Original Research Paper

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Medicine

STUDY OF CARDIAC VALVULAR MANIFESTATION IN PATIENTS WITH RHEUMATOID ARTHRITIS

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ABSTRACT **Background:** Cardiovascular diseases are common in Systemic Rheumatological diseases. Cardiac involvement can be their first manifestation and can vary from subclinical to severe manifestations. Cardiac Valvular manifestations of Rheumatoid Arthritis thus deserves special study. **Objectives:** To study extent and severity of cardiac valvular involvement by echocardiography in an established case of rheumatoid arthritis and to asses any correlation between severity of cardiac lesion with duration and severity of RA.

KEYWORDS : Rheumatoid Arthritis, Cardiac Valvular Diseases , Mitral Regurgitation

INTRODUCTION

Rheumatoid arthritis is a chronic systemic disease of unknown etiology. It is characterized by chronic symmetrical peripheral polyarthritis. It has a progressive course with exacerbations and remission being part of its natural history. Its onset could be at any age but usually starts in the third to fourth decade of life. Overall there is a 3:1 female preponderance but this excess is greater in young people and the age related incidence in older age group is approximately equal[2]. Though being principally a disease of joints, several extra articular manifestations are noted. The systemic manifestations include involvement of cardiac, pulmonary, hematological, neurological system and ocular system.

The prevalence of rheumatoid arthritis is between 0 .7% to 1.5%. Malvaiya et al found the prevalence in indian rural population to be 0.75%. Many cardiac lesions have been described since then including pericardial effusion, constrictive pericarditis, mitral regurgitation, mitral stenosis, aortic root dilatation and aortic regurgitation.

The first echocardiographic study of patients with rheumatoid arthritis was done by Prakashet al (1973) who found pericardial involvement in 7 out of 16 RA patients. Among the extrarticular manifestation cardiac involvement occurred in 70% of patients with nodular disease and 40% patients with non nodular disease. Most common valve lesion associated with RA is regurgitant lesion. Mitral regurgitation and aortic regurgitation are the two most common types of valve lesion.

AIMS & OBJECTIVES

To study extent and severity of cardiac valvular involvement by echocardiography in an established case of rheumatoid arthritis and to assess any correlation between severity of cardiac lesion with duration and severity of RA.

SPECIAL OBJECTIVE: Percentage of RA patients having cardiac valvular lesion with special reference to:

- Their morphology
- Severity
- Functional incapability
- Arrhythmias
- Left ventricular function
- Pericardial involvement
- Any correlation of severity with severity or activity of RA

MATERIALAND METHODS

The study was performed on rheumatoid arthritis patients attending OPD in All India institute of Medical Science Patna Bihar. a total of 48 patients were enrolled in the study. The duration of study is 1 year. This is a cross-sectional observational study.

INCLUSION CRITERIA

After clinical evaluation and laboratory investigation those patients satisfying the modified ACR criteria (1987) were included in the study.

EXCLUSION CRITERIA

Those suffering from congenital heart disease, ischemic heart disease,valvular heart disease with rheumatic history and diabetes mellitus were excluded from their study.

All patients were evaluated with :

DETAILED HISTORY

Age, sex, duration of RA, duration of morning stiffness, chest symptoms, list of painful joints, presence of other systemic disease and history of other extra articular manifestation of RA. Treatment history was documented. Functional class was recorded on Steinbrockers scale.

EXAMINATION

A systemic examination of all joints was done for features of activity, tender joint count and swollen joint count examination was done.

TENDER JOINT COUNT AND SWOLLEN JOINT COUNT

A simplified 28 joint articular index as described by *Fuchs et al* was used to asses disease activity. Twenty eight joints included ten proximal interphalangeal joints of the fingers, ten metacarpophalangeal joints, the wrist, elbow, shoulder and the knee joint bilaterally.

Cardiovascular examination was done in detail. Abdominal, neurological and rheumatological examination was also done. Extra-articular manifestations are carefully looked for and documented.

STEINBROCKERS CLASSIFICATION IN RHEUMATOID ARTHRITIS

Class-I: complete functional capability with ability to carry on all usual duties without handicaps

Class-II: functional capacity adequate to conduct normal activities despite handicap of discomfort or limited mobility of one or more joints.

Class-III: functional capacity adequate to perform only few or none of the duties of usual occupation or of self care.

INVESTIGATIONS:

ESR - It was obtained by westergren method.

RHEUMATOID FACTOR (IgG) - A quantitative assay was performed using a latex fixation lab kit.

C-REACTIVE PROTEIN - Quantitative assay was performed using latex agglutination kit.

ROUTINE INVESTIGATION - Hemoglobin estimation, blood urea, serum creatinine and blood sugars

ECHOCARDIOGRAPHY- With the patient in the supine and left lateral position M-mode, 2-D and Doppler echocardiography was done.

ELECTROCARDIOGRAM- A 12 lead electrocardiogram was performed in all subjects.

RADIOGRAPHIC ASSESSMENT - Routine PA view CXR was taken in all patients.

X-RAY of both hands was taken in all patients for assessment of rheumatologic activity, deformity and erosion. This was assessed according to the steinbrockers radiological assessment of the hand scale.
The steinbrocker criteria for staging hand radiograph were defined as follows

I. No destructive changes, but particular osteoporosis may be present.
II. Osteoporosis and slight articular and/or subchondral bone destruction are present.
III. Osteoporosis and cartilage and/or bone destruction
IV. stage III plus fibrosis or bony ankylosis

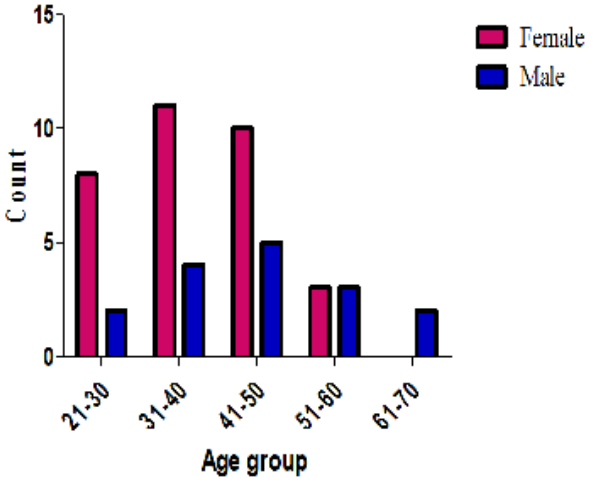
STATISTICAL METHODS

Descriptive statistics that is, mean with standard deviation and frequency distribution were performed for continuous and categorical variables,respectively. To see significant differences between the groups for continuous variables student "t" test (unpaired two tailed) was performed and to see the difference between the means in skewed deviation. For comparing categorical variables chi square test was used, $p \leq .05$ has been considered as statistically significant.

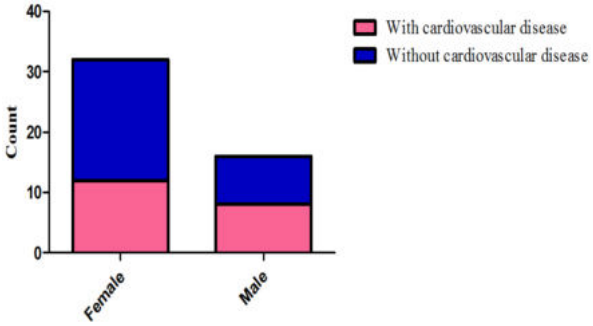
RESULTS & OBSERVATIONS

The study was performed in All India Institute of Medical Science Patna. between July 2019 to June 2020. 48 patients of rheumatoid arthritis were diagnosed with modified ACR criteria and included in the study after they fulfilled the inclusion and exclusion criteria.

Characteristics	Patients (n=48)
Age (mean)	39.96±9.934
Duration of disease (mean)	4.2333±1.90356
Morning Stiffness (mean)	2.3646±4.11890



Age distribution with Sex in the study population:

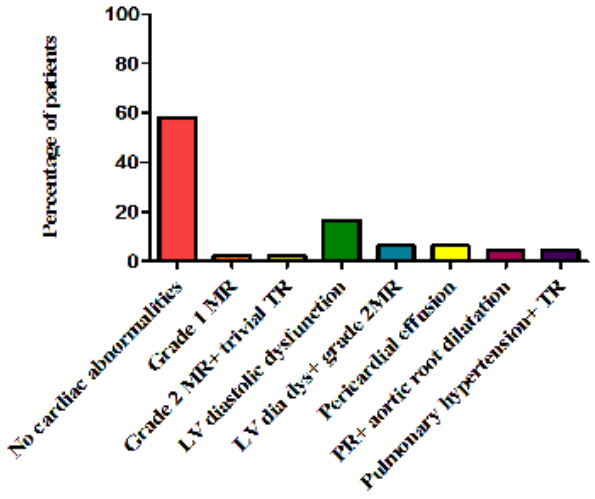


Distribution of cardiovascular manifestation according to sex:

Echocardiographic finding in the disease population:

Cardiac abnormalities Parameters	No of Patients (n=48)	Percentage of patients
No cardiac abnormalities	28	58.3
Grade 1 MR	1	2.1
Grade 2 MR+ trivial TR	1	2.1
LV diastolic dysfunction	8	16.7
LV diastolic dysfunction+ Grade 2 MR	3	6.2
Pericardial effusion	3	6.2
Pericardial thickening(PR)+ aortic root dilatation	2	4.2
Pulmonary hypertension+ TR	2	4.2

MR-Mitral Regurgitation, TR-Tricuspid Regurgitation



Correlation between Steinbrocker's class and cardiac abnormalities:

Parameter	Patients with Cardiac Abnormalities	Patients without Cardiac Abnormalities	P value
Steinbrocker's class-I	2 (15.4)	11 (84.6)	0.017
Steinbrocker's class-II	13 (44.8)	16 (55.2)	
Steinbrocker's class-III	5 (83.3)	1 (16.7)	

Distribution of patients according to Steinbrocker's class:

Parameter	No of Patients
Steinbrocker's class-I	13
Steinbrocker's class-II	29
Steinbrocker's class-III	6

Distribution of Rheumatoid Nodule in study population:

Parameter	No of Patients	Percentage of Patients
Patients without Rheumatoid Nodule (RN)	39	81.3
Patients with Rheumatoid Nodule (RN)	9	18.7

Correlation of Rheumatoid nodule with cardiovascular disease:

Parameter	Patients with Cardiovascular disease (%)	Patients without Cardiovascular disease (%)	P value
Patients with Rheumatoid nodule(RN)	9 (100)	11(28.2)	0.000
Patients without Rheumatoid nodule(RN)	0 (0)	28 (71.8)	

Chi square 15.50, df=1; p=.0.000

Echocardiographic abnormalities are found in 20 patients. Among them one patient has grade1 MR, 4 patients have grade 2 MR, 11 patients have diastolic dysfunction which is the commonest cardiovascular manifestation in the study. Three patients have trivial TR. Among them 2 patients have evidence of pulmonary arterial hypertension. 2 patients have pericardial thickening and aortic root dilatation. 3 patients have evidence of mild pericardial effusion. Among patients with diastolic dysfunction , 3 patients also have

evidence of MR.

Further patients with cardiac abnormalities and those without cardiac abnormalities are compared. A significant correlation was found between tender joint count, Steinbrockers functional class , disease duration, Rheumatoid nodule, ESR. There was no significant correlation between swollen joint count and Hb concentration.

DISCUSSION

In this study, cardiac structural and functional abnormalities is seen in 20 (41.7%) patients. Left ventricular filling abnormalities are seen in 11 patients (22.9%). Pericardial involvement is seen in 5 patients (10.4%). 3 patients have pericardial effusion and 2 patient have pericardial thickening. Patients with pericardial thickening also found to have aortic root dilatation. Pulmonary hypertension and tricuspid regurgitation found in 2 patients. Maione[1] et al compared 39 RA patients and compared them with 40 controls and found cardiac involvement in 43% of patients and most common abnormality to be diastolic dysfunction (26%), pericardial involvement in 8% and valvular lesion in 8%. Corrao[6] et al studied 35 RA patients in 1995 and found cardiac abnormality in 57.1% of cases.

In our study cardiac valvular dysfunction is found in 18.8% of patients. Most of them have single valvular lesions. Mitral valve involvement was found in 10.4% of patients and regurgitant lesion is found in all of them. Aortic insufficiency with aortic root dilatation is found in 2 (4.2%) of patients. 2 patients have tricuspid regurgitation. Most of the valve lesions are asymptomatic. 50% of mitral regurgitation patients also have diastolic dysfunction.

Age and sex distribution

The mean age in this study is 39.96 years with a range from 21 to 62 years. The maximum incidence of cardiac abnormality is found in 41 to 50 years age group (20%). The male to female ratio in this study is 1:2. In a study by maioneet al the mean age of the study was 46.4 years with arrange of 18 to 76 years and the female to male ratio is 1:2.2. The maximum incidence of cardiac abnormality was seen in 30-60 years age group.

Duration of illness

In this study there is slightly higher incidence of cardiac valvular abnormality in patients with increased duration of disease. The mean duration of disease in patients with cardiac abnormality is 4.92 years whereas mean duration of disease is 4.23 years. The mean age of patients with cardiac valvular abnormality is 42.1 years. The mean duration of disease in patients with diastolic dysfunction is 6.42 years. Franco et al evaluated 32 patients with RA for diastolic dysfunction with duration of disease. They found that there is a linear association between diastolic dysfunction and duration of disease which corroborates with our present study.

Extra articular manifestation

The extra articular manifestation noted apart from cardiac involvement is rheumatoid nodules in 9 patients, pleural effusion in 1 patient and interstitial lung disease in 1 patient. In the present study there is significantly increased incidence of cardiac manifestation in patients with rheumatoid nodules (p-value-.000)

Kowalik evaluated echocardiographic findings in RA patients with subcutaneous nodules. Their study revealed significantly increased incidence of cardiac abnormalities in RA patients with subcutaneous nodules (odds ratio-15, p-value<0.0002)

Clinical features and investigation

History related to rheumatoid arthritis including joint pains, morning stiffness and swelling of joints was present in almost all the joints in the study group. However none of the patients presented with symptoms suggestive of cardiac disease or LV diastolic dysfunction in particular. Conrao et al evaluated 35 RA patients for cardiac abnormalities and found that none of their patients had presented with history or predominant cardiac finding suggestive of cardiac involvement and hence they concluded that there was evidence for silent heart disease in RA.

STEINBROCKERS FUNCTIONAL CLASS

Majority of patients in the two groups belong to class II. There is positive correlation between steinbrockers functional class and cardiac abnormalities (pvalue-0.017) Maoine et al and Corrao[6] et al found no correlation of cardiac abnormalities with steinbrockers functional class assessment.

DISEASE ACTIVITY BY JOINT COUNT TENDER AND SWOLLEN JOINT COUNT

The mean tender joint count in this study is 16.2 in the entire group, in those without cardiac abnormalities 13.43, and in those with cardiac abnormalities 20.2. The mean swollen joint count in the entire group is 10.2 and 8.79 in patients without cardiac abnormality and 10.1 in patients with cardiac abnormalities. There is significant correlation between tender joint count and cardiac abnormality (p-value-0.010) but no correlation between swollen joint count and cardiac abnormality (p value-0.486). Maoine et al found the mean tender joint count to be 12.4 and mean swollen joint count to be 9.7

RHEUMATOID FACTOR

Rheumatoid factor was positive in 80% of patients with cardiac involvement compared to 65% in patients without cardiac abnormalities. Hence patients with cardiac lesions are more frequently found to be seropositive though the association is not statistically significant.

Maione et al, Kushal et al in their separate studies found no association between rheumatoid factor positivity and occurrence of cardiac lesion.

RADIOLOGICAL CHANGES

Pleural effusion was found in one patient who was found to be of rheumatic etiology. None of the patient is found to have cardiomegaly, pericardial involvement in the form of pericardial effusion or pericardial calcification on CXR. Kushal reported that CXR was normal in all of his patients.

X-ray of the hand is taken for all RA patients and staged according to steinbrockers radiological classification. There is significant association of cardiac abnormalities with higher stages of steinbrockers radiological classification.

ELECTROCARDIOGRAM

ECG changes seen are non-specific ST-T changes and minor conduction abnormalities.

Tlustochowicz evaluated 70 RA patients with baseline electrocardiogram and 24hr ECG monitoring was carried out and compared with controls. They did not find any difference in the test and control group as well as between baseline ECG and 24 hr ECG.

ECHOCARDIOGRAPHY

Echocardiography was done in all 30 patients .Structural and functional abnormalities were found. Echocardiographic abnormality was found in 20 patients. Left ventricular diastolic dysfunction was found to be the commonest abnormality in 11 patients (22%) cases. One patient was found to have bi-ventricular diastolic filling abnormality. Pericardial involvement was seen in 5 patients (10.4%). two others found to have pericardial effusion which was small (<300ml) and was not associated with significant cardiovascular dysfunction or clinical manifestation. Pericardial thickening was present in 2 patients (4.2%).

None of the patients with pericardial involvement was found to have clinical or radiological evidence of tuberculosis. All patients with pericardial effusion were evaluated for thyroid function test which was found to be normal .Corrao et al (42%) and kaushal et al(16%)found increased incidence of pericardial involvement in RA patients.

SUMMARY & CONCLUSION

Cardiac manifestation seen in 20 patients (42%) out of 48 cases and maximum incidence of disease is seen in 41-50 yrs age group and the male to female ratio is 1:2. The mean duration of disease found to be 4.23 years in the entire study group and 4.92 years in patients with cardiac disease.There is positive correlation of patients with cardiac abnormalities to tender joint count, steinbrockers functional class, rheumatoid nodule, ESR, disease duration but no correlation found between swollen joint count and hemoglobin concentration. Most patients with cardiac abnormalities have normal x ray. The electrocardiogram shows minor conduction abnormality. The most common abnormality seen in this group of patients is left ventricular dysfunction in 22.9% of patients, valvular abnormality in 19% of patients, pericardial involvement in 10.4%of cases, pulmonary hypertension in 4.2% of cases.

Most common valve involved is the mitral valve (10.4%). Most common lesion is the regurgitant lesion. None of the patients have clinical manifestation of cardiac involvement suggesting that cardiac involvement in RA is largely subclinical. Cardiac abnormalities are an important extra articular manifestation of Rheumatoid arthritis.

The abnormalities are largely subclinical. The early detection of cardiac abnormalities can be very important in the correct assessment and management of the RA patients especially in light of the fact that the most common mortality in RA patients is cardiovascular disease. Therefore every patient must be submitted to cardiological assessment (in particular echocardiography) in order that cardiac abnormality can be detected early and can be treated, and the incidence of mortality and morbidity reduced.

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