostic impact and effect of therapeutic interventions [13].

North American directives [14] recommend the two dimensional echocardiography for all the CKD patients undergoing dialysis one to three months after the start of renal replacement treatment, regardless of the symptoms.

Graph – 1: Echocardiographic abnormalities.



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