Evaluation of Troponin T Level in Acute Rheumatic Carditis

ABSTRACT

Background Acute rheumatic fever (ARF) is more common in children of many developing countries.

Aim The purpose of this study is to test whether it is possible to identify myocardial involvement in cases with rheumatic carditis by the measurement of serum cardiac troponin T (cTnT).

Methods Eighty patients diagnosed as ARF underwent echocardiography and their cTnT serum levels were measured. Patients were divided into groups as Cases and Control with 40 patients in each group.

Results In Cases 57.5% were male and 42.5% were female. All patients complained about joint pain. In 59% of cases troponin T was not detectable. It was detectable in the range of 0.01–0.05 ng/ml in 35% of cases and it was in the range of 0.05–0.1 ng/ml in 7% of cases of endocarditis and pericarditis.

Conclusion Measurement of cTnT may be added to diagnostic accuracy of myocarditis.

KEYWORDS acute rheumatic fever, rheumatic heart disease, Troponin-T

INTRODUCTION

Rheumatic fever and rheumatic heart disease (RHD) continues to be a major health problem in developing countries. Rheumatic fever is the leading cause of acquired heart disease in children and young adult. RHD remains the most common acquired heart disease worldwide and is the major cause of cardiovascular death during the first five decades of life in the developing country. It accounts for 30–40% of cardiovascular admission in the developing country. Prevalence of rheumatic fever in India has been found to be 0.3 to 0.5 per thousand and prevalence of RHD is 5 per 10,000 of school children\(^1\). It continues to be a major problem in paediatric population and is one of the leading causes of heart disease in children in the developing and underdeveloped countries and accounts for about 600,000 cases of RHD in India and 120,000 new cases of ARF annually\(^2\).

According to Working Group of Indian Academy of Pediatrics, under IAP vision 2007, prevalence of ARF and RHD in Indian population varies from 0.5/1000 to 11/1000 in various studies. Rheumatic fever is a multi system inflammatory disease, which occurs as delayed sequelae to group A beta hemolytic streptococci (GABHS) pharyngitis. Pericarditis is a major criteria for the diagnosis of rheumatic fever according to updated Jones criteria 1992\(^3\). However there is no objective marker of myocardial involvement in rheumatic fever.

Troponin is a structural protein that is specific to myocardium. Troponin is normally absent from the circulation and is released into the bloodstream after disruptive myocardial injury. Troponins are currently finding use in the diagnosis, risk stratification, and prognostication of acute coronary syndrome. Study has also conclusively shown that it can be used as a marker of and correlates well with the severity of congestive heart failure. Troponin could therefore serve useful as a marker of myocardial involvement in patient with first episode and recurrence of rheumatic fever and in patient of RHD with congestive heart failure\(^1\). There are studies on the use of troponin T to diagnose or assess myocardial damage in acute rheumatic fever. The current study aims at evaluation of troponin T level in acute rheumatic fever and...
Table 1: Jones criteria, updated 1992

<table>
<thead>
<tr>
<th>Major criteria</th>
<th>Minor criteria</th>
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<tr>
<td>Carditis</td>
<td>Clinical:</td>
</tr>
<tr>
<td>Migratory polyarthritis</td>
<td>Arthralgia</td>
</tr>
<tr>
<td>Chorea</td>
<td>Fever</td>
</tr>
<tr>
<td>Erythema marginatum</td>
<td>Laboratory:</td>
</tr>
<tr>
<td>Subcutaneous nodules</td>
<td>Raised acute phase reactants</td>
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<tr>
<td></td>
<td>like ESR and CRP</td>
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<td></td>
<td>Prolonged PR interval</td>
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Essential criteria

- Evidence of preceding streptococcal infection in form of:
  - Increased ASO titers (>333 unit of children and >250 for adults)
  - Positive throat culture for group A streptococcus
  - Recent scarlet fever

The present study was done in patients of acute rheumatic fever and RHD attending OPD/emergency/indoor department of B.R.D Medical College and Nehru Chikitsalya Gorakhpur.

An informed consent from all patients and Institutional Ethics Committee approval was obtained before starting the study.

Total 80 patients were selected, who were divided into two groups of 40 patients each as Control and Case group.

Criteria for selection

1. Patients diagnosed as acute rheumatic fever as per updated Jones criteria (Table 1; two major or one minor and two minor criteria plus supportive evidence of previous streptococcal throat infection)

2. Previously established cases of RHD presenting with acute rheumatic activity (according to Ferrielli P 2002, proceeding of Jones criteria workshop-ideally, a presumptive diagnosis of recurrent rheumatic fever may be made when a single major or several minor manifestations are present in a patients with a history of rheumatic fever or rheumatic heart disease, provided there is supporting evidence of a recent group A streptococcal infection).

Patients included in the present study were subjected to detailed clinical history and physical examination.

All patients underwent echocardiographic evaluation on admission for acute rheumatic fever and recurrence of rheumatic fever before starting anti-inflammatory treatment. Echocardiographic imaging was done with HP Sonos 2500 machines (Hewlett Packard, Inc.) equipped with 2.5, 3.5 and 5 MHz transducers.

A standardised cross-sectional and Doppler echocardiographic examination was performed with multiple orthogonal, paragonal, apical, four-chambered and subcostal views with the patients supine and left lateral position for optimal visualisation.

Assessment of serum cardiac troponin T blood level was performed with the third generation troponin T test (troponin T STAT) on an Elecsys 2010 immunoassay analyzer. The third-generation troponin T test uses the same monoclonal antibodies (M11.7 and M7) as the second-generation test but is standardised with human recombinant cardiac troponin T instead of bovine cTnT (roche Diagnostics). This test is characterised by high sensitivity, with a lower limit of detect ability of 0.01 ng/ml. The upper limit of the normal cTnT value is 0.1 ng/ml.

Treatment given: Patients with rheumatic carditis and CHF were treated with steroid and aspirin (along with dietary salt restriction and diuretics), whereas patients with carditis but without CHF were treated with aspirin. Injectable benzathine penicillin G for secondary prophylaxis was initiated or regulated in all patients.

Statistical analysis

First, identifying statistics were assigned to variables. Mean and standard deviations were calculated for time-varying variables and percentages were calculated for categoric variables.

RESULT

In the present study, in Cases, 23 (57.5%) were male and 17 (42.5%) were female whereas in Control group 21 (52.5%) were male and 19 (47.5%) were female. In Case group male:female ratio was 1.3:1 and most of the patients [17 (42.5%)] were in the age group of 10–25 years. In control group, male:female ratio was 1:1.1. Most of the patients [16 (40.0%)] in each age group were from the age group of 10–20 and 20–30 years.

Distribution of clinical presentation in cases showed that all 40 (100%) patients complained about joint pain,
out of which 32 (80%) complained about arthritis and 8 (20%) have only arthralgia. Similarly, all 40 (100%) patients complained about dyspnea out of which 12 (30%) of patients reported to have dysnea of grade 4 severities. Palpitation, fever, history of acute rheumatic fever and chorea was present in 31 (77.5%), 22 (55%), 18 (45%) and 3 (7.5%) patients, respectively.

In the present study, most common physical signs was JVP which was raised in 28 (70%) of patients followed by pedal oedema in 20 (50%) patients, pericardial rub in 16 (40%) and tachycardia in 12 (30%) patients.

Mitral stenosis was determined by calculating mitral valve area in all the patients and we found that mild (1.5–2.5 cm²) to moderate (1–1.5 cm²) grade of mitral stenosis was found in 26 (65%) of cases. Nine (22.5%) cases have normal (<1 cm²) mitral valve area and 7 (17.5%) patients have sever (>2.5 cm²) mitral stenosis.

In distribution of cases according to valvular lesion showed that most common valvular lesion in present study was MS+MR in 17 (42.5%) patients. Least common valvular lesion was isolated MR and isolated AR in 3 (7.5%) and 2 (5%), respectively.

Distribution of evaluation of Jones minor criteria in the present study showed that erythrocyte sedimentation rate (ESR) was raised above 40 mm/hr in 17 (42.5%) patients while in 23 (57.5%) cases it was in the range of 20–40 mm/hr. C-reactive protein (CRP) was positive in 11 (27.5%) patients, anti-streptolysin O (ASO) titer values was above 240 TU in 13 (32.5%) patients and PR interval above 0.2 sec was found in 2 (5%) patients.

Only endocarditis was present in 32 (80%) cases and 5 (12.5%) cases have featured only pericarditis. Both endocarditis and pericarditis were present in 7 (17.5%) cases.

Evaluation of troponin T valve according to mitral valve area showed that in 59% of cases troponin T was not detectable. In 3% of cases troponin T was in the range of 0.05–0.1 ng/ml, of which one has mild mitral stenosis and other had normal mitral valve area.

Troponin T valve according to endocarditis and pericarditis showed that troponin T was not detectable in 59% of cases. It was detectable in the range of 0.01–0.05 ng/ml in 35% of cases and it was in the range of 0.05–0.1 ng/ml in 7% of cases. In none of them troponin T crossed them, troponin T crossed the cut off valve of myocardial infarction (0.1 mg/ml).

Troponin T valve according to valvular lesion in the present study was not detectable in 59% of cases. In 4 (10%) cases, troponin T was in the range of 0.05–0.1 ng/ml of whom one has valvular lesion of aortic regurgitation and other has both mitral stenosis and mitral regurgitation.

In treatment of all the cases, 19 (47.5%) were given aspirin only. Steroid was added to aspirin when cases showed the feature of CHF in the remaining 21 (52.5%) of cases (Table 2).

**DISCUSSION**

ARF is a systemic inflammatory disease that follows infection with some strains of group A streptococci (GAS). An immune response against streptococcal antigens triggers events in inflammatory response against heart, joints and brain. RHD, which is among major symptoms of ARF, is the most common acquired cardiac disease for all age groups in the world.

Erting et al. reported almost similar level of ESR, ASO, PR interval and CRP in his study as reported by the present study.

Troponin is specific to myocardium and function as structural protein. Many authors have studied about troponin T which is 37 kDa in weight and is a part of the troponin-tropomyosin molecular switch of the thin filament of myofibrils in the sarcomere. Normally troponin T is not present in blood stream but due to myocardial injury it is released during circulation. Recently, it is being used in diagnosis, risk stratification and prognostication of acute coronary syndrome.

In our study, cardiac troponin was raised in 35% of cases and troponin T was below cut off value for MI. The possible reason for this may be due to that in MI there is a stopping of blood supply to cardiac cell; this may result in sudden increase in cardiac troponin T level above the normal cut off value.

Our study reported almost similar results as reported by Gupta et al. (2002), they have measured serial cardiac

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**Table 2**: Comparison of different clinical and laboratory parameters between cases and control.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Cases</th>
<th>Control</th>
<th>t value</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td>Pulse</td>
<td>92±13.27</td>
<td>76±4.12</td>
<td>7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>ESR</td>
<td>38±11.36</td>
<td>15±3.4</td>
<td>11.77</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PR interval</td>
<td>0.17±0.03</td>
<td>0.11±0.01</td>
<td>6.80</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>ASLO titer</td>
<td>179±72.55</td>
<td>0±0</td>
<td>11.68</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MV area</td>
<td>1.37±0.72</td>
<td>3.08±0.19</td>
<td>11.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>LV ejection fraction</td>
<td>56±5.2</td>
<td>59±3.79</td>
<td>2</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Troponin T</td>
<td>0.01±0.012</td>
<td>0±0</td>
<td>4.53</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Data are expressed as mean±SD, ESR: erythrocyte sedimentation rate, ASLO: anti-streptolysin O values, MV: mitral valve, LV: left ventricular.
troponin in the sera of acute rheumatic fever patients. They found a minimal degree of elevation in cardiac troponin I above normal value in 18% of patients with carditis.3

Missov et al. reported fairly large number of patients with CHF that has mild increase in troponin T level. Physician should not be surprised as it not always means that there is an acute coronary syndrome present.10

One more study done by Alehan et al. reported the role of troponinT level in the diagnosis of ARF and rheumatic carditis. He found no significant raise in troponin T level in ARF. But there was a low level of troponin T in active carditis despite ischaemic myocyte injury; this was later supported by the biopsy of patients with ARF carditis. Patients were lacking myocardial necrosis.11 Almost similar study was performed by Oran B et al he reported no statistical difference between both the groups for serum cardiac troponin-I, a specific marker for myocardial cell damage.12

In nut shell, present study has shown that troponin T can be used as a marker of and correlates well with the severity of CHF.

CONCLUSION

From the present study, we conclude that the diagnosis of acute rheumatic carditis still remain in the area of alert clinician. No single test is diagnostic of carditis that is evident from D Jones criteria (1944) and its modification in last 65 years. Measurement of cardiac troponin T may be added to diagnostic accuracy of myocarditis.

REFERENCES