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## Sick Sinus Syndrome—A Rare Complication of Typhoid Fever

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The emergence of multiresistant strains of *Salmonella typhi* has led to a high prevalence of typhoid fever in the tropics. Due to delay in achieving clinical cure, one infrequently encounters rare complications of typhoid fever. Although cardiovascular collapse and myocarditis are frequently seen, sick sinus syndrome has not been reported in children to the best of our know-

ledge. A child with typhoid fever who had sick sinus syndrome in addition to cardiovascular collapse is being described.

### Case Report

A 10 year old male presented with high grade continuous fever for 15 days to the pediatric ward of LNJP Hospital. The fever was not associated with respiratory distress, alteration of sensorium or seizures. Examination revealed a sick looking child, conscious with cold extremities, normal JVP, a pulse rate of 120 per minute, regular, low volume with a blood pressure of 68/40 mm Hg. The spleen was 2 cm below the costal margin and liver was just palpable. Chest, cardiovascular and central nervous system were clinically normal. A provisional diagnosis of enteric fever with shock (circulatory collapse) was made. The investigations revealed a hemoglobin of 8.5 g/dl, TLC 2750 cells/mm<sup>3</sup>, DLC P<sub>76</sub> L<sub>22</sub> M<sub>2</sub> Peripheral smear revealed normocytic normochromic anemia with toxic granules in leucocytes. Widal test was positive with a TO 1:800 and TH 1:800. Blood culture grew *Salmonella typhi*. The subject was administered injection ciprofloxacin and dopamine infusion to combat hypotension. There was a progressive decline in heart rate which became irregularly irregular and attained the rate of 50 per minute 12

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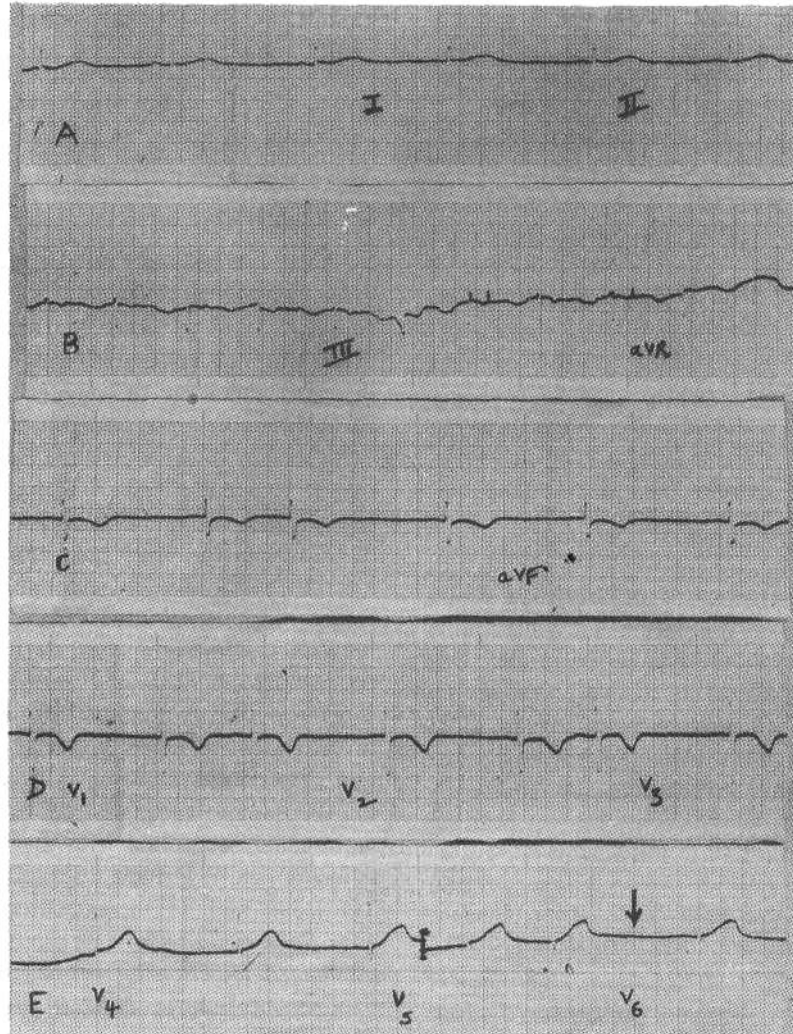
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hours later. The BP continued to remain at 70 systolic despite maximal doses of dopamine. Electrocardiogram revealed sinus bradycardia (HR 40-50 per min), sinus arrhythmia (38-75 per min), PR interval 0.2 sec, QTc interval 0.4 sec, atrial ectopic beats, episodes of sinus arrest and symmetric T wave inversion over precordial leads.

This was consistent with a diagnosis of myocarditis with SA node dysfunction in the form of sick sinus syndrome (*Fig. 1*). Intravenous atropine did not abolish the bradycardia and stimuli like pain failed to increase the heart rate. Echocardiographic examination revealed a structurally normal heart with an ejection fraction of 55%. The



*Fig. 1. ECG findings in the patient. (A) Sinus bradycardia, (B) Atrial ectopics, (C) Sinus arrhythmia, (D) Symmetric T wave inversion, and (E) Sinus arrest (Arrow).*

child was kept in the Coronary Care Unit under continuous cardiac monitoring. With the continuation of dopamine infusion, heart rate began to rise by the 6th day. Episodes of sinus arrest became infrequent and with the normalization of BP, the ECG reverted to normal by the 8th day. Soon after, dopamine was discontinued and the child steadily recovered. He was discharged 14 days later.

### Discussion

Typhoid myocarditis is a known entity, the incidence being as high as 32.6% in proven enteric fever as reported by Thiruvengadam *et al.*(1). The clinical manifestations of typhoid myocarditis depends on factors like anemia, nutritional status and the presence or absence of pre-existing cardiovascular disease in the patient(2). The clinical manifestations may comprise the whole range of symptoms and signs found in heart disease. Symptomatic myocardial involvement is rare compared to the frequency of electrocardiographic changes(3). The criteria for a diagnosis of myocarditis

are prolongation of PR interval, lengthening of the QTc interval, various arrhythmias, conduction defects, ST segment depression and/or T wave inversion over left ventricular epicardial leads(4). The various cardiac abnormalities reported in enteric fever are shown in *Table I*. Features of myocarditis and conduction disturbances were the major abnormalities observed.

According to Friedberg(9), severe conduction disturbances, advanced degree of AV block and SA node dysfunction are probably indicative of organic myocardial involvement. Although there are conflicting reports about the severity of typhoid infection and its relationship to electrocardiographic abnormalities, most agree that ECG changes indicate severe degree of myocardial involvement.

Most of the above described cardiac complications of typhoid were observed on adult patients. Although complications of typhoid fever have been described in children(10), a detailed account of cardiovascular complications is not available. Among

**TABLE I**-Summary of Reported Cardiac Abnormalities in Typhoid Fever

| Author            | Year | No. of cases | Abnormalities (%) | Description   |
|-------------------|------|--------------|-------------------|---|
| Witz (5)          | 1948 | 50           | 70                | ST segment depression and T wave inversion  |
| Rowland (6)       | 1961 | 530          | 1.2               | Tachycardia and clinical signs of myocarditis without congestive heart failure. No arrhythmias.   |
| Thiruvengadam (1) | 1967 | 100          | 32.6              | ST segment depression and T wave alteration. 1 showed Wenckebach phenomenon, 1 case sinus bradycardia and 1 case had sinus arrhythmias, 2 cases had ventricular ectopies. |
| Kamat (7)         | 1978 | 400          | 4                 | Transient T wave changes, No arrhythmias.   |
| Mathur (8)        | 1990 | 1            |                   | Isolated case of SA block.  |

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pediatric hospital admissions, cardiovascular collapse and gastrointestinal bleed are the major complications encountered. Arrhythmias especially sick sinus syndrome are extremely rare. The failing SA node in Sick Sinus Syndrome expresses dysfunction by a slowing of automaticity, so that the pacemaker discharges less frequently. Sick sinus syndrome usually begins with episodes of sinus bradycardia which may be sustained or intermittent. In SA nodal dysfunction, one not only sees such bradycardia (HR<60 per minute) but also may get inappropriate responses to stimuli which increase heart rate and SA exit block. No other cause of sick sinus syndrome other than myocarditis could be documented in this case. In this child with proven typhoid fever, it lasted for 8 days and resolved spontaneously with clinical cure.

Although sick sinus syndrome is extremely rare, one may see an increase in its incidence due to the delay in achieving clinical cure because of emergence of multidrug resistant *Salmonella typhi*.

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