

## Diagnosis of rheumatic carditis in Mongolian children

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### Abstract

**Purpose** The aim of this study was to evaluate the clinical and echocardiographic findings in patients with acute rheumatic fever (ARF) and rheumatic heart diseases (RHD) and to compare echocardiographic findings with the clinical symptoms for the detection of subclinical carditis.

**Methods** The study included 156 patients who meet the modified criteria of Jones. M-mode echocardiography was performed using a Sonos-1000 echo machine and 3.5-MHz transducer.

**Results** Total of 156 patients with acute RF and RHD (median age 11.9, standard deviation 3.32, range 5–17, male to female ratio 1:1.4) were evaluated. All patients were divided into 2 groups according their diagnosis. The first group included 71 (45.5%) patients with a first onset of rheumatic fever (ARF), the second group—86 (54.5%) patients with a recurrent rheumatic fever (RHD). By echocardiography, 21 (20.1%) patients of first group, who had clinically isolated polyarthritis and chorea were diagnosed a first degree of mitral regurgitation and mitral valve thickening, which is the characteristic finding of rheumatic carditis. Out of all patients, mitral valve regurgitation was detected by 2D echocardiography in 146 (93.5%) patients. The cause of mitral valve regurgitation was annular dilatation in 48%, mitral valve prolapse in 10% and fibrotic change of valve in 42%.

**Conclusion** Mitral regurgitation is the most common finding on Doppler color imaging in patients with the

rheumatic carditis. In patients clinically manifesting only polyarthritis and/or chorea, we should exclude the subclinical carditis that can be easily detected by echocardiography. The presence of subclinical carditis should be accepted as an evidence of carditis.

**Keywords** Rheumatic carditis · Mitral regurgitation · Subclinical rheumatic carditis · Rheumatic heart disease

### Introduction

Rheumatic fever (RF) is a delayed sequel of group A streptococcal throat infection and continues to be a common health problem in developing countries. About 30% of RF patients develop rheumatic heart disease (RHD), with high morbidity and cost to the public health system [1–6].

The major complication of acute rheumatic fever (ARF) is the appearance of carditis and subsequent development of a chronic valvular heart disease [2, 7–11]. Accurate detection of carditis is important because the chronic valvular disease rarely develops in patients without carditis [7, 9, 12]. Echocardiography has a leading role in diagnosis of rheumatic carditis and RHD [7, 13–19]. The diagnosis of carditis in an ARF traditionally depends on characteristic auscultatory findings [20]. Using color and pulsed Doppler echocardiography minor degrees of pathological regurgitation without the characteristic clinical findings can be detected [14]. With the availability of echocardiogram as an investigative tool, a new subset of carditis is being recognized, namely subclinical carditis [21–23]. The only physical finding which can be considered as being essential for diagnostic of rheumatic carditis is the presence of mitral or aortic valve regurgitation in an acute attack of RF [24–26]. If a murmur of mitral or aortic valve regurgitation is not made out clinically, the

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patient is labeled as not having carditis [20, 27, 29]. Utilizing echocardiographic evaluation, a very sensitive investigation, presence of mitral valve disease not audible clinically, that is, subclinical carditis has been recognized [28–30].

## Purpose

The aim of this study was to evaluate the clinical and echocardiographic findings in ARF and RHD patients and compare these findings with the clinical symptoms.

## Methods

The study included 156 patients with ARF and RHD who were diagnosed and treated in 2000–2009 at the Cardiology Division of the Maternal and Child Research Medical Center in Ulaanbaatar, Mongolia. In all cases, the diagnosis of ARF was made according to the modified criteria of Jones. M-mode echocardiography was performed in all cases using a Sonos-1000 echo machine and 3.5-MHz transducer. The following measurements were made and evaluated by application of the recommendations of the American Society of Echocardiography.

The statistical analysis was performed using the SPSS 16.0 statistical package.

## Results

The study included 156 patients with acute RF and RHD (median age 11.9, standard deviation 3.32, range 5–17, male to female ratio 1:1.4). All patients were divided into 2 groups according their diagnosis. The first group included 71 (45.5%) patients with a first attack of acute rheumatic fever (ARF), the second group 86 (54.5%) patients with recurrent rheumatic fever (RHD). ARF and RHD were diagnosed in all patients by using modified Jones criteria. The patients' clinical profiles according to the Jones criteria are shown in the Table 1. By clinical examination, the rheumatic carditis was diagnosed in 45 (28.8%) patients and the isolated polyarthritis and chorea in 26 (16.7%)

**Table 1** Clinical profile of patients by Jones criteria

	ARF		RHD		$\chi^2$	$d$	$p$
Carditis	66	93%	85	100%	6.1	1	0.013
Polyarthritis	45	63.4%	36	42.4%	6.8	1	0.009
Chorea	10	14.1%	2	2.4%	7.4	1	0.006
Subcutaneous nodule	4	5.6%	0	0	4.9	1	0.027
Erythema marginatum	3	4.2%	1	1%	1.4	1	0.23

patients of first group. The tachycardia, decreased first heart sound in apex, holosystolic and diastolic murmur, cardiomegaly and pericardial rub were accepted as a clinical symptom of rheumatic carditis.

In second group all patients had clinical symptom of rheumatic carditis and previous history of an ARF.

By echocardiography, 21 (20.1%) patients of first group, who had clinically isolated polyarthritis and chorea were diagnosed a first degree of mitral regurgitation and mitral valve thickening, which is the characteristic finding of rheumatic carditis. In both groups, as found by 2D echocardiography 108 (69.2%) patients had mitral regurgitation (MR), 1 (0.6%) patient had isolated mitral stenosis, 8 (5.1%) patients had mitral regurgitation and mitral stenosis, 1 (0.6%) patient had aortic regurgitation, 10 (6.4%) patients had combined mitral and aortic regurgitation, 13 (8.3%) patients had mitral and tricuspid regurgitation, 5 (3.2%) patients had combined mitral valve disease and aortic regurgitation and 2 (1.3%) patients had mitral, aortic and tricuspid regurgitation.

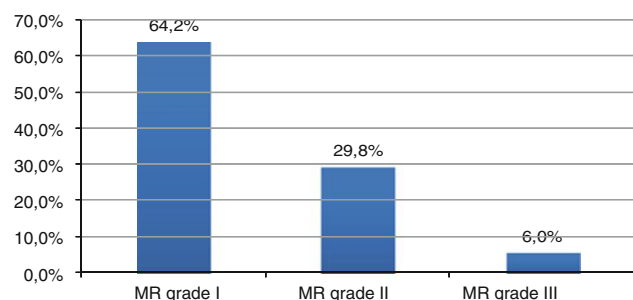
Among 108 patients, who had MR the following distribution was observed, as shown in Fig. 1: 84 patients (64.2%) MR grade I, 46 patients (29.8%) MR grade 2 17 patients (6%) MR grade 3. Total 146 (93.5%) patients were diagnosed with mitral valve disease by echocardiography (Fig. 2).

The cause of mitral valve regurgitation was annular dilatation in 48%, mitral valve prolapse in 10%, fibrotic change of valve in 42% (Fig. 3).

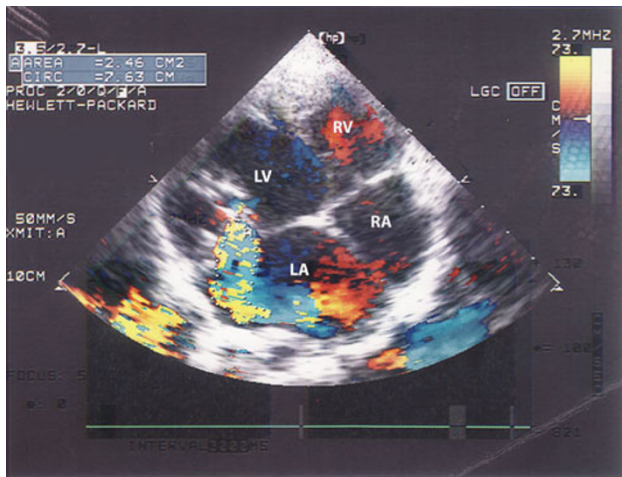
The left atrial dilatation was found in 36 (23.1%) patients and left ventricle dilatation in 88 (56.4%) patients while left ventricular systolic function was decreased in 54 (51.4%) patients. The paradoxical motion of ventricular septum was detected in 8 (22.8%) patients and hypokinetic motion in 1 (2.85%) patient. Clinically, those patients had clinically, heart failure symptoms of varying degrees.

## Discussion

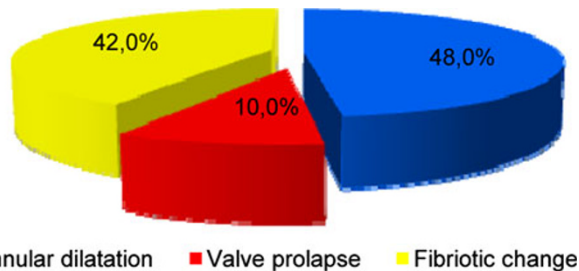
Carditis is the single most important prognostic factor in rheumatic fever [1, 3, 11]; only valvulitis leads to



**Fig. 1** Mitral regurgitation in patients with rheumatic carditis



**Fig. 2** Patient Ts. 12 years old, female. 2D echocardiography picture of III grade of mitral regurgitation



**Fig. 3** The cause of mitral valve regurgitation in patients with rheumatic carditis

permanent damage and its presence determines the prophylactic strategy [31]. The clinical diagnosis of carditis in an index attack of rheumatic fever is based on the presence of significant murmurs (suggestive of mitral and aortic regurgitation), pericardial rub or unexplained cardiomegaly with congestive heart failure. Even careful clinical auscultation can miss mild valvular regurgitation [15, 32]. Two dimensional echo-Doppler and colour flow Doppler echocardiography are most sensitive for detecting structural abnormality, abnormal blood flow and valvular regurgitation [13, 33–35]. This method can detect all valvular regurgitations; where as some of them can be not audible or difficult to hear.

The rheumatic process mostly involves mitral valve, most (93.5%) cases of which develop mitral regurgitation. The causes of mitral regurgitation in children are ventricular dilatation, mitral valve prolapse and leaflet mobility due to the fibrotic change. Unlike in adults the calcification of the valve leaflets is a rare observation [35–38]. Clinically, all patients with left atrial dilatation had the heart failure symptoms of varying degrees. So that left atrial dilatation observed by echocardiography indicates

decompensation of heart function. This could be accepted as an echocardiographic criterion of heart failure.

By echocardiography, 21 (20.1%) patients of first group, who had clinically isolated polyarthritis and chorea were diagnosed a pathological mitral regurgitation and signs of carditis.

A rheumatic heart disease develops only in patients with carditis so that those patients with subclinical carditis should be considered as candidates for developing chronic valvular heart disease. Patients with subclinical rheumatic carditis need a more stronger treatment option and longer secondary antibiotic prophylaxis to avoid a recurrent attack and development of a severe rheumatic heart disease. Echocardiography is more sensitive than clinical assessment for detection of the carditis in the acute rheumatic fever.

### Conclusion

Mitral regurgitation is a most common finding (93.5%) in patients with rheumatic carditis on the Doppler color flow imaging and is related to ventricular dilatation and/or restriction of leaflet mobility due to the fibrotic change.

Subclinical carditis can be easily detected by echocardiography and should be accepted as an evidence of carditis.

All patients with clinical manifestation of polyarthritis and/or chorea should be evaluated by echocardiography in order to detect subclinical carditis.

**Conflict of interest** The authors state that they have no conflict. None of the authors have any financial interest in any organization providing support for this study.

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