

## Original Research Article

# QT dispersion in irritable bowel syndrome

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### ABSTRACT

**Background:** The pathogenesis of irritable bowel syndrome (IBS) has not been fully elucidated. The gastrointestinal tract have a well-differentiated intrinsic nervous system and also this system is connected with nervous system. The symptoms of IBS are related with autonomic nervous system (ANS). It was also possible to see cardiovascular symptoms due to this link. This link can influence QT dispersion (QTd). The aim of this case control study is to show the cardiac effects of IBS by changes in QTd.

**Methods:** There were 56 newly diagnosed patients with IBS and 60 control subjects were included in this study. IBS was diagnosed using the new Roma IV Criteria. Standard 12-lead electrocardiogram (ECG) were taken in both two groups. QTd and corrected QTd (QTcd), QT max, QT min, QT average, Corrected QT (QTc) min, QTc max, QTc average values were calculated with Bazett Formula from rest ECGs.

**Results:** There were 56 newly diagnosed patients with IBS and 60 control subjects were included in the study (p:0.94). The mean age of the patients and control patients were 51.75±10.41 years and 48.41±9.72 (p: 0.53) years, respectively. QTd and corrected QTd (QTcd), QT max, QT min, QT mean, Corrected QT (QTc) min, QTc max, QTc mean values were calculated. QTd and QTcd values were found to be significantly higher in the patients with IBS (40.2±7.18; 34.1±6.18 / 52±9.8; 50.6±7.61 Msec, respectively). It is concluded that, QTd (p: 0.022) and QTcd (p: 0.032) were significantly increased in the IBS.

**Conclusions:** Activation of ANS in the patients with IBS can affect QT period in ECG.

**Keywords:** Electrocardiogram, Irritable bowel syndrome, QT dispersion

### INTRODUCTION

Irritable bowel syndrome (IBS) is a gastrointestinal disease characterized by chronic abdominal discomfort, pain, changing defecation habits and stool viscosity.<sup>1</sup> The prevalence of IBS in the general population is 15-20%. The prevalence of IBS is higher between 20 and 40 years of age and in women. IBS accounts for 20-50% of gastroenterology outpatient applications.<sup>2</sup>

IBS can be seen heterogeneous findings and be formed as spastic colon or non-ulcerative dyspepsia in the clinic. The gastrointestinal tract have a well-differentiated

intrinsic nervous system and also this system is connected with nervous system by sympathetic and parasympathetic stimulus. The symptoms of IBS are related with autonomic nervous system (ANS). It was also possible to see cardiovascular symptoms due to this link.<sup>3</sup>

The variability in QT length between leads in ECG is defined as QT dispersion (QTd). This reflects differences in myocardial repolarization time at different sites of the ventricle (4). QTd is calculated by subtracting the shortest QT distance from the longest in different leads in the 12-lead standard ECG. This method can also be applied with corrected QT (QTcd). Currently, the clinical

use potential of QTd has not been established. QTd is related with congenital long QT syndrome, some antiarrhythmic drug toxicities, hypertrophic cardiomyopathy and myocardial infarction.<sup>5-7</sup> It is shown that there is a relationship between QTd and ANS.<sup>8,9</sup>

The aim of this study was to determine whether a significant QT dispersion changes in IBS or not.

**METHODS**

A total of 56 newly diagnosed patients with IBS (Group 1) who were applied to internal medicine/gastroenterology polyclinics of Sakarya University Hospital between April 2016 and June 2018, and 60 control subjects (Group 2) were included in this case control study. IBS was diagnosed using the new International Working Team (Roma IV) Criteria.<sup>10</sup>

Patients who were diagnosed with IBS and were not diagnosed as another pathology were included in the study group. 60 healthy subjects were included in the control group. Similar age and gender were found for control group as study group.

Standard 12-lead electrocardiogram (ECG) were taken at rest in both two groups. The duration of the QT interval was measured by the cardiologist from the start of the QRS complex to the end of the T wave. The median RR and average QT interval was computed after exclusion of RR intervals that immediately preceded or followed premature ventricular complexes. Bazett’s formula (QTcBazett,  $QT/\sqrt{RR}$ ) were used to correct the QT (QTcd) interval for heart rate. A prolonged QTcBazett was defined as a QTc greater than 450 ms for men and greater than 460 ms for women according to the American Heart Association (AHA) recommends. QT dispersion is defined as the absolute difference between the maximum QTc and the minimum QTc time. This difference is considered to be 50 ms by the American Heart Association and the American Cardiology / Heart Rhythm Association (American Heart Association and the American College of Cardiology/Heart Rhythm Society). Time above this value is defined as prolonged QT dispersion.<sup>11</sup> The institutional ethics committee approved the study protocol.

**Statistical analysis**

Statistical analysis was made using computer software (SPSS version 19.0, SPSS Inc. Chicago, IL, USA). Categorical variables were presented as number/percentage and continuous variables presented as mean ±standard deviation. The chi-square test was used to compare the categorical variables. continuous variables were compared using student t-test or Wilcoxon. Linear regression analysis was used to correlate QT with continuous variables. P value was accepted as <0.05 for all data.

**RESULTS**

Mean age of patients with IBS group was 51.75±10.41 years and mean age of control group was 48.41±9.72 years (p:0.53). 39 female (69.6%) and 17 male (30,4%) were in the patient group and 38 female (63,3%) and 22 male (36.7%) were in the control group. There were no significant differences in sex and age between two groups (p>0.05) (Table 1).

**Table 1: Demographic characteristics.**

Parameters	IBS	Control	P values
Patients (n)	56	60	
Female/male (n)	39/17	38/22	0.94
Age (years)	51.75±10.4	46.41±9.72	0.53

**Table 2: Comparison of QT parameters of patients with irritable bowel syndrome and healthy volunteers.**

QT (msn)	IBS (n:56)	Control (n:60)	P Value
Minimum QT	354.4±17.5	350±18.5	0.21
Maximum QT	389.5±17.6	383.9±19.4	0.2
Mean QT	370.8±17.2	368.8±22.2	0.57
QTd	40.2±7.18	34.1±6.18	0.022
Minimum QTc	392.6±23.6	388.1±21.7	0.26
Maximum QTc	444.4±23	440.6±23.2	0.38
Mean QTc	418.1±24.9	408±21.7	0.06
QTcd	52±9.8	51.9±7.61	0.032

QTd and corrected QTd (QTcd), QT max, QT min, QT mean, Corrected QT (QTc) min, QTc max, QTc mean values were compared between two groups and QTd (p: 0,022), QTcd (p: 0.032) values were found to be higher in the patients with IBS (40.2±7.18; 34.1±6.18/ 52±9.8; 50.6±7.61 Msec, respectively) (Table 2).

**DISCUSSION**

QT interval involves the time taken for ventricular depolarization and repolarization. Normal QT interval varies with age, gender, heart rate. Every pulse transmission time is variable in the heart. Although this change is primarily caused by the myocardial structure itself, it forms part of this variability in the autonomic nervous system (ANS) and endocrine system.<sup>12</sup> QT was found to be longer in patients with hypertension and anxiety in a study. The mechanism of this relationship is connected the activation of ANS.<sup>13</sup> The relationship between ANS and QTd was showed in a study about acute MI.<sup>9</sup>

The mechanism of gastrointestinal tract symptoms in IBS is not fully understood but increased visceral sensitivity to painful stimulus were showed.<sup>14</sup> A relationship between primary fibromyalgia (FM) and IBS has been

showed in many studies.<sup>15-17</sup> Patients with IBS and patients with IBS+FM were compared in a study. Greater Visceral hypersensitivity were found in the patients with IBS+FM.<sup>18</sup> There are three mechanisms in the pathophysiology of these diseases; primary smooth muscle disorders, local defects in neural regulation and defects in ANS.<sup>19</sup>

Functional bowel diseases are diagnosed according to the updated ROMA criteria. Gastrointestinal pathologies are prominent in IBS. Psychosocial disorders and disorders of the brain's conduction system constitute the other components of this disease. Although the reason for this interaction is not fully explained, it is thought that these symptoms in IBS are caused by anomalies in autonomic nervous system which are common embryonic origin.<sup>10</sup>

Nakagawa et al, have shown that there is a close relationship between QT dispersion and autonomic nervous system imbalance in QT pattern in patients with functional bowel disease, also Fujimoto et al support this study.<sup>8,9</sup> Yorulmaz et al and Deepak J et al found same results showing autonomic dysfunction in IBS.<sup>20,21</sup> Akkus et al also showed prolongation of QTd and QTcd times for the QT dispersion in the patients with IBS and similar results were obtained in our study.<sup>22</sup>

## CONCLUSION

In conclusion, our findings were consistent with the literature. Also association between QT dispersion and ischemic heart disease, myocardial infarction, ventricular fibrillation was showed in many studies. Patients with IBS should be followed closely for cardiovascular diseases.

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