Clinical Evaluation Versus Echocardiography in the Assessment of Rheumatic Heart Disease

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Abstract

Background: Rheumatic heart disease (RHD) is still a common form of heart disease among children and young adults, especially in developing countries like India. Between 1940 and 1983, the prevalence rate of RHD varied from 1.8 to 11 per 1000 (national average 6 per 1000), while between 1984 and 1995 the rate varied from 1 to 5.4 per 1000 [1]. The study was carried out to assess the accuracy of a medical student's clinical evaluation of valvular heart disease and compare it with that of an echocardiographic evaluation and to determine the sensitivity, specificity and predictive values of clinical examination as compared to echocardiography for the various lesions in RHD patients.

Method: 50 children between the ages of 5-16 years, attending the out patient department or admitted in a large teaching hospital, satisfying the criteria of RHD, were included in the study. Each patient underwent detailed clinical evaluation and relevant investigations including echocardiography.

Results: Mitral valve was involved most often both by echocardiography and clinically. Isolated aortic valve involvement was rare. The most common lesion was mitral regurgitation (MR) both by auscultation and by echo. Mixed lesions were seen more often than pure lesions. Mitral stenosis (MS) had the highest sensitivity while tricuspid regurgitation (TR) had the highest specificity. MR had the highest positive predictive value and MS the highest negative predictive value. Sensitivity and specificity of aortic regurgitation (AR) was very low when compared to earlier studies. There was a statistically significant difference between echo diagnosis and clinical diagnosis ($p < 0.05$).

Conclusion: It is recommended that echocardiography be done routinely for the diagnosis of cardiac lesions in patients of RHD as clinical examination alone can miss various lesions, especially when the lesions are mild or when multiple lesions are present.

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Key Words : Aortic valve; Children; Mitral valve; Rheumatic heart disease; Tricuspid valve

Introduction

The beating heart and the blood vessels must have been known to primitive and pre-historic man since they are so obvious. But the diseases of the heart and blood vessels were not recognised until post-mortem examination disclosed them in the 16th century when the church began to permit autopsies. The murmurs of the heart could be identified after the invention of the stethoscope by Lennae in 1816 [2].

Due to many factors like tachycardia, an untrained ear, noisy surroundings and low intensity of the murmur, many murmurs in the cardiovascular system are missed clinically [3]. Invention of the echocardiogram by Edler et al in 1951 changed this. It has been seen in many studies that the echo is much more sensitive in picking up the lesions which are easily missed on clinical examination [3-9].

Cardiac involvement is the most important component and the only permanent sequelae of acute rheumatic fever [3,10,11]. The role of echocardiogram in detecting heart lesions in acute rheumatic fever has been controversial. On one hand, some researchers [8-10]

find it useful in identifying sub clinical mitral and aortic valve diseases, whereas others [12] disagree with an incremental diagnostic utility of 2D echocardiography and Doppler in Rheumatic fever without clinical carditis. The serial use of echocardiography in patients with proven RHD is helpful in finding the progression or regression of the disease [10]. RHD is the most common cause of heart disease in the first 4 decades throughout the world and in some countries is responsible for up to half of all deaths from cardio vascular disease [11]. RHD is a preventable disease. It should be diagnosed promptly and patient put on secondary prophylaxis against further infection and damage of the valves [11]. Jones criteria cannot be strictly followed as it may result in the under diagnosis of the disease in our country [3].

The present study was therefore undertaken with a view to assess the accuracy of a medical student's clinical evaluation of valvular heart disease and compare it with that of an echocardiographic evaluation and to determine the sensitivity, specificity and predictive values of clinical examination as compared to echocardiography for the various lesions in RHD patients.

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Material and Methods

50 consecutive cases of RHD admitted to a large teaching hospital and out patient cases seen between March 2001 to August 2001 formed the material for the present study. All the patients were in the paediatric age group between 5 to 16 years. Cases above 16 years and cases of acute rheumatic fever were excluded from the present study.

Each case was examined in detail with reference to complaints and history. A record of physical findings was made and cardiovascular examination was done in each case. Echocardiography was done in all cases using a Hewlett Packard Sonos 1500 Echodoppler system by a cardiologist.

Results

50 consecutive cases of RHD were studied in our hospital complex. The distribution of the various valvular lesions noted singly and in combination are shown in Table 1. MR was the most common lesion recorded singly or in combination and was noted in 37 out of 50 cases (74%) clinically and 42 out of 50 cases (84%) were diagnosed by echo. 35 out of 42 cases of MR could be identified with respect to lesion only. Thus 7 out of 42 cases were missed on clinical examination. Clinical examination made a total of 9 errors. Pure MR was found in 10 cases.

Table 1
Distribution of the various valvular lesions

Lesion	Clinical (N=50)	Echo (N=50)
MS	6	1
MR	11	10
AR	0	1
TR	0	0
MS+MR	7	5
MS+AR	1	0
MS+TR	3	4
MR+AR	3	5
MR+TR	2	5
AR+TR	0	0
MS+MR+AR	2	0
MS+MR+TR	7	11
MR+AR+TR	5	4
MS+AR+TR	3	2
MS+MR+AR+TR	0	2

MS was the second most common lesion clinically, in 29 out of 50 cases (58%) and third most common by echo, in 25 out of 50 cases (50%). All the cases of MS were between the age of 10-16 years and could be diagnosed clinically. 4 cases were misdiagnosed. 4 errors were committed. Only one case had pure MS without any other lesion.

AR was seen in 15 out of 50 cases (30%) clinically and 13 out of 50 cases (26%) by echo. Clinically no case was found in isolation. All were associated with mitral valve disease. 10 out of 13 lesions could be identified clinically. Pure AR was seen in one case by echo.

TR was the second most common lesion by echo, seen in

28 out of 50 cases (56%) and the third most common lesion clinically, found in 20 out of 50 cases (40%). No case of isolated TR was seen. Only 17 out of 28 cases diagnosed by echo could be identified clinically. Clinical examination made 14 errors. The distribution of various lesions is shown in Table 1.

MS had the highest sensitivity while TR had the highest specificity in clinical examination. MR had the highest positive predictive value and MS had the highest negative predictive value for clinical examination. The sensitivity, specificity, predictive value of clinical examination for identifying the lesion is shown in Fig 2. There was a statistically significant difference ($p < 0.05$ for most lesions) between clinical diagnosis and echo diagnosis as shown in Table 2.

Table 2
Statistical significance between diagnosis, clinical vs echocardiography

Lesion	p value
MS	0.625
MR	0.039
AR	0.039
TR	0.0018

Discussion

Mitral valve is involved most commonly in RHD. This is in agreement with the available literature [14-18]. This study found mitral valve involvement in 98% of the cases. MR was the commonest lesion (84%) in the study, also shown by various other authors (14-17). MS was found in 50% of the cases. But one earlier study [17] had found only 11% incidence. Such great difference could not be explained but a part of it may be due to selection bias and also the fact that the earlier study was done on children younger than 12 years. As MS takes a longer time to develop, there is a higher incidence in the present study since it included children upto 16 years of age. Also, the incidence of juvenile MS is much more common in India as noted in earlier studies [17,19].

Combined mitral and aortic valve disease, is the second most common lesion [20]. The study found TR to be more common than AR. However, cases of TR were found to be functional unlike the other lesions, which were pathological. The incidence of aortic valve disease was found to be low (30%) in our study. Routray has reported combined mitral and aortic valve involvement as 27% [21], which is in agreement with our study. Pure AR is rare and aortic stenosis (AS) is absent in this age group. Earlier studies have also shown similar results [14-17]. TR is generally functional, was found to be present in 56% of the cases with mitral valve disease. This is comparable to earlier reports [17]. Incidence of TR is more than that in the west.

Echo and colour Doppler are useful tools, as clinical

Fig. 1 : Distribution of various lesions: clinical vs echocardiography
MS- mitral stenosis, MR - mitral regurgitation, AR - aortic regurgitation, TR - tricuspid regurgitation

Fig. 2 : The sensitivity, specificity, predictive values of clinical examination
MS- mitral stenosis, MR - mitral regurgitation, AR - aortic regurgitation, TR - tricuspid regurgitation
Sens - sensitivity, Spec - specificity, +ve PV - positive predictive value, -ve PV - negative predictive value

Fig. 3 : The sensitivity, specificity, predictive values are compared to other studies
MS- mitral stenosis, MR - mitral regurgitation, AR - aortic regurgitation, TR - tricuspid regurgitation
Sens - sensitivity, Spec - specificity, PPV - positive predictive value

detection of all the murmurs is difficult [3] and Doppler and colour flows are more sensitive and specific in picking up the lesions [3-6,13]. Other features like mitral valve prolapse, pericardial effusion and vegetations can

also be picked up [3]. Doppler has a higher accuracy when compared to clinical evaluation alone [4-6]. While in detection of valve disease, it is of importance, as the prime objective is the assessment of severity, which is a guide to the management of the case [4]. One earlier study failed to reveal any incremental diagnostic utility of echocardiography and Doppler colour flow imaging in rheumatic fever without clinical evidence of carditis [20].

The sensitivity, specificity and predictive values of various lesions detected clinically, are compared in Fig 2. It can be seen that sensitivity of MS is the highest and TR is the lowest. MR shows the lowest specificity and TR shows the highest specificity. The sensitivity, specificity and predictive values are compared to other studies [4-6] as shown in Fig 3. The large difference is due to the observer variability since an undergraduate medical student did the clinical examination and an experienced cardiologist performed echocardiography.

Significant differences ($p < 0.05$) between clinical and echocardiographic examination for various lesions were determined by Mc Nemar's test [4, 5]. The results are shown in Table 2. Except for MS, for all the other lesions, the difference is significant i.e. $p < 0.05$. For TR it is more significant i.e. $p < 0.01$.

To conclude, mitral valve was involved the most often both by echo and clinically. Isolated aortic valve involvement was rare. The most common lesion was MR both by auscultation and by echo. Mixed lesions were seen more often than pure lesions. MS had the highest sensitivity while TR had the highest specificity. MR had the highest positive predictive value and AR the highest negative predictive value. Sensitivity and specificity of AR was very low when compared to earlier studies. There was a statistically significant difference between echo diagnosis and clinical diagnosis. This may be a biased opinion since a medical student did the clinical examination and a cardiologist did echocardiography.

From the viewpoint of a final year medical student, it is recommended that echocardiography be done routinely for the diagnosis of patients of RHD as clinical examination alone can miss various lesions, especially when the lesions are mild or when multiple lesions are present.

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