ELECTROCARDIOGRAPHIC CHANGES IN VIRAL HEPATITIS

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ABSTRACT

Electrocardiograms of 322 patients with viral hepatitis were examined. Abnormal electrocardiograms were found in 229 patients (71.1%). The commonest abnormalities were T wave changes in 27 per cent. Other significant abnormalities were sinus bradycardia (13.7%), ST segment changes (5.7%), ventricular premature beats (2.5%) and U waves (6.5%). All the electrocardiographic abnormalities were transient and had no correlation with the severity or duration of illness.

MJAFI 1996; 52 : 221-224

KEY WORDS : Electrocardiography; Hepatitis viral human; Myocarditis.

Introduction

Viral hepatitis is a systemic disorder affecting various organs. Meir [1] was the first to report electrocardiographic (ECG) abnormalities in 80 per cent of his patients with viral hepatitis. Subsequently the incidence of ECG changes in viral hepatitis has been found by various workers [2-9] to vary grossly between 7 to 93 per cent. Hence this study has been undertaken to evaluate ECG changes in a larger number of service patients with viral hepatitis.

Material and Methods

Three hundred and twenty two patients with viral hepatitis hospitalized during a three year period (1991-1993) in a service hospital were the subjects for this study. There were 311 males (96.6%) and 11 females (3.4%). The ages ranged from 18 to 40 years (mean 27.23 years). All patients with history or clinical evidence of thyroid disease, cardiac disorders, history of ingestion of cardiotoxic drugs, and cholestasis associated with viral hepatitis were excluded from the study. Only patients aged 40 years and below were included in the study to minimize the possibility of associated coronary artery disease.

The diagnosis of viral hepatitis was based on clinical presentation, liver function tests and enzyme studies. Routine examination of blood, urine

and stool, and chest radiography were done in all. Liver function tests (LFT) and enzyme studies (transaminases and alkaline phosphatase) were carried out at the time of admission and then every week till the serum bilirubin level was below 1.0 mg/dL. Serum electrolyte (sodium and potassium) estimation was done, wherever possible, to exclude any electrolyte imbalance as the cause of ECG abnormality.

A standard 12-lead ECG was taken in each case, initially on the day of admission, then around the height of the illness as judged by weekly serum bilirubin estimation and finally at the time of discharge from hospital. An ECG was also recorded whenever any abnormality of pulse was detected clinically. All the ECG tracings were analyzed in detail for rate, rhythm, abnormalities of P wave, PR interval, QRS complex, ST segment changes, T wave, U wave and corrected QT interval (QTc).

A blood sample from every patient was tested for surface antigen of hepatitis B virus (HBsAg) and those who were negative were presumed to be suffering from other hepatitis virus infection.

Results

Most patients - 231 out of 322 (71.7%) belonged to the age group of 20-30 years, usually comprising of young soldiers, while 86 patients (26.7%) were above 30 years and the remaining 5

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patients were between 18-20 years of age. Serum bilirubin levels ranged between 1.6 mg/dL to 5.0 mg/dL at the time of admission. Peak level of serum bilirubin was 2.8 mg/dL to 5.0 mg/dL in 98 cases (30.4%), 5.1 mg/dL to 10 mg/dL in 74 cases (54.0%) 10.1 mg/dL to 15.0 mg/dL in 32 cases, while it was above 15.0 mg/dL in 18 cases (5.6%). In one patient a peak level of 32 mg/dL was reached. Eighty two patients (25.5%) were found to be HBsAg positive and the rest were presumed to be suffering from other types of viral hepatitis. The number of cases in various age groups, range of peak serum bilirubin, enzyme levels, type of viral hepatitis and its correlation with the number of cases showing ECG abnormalities in each range is depicted in the Table.

TABLE

Various ranges of age, peak serum bilirubin, enzyme level, type of viral hepatitis and their correlation with ECG abnormalities

	No of patients	No of cases showing ECG abnormality	% of cases showing ECG abnormality
Age (years)			
18-20	5	4	80.0
21-30	231	197	85.3
31 and above	86	68	79.1
Peak serum bilirubin (mg/dL)			
2.8 - 5.0	98	74	75.5
5.1-10.0	74	55	74.3
10.1-15.0	32	22	68.8
15.1 and above	18	13	72.2
SGPT (IU/L)			
17-150	34	27	79.4
151-300	164	135	82.3
301-500	78	41	52.6
500 and above	46	29	63.9
Alkaline Phosphatase (KA units/100 mL)			
3-10	268	194	72.4
21-40	49	37	75.5
40 and above	5	3	60.0
Type of hepatitis			
Other than HBV	240	187	77.9
HBV	82	56	68.3

Two hundred and twenty nine cases (71.1%) showed various ECG abnormalities. The different abnormalities noted were as follows:-

Heart rate : It ranged from 52 to 90 per minute. Sinus bradycardia (heart rate < 60/min) was noted in 44 cases (13.7%), sinus tachycardia (heart rate > 100/min) in 19 cases (6%), while the others had heart rates between 60-72/min.

Rhythm : Abnormality in rhythm was seen in the form of ventricular premature beats in 8 cases (2.5%). This was not related to peak serum bilirubin level and reverted back to normal after 12 days (average) without any treatment.

P wave : Abnormal P waves were seen in 3 cases (0.9%) in form of P mitrale. P wave amplitude in standard lead II exceeded in only one case.

PR interval : Majority of the cases (86.3%) had PR interval between 0.14-0.16 seconds. Six cases (1.9%) had first degree heart block. This reverted to normal in 5 to 12 days on its own. There was no relation between the heart rate, PR interval and level of serum bilirubin.

QRS complex : No abnormality of the QRS complex was detected in the present study.

ST segment and T wave : ST segment elevation over the chest leads was seen in 9 patients (2.8%) and over the limb leads in 2 cases (0.6%). Depression of ST segment was seen in 7 patients (2.2%) usually over the precordial leads. The commonest T wave abnormality was tall T waves over chest leads in 69 patients (21.4%), while inverted T waves were present in 18 (5.6%). None of the cases showing abnormalities of ST segment had associated T wave changes. In all, 105 cases (32.6%) showed ST and T wave abnormalities. Only 5 cases showed depression of J point.

QT interval : Prolongation of corrected QT interval (Qtc) was seen in 18 of the 322 patients studied (5.6%).

U waves : Presence of U wave was noticed in 21 cases (6.5%), usually over the chest leads. Serum electrolyte estimation was specifically done in these cases and was found to be within normal limits in all. None of the abnormalities noticed were related to severity or duration of illness. The changes reverted back to normal before serum bilirubin level reached the normal values.

Discussion

In the present series 71.1 per cent (229 out of 322) of cases studied showed ECG abnormalities.

There has been a wide variation in the incidence of ECG abnormalities reported by various workers. While a low incidence of 7 per cent was reported in one of the earliest studies [3], later studies [6,8] have found the incidence to be between 56.6 per cent to 86.1 per cent. However one Indian study [5] has reported the incidence to be as high as 93.3 per cent. ECG abnormalities detected have been usually benign, though deaths from ventricular premature beats and congestive cardiac failure have also been reported. The wide variation in the reported incidence may be due to gradual awareness about the problem and better interpretation of ECG tracings.

The commonest ECG abnormality detected in the present study was T wave abnormality (27.0%). Various workers [3,4,6,8] have reported varying incidence ranging from 21.3 per cent to 82 per cent. Bellet [10] described tall and peaked T waves only in severe cases of viral hepatitis. However no such correlation was noticed in the present study.

Sinus bradycardia is thought to be a common finding in viral hepatitis associated with circulating bile salts, hence related to the severity of jaundice. However, most of the earlier studies [4,5,8] have found the incidence of sinus bradycardia to be less than 25 per cent. In the present study it was seen in 13.7 per cent of the cases. This figure is almost similar to the reported incidence of 12 per cent in another study [6]. Abnormalities of rhythm have been reported to be between 7.3 per cent to 17.3 per cent [4,6,8] of the cases studied. However, it was noticed in only 2.5 per cent of our patients. P wave abnormalities in form of flat P waves or P mitrale were seen in only 4 cases (1.2%), while it was once reported as 4 per cent [6]. Lymphocytic infiltration of the myocardium especially the atrial myocardium occurs in viral hepatitis and this may be responsible for P wave changes [10].

The principal mechanism of cardiac involvement in viral myocarditis is believed to be a cell mediated immunological reaction to new cell-surface changes or a new antigen related to the virus, and not merely resulting from cell damage caused by viral replication [11,12]. A short PR interval has been reported by some workers [10]. Incidence

has been reported as 0.9 per cent to 1.3 per cent [6,8] and 1.9 per cent in the present study. No significant correlation could be found between varying PR interval and heart rate on one hand, and serum bilirubin and enzyme levels on the other.

Though QRS complex changes have been reported [6,10] by some workers, no such abnormality was detected in the present study. Low QRS voltage indicates pericardial inflammation [3]. Various ST segment changes have been reported by many workers [3,5,6,8], the incidence ranging from 50 to 70 per cent. Incidence of ST segment abnormality in this study (5.6%) is the same as the incidence (5.6%) reported in another study [4]. The incidence of QTc varies, as reported by various workers [3,6], from 14.9 to 70 per cent. However, this abnormality was detected in only 5.6 per cent of patients in the present study. Prolongation of QTc may be due to myocardial necrosis and subepicardial inflammation. Lymphocytic infiltration of the myocardium was the hallmark of viral infection including viral hepatitis and this may be responsible for various ECG abnormalities.

The outcome after viral myocarditis is quite variable, perhaps related to differing genetic susceptibility of individual patients. In most, the event is entirely self-limited and often unrecognized [9,11]. Unrecognized myocarditis may be the cause of arrhythmias in what appears to be a structurally normal heart. While transient ECG abnormalities suggesting myocardial involvement are noted in many patients, most patients do not have any other clinical manifestations of myocarditis. Symptomatic myocarditis is generally observed in the 1st to 3rd week of illness [12]. The ECG abnormalities are transient and asymptomatic, although congestive heart failure, cardiomegaly and sudden death have been reported [9].

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