Clinical features and electrocardiogram parameters in Parkinson's disease

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Abstract

We investigated the relation between clinical features and electrocardiogram (ECG) parameters in patients with Parkinson’s disease (PD). One hundred and fifty-six PD patients were enrolled. Their clinical features [body mass index (BMI), age, disease duration, and disease stage] and ECG parameters [RR, PR, QRS, and QT intervals, and heart rate-corrected QT (QTc)] were analyzed. BMI was positively correlated with the PR and QRS intervals in patients with PD. The QRS interval was positively correlated with disease duration and Hoehn and Yahr stage, and the QT interval and QTc were positively correlated with age. Clinical features and ECG parameters are likely to be closely associated with each other. Several ECG parameters reflect autonomic dysfunction or disease progression. Clinicians should pay more attention to ECG parameters in the treatment of PD patients.

Introduction

Several previous papers indicated reduced uptake in cardiac 123I-metaiodobenzylguanidine scintigraphy (MIBG) in patients with Parkinson’s disease (PD).1 Recently, prolongation of the PR interval on electrocardiogram (ECG) was reported to reflect the abnormal MIBG findings in PD.2 In addition, an increased body mass index (BMI) was associated with autonomic dysfunction in PD as determined using the MIBG method.3 In this study, we investigated the relation between clinical features, including BMI, and ECG parameters in patients with PD.

Materials and Methods

This was an observational, cross-sectional study. From April 2011 to December 2016, 160 consecutive possible PD patients who were naïve to anti-parkinsonian drugs were admitted to our hospital. Their diagnoses were determined in accordance with the National Institute of Neurological Disorders and Stroke diagnostic criteria for PD.4 After ECG recording, it was confirmed that all patients exhibited a beneficial response to L-DOPA. Their clinical features (BMI, age, disease duration, and disease stage) and ECG parameters were analyzed. Disease stage was defined based on the Hoehn and Yahr (H-Y) scale.5 Four patients were excluded from the study because of diabetes mellitus.6 No subjects had heart disease or received antidepressants, antihypertensives, or aypical antipsychotics, all of which are factors that could affect ECG parameters. The final study population consisted of 156 patients with PD (female 90, male 66). A standard 12-lead ECG was recorded with an ECG machine (FCP-7541; Fukuda Denshi, Tokyo, Japan) in all subjects between 2 pm and 3 pm. The RR, PR, QRS, and QT intervals were measured, and QTc was calculated by QT/(RR)^1/2. Written informed consent was obtained from all the participants. This study protocol was approved by the local ethics committee and was carried out in accordance with the Declaration of Helsinki.

The correlations between clinical features and ECG parameters were analyzed using Spearman’s rank correlation coefficient. The significance level was set at P<0.05. SPSS version 22 software was used for statistical analysis.

Results

The BMI, age, disease duration (months), and H-Y stage of the 156 PD patients, expressed as mean±SD, were 22.8±3.2, 68.5±8.7, 22.4±17.5, and 2.2±0.8, respectively. Table 1 shows the relations between clinical features and ECG parameters. BMI was positively correlated with the PR and QRS intervals in patients with PD (Figure 1A and B), regardless of disease duration and severity. The QRS interval was positively correlated with disease duration and H-Y stage (Figure 1C), and the QT interval and QTc were positively correlated with age (Figure 1D).

Discussion

This study demonstrated three main findings. First, BMI was positively correlated with the PR and QRS intervals. Second, the QRS interval was positively correlated with disease duration and H-Y stage. Third, QTc was positively correlated with age.

In our previous studies of patients with PD, the PR interval was correlated with autonomic dysfunction, and autonomic dysfunction was associated with BMI increase.2,3 The results of the current study indicated a positive correlation between BMI and the PR and QRS intervals. In a large-scale study of normal subjects, prolongation of both the PR and QRS intervals were reported in obese people.7 Our results suggest a similar relation in PD patients, and indicate that autonomic dysfunction, BMI increase, and prolonged PR and QRS intervals are likely to be closely associated with each other in PD.

The QRS interval was positively correlated with disease duration and H-Y stage in the current study. This interval represents the near-simultaneous activation of the right and left ventricles. A pathological study of

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Key words: Parkinson’s disease; Electrocardiography; Autonomic dysfunction.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institution and with the 1964 Helsinki declaration and its later amendments.

Conflict of Interest: The authors declare no potential conflict of interest.

Contributions: HM, design and coordination of the study, analysis and interpretation of the data, collection of the material, drafting of the manuscript; NI, analysis and interpretation of the data, collection of the material, drafting of the manuscript; KS and MN, interpretation of the data, drafting of the manuscript.

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Table 1. Correlations between clinical features and electrocardiogram parameters.

<table>
<thead>
<tr>
<th>Electrocardiogram parameters</th>
<th>BMI</th>
<th>Clinical features</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>age (years)</td>
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<tr>
<td></td>
<td>1</td>
<td>0.033</td>
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<tr>
<td>age (years)</td>
<td>0.033</td>
<td>1</td>
</tr>
<tr>
<td>duration (month)</td>
<td>-0.108</td>
<td>1</td>
</tr>
<tr>
<td>H-Y</td>
<td>-0.044</td>
<td>0.226**</td>
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Electrocardiography
- RR: -0.027, PR: 0.177*, QRS: 0.173*, QT: -0.052, QTc: 0.021
- RR: 0.112, PR: -0.019, QRS: 0.172*, QT: 0.179*, QTc: 0.173* (rho = 0.021, P = 0.010)
- BMI: 1, age: 0.033, duration: -0.044, H-Y: -0.027, RR: -0.027, PR: 0.177*, QRS: 0.173*, QT: -0.052, QTc: 0.021
- BMI: 0.033, age: 1, duration: -0.024, H-Y: -0.027, RR: 0.177*, PR: 0.142, QRS: 0.226**, QT: 0.179*, QTc: 0.173* (rho = 0.021, P = 0.010)
- BMI: 1, age: 0.033, duration: -0.108, H-Y: -0.044, RR: -0.027, PR: 0.177*, QRS: 0.173*, QT: -0.052, QTc: 0.021

The results indicate Spearmann’s rank correlation coefficients (rho). *, P<0.05; **, P<0.01. BMI, body mass index; H-Y, Hoehn and Yahr scale.

Figure 1. Scatter diagrams showing the relationship between clinical features and electrocardiogram parameters. Body mass index was positively correlated with PR (A) and QRS (B) intervals. QRS interval was positively correlated with Hoehn and Yahr (C) stage, and QTc was positively correlated with age (D).

Conclusions
Clinical features and ECG parameters are likely to be closely associated with each other. Several ECG parameters reflect autonomic dysfunction or disease progression. Clinicians should pay more attention to ECG parameters in the treatment of PD patients.

References