Increased QT dispersion and P wave dispersion in major depressive disorder

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BACKGROUND: QT and P wave dispersion parameters can indicate abnormalities in autonomic nervous system and cardiac functioning.

OBJECTIVES: To determine QT and P wave dispersion in patients with major depressive disorder compared with healthy volunteers.

METHODS: Fifty newly diagnosed patients with major depressive disorder and 50 age- and sex-matched healthy volunteers underwent 12-lead electrocardiography. QT interval, QT dispersion, heart rate-corrected QT dispersion and P wave dispersions were calculated manually by a blinded specialist.

RESULTS: Groups were comparable in terms of age, sex, body mass index, smoking status, metabolic diseases and left ventricular ejection fraction. The major depressive disorder group had significantly higher QT dispersion (38.5±9.9 versus 41.7±3.8; P<0.001), heart rate-corrected QT dispersion (62.5±10.0 versus 45.2±4.3; P<0.001) and P wave dispersion (46.9±4.8 versus 41.5±5.1; P<0.001).

CONCLUSION: Increased QT dispersion, heart-rate corrected QT dispersion and P wave dispersion in major depressive disorder patients may be indicative of autonomic imbalance and increased risk of cardiac morbidity and mortality.

Key Words: Autonomic nervous system; Cardiac function; Cardiovascular diseases; Depression; Electrocardiography


Methods

The present case-control study was conducted in the psychiatry department of Van Training and Research Hospital (Van, Turkey) between 2010 and 2012. A total of 50 patients diagnosed with MDD for the first time at the outpatient psychiatry clinic of the hospital and 50 age- and sex-matched physically and mentally healthy volunteers were included in the study. Patients with underlying cardiac conditions, abnormal ECG findings, or taking antidepressants or other medication use that may interfere with ECG results were excluded. The study was approved by the local ethics committee and written informed consent was obtained from all subjects.

Electrocardiographic calculations

Standard 12-lead ECG 50 mmV recording was performed following a 10 min rest in the supine position. The QT interval, QT dispersion and P wave dispersion were measured in any of the 12 leads.

Statistical analysis

SPSS version 15.0 (IBM Corporation, USA) for Windows (Microsoft Inc, USA) was used for the statistical analysis. Descriptive statistics were expressed as mean ± SD or frequencies. Group means were compared using either the Mann-Whitney U test or independent samples Student’s t test. Categorical variables were compared using Pearson’s χ² test; P<0.05 was considered to be statistically significant.

Results

Demographic and clinical characteristics of MDD patients and healthy volunteers are presented in Table 1. There was no significant difference between the groups in terms of age, sex, body mass index, smoking status, metabolic diseases and left ventricular ejection fraction (Table 1).
MDD patients had significantly higher QTD (58.5±9.9 versus 41.7±3.8; P<0.001), QTcD (62.5±10.0 versus 45.2±4.3; P<0.001) and PD compared with age- and sex-matched healthy volunteers. Women had higher PD compared with men (45.1±6.3 versus 42.6±3.8; P=0.015), while QTD and QTcD were not significantly different between men and women. Smoking status, age and body mass index did not significantly affect QTD, QTcD or PD.


discussion

In the present study, we showed that nonmedicated patients with a first-time diagnosis of MDD had significantly higher QTD, QTcD and PD compared with age- and sex-matched healthy volunteers. QTD and QTcD were previously investigated in a small-scale study. Nahshoni et al (23) measured QTD and QTcD in a group of 18 elderly patients with recurrent MDD maintained on antidepressant medication and showed that they had significantly higher QTD and QTcD compared with nine age- and sex-matched healthy subjects. Our results support and extend their findings in a larger group of MDD patients. Because our patients were not using antidepressant medication at the time of ECG measurements, drug side effects can be eliminated as a potential cause of ANS imbalance in these patients. Furthermore, our analysis shows that QTD is affected even in younger or middle-age patients at or near the beginning of their first-ever major depressive episode, suggesting that the toll of stress on the cardiovascular system is immediate. However, at this time we cannot rule out the possibility that elevated QTD could also be a trait marker of depressive personality.

Two studies measured QTD of MDD patients in relation to the effects of electroconvulsive therapy. Tenaka et al (24) noticed that MDD patients had high QTD at baseline and that QTD peaked immediately after electroconvulsive therapy and returned to baseline within 5 min to 6 min. In a follow-up study they showed that older and younger patients had similar QTD at baseline but QTD was increased significantly more in older patients during the 7 min following electroconvulsive therapy (25). Although these studies focused on the effects of electroconvulsive therapy and did not include a control group, their observation of high baseline QTD in MDD patients is consistent with our results. It would be interesting to determine whether QTD would further decrease to normal levels in successfully treated MDD patients.

To the best of our knowledge, ours is the first study to show elevated PD in MDD patients compared with a control group. PD was assessed in 30 MDD patients undergoing electroconvulsive therapy and a significant increase in PD was observed after the shock compared with the baseline reading (26). However, in this study there was no control group to determine the difference at baseline.


disclosures

The authors have no conflicts of interest to declare.


tables

<table>
<thead>
<tr>
<th>TABLE 1 Demographic and clinical characteristics of the patients</th>
<th>Control (n=50)</th>
<th>MDD (n=50)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>39.8±5.3</td>
<td>38.5±4.3</td>
<td>0.055</td>
</tr>
<tr>
<td>Sex, men/women</td>
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<td>20/30</td>
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</tr>
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<td>Body mass index, kg/m²</td>
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<td>0.922</td>
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<tr>
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<td>–</td>
</tr>
<tr>
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<td>0</td>
<td>1</td>
<td>–</td>
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<tr>
<td>Hyperlipidemia</td>
<td>2</td>
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<td>LVEF, %</td>
<td>60.5±2.2</td>
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<tr>
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<td>138.9±4.0</td>
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<td>Mg²⁺, mg/dL</td>
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<td>1.9±0.3</td>
<td>0.126</td>
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<tr>
<td>Ca²⁺, mg/dL</td>
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<td>9.3±0.7</td>
<td>0.185</td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD unless otherwise indicated. MDD Major depressive disorder; LVEF Left ventricular ejection fraction

| TABLE 2 Mean QTD and P dispersion on 12-lead electrocardiographic recording of control and major depressive disorder (MDD) groups |
|---|---|---|---|
| | Control | MDD | P |
| QTD | 43.6±3.7 | 58.8±5.5 | <0.001 |
| QTcD | 44.3±5.1 | 61.5±9.1 | <0.001 |
| PD | 42.4±5.3 | 46.2±5.6 | <0.001 |

Data are presented as mean ± SD unless otherwise indicated. PD P wave dispersion; QTcD Heart rate-corrected QT interval dispersion; QTD QT interval dispersion

There are some limitations to the present study. QT interval measurement is affected by factors such as low T wave amplitude, T wave merging with P or U waves and abnormal morphology of T wave (27). Consequently, intraobserver and interobserver variability is often high with QTD measurements. We tried to overcome this problem by having a single blinded expert performing all measurements methodically. Because computerized dispersion calculations were not shown to be superior to manual calculations, we opted for manual measurement (28).

Heart rate correction of QTD is controversial. Current belief dictates that heart rate does not modify QTD and that QTD should not be corrected for heart rate (27). Although we calculated QTcD in our study, the results paralleled QTD and did not affect the interpretation of our results.

limitations

Potential limitations to the present study include the relatively small sample size and the fact that there is no supporting evidence, such as a biomarker, 24 h Holter or 24 h ambulatory blood pressure monitoring, that would show conclusively that the reason for correlation is indeed ANS disturbances.


cOnClusion

Our study shows increased PD, QTD and QTcD in patients newly diagnosed with MDD, suggesting a link between ANS imbalance and depression. Further studies are warranted to show a causative link between these ECG parameters and cardiovascular morbidity and mortality in MDD.


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