Original Research Article

X-Ray, electrocardiographic and echocardiographic features of cardiomyopathy in adults

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Abstract

Background: Cardiomyopathies are diseases of heart muscle that result from myriad of insults such as genetic defects, cardiac myocyte injury or infiltration of myocardial tissues. Cardiomyopathies result from insults to both cellular elements of the heart, notably the cardiac myocyte and processes that are external to cells such as deposition of abnormal substances into the extracellular matrix. Cardiomyopathies are traditionally defined on the basis of structural and functional phenotypes like dilated characterized primarily by an enlarged ventricular chamber and reduced cardiac performance, hypertrophic characterized by thickened hypertrophic ventricular walls and enhanced cardiac performance and restrictive characterized by thickened stiff ventricular walls that impede diastolic filling of the ventricle. **Methods:** This was a prospective study of 50 patients of cardiomyopathy admitted in the medicine department of a tertiary care medical college situated in an urban area. The study was conducted after due approval from institutional ethical committee and obtaining informed consent from the patients. The patients were included in the study on the basis of predefined inclusion criteria. Patients having any exclusion criteria were excluded from the study. Xray, Electrocardiographic and echocardiographic features of the patients were studied. The data was tabulated and analyzed using SPSS 16.0 version software. **Results:** The study consisted of 50 patients of cardiomyopathy out of which 26 (52%) were males and 24 (48%) were females with a M: F ratio of 1:0.92. Commonest types of cardiomyopathy was found to be dilated cardiomyopathy (46%) followed by ischemic cardiomyopathy (44%). More than 50% of the cases were found to be between the age group of 51 to 70 years. In-Xray findings, 18(78%) out of 23 patients of DCM group show evidence of cardiomegaly with CT ratio more than 0.5, while 9(39%) out of 22 patients of ICM group show evidence of cardiomegaly. Cardiomegaly is not seen in HCM and RCM group. In ECG findings, ST-T changes 82%, T wave changes 69%, left axis deviation 39% and LVH 25% are common abnormalities seen in DCM patients. **Conclusion:** Cardiomyopathy is one of the important causes of morbidity and mortality in adult population. Early recognition with the help of Xray, ECG, Echo and prompt management of cardiomyopathy will retard the progression of the disease and reduce morbidity and mortality in patients with cardiomyopathy.

Key Words: Cardiomyopathy, X-ray, Electrocardiogram andEchocardiogram, Early Recognition, Morbidity and

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INTRODUCTION

Cardiomyopathies are diseases of heart muscle that result from myriad of insults such as genetic defects, cardiac myocyte injury or infiltration of myocardial tissues. Cardiomyopathies result from insults to both cellular elements of the heart, notably the cardiac myocyte and processes that are external to cells such as deposition of abnormal substances into the extracellular matrix. Although cardiomyopathy is easily defined, classification of its various forms is difficult because majority of cases

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are associated with generalized cardiac dilation and ventricular systolic dysfunction in which etiology is unknown. Knowledge about cardiomyopathies falls into several categories like etiology, gross anatomy, histology, genetics, biochemistry, immunology, hemodynamic function, prognosis, treatment, and others. Several classification of cardiomyopathy have been proposed based on extensive current category of knowledge about heart disease which are useful to both physician and scientist, but no single classification utilize all of knowledge with much overlap between them. The only currently used clinical classification of cardiomyopathy developed was that of WHO and international society and federation of cardiology. WHO classification reveals two separate categorization in series, one based primarily on left ventricular morphology and function and other on etiology. Functional classification is most widely used clinically in which cardiomyopathy are classified into dilated, hypertrophic and restrictive depending upon basic disturbances in function. Importance of this scheme is that all cardiomyopathies are readily placed in one of three categories and therapeutic approaches to each category are distinctly different. Cardiomyopathies are traditionally defined on the basis of structural and functional phenotypes like dilated characterized primarily by an enlarged ventricular chamber and reduced cardiac performance, hypertrophic characterized by thickened hypertrophic ventricular walls and enhanced cardiac performance and restrictive characterized by thickened stiff ventricular walls that impede diastolic filling of the ventricle. A recently appreciated structural and functional phenotype is arrythmogenic right ventricular dysplasia/cardiomyopathy. The dilated cardiomyopathy phenotype is often viewed as a final common pathway of numerous cardiac injuries and is the most common cardiomyopathic phenotype. Objective of this study was to focus on chest x-ray, ECG and ECHO features of cardiomyopathy and to establish a correlation between the ECG, X-ray and ECHO features. X-ray, ECG and Echo changes depend upon the type and severity of Cardiomyopathy, diagnosis of Cardiomyopathy was done by Echocardiogram.

Chest X-ray: DCM: Chest radiography reveals cardiomegaly with prominent left ventricular apex and prominent pulmonary artery segment. Pulmonary venous congestion and frank pulmonary edema are often evident. Massive cardiomegaly resembling pericardial effusion is hallmark of established disease. Rarely in fulminant cases cardiomegaly may not be prominent because ventricles has not had time to dilate despite the features of pulmonary edema.

HCM: Chest X-ray is not very useful in evaluation of HCM. It may reveal mild to severe cardiomegaly of LV type especially in obstructive HCM. Biventricular enlargement, atrial enlargement and evidence of pulmonary congestion may be found.

RCM: Chest X- ray- usually reveals normal sized ventricles. Atrial enlargement and pericardial effusion may produce enlarged cardiac silhouetee. Pleural effusion and signs of pulmonary congestion may also be present. Pericardial calcification may also be detected.

Electrocardiography-

DCM: The electrocardiogram is usually abnormal and nonspecific. The presentation may manifest with any of the following features. Atrial enlargement: left atrial or biatrial enlargement is common feature.1.First degree AV block: prolongation of P-R interval is common finding. Higher degrees of AV block are rare.2.abnormalities of QRS complex- a)Generalized low amplitude deflexions particularly affect frontal plane leads.b)Left QRS axis deviation.c)Right QRS axis deviation d)Left bundle branch block e)Right bundle branch block f)Left ventricular hypertrophy g)Pathological Q waves.3. Abnormalities of S-T segment and T wave4. Arrhythmias– atrial and ventricular extra systoles are common as well as atrial fibrillation.

HCM: The ECG is abnormal in majority of patients with HCM. HCM usually presents with following ECG manifestations.1)Ventricular hypertrophy- ventricular hypertrophy may affect one or more of the following regions.a) interventricular septum b)the free left wall 2)Intraventricular conduction defects 3)Atrial enlargement 4)Short P-R interval in few cases 5)WPW syndrome 6)Prolongation of Q-T interval 7)Disturbances of cardiac rhythm- ventricular extrasystoles, paroxysmal ventricular tachycardia maycause sudden death. SVT and atrial fibrillation can occur. AF leads to clinical deterioration.

RCM: Low voltage ECG commonly seen in amyloid infiltration restrictive cardiomyopathy. Atrial fibrillation is common in idiopathic restrictive cardiomyopathy and cardiac amyloidosis. Other common findings are ventricular arrythmias and conduction disturbances, common in infiltrative disease.

ECHOCARDIOGRAPHY-

DCM: In cases of dilated cardiomyopathy the heart is typically greatly enlarged and systolic function is markedly depressed. Four chamber dilatation is a common but not uniform finding as some patients may have relatively preserved RV size. Typical echocardiographic findings in DCM include an increased LV end diastolic diameter and volume with decreased fraction, thinning of LV walls, increased end point septal separation, LA enlargement and limited mitral and aortic valve opening(due to low stroke volume). Intracardiac

thrombi are frequently observed and most often found in LV apex.

HCM: The fundamental abnormality on echocardiogram in HCM is LVH, which is often severe. Although the hypertrophy may be confined to the septum, it may be concentric or involve any other portion of the LV. Classic finding is asymmetric septal hypertrophy (ASH) defined as a disproportionate thickness of the interventricular septum compared to posterobasal wall with a ratio of greater than 1.3 to 1. In some cases the entire septum is hypertrophied, while in others the thickening may be localized to proximal, mid, or distal (apical) septum. Asymmetric hypertrophy of the proximal IVS may lead to dynamic LV outflow tract obstruction. Ingeneral, the more extensive the hypertrophic process, the more severe the symptoms. The other characteristic findings of HCM are systolic anterior motion of the MV which usually involves the anterior MV leaflet, midsystolic closure of the aortic valve, Diastolic dysfunction andin LVOT-the maximal velocity in obstructive HCM peaks late in systole, creating a characteristic "saber-tooth".

RCM: Typical 2D echocardiographic features of RCM include. 1) a diffuse increase of ventricular thickness in the absence of ventricular chamber dilation and 2)marked biatrialenlargement.Doppler examination may show a mitral inflow relaxation abnormality early in course of restrictive cardiomyopathy. Restrictive pattern (E much greater than A, with shortened E decelaration time) is classic finding, and indicates both a high LA pressure and poor prognosis.The finding of a restrictive mitral inflow pattern on Doppler echocardiography has been identified as a marker of advanced disease and poor prognosis.

MATERIALS AND METHODS

This was a prospective cohort study of the 50 patients of cardiomyopathy who were admitted in medicine department of a tertiary care institute situated in an urban area. The institutional ethical committee approved the study and informed consent was obtained from all the patients. The patients were included in this study on the basis of a predefined inclusion criteria, any patient having any exclusion criteria was excluded from the study. A detailed history was taken in all the patients with a special emphasis on presence of diabetes, hypertension or ischemic heart disease. If present the duration was alsonoted down. History suggestive of cardiomyopathy in any of the family member or sudden death of any family member in past was enquired into. Demographic details like age, sex and address were noted down. Presenting complaints and past history was also noted down. General and systemic examination including cardiovascular system examination was done. Pulse rate and rhythm was noted. JVP was obtained. Cardiac auscultation was done to find out presence of abnormal heart sounds like S3 Gallop or murmur. Biochemical investigations like hepatic and renal function tests, electrolytes and blood sugar levels were done in all cases. Chest X ray, ECG and Echocardiography was done in all cases and findings were noted down. The diagnosis of cardiomyopathy was done on the basis of 2D-Echo. The data was tabulated and analyzed using SPSS 16.0 version software.

Inclusion Criteria-

Patients were selected from those presenting with

1. Signs and symptoms of congestive cardiac failure.
2. Abnormal ECG changes.
3. A symptomatic patients having unexplained cardiomegaly on chest X-ray.

Exclusion Criteria

1. Valvular heart disease, congenital heart disease and pericardial disease were not included.
2. Patients with history of acute MI were not included.

RESULTS

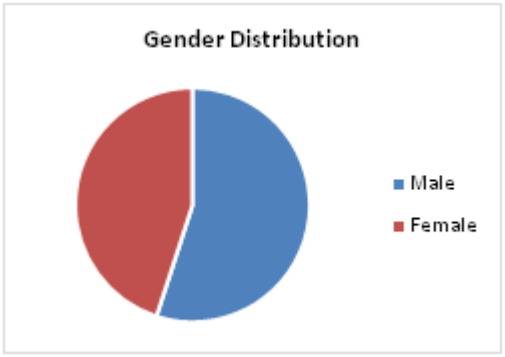

Figure 1: Gender Distribution of the studied cases

This was a prospective study comprising of 50 adult patients with cardiomyopathy. Out of these 50 patients there were 26 males and 24 females with a M: F ratio of 1:0.92. The difference was not found to be statistically significant. The analysis of gender distribution on the basis of type of cardiomyopathy showed that in DCM Females were commonly affected (30%) while ICM was more common in males (30%) while in HCM males were predominantly affected (6%).

Table 1: Gender Distribution and type of cardiomyopathy

Gender	Type of CM					Total
	DCM	ICM	Obstructive HCM	Non Obstructive HCM	RCM	
Male	8	15	0	3	0	26
Female	15	7	1	0	1	24
Total	**23**	**22**	**1**	**3**	**1**	**50**

The most common type of cardiomyopathy was found to be dilated cardiomyopathy (46%) followed by Ischemic cardiomyopathy (44%). Dilated and Ischemic cardiomyopathy patients formed 90% of the total studied cases. Hypertrophic and restrictive cardiomyopathy was seen in 10% of the patients.

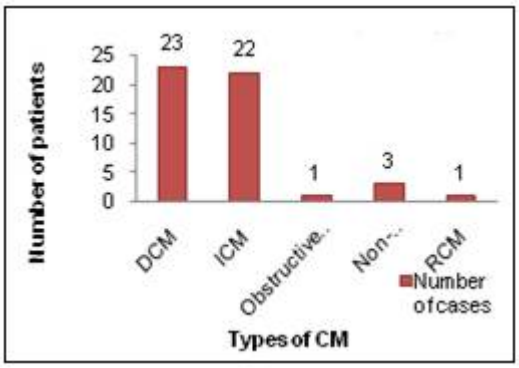

Figure 2: Type of cardiomyopathy in the studied cases

Table 2: Age distribution of the patients with cardiomyopathy

Age Group	Type of CM					Total
	DCM	ICM	Obstructive HCM	Non-obstructive HCM	RCM	
21-30	1	0	1	0	0	2
31-40	1	0	0	1	0	2
41-50	7	2	0	0	0	9
51-60	6	8	0	1	0	15
61-70	7	5	0	1	1	14
71-80	1	7	0	0	0	8
Total	**23**	**22**	**1**	**3**	**1**	**50**

The analysis of the patients on the basis of age group revealed that the most common age group to be affected by cardiomyopathy was 51-60 years (30%) followed by 61-70 years (28%), 41-50 years (18%) and 71-80 years (16%). The study of type of cardiomyopathy and the affected age group showed that the most common age groups affected in patients with DCM were 41- 50 years and 61-70 years while in cases of ICM the most common age group affected was found to be 51-60 years. There was only 1 patient of obstructive HCM belonging to age group of 21-30 years while restrictive cardiomyopathy was seen in 1 patient belonging to age group of 61-70 years.

X-ray: The analysis of chest X -ray on the basis of types of cardiomyopathy showed that cardiomegaly and pulmonary congestion is more common in DCM group 18(78%) and 13 (56%) as compared to ICM group 9 (39%) and 1(4%).

Table 3: Radiological findings with respect to type of Cardiomyopathy:

Radiological findings	Type of CM present					Total
	DCM	ICM	Obstructive HCM	Non-obstructive HCM	RCM	
Cardiomegaly	18	9	0	0	0	27
Pulmonary Congestion	13	1	0	0	0	14

ECG: Analysis of ECG findings with Cardiomyopathy- ST-T changes is the commonest finding seen in all types of cardiomyopathy, seen in 43 patients (86%). T wave changes is another common finding seen in 36 patients (72%).other common findings normal axis seen in 30 patients (60%), LAD 17 (34%), LVH 12(24%) Arrythmias 11(22%), Blocks 13(26%)

Table 4: Distribution of patients with respect to ECG and type of Cardiomyopathy:

History	Types of CM				
	DCM	ICM	HCM_ Obstructive	HCM_ Non-obstructive	RCM
Axis					
Normal	13	13	1	2	1
LAD	9	7	0	1	0
RAD	1	2	0	0	0
STT changes	19	19	1	3	1
T-wave changes	16	15	1	3	1
LVH					
Present	4	4	0	0	0
LVH with strain	2	0	0	2	0
low voltage	1	2	0	0	0
Arrythmias					
AF	1	1	0	0	1
VPC	4	3	0	0	0
Ventri. Bigemini	0	1	0	0	0
Blocks					
1st deg	1	0	0	0	0
CHB	0	1	0	0	0
Incomplete RBBB	0	0	1	0	0
incomplete LBBB	0	2	0	0	0
LBBB	3	3	0	0	0
LBBB,LAHB	0	1	0	0	0
RBBB	0	1	0	0	0

ECHO: Various echocardiographic findings with respect to type of cardiomyopathy. Dilated LV cavity, poor LV contractility, decreased EF, hypokinesia, diastolic dysfunction, valvular regurgitation are common findings in DCM and ICM group while IVS and LVPW thickness are common findings in HCM group.

DISCUSSION

In our prospective study of 50 patients with the commonest types of cardiomyopathy was found to be dilated cardiomyopathy (46%) followed by ischemic cardiomyopathy (44%) and non obstructive hypertrophic cardiomyopathy (6 %). Similar findings were seen in study conducted by Hollister R.M *et al*[1] In their study of 62 patients with CM, 25 patients had DCM, 28 patients had HCM and 9 patients had RCM. The analysis of the cases with respect to gender and type of cardiomyopathy showed that in DCM group 15 out of 23 patients (65.52%) were females and 8 (34.48%) were males. In ICM group 15 out of 22 patients (68.18%) were males and 7 (31.92%) were females. As seen together DCM and ICM 23 out of 45 patients (51.11%) were males and 22 (48.89%) were females. Thus there was a slight male preponderance in our study. Similar male preponderance in the patients with dilated cardiomyopathy was found in the studies conducted by Fuster *et al* and Rihal *et al*[2,3] The analysis of patients with hypertrophic cardiomyopathy showed that the mean age of the patients was 44 years and the M: F ratio was found to be 3:1. These findings were consistent with the findings as reported by Braunwald *et al*[4] in their study of 64 patients with cardiomyopathy out of which 43 (67%) were male and 21 (33%) were females.simillarmale preponderance is also seen in apical variant of HCM, as seen in following study, panja[5]. In our study of patients with hypertrophic cardiomyopathy there was no patient with family history of cardiomyopathy as well as history of sudden death in any of the family members.

Radiological Features: Cardiomegaly -In the present study, 18 (78%) out of 23 patients of DCM group show evidence of cardiomegaly with CT ratio more than 0.5, while 9 (39%) out of 22 patients of ICM group show evidence of cardiomegaly. Cardiomegaly is not seen in HCM and RCM group. Pulmonary congestion- in the present study, 13(56%) of DCM group, 1 (4%) of ICM group show evidence of pulmonary congestion.

Hypertrophic Cardiomyopathy: Cardiomegaly and pulmonary congestion was absent in all 4 patients.Cardiomegaly can occur in non-obstructive, obstructive and apical variant of HCM. Godwin *et al* [6] found cardiomegaly in X-ray 15/29 (50%) patients with obstructive HCM and found that particular shape did not characterize the cardiac silhouette.

Electrocardiogram DCM: In the present study out of 23 patients, normal axis is seen in 13 (56%)left axis deviation is seen in 9 (39%), right axis in 1 (4%), ST-T changes in 19 (82%), T wave changes in 16 (69%), left

ventricular hypertrophy in 4 (17%), LVH with strain in 2 (8%), low voltage in 1 (4%), atrial fibrillation in 1 (4%), VPC in 4 (17%), 1st degree AV block in 1(4%) and LBBB in 3 (13%) of patients. Thus it is seen that ST-T changes 82%, T wave changes 69%, left axis deviation 39% and LVH 25% are common abnormalities seen in DCM patients.

Table 5: Various echocardiographic findings with respect to type of cardiomyopathy

Echo Cardiography Features	DCM	ICM	Obstructive HCM	Non-Obstructive HCM	RCM	Percentage (%)
LVID (d) mm	58.80 ± 5.93	58.25± 5.70	43	55.0± 6.21	51	
LVID (s) mm	45.95± 8.09	44.86 ± 7.23	29	38.25 ± 9.54	40	
IVS mm	10.33 ± 2.60	10.27± 2.58	20	13.75 ± 2.63	14	
LVPW mm	10.43 ± 1.84	10.43± 1.64	12	13.7± 2.52	12	
LA	41.65 ± 5.74	41.88± 5.33	36	45.75 ± 2.98	45	
Ejection Fraction (%)	27.34 ± 12.80	28.31 ± 12.63	70	47.0 2± 1.32	40	
Hypokinesia	22	22	0	0	1	90.00
ASH	0	0	1	0	0	2.00
SAM	0	0	1	0	0	2.00
DD	6	8	0	1	1	32.00
LVOT Obstruction	0	0	1	0	0	2.00
		Valvular regurgitation				
AR	0	1	0	1	0	4.00
MR	9	6	1	0	0	32.00
MR,AR	1	0	0	0	0	2.00
MR,TR	11	7	0	0	0	36.00
TR	1	0	0	0	0	2.00

ICM- in the present study out of 22 patients, normal axis in 13 (59%), LAD in 7 (32%), RAD in 2 (9%), ST-T changes in 19 (86%), T wave changes in 15 (68%), LVH in 4 (18%), low voltage in 2 (9%), atrial fibrillation in 1 (4%), VPC in 3 (13%), ventricular bigemini in 1(4%), complete heart block in 1 (4%), LBBB in 6(26%) and RBBB in 1 (4%) of patients. Thus it is seen that ST-T changes 86%, T wave changes 68%, LAD 32%, LVH 18% and LBBB 26% are common abnormalities seen in ICM patients.

Axis: In DCM, LAD is seen 39% patients and in ICM LAD is seen in 32% patients. These findings in the present study were comparable to study done by Parale *et al*[7] who found left axis deviation in 59% of patients.

Blocks- In the present study 1 patient in DCM had 1st degree AV block while 1 patient in ICM group had complete heart block. Scholler *et al*[8] found first degree AV block in 17.6% and second degree AV block in 10.6% patients. In present study LBBB is seen in 3 (13%) of DCM patients and LBBB 6 (26%) and RBBB in 1 (4%) of ICM patients. findings in the present study is comparable with other studies Likoff *et al*[9] found LBBB in 22% patients. Barboso *et al*[10] reported LBBB in 24.6% and RBBB in 4.4%. Schoeller *et al*[8] found LBBB in 41.2% and RBBB in 3.5%.

Arrythmias- In the present study, in DCM group 1 (4%) had atrial fibrillation and 4(17%) had ventricular premature complexes (VPC). Of the ICM group 1 (4%) had AF, 3 (13%) had VPC and 1 (4%) had ventricular bigemini. Likoff *et al*[9] found AF in 18%, VPC 100% (Holter), and VT 46% (Holter). Borbosa *et al*[10] found AF in 28% and SVT in 3%. Wilensky *et al*[11] found AF in 14%, VPC in 44% and atrial flutter in 4% patients. Scoeller *et al*[8] and Anderson *et al*[12] found AF in 25.9% and 19.0% respectively. Parale *et al*[7] found AF in 12% and VPC in 22.5% patients thus findings in the present study is comparable with above studies.

Hypertrophic cardiomyopathy: In our study out of 4 HCM patients, normal axis is seen in 3 (75%), LAD in 1(25%), ST-T and T wave changes in all 4 (100%), LVH in 2 (50%) and RBBB in 1 (25%) patients similar findings were seen in study conducted by Savage *et al*[13] who found ST changes in 81%, LVH in 64%, LA enlargement in 48% and abnormal Q wave in 33% patients. Shapiro *et al*[14] found ST changes in 54%, LVH in 87% patients.

Echocardiographic features: DCM+ICM -Left ventricle: diameters and systolic function- dilated poorly contracting ventricles are functions of dilated cardiomyopathy.

Table 6:

Study	LVID d	LVID s	Ejection fraction%
Rihal *et al*[3]	69+/-9mm	60+/-9mm	23+/-9
DCM	58+/-5mm	45+/-8mm	27+/-12
ICM	58+/-5mm	44+/-7mm	28+/-12

As compared to study done by Rihal *et al*[3] left ventricular dimensions were less but all patients had hypokinesia and poor ejection fraction.

Left ventricular posterior wall and interventricular septum: In the present study LVPW and IVS thickness in both DCM and ICM is within normal limits.

Table 7:

Study	LVPW	IVS
Abbassi *et al*[15]	8.0+/-2mm	-
Anderson *et al*[12]	9.0+/-1.7	-
DCM	10.43+/-1.84	10.33+/-2.60
ICM	10.43+/-1.64	10.27+/-2.58

As compared with other studies LVPW and IVS are within normal limits. Abbasi *et al*[15] found that posterior left ventricular wall motion was markedly reduced in dilated cardiomyopathy.

Left atrium: In the present study, left atrial enlargement was seen in 15(65%) of DCM group and 12(54%) of the ICM group. Mean LA diameter in DCM was 41.65+/-5.7 and in ICM was 41.88+/-5.33. The findings in the present study was comparable with a study done by karl *et al* [16] in which mean left atrial diameter was found 47+/-7mm.

Valvular Regurgitation- DCM: In the present study, valvular regurgitation is seen in 22 (96%) of patients. There was isolated MR in 9(39%) of patients, while associated MR with TR in 11 (47%), MR with AR in 1(4%) of patients. There was isolated TR in 1 (4%) of patients. **ICM-** valvular regurgitation is seen in 14 (63%) of patients. There was isolated MR in 6 (27%) of patients, while associated MR with TR in 7 (31%) and isolated AR in 1 (4%) of patients. Commonest type of Valvular Regurgitation found in both DCM and ICM group was MR found in DCM-21/23 patients (91%) and In ICM-13/22 patients (59%).Thus findings in the present study was comparable to other study done by Karl *et al*[16] who found that MR was present in 89% of the patients.

Diastolic Dysfunction: In the present study, 6(26%) of the DCM group and 8(36%) of the ICM group show diastolic dysfunction. Anderson *et al* [12] have shown the presence of diastolic dysfunction even in patients without LV dilatation.

Pericardial effusion and intracavitatory clots- In the present study, none patients of DCM or ICM group show evidence of pericardial effusion or intracavitatory clots.

Hypertrophic Cardiomyopathy- ECHO Features- The differences in study groups (obstructive, non obstructive, apical) were noted in following points- septal thickness, ASH, SAM, LA enlargement, LVOT gradient, valvular involvement.

Septal thickness: In the present study, thickness of septum was increased in all 4 patients, with an average of 20mm in obstructive HCM and 13.75+/-2.63 in non obstructive group. This was found to be significantly higher in obstructive HCM (20mm) compared with non obstructive HCM patients mean(13.75mm).Findings in the present study were comparable to study done by Gilbert *et al*[17] who reported septal thickness in HCM patients (20.7mm) which was significantly higher than normal[8.7].

Asymmetric Septal Hypertrophy (ASH): In our study 1 patient in obstructive HCM show asymmetric septal hypertrophy. Ratio of IVS : LVPW in obstructive group is 1.5:1 while in non obstructive HCM it is 1:1.Findings in the present study were comparable to study done by Gilbert *et al*[17] who noted higher incidence of ASH and higher ratio of IVS : LVPW in obstructive group as compared with non obstructive group.Savage *et al*[13] attempted to find a correlation between echo and ECG in HCM patients with or without obstruction. They found that patients of obstruction had LVH more frequency, higher mean septal values and IVS : LVPW ratio than non obstructive. **LA enlargement** -was found significantly more in patients with non obstructive HCM, while in single patient of obstructive HCM LA size was normal, this is contrast to study done by Gilbert *et al*[17] found LA enlargement significantly more often in patients with obstruction than those without obstruction.

LVOT gradient: Was found in obstructive HCM. It was more than 20mm Hg.

Systolic anterior motion of the mitral valve (SAM): It was seen in single patient of obstructive HCM and none of non obstructive HCM group. SAM was taken as indicator of presence of obstruction. Gilbert *et al*[17] found that severe SAM in all patients with obstruction at rest and in no patients without obstruction.

CONCLUSION

Cardiomyopathy is one of the important causes of morbidity and mortality of cardiac origin. Early diagnosis and appropriate intervention will reduce the morbidity and mortality associated with cardiomyopathy. The commonest ECG abnormality in both the DCM and HCM groups is nonspecific ST-T changes. The dilated CM group characteristically has cardiomegaly on chest X-ray, whereas in HCM and RCM cardiomegaly is not so prominent. Pulmonary congestion is seen commonly in DCM group. The ECHO findings in DCM characteristically reveals a dilated LV cavity with poor interventricular septal and posterior wall motion and a normal wall thickness. The ejection fraction is characteristically low. In HCM, on the other hand, a hypertrophied nondilated LV with an near normal ejection fraction is the characteristic finding. SAM, ASH, LVOT obstruction together indicate the obstructive type of HCM.

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