QT interval changes and reversibility of QT dispersion in patients with acute pancreatitis

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ABSTRACT
Background/Aims: QT dispersion is a sign of heterogeneity of ventricular myocardial wall and is associated with cardiac mortality and morbidity. Data regarding with the persistence of QT interval changes in cases with acute pancreatitis (AP) that required clinical follow-up, are insufficient. Therefore, in this study, we aimed to evaluate the QT interval changes during attack and after remission of the disease, in cases with AP.

Materials and Methods: The cases admitted to the Gastroenterohepatology Clinic with the diagnosis of AP were included into the study. Ranson’s score parameters, electrocardiography and echocardiography of all patients included into the study were evaluated. Electrocardiographic changes were evaluated two times, during attack and after remission of the disease.

Results: A total of 134 subjects (F/M:54/80, 41/59%) diagnosed as AP were included into the study. Seventy two (54%) of the AP cases included into the study were biliary, 32 (24%) were alcohol dependant, 19 (14%) were idiopathic, 9 (7%) were hyperlipidemic and 2 (1%) were ERCP related cases. Mean age of the patents was 57.7±15 years old (range: 19-82 years old) and mean Ranson’s score was 3.8±1.9 (range: 1-7), according to the numerical scoring system. We compared QT interval changes during the attack and after the remission of AP and found significant increase in QT dispersion levels during acute attack of AP (p<0.001).

Conclusion: The most common electrocardiographic changes in AP patients are QT interval changes including QT dispersion. QT dispersion which was emerged during the attack recovered after the remission of the disease.

Keywords: Acute pancreatitis, ECG, QT dispersion

INTRODUCTION
Acute pancreatitis (AP) is a systemic inflammatory disorder of the pancreas with a rising incidence around the globe (1). Significant morbidity and mortality can be seen in AP patients due to the systemic complications and multi-organ failure. Cardiac involvement has an important place during systemic involvement and cardiac dysfunction in AP patients was confirmed by many studies (2-4). AP has frequently been reported to be associated with transient electrocardiographic (ECG) changes such as ST-T changes mimicking myocardial infarction, sinus bradycardia (5), repolarization changes (6), nonspecific T wave changes and accelerated atrial or nodal rhythms (7) have also been reported in early phase of acute pancreatitis. In addition, QT interval changes, particularly early repolarization was described to be the most common ECG finding of AP patients (8,9). QT dispersion was defined as an index of the spatial dispersion and attributed to difference of ventricular recovery times (10). It has also been reported that QT dispersion has a high sensitivity rate for prediction of severe tachyarrhythmias such as sustained ventricular tachycardia (11). Increased QT dispersion was reported in two studies with limited AP patients (12,13). In addition, the data regarding with the persistence of QT dispersion were also insufficient. As mentioned, the persistence of QT dispersion in patients with AP requires long-term follow-up due to the increasing frequency of tachyarrhythmias such as sustained ventricular tachycardia. In this study, we aimed to investigate QT changes during the attack and after the remission of AP.
Buğdacı et al. QT interval changes and acute pancreatitis

MATERIALS AND METHODS
The patients admitted to our Gastroenterohepatology depart-
ment and diagnosed as AP were included into the study. AP
diagnosis was made by characteristic findings and symptoms,
(upper abdominal pain and/or guarding and/or rebound ten-
tension), elevated serum enzymes (≥3-fold amylase and/or li-
pase) and abdominal ultrasonography (performed two times
before and after 24 hours) and/or contrast enhanced comput-
erized tomography (CT) performed after 48-72 hours. Acute
pancreatitis was considered to be biliary in origin if stones or
sludge were detected in the gallbladder and/or common bile
duct and alcoholic in origin if the patient or his/her relatives
reported consumption of >60 g of pure alcohol per day. Serum
triglyceride level more than 750 mg/dL and exclusion of other
etiologies were accepted as hyperlipidemic etiology. Patients
were classified as having an idiopathic etiology if the history
and laboratory findings ruled out known etiologic factors and
ultrasonography and/or contrast enhanced CT revealed a nor-
mal biliary tract.

Ranson's score parameters obtained by using findings within
the first 48 hours were used for prognostic evaluation. All com-
puterized tomography (CT) scans were reviewed by radiolo-
gists dedicated to abdominal imaging, who were blinded to
the laboratory data and clinical course. Serum calcium concen-
tration (mg/dL) was calculated by correcting with 0.8 x [4-albu-
min (g/dL)].

In this study, patients with known congestive heart failure,
pulmonary embolism, systemic and pulmonary hyperten-
sion, atrial fibrillation, paroxysmal supraventricular arrhythmia,
chronic renal failure, cirrhosis, chronic obstructive pulmonary
disease, valvular heart diseases and congenital heart diseases
and those with a history of consumption of antiarrhythmic
drugs were not included.

Electrocardiography (ECG) and echocardiography
Standard 12-lead ECG were performed with the subject in su-
pine position during quiet respiration and recorded at 25 mm/
sec. ECG patterns was evaluated according to the commonly
adopted clinical criteria. Early repolarization was defined as an
elevation of the QRS-ST junction (j point) in at least two leads at
the time of admission of the patients. QT interval was assessed
as an interval beginning from depolarization of QRS complex
to the end of the T wave in each lead -defined as a return to the
T-P baseline-. QT interval was measured until nadir of the notch
between T and U waves in the presence of the U wave. QT in-
terval dispersion was defined as difference between maximum
and minimum QT intervals in milliseconds (ms) measured in
ECG leads. Corrected QT (QTC) was evaluated according to the
Bazzet formula. QTC was defined to be prolonged QT when it
was > 440 ms in males and >460 ms in females. Echocardiog-
raphy was applied by the same cardiologist within the first day
of acute presentation. Transthoracic echocardiography imag-
ings were obtained from parasternal long-axis window and

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RESULTS
A total of 134 subjects (F/M:54/80, 41/59%) diagnosed as AP
were included into the study. Seventy two (54%) of the AP cases
included into the study were biliary, 32 (24%) were alcohol de-
pendant, 19 (14%) were idiopathic, 9 (7%) were hyperlipidemic
and 2 (1%) were ERCP related cases. Mean age of the patients
was 57.7±15 years old (range: 19-82 years old) and mean Ran-
son's score was 3.8±1.9 (range: 1-7) according to the numeri-
cal scoring system. Seven of the patients were necrotizing and
the others were edematous AP patients. Follow-up period was
ranged from 6 to 12 months. In this study, two of the patients
with edematous AP were died during the follow-up period.

Eighty-eight of AP cases (66%) had ECG changes. ECG changes
were seen most frequently in patients with biliary (73%) and
alcohol dependant (21%) AP. The most frequently seen electro-
cardiographic findings were repolarization changes on lateral
chest derivations (57%), left anterior hemi-block (44%) and si-
nus tachycardia (20%), respectively.

We compared QT changes during the attack and after the re-
mission of AP and found significant increase in QT maximum,
minimum and dispersion levels during the acute attack of AP (Figure 1) (Table 1).

We did not find QT prolongation in our study patients. In addition, we did also not find neuromuscular hyperactivity and tetany in AP patients who exhibited hypocalcemia. There was a significant positive correlation between serum calcium and albumin (r=0.314, p=0.043).

Echocardiography was performed in all cases with AP. Echocardiography data were within the normal ranges in all participants.

DISCUSSION

In the current study, the most common electrocardiographic changes in patients with AP were QT interval changes. The most common ECG finding observed in this study is consistent with report of QT interval changes as an early repolarization in a study performed by Rubio-Tapia et al. (14). However, Rubio-Tapia et al. (14) stated it as an unimportant finding with the term of “nonspecific repolarization”. While early repolarization was described as a benign situation in the beginning, it was shown to be a prognostic parameter of ventricular tachyarrhythmias in the studies performed in recent years (15-18). It is not exactly known why the lateral early repolarization occurs. The increase in ventricular myocyte sensitivity due to cardiac depressant factors (such as kinin and myocardial depressant factor) in AP cases may have a role. Also, the QT dispersion like early repolarization is another change at this interval. In the current study, we found that QT dispersion was significantly increased in patients with acute pancreatitis. Currently, the data regarding with the etiopathogenesis of QT dispersion were insufficient. The increase in QT dispersion was considered as a sign of inhomogeneity of ventricular repolarization and it was also considered to be a marker of cardiac electrical instability (19-21). Sakagami et al, and Ates et al. showed increased QT dispersion in alcohol-dependant and biliary AP cases (12-13). However, these two studies have been performed with a limited number patients. Our study confirmed the QT changes in early phase of AP. In addition, we demonstrated for the first time the recovery of QT changes after the remission of the disease.

Although the exact mechanism of cardiovascular changes remain topics of continued research, various hypotheses have been speculated for the underlying mechanism of electrocardiographic changes during the course of AP, including toxic effects of the pancreatic proteolytic enzymes such as myocardial depressant factor and kinins on the myocardium, autonomic imbalance with vagal predominance, coronary artery spasm, metabolic and electrolyte abnormalities, prothrombotic rearrangements, hemodynamic instability, and systemic inflammatory response-induced cardiac damage (22-25).

In conclusion, the most common electrocardiographic changes in AP patients is QT interval changes including QT dispersion. We do not advise long-term follow-up of patients with AP for increased risk of tachyarrhythmias such as ventricular tachycardia because of the reversibility of QT dispersion.

Conflict of Interest: No conflict of interest was declared by the authors.

REFERENCES


Table 1. QT changes of acute pancreatitis subjects during attack and after remission of the disease

<table>
<thead>
<tr>
<th></th>
<th>During attack</th>
<th>After remission</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>QT max (ms)</td>
<td>430.7±23.9</td>
<td>388.8±21.45</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>QT min (ms)</td>
<td>381.2±23.38</td>
<td>361.2±16.45</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>QT dispersion (ms)</td>
<td>48.7±21</td>
<td>24.85±16.13</td>
<td>&lt;0.001</td>
</tr>
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Figure 1. a, b QT maximum value of a patient was 360 ms after the resolution (a) and, was 420 ms during attack (b) of acute pancreatitis.


