ORIGINAL ARTICLE

Frequency of Corrected QT (QTC) Interval Prolongation in Chronic Liver Disease Patients

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ABSTRACT

Aim: To determine the frequency of prolonged QTc interval in patients with chronic disease.
Study design: Descriptive Cross-sectional
Place and duration: Department of Medicine, Nishtar Hospital, Multan in one year duration (September 2017 to September 2018).
Methodology: This study included 239 patients with chronic liver disease. A written informed consent was taken before start of the study. Non probability consecutive sampling was used. Study variables are age, gender, length of QTc, prolonged QTc. Data was entered in SPSS version 23 and analyzed for all possible variables. P value ≤0.05 was taken as significant.
Results: The QTc interval ranged from 384ms to 476ms with a mean of 421.8±25.2ms. Using a cut-off value of 440ms for prolonged QTc, the frequency of prolonged QTc was found to be 23.8% in all the patients regardless of age and gender.
Conclusion: Frequency of Prolonged QTc interval was found to be 23.8% in local population with chronic liver disease regardless of age and gender of the patient.
Keywords: CLD, Prolonged QTc, Cirrhotic Cardiomyopathy

INTRODUCTION

Degeneration of liver parenchyma due to a continuous viral infection leads to liver cirrhosis or fibrosis called chronic liver disease. This process may take few months to years. Chronic liver disease is very common disorder in developing countries like Pakistan mostly with viral cause like viral hepatitis B and C. It is the 10th leading cause of death[1].

Many cardiovascular abnormalities are also associated with chronic liver disease e.g., hyperdynamic circulation, cirrhotic cardiomyopathy and pulmonary vascular changes. Much evidence suggested the role of liver cirrhosis in development of cardiovascular abnormalities such as gastro esophageal varices and hepato pulmonary syndrome and self developing bacterial infections [2]. ECG finding like QT interval prolongation has been shown in patients with chronic liver disease and represents the most common ECG changes in cirrhotic cardiomyopathy[3].

Measurement of QT interval starts from QRS complex to finish line of T wave named as QT interval in chest leads of ECG with longest interval and without prominent U waves is the final interval of ECG waveform. QT interval is influenced by autonomic tone and heart rate, so measurement of the QT interval should be made during a resting state. The QT interval has an inverse relationship with heart rate. The several formulas are available for corrected QT interval and mostly used is the Bazett equation i.e. by dividing QT interval and R-R square root in seconds. The normal length of QTc is 0.38-0.44 sec. Electric ventricle systole can be estimated from QT-interval's length and width, its increase in length/prolongation showed cardiac arrhythmias especially ventricular type[4].

There lies a strong mutual interaction between liver and heart function that represents normal and abnormal functioning of liver and heart (may be acute or chronic in nature). These can be classified into liver diseases affecting the heart, heart diseases affecting the liver, and conditions affecting the heart and the liver at the same time[5]. Prolonged QTc interval in patients with chronic liver disease showed higher mortality rates than those with normal QTc interval.[6] There was increased mortality risk of three fold in patients with liver disease which have prolonged QTc[7].

This study is used in early screening of all patients with chronic liver disease for QTc prolongation during their hospital stay or at presentation which predict malignant arrhythmias. Early detection of prolonged QTc interval and prevention of factors known to prolong QTc interval, will be a good therapeutic approach for patient of chronic liver disease.

METHODOLOGY

Study was started after approval from hospital ethical board. Research was conducted at Department of Medicine, Nishtar Hospital, Multan. Duration was one year i.e. September, 2017 to August, 2018. 239 diagnosed cases of chronic liver disease from OPD and admitted in ward who met the criteria were included in the study after informed consent. Detailed history, physical examination and biochemical tests were carried out i.e. CBCs, prothrombin time, LFTs, creatinine, electrolytes; albumin and anti-HCV and HBs Ag by ELISA method. USG

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abdomen, chest X-ray and 12 leads ECG were taken. The R-R interval and QT interval was measured. The QTc interval was calculated from Bazzete`s equation.

Bazette's formula for corrected QT interval; QTc = QT/√(R-R). QTc more than 440 ms was taken as prolonged. Chronic liver disease cases were diagnosed clinically: presence of one or more than one signs like palmer erythema, spider naevi, liver span, jaundice, splenomegaly, ascites, dependant (sacral or pedal) oedema. Biochemically; Prolonged prothrombin time (> 4 seconds above the control), low serum albumin less than 3.5mg/dl, anti HCV and anti HBs Ag by ELISA positive, ultrasound abdomen showing, coarse texture liver.

Exclusion criteria: Subjects with Valvular heart disease, ischemic heart disease, heart failure, hypertension, chronic obstructive pulmonary disease, chronic renal failure, and pregnant patients, age <18 and >60 were excluded from the study.

Collected data for this study was entered into SPSS version. Numerical variables; age and QTc have been presented by mean ±SD. Categorical variables i-e genders, prolonged QTc have been presented by frequency and percentage. Chi square and student t test were applied to calculate association among variables taking p≤0.05 as significant.

RESULTS

The detail of results is given in table 1

Table-1: Distribution of variables

Characteristics	Mean	SD
Age	48.9	6.8
Gender		
Male	172	72 %
Female	67	28 %
QTc (milliseconds)	421.8	25.2
QTc (milliseconds)		
Normal	182	76.2%
Prolonged	57	23.8%

DISCUSSION

There is evidence that prolonged QTc which is frequently observed in patients with chronic liver disease can predict patient outcome in terms of mortality.[8] In our study, the QTc interval ranged from 384ms to 476ms with a mean of 421.8±25.2ms. Using a cut-off value of 440ms for prolonged QTc, the frequency of prolonged QTc was found to be 23.8% among all the patients regardless of age and gender. These results are consistent with those of Sulehria et al[9] who observed this frequency to be 22.1% in Lahore and Bhatti et al[10] who reported this frequency to be 24.7% in CLD patients at Islamabad[6].

Even within Pakistan, the frequency of prolonged QTc varied from 22.1% as reported by Sulehria et al[9] to 52.1% reported by Tariq et al[11] suggesting multifactorial origin of this QTc prolongation. Bernardi et al[12] conducted a study on Italian population in 1998 and reported prolongation of QTc intervals in 46.8% of patients. In our study, we observed prolongation of QTc interval in 23.8% of patients. Steven et al[13] conducted a similar study on American population and reported prolongation of QTc interval in 18% of patients who were diagnosed with chronic liver disease.

It is concluded that this frequency of prolonged QTc is highly variable in CLD patients in different populations as low as 18% (USA pediatric population with CLD)[13] to as high as 71% in Romania as reported by Mozos et al[14]. A possible explanation for this variation can be the underlying cause of CLD which is mostly alcoholism in western countries and viral hepatitis in Indian sub-continent particularly Pakistan.

Conclusion: Frequency of Prolonged QTc interval was found to be 23.8% in local population with chronic liver disease regardless of age and gender of the patient.

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