Evaluation of Cardiovascular Status in Severe Leptospirosis

SV Trivedi*, A Bhattacharya**, K Amichandwala***, V Jakkamsetti+

Abstract

Objectives: To note incidence and profile of cardiac involvement in severe leptospirosis in South Gujarat.

Methods: A study was carried out on twenty-five serologically proved leptospirosis patients referred to Government Medical College, New Civil Hospital, Surat between June 2002 to September 2002. In all the patients detailed history, physical examination and specific investigations were done to find out the incidence and profile of cardiac involvement in severe leptospirosis.

Results: Out of twenty-five seropositive patients, 14 (56%) had cardiovascular manifestations. Electrocardiography abnormalities were seen in 13 (52%) patients. The commonest finding was first-degree AV block seen in 11 (44%) patients followed by ST-segment depression in four (16%) patients, T-wave inversion in leads II, III and avF in two (8%) patients, corrected QT-interval prolongation in three (12%) patients and ventricular premature beats in two (8%) patients. Atrial fibrillation was seen in only one patient. Left ventricular function as assessed by two-dimensional echocardiography was normal in all patients.

Conclusion: In cardiovascular involvement of leptospirosis, although electrocardiographic abnormalities were commonly seen, there was no left ventricular dysfunction.

INTRODUCTION

Leptospirosis is a zoonosis with a worldwide distribution that affects at least 160 mammalian species. It is an acute generalized infectious disease characterized by extensive vasculitis caused by Leptospira. Leptospira are spirochetes belonging to the order Spirochaetales and the family Leptospiraceae. More than 90% of symptomatic persons have the relatively mild and usually anicteric form of leptospirosis. About 10% of individuals infected with leptospirosis develop severe disease. Severe leptospirosis causes a multi-system disorder mainly involving the hepatic and renal system. It also affects the pulmonary, hematopoietic, CNS, ocular and cardiovascular system. South Gujarat has seen a number of leptospirosis cases in the last five years during the monsoon season. In this study we present our observations on cardiac involvement and cardiac function evaluation in severe leptospirosis.

MATERIAL AND METHODS

During the period from June 2002 to September 2002, a prospective study was done in patients with clinical suspicion of leptospirosis who were referred to New Civil Hospital, Surat, a tertiary referral center. All patients who presented with fever with chills, headache, conjunctival suffusion, myalgia and muscle tenderness with jaundice and multisystem involvement were screened for IgM antibodies against leptospira by Dipstick method. Dip-S-Ticks kits manufactured by PANBIO INDX INC of Baltimore were used. This test is a qualitative enzyme immunoassay (EIA) for detection of IgM antibodies against Leptospira biflexa (serovar patoc 1). Blood samples were drawn on the first and the fourteenth day of presentation. Only seropositive leptospirosis patients were included in this study. Case definition of leptospirosis as proposed by the National Institute of Communicable Diseases (NICD), New Delhi was followed.

Out of 38 suspected leptospirosis patients 25 were serologically positive for leptospirosis. In addition to investigations like complete blood count, liver function tests, blood urea, serum creatinine, serum electrolytes, CPK and CPK-MB, platelet count, prothrombin time, and ultrasonography of abdomen, cardiovascular involvement...
was evaluated by history, physical examination, 12-lead ECG, chest X-ray PA view and 2-D echocardiography.

**RESULTS**

Out of a total of 25 seropositive patients, 14 (56%) patients had cardiovascular involvement. These patients were from a wide age range (20-60 years) with a male to female ratio of 23:2. Most of the patients were paddy farm workers. Two of the 25 patients died. Both patients had advanced acute renal failure and that was responsible for their mortality.

In our study five (20%) patients had dyspnoea and five (20%) patients had transient hypotension (systolic blood pressure less than 90mmHg). Patients did not show clinical signs of gallop rhythm, pericardial friction rub, new murmurs and/or cardiac enlargement.

Chest X-ray PA view was normal in 19 (76%) patients. Five (20%) patients had bilateral diffuse infiltrates suggestive of alveolar hemorrhage and one patient had a unilateral pnemonic patch.

Electrocardiographic changes were seen in 13 (52%) patients (Table 1). Electrolyte disturbances were corrected before ascribing ECG changes to myocarditis. The commonest arrhythmia seen in our study was first-degree atrioventricular (AV) block in 11 (44%) patients. This finding was transient, remaining only for a period of 2-7 days, and did not progress to a higher degree AV block. Sinus tachycardia was noted in 10 (40%) patients. ST-segment depression was seen in four (16%) patients which regressed in 2-4 days. T-wave inversion was noticed in two (8%) patients, which was seen in leads II, III and avF. Corrected QT interval (QTc) prolongation was seen in three (12%) patients. Ventricular premature beats were seen in two (8%) patients. One patient had atrial fibrillation (AF), and because she died due to uremia within hours of admission, the course of atrial fibrillation could not be determined. ECG was normal in 12 (48%) patients throughout their illness.

Two-dimensional echocardiographic evaluation was done in 21 patients (Table 2). In four out of 25 cases 2D-echo could not be done and we accept this as a limitation of our study. The end-diastolic volume (EDV), end-systolic volume (ESV), stroke volume (SV), ejection fraction (EF) and fractional shortening (FS) were within normal limits in all patients. None of the patients showed regional wall motion abnormalities. Minimal pericardial effusion was seen in five (20%) patients associated with mild pericardial thickening.

### Table 1: Electrocardiographic abnormalities in 25 patients of leptospirosis

<table>
<thead>
<tr>
<th>Arrhythmias</th>
<th>No. of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First degree AV block</td>
<td>11 (44)</td>
</tr>
<tr>
<td>Sinus tachycardia</td>
<td>10 (40)</td>
</tr>
<tr>
<td>ST-segment depression</td>
<td>4 (16)</td>
</tr>
<tr>
<td>QTc prolongation</td>
<td>3 (12)</td>
</tr>
<tr>
<td>T-wave inversion in II, III, avF</td>
<td>2 (8)</td>
</tr>
<tr>
<td>Ventricular premature beat</td>
<td>2 (8)</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>1 (4)</td>
</tr>
</tbody>
</table>

### Table 2: Echocardiographic measurements of left ventricular function in 25 patients of leptospirosis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVIDd(mm)</td>
<td>38.4 - 50.4</td>
<td>45.0 ± 3.75</td>
</tr>
<tr>
<td>LVIDs(mm)</td>
<td>26.7 - 36.1</td>
<td>31.9 ± 2.72</td>
</tr>
<tr>
<td>EDV(ml)</td>
<td>70.3 - 116.0</td>
<td>92.51 ± 17.55</td>
</tr>
<tr>
<td>ESV(ml)</td>
<td>22.1 - 49.7</td>
<td>32.96 ± 10.07</td>
</tr>
<tr>
<td>SV(ml)</td>
<td>35.6 - 90.9</td>
<td>59.55 ± 22.97</td>
</tr>
<tr>
<td>LVEF(%)</td>
<td>56.51 - 72.03</td>
<td>64.31 ± 4.62</td>
</tr>
<tr>
<td>FS(%)</td>
<td>21.2 - 43.2</td>
<td>30.43 ± 8.42</td>
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LVIDd : Left ventricular internal dimension in diastole; LVIDs : Left ventricular internal dimension in systole; SD : Standard deviation.

Out of the 13 patients who had ECG abnormalities, 46.1% had increased CK-MB values. Abnormal CPK was found in 44% cases and in this subgroup 72.7% had increased CK-MB values.

### DISCUSSION

We found the incidence of cardiovascular involvement in 56% of cases. The commonest clinical findings seen in the cardiovascular system in severe leptospirosis patients were tachycardia and hypotension. Signs of cardiac failure were not seen in any of the patients.

ECG abnormalities were seen in 52% of patients in the present study which is comparable to other studies. The most common finding was first degree AV block (52%), which was transient in nature. This can be attributed to interstitial myocarditis. A significant statistical correlation was observed between myocarditis and the inflammatory involvement of the conduction tissue by some workers. ST segment depression was seen in four (16%) patients and T-wave inversion in leads II, III, avF was seen in two (8%) patients, which were also transient. Ventricular premature beats were seen in two (8%) patients. These ECG changes could be due to acute coronary arteritis, affecting the main branches of the coronary arteries. In autopsy studies it was noticed that the heart and main vessels are involved during the septicemia phase of the disease, and bacterial migration, toxin(s), enzymes, and/or antigenic products liberated by bacterial lysis might account for the cardiac pathology.

Atrial fibrillation was seen in only one patient in our study, though it was the commonest arrhythmia seen in other studies. Left ventricular function as assessed by echocardiography was normal in all the patients in our study. Five (20%) patients had transient hypotension, but their ejection fraction was normal, indicating that hypotension is not due to left ventricular dysfunction, as also seen in studies by other workers.

Five (20%) patients had minimal pericardial effusion with mild pericardial thickening. All these patients had advanced renal failure, suggesting that uremia might have been responsible for the pericarditis and consequent pericardial effusion.

Cardiac involvement in severe or fatal leptospirosis is common, with most of the fatal cases demonstrating evidence...
of myocarditis. Many patients with severe systemic disease demonstrate atrial fibrillation, first degree heart block and transient ST-segment and T-wave abnormalities, presumably reflecting myocarditis, although significant left ventricular dysfunction is uncommon.10

CONCLUSIONS

Cardiovascular involvement was seen in 14 (56%) patients of leptospirosis in our study. Tachycardia and hypotension were the prominent clinical features seen in the cardiovascular system. Commonest ECG abnormalities were first degree AV block (52%), ST segment depression (16%) and T-wave inversion (8%). Two-D echocardiography showed normal left ventricular function in all patients. From this study we can conclude that in severe leptospirosis though there are features suggestive of myocarditis, left ventricular function remains normal.

REFERENCES


Announcement

INDO-US Workshop on Diabetic Foot Complication on December 4th and 5th 2003, at Chennai, India.

Theme: Preventing Diabetic Amputations in Developing Countries.

Organised by: Diabetes Research Centre, WHO Collaborating Centre for Research, Education and Training in Diabetes, Royapuram, Chennai 600013, India.

Tel. 044-25954913/14/15; Website: www.mvdiabeticfoot.com

For further information and registration contact: Dr. Vijay Viswanathan, M.D., Ph.D., Organizing Secretary
E_mail: dr_vijay@vsnl.com

Sd/-
V Viswanathan

Announcement

Following are the office bearers of API Bihar Chapter for the session 2003-04

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