SYSTOLIC MURMURS IN APPARENTLY HEALTHY INDIVIDUALS

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ABSTRACT

Presence of a systolic murmur is not always indicative of organic heart disease or abnormality, especially so in asymptomatic individuals. We studied 210 young adults (192 males, 18 females) of the age group 16 to 23 years with systolic murmurs to evaluate the utility of noninvasive tests in ascertaining the presence or absence of heart disease. Each case was categorized after clinical evaluation and again after noninvasive investigations (chest radiogram, 12 lead ECG, and echocardiography) into 3 groups. Based on clinical evaluation alone, 190 (90.5%) cases had no evidence of heart disease (group A), 16 (7.6%) cases had definite heart disease (group C) and in 4 (1.9%) cases the presence of heart disease could not be ruled out definitely (group B). The recategorization after investigations did not alter the initial diagnosis in any of the subjects from groups A and C (98.1%). Two cases from group B (0.95%) changed groups whereas in the remaining 2 cases (0.95%) from group B no definite conclusions could be reached even after echocardiography.

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KEY WORDS : Heart disease; Heart murmurs; Echocardiography; Diagnosis.

Introduction

The presence of heart murmurs was recognized over a century ago [1]. These have been studied extensively since then [2,3,4]. It is now agreed that not all systolic murmurs are indicative of organic heart disease (HD) or pathological abnormality. These are called 'innocent heart murmurs'. The initial investigative evaluation of an individual with a murmur has traditionally included chest radiography and electrocardiography [5,6]. Recently, the use of echocardiography has become routine in addition to the above two investigations to confirm the presence of structural heart disease or to prove the innocent nature of the murmur [7]. The present study was undertaken to evaluate the usefulness of noninvasive investigations in the differentiation of organic and innocent murmurs in asymptomatic apparently healthy individuals.

Material and Methods

The study group comprised of 210 apparently healthy individuals (192 males, 18 females) of age

group 16-23 years, who were evaluated at the Cardiology Centre of Command Hospital (Southern Command), Pune over a 2 year period. All these individuals were detected to have systolic murmurs at the time of medical examination prior to enrolment into the Armed Forces. They included candidates for admission to the Armed Forces Medical College and College of Nursing. Each subject was assessed clinically with a detailed history and physical examination, including dynamic auscultation, to classify the murmur as innocent or as organic. The criteria used to label a murmur as innocent or organic were those suggested by Caceres & Perry [8] and Rosenthal [9] respectively (Table 1).

Based on clinical judgement alone, the subjects were then categorized into three groups:-

Group A - No heart disease

Group B - Possible heart disease

Group C - Definite heart disease

Group A consisted of cases having innocent systolic murmurs, group C of organic murmurs and group B of those cases wherein the organic

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TABLE 1
Criteria for innocent and organic murmurs

Innocent Murmur (Caceres and Perry [8])	
1.	Systolic in time
2.	Duration usually short
3.	Loudest usually along the left sternal border, either in the second or third left intercostal spaces or in the fourth and fifth intercostal spaces, medial to the apex
4.	Transmission occurs, but usually not widespread
5.	Groaning quality
6.	Loudness varies from examination to examination but usually grade 3 or less
7.	Loudness may change with change in posture
8.	No consistent change in loudness with respiration
9.	Increased loudness of murmur with exercise
10.	Other heart sounds normal, especially second sound, with normal split
11.	Absence of thrills
Organic Murmur (Rosenthal [9])	
1.	All diastolic murmurs
2.	All pansystolic murmurs
3.	Late systolic murmurs
4.	Very loud murmurs
5.	Continuous murmurs
6.	Associated cardiac abnormalities

nature of the murmur could not be ruled out definitely.

All cases were then subjected to chest radiogram, 12 lead electrocardiogram and M-mode and 2D echocardiographic studies (performed on a phased array sector scanner). Each case was then reassessed combining the clinical and investigational data and recategorized into 3 groups (A, B and C) as before. The results were then compared to reach a conclusion whether a thorough clinical assessment by itself is adequate to identify structural HD or additional investigative procedures like ECG, chest radiogram and echocardiography are essential to reach a diagnostic finality.

Result

Age and sex distribution

The mean age of the subjects was 19.9 years (range 16 to 23 years). Majority of the individuals (74.4%) were in the 17 to 20 years age group. There were 192 males (91.4%) and 18 females (8.6%).

Clinical evaluation

Based on clinical evaluation alone, 190 cases (90.5%; 172 males and all 18 females) had no evidence of HD (Group A), 16 cases (7.6%; all males) had definite evidence of HD (Group C) and in the remaining 4 cases (1.9%) the presence of HD could not be ruled out definitely and these formed group B.

None of the subjects had any symptoms referable to the cardiovascular system. The abnormalities detected on general examination were: chest deformities in 31 cases (14.8%) which included depressed sternum (25 in group A, 1 in group C), pectus carinatum (1 in group C), Marfanoid features (1 in group A, 2 in group C), scoliosis (1 in group A), and congenital clubbing in 1 subject in group A.

Examination of the cardiovascular system (Table 2) revealed systolic clicks in 7.9% and a physiological third heart sound in 46.8% cases of group A. In group C abnormalities of peripheral pulsation, hypertension, cardiomegaly, and precordial thrills were present in significant numbers.

Murmur characteristics

The characteristics of the murmurs are shown in Table 3. In group A most cases had murmurs of grade 2 intensity or less (74.2%), located along the left sternal edge (97.4%), early or mid systolic in contour (100%), and decreased in intensity on standing (93.7%).

In group B the findings which doubted the innocent nature of the murmur and the clinical diagnosis in each case were as follows: grade 2 late systolic murmur at the apex which increased on standing but was not preceded by a click - possible mild mitral regurgitation, grade 4 murmur at left lower sternal edge [LLSE] with normal second sound - possible ventricular septal defect, grade 3 murmur at right upper sternal edge (RUSE) conducted to the neck but no other abnormality on CVS examination - possible bicuspid aortic valve, grade 1 murmur at RUSE associated with early diastolic murmur but no abnormality of peripheral pulses - possible mild aortic incompetence.

In group C murmur characteristics which are pointers to organicity (location in aortic area or apex, loudness greater than grade 3, conduction to

TABLE 2

Positive finds on examination of the cardiovascular system (other than the murmur)

Findings	Group A (n=190)	Group B (n=4)	Group C (n=16)	Total (n=210)
Abnormalities of peripheral pulses	1 (0.5)	—	7 (43.8)	8 (3.8)
Hypertension	—	—	3 (18.8)	3 (1.4)
Arterial pulsations in neck or suprasternal notch	—	—	3 (18.8)	3 (1.4)
Cardiomegaly	—	—	4 (25.0)	4 (1.9)
Left ventricular heave	—	—	2 (12.5)	2 (0.95)
Thrill	—	1 (25.0)	2 (12.5)	3 (1.4)
Systolic click	15 (7.9)	2 (50.0)	4 (25.0)	21 (10.0)
Third heart sound	89 (46.8)	1 (25.0)	2 (12.5)	92 (44.0)
Fourth heart sound	—	—	1 (6.25)	1 (0.48)

Percentage in parenthesis

TABLE 3

Murmur characteristics

Murmur characteristics	Group A (n=190)	Group B (n=4)	Group C (n=16)
Location			
Aortic area (RUSE)	1 (0.5)	2 (50.0)	5 (31.2)
Pulmonary area (LUSE)	126 (66.3)	—	6 (37.5)
Tricuspid area (LLSE)	56 (31.1)	1 (25.0)	4 (25.0)
Mitral area (Apex)	4 (2.1)	1 (25.0)	1 (6.3)
Loudness			
Grade I	49 (25.8)	1 (25.0)	4 (25.0)
Grade II	138 (72.6)	1 (25.0)	7 (43.8)
Grade III	3 (1.6)	1 (25.0)	3 (18.7)
Grade IV	—	1 (25.0)	2 (12.5)
Grade V	—	—	—
Grade VI	—	—	—
Conduction			
To the neck	—	1 (25.0)	3 (18.7)
To the axilla	—	—	—
Contour			
Pansystolic	—	—	1 (6.3)
Early/mid systolic	190 (100.0)	3 (75.0)	12 (75.0)
Late systolic	—	1 (25.0)	3 (18.7)
Change in intensity of murmur on standing			
Increase	—	1 (25.0)	3 (18.7)
Decrease	178 (93.7)	2 (50.0)	12 (75.0)
No change	12 (6.3)	1 (25.0)	1 (6.3)
Associated diastolic murmur	—	1 (25.0)	8 (50.0)

Percentage in parenthesis

the neck, pansystolic or late systolic contour and presence of associated diastolic murmur) were commonly encountered. The diagnoses, after clinical evaluation, in the 16 cases in group C were as follows : bicuspid aortic valve - 4, aortic incompetence - 6, mitral value prolapse - 3, Ebstein's anomaly - 1, and hypertension - 2.

Investigations

The radiological and electrocardiographic findings are summed up in Table 4. In group A no abnormality was seen on chest radiography, other than prominent main pulmonary artery due to rotation in 2.6% cases. Prominence of aorta was seen in 1 subject in group B. In group C, 62.5% cases showed no abnormality. None of the abnormalities seen on the ECG in any of the groups were diagnostic of organic heart disease by themselves. Echocardiography excluded the presence of structural heart disease in all cases in group A. It also confirmed the clinical diagnosis in all cases in group C. In group B it confirmed the presence of bicuspid aortic valve in 1 case and ruled out the possibility of ventricular septal defect in another case. In the remaining 2 cases (0.95%) in group B no definite conclusion could be reached even after echocardiography. Hence, the noninvasive investigations did not alter the initial diagnosis in any of the 206 cases (98.1%) from groups A and C. Of

the 4 cases in group B, 1 each changed to groups A and C. The remaining 2 cases (0.95%) continued to be in group B with a possibility of HD persisting even after noninvasive investigations. They were advised cardiac catheterization.

Discussion

The clustering of cases in the age group 17-20 years (74.4%) and male preponderance (91.4%) in the present study occurred because the study group comprised of individuals desirous of enrolment in the Armed Forces. In clinical evaluation a major handicap in our study was the lack of reliability on history as the admission of presence of organic heart disease was likely to affect the career prospects of the individuals.

Abnormal chest configurations are known to be associated with heart murmurs in the absence of heart disease [10]. This was seen in 14.8% cases in group A in the present study. Systolic clicks and physiological third heart sound which were seen in significant numbers in group A are also known findings in normal young adults [11, 12]. Their importance lies in the fact that they can be misinterpreted as murmurs. On clinical examination abnormalities of peripheral pulsation, hypertension, cardiomegaly, and thrills when present were indicators of the organic nature of the murmur. Most

TABLE 4
Radiological and electrocardiographic findings

Findings	Group A (n=190)	Group B (n=4)	Group C (n=16)
Radiological			
No abnormality	185 (97.4)	3 (75.0)	10 (62.5)
Prominent main pulmonary artery	5 (2.6)	—	1 (6.2)
Prominent aorta	—	1 (25.0)	3 (18.8)
Cardiomegaly	—	—	2 (12.5)
Electrocardiographic			
No abnormality	169 (89.0)	2 (50.0)	11 (68.8)
Rhythm disturbances	1 (0.5)	—	3 (18.8)
Axis deviation	5 (2.6)	—	—
RBBB	4 (2.1) (Partial)	—	1 (6.2) (Complete)
LVH by voltage criteria	8 (4.2)	2 (50.0)	(6.2)
Nonspecific T-wave changes	3 (1.6)	—	—

Percentage in parenthesis

murmurs could be identified as innocent or organic after a detailed clinical examination and the murmur characteristics contributed most significantly in this differentiation. Radiological abnormalities in heart size or great vessels, when present, were a definite feature in favour of, but absence of these did not exclude the presence of, an organic disease. Due to presence of nonspecific changes in normal young adults, ECG also did not prove to be of value in distinguishing organic from innocent murmurs. Similarly, the echocardiogram was also conclusive in only 2 out of 4 subjects in whom there was a doubt of HD.

The noninvasive investigations including echocardiography, therefore, did not add to diagnostic accuracy and offered no additional help in evaluation of systolic murmurs. Similar observations have been made by other workers. Newburger et al concluded that diagnostic tests are unlikely to change the clinical diagnosis in children referred for evaluation of a heart murmur to a paediatric cardiologist [13]. Rosenthal also found that the use of noninvasive studies, particularly the echocardiogram, in determining the innocence or guilt of a murmur is unwarranted [9]. In a recent study Xu et al inferred that echocardiography rarely revealed significant abnormalities during the assessment of patients, between 1 to 50 years of age, with nonspecific systolic murmurs, especially when the test was used to confirm the clinical suspicion that the heart was normal [14]. Danford et al, after assessing the cost involved in the evaluation of heart murmurs in children, have advocated that a cardiology consultation should be the preferred approach as compared to ordering echocardiography by a primary physician [15].

We conclude that a thorough clinical evaluation can accurately identify innocent murmurs and organic heart disease in the majority of cases. Since noninvasive investigations especially echocardiog-

raphy are not inexpensive, these should be reserved for those patients with systolic murmurs in whom there is a definite or strong suspicion of structural heart disease on clinical assessment.

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