Original Article

Association of Anti-Ro Antibodies with ECG Abnormalities in Systemic Lupus Erythematosus: A Cross-Sectional Study in a University Hospital

Parisa Delkash[1], Mohammad Abdehagh[2], Soheila Sadeghi[3], Fatemeh Omidi[4*]

[1]Department of Rheumatology, Imam Hossein Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[2]Basic and Molecular Epidemiology of Gastrointestinal Disorders Research Center, Research Institute for Gastroenterology and Liver Diseases, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[3]Department of Internal Medicine, Imam Hossein Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[4]Prevention of Cardiovascular Disease Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

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Abstract

Background: Systemic lupus erythematosus (SLE) is a chronic autoimmune disease with various cardiovascular manifestations. Anti-Ro antibodies are commonly found in SLE patients and may contribute to cardiac abnormalities, including electrocardiographic (ECG) changes. This study assessed the association between Anti-Ro antibodies and ECG abnormalities in SLE patients.

Materials and Methods: In this cross-sectional study, 85 SLE patients, all positive for Anti-Ro antibodies, were enrolled from a university hospital. Demographic data, clinical features, and 12-lead ECG results were collected. ECG abnormalities were evaluated, including sinus tachycardia, premature ventricular contractions, QRS fragmentation, ST changes, and QT interval prolongation. Data analysis was performed using SPSS version 26, with appropriate statistical tests to compare variables.

Results: Among the 85 patients, 6 (7.06%) exhibited sinus tachycardia, 1 (1.18%) had premature ventricular contractions, and 12.94% showed QRS fragmentation. ST elevation was observed in a minority of patients (30.59%), while 88.24% had normal ST depression results. QTc was prolonged in 11.76% of patients. No significant associations were found between Anti-Ro antibodies and specific ECG abnormalities.

Conclusion: This study did not find a significant correlation between Anti-Ro antibodies and ECG abnormalities in SLE patients. However, further research with a larger sample size and more in-depth analysis is needed to clarify Anti-Ro antibodies' role in SLE's cardiovascular manifestations.

Keywords: Systemic lupus erythematosus, Anti-Ro antibodies, Electrocardiographic abnormalities, Sinus tachycardia, QT prolongation, Cardiovascular manifestations, Autoimmune disease

***Corresponding Author:** Fatemeh Omidi, MD, Prevention of Cardiovascular Disease Research Center, Shahid BeheshtiUniversity of Medical Sciences, Tehran, Iran. Email: dr.fateme.omidi@gmail.com. ORCID:https://orcid.org/0000-0001-7302-9136
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Introduction

Systemic lupus erythematosus (SLE) is a complex autoimmune disease characterized by widespread inflammation that affects multiple organs, including the skin, kidneys, joints, and cardiovascular system[1-3]. One of the key features of SLE is the production of various autoantibodies, including anti-Ro antibodies, which have been implicated in a range of clinical

manifestations[4-6]. While the relationship between these antibodies and various SLE-related complications is well-documented, their role in cardiovascular abnormalities remains a subject of ongoing investigation. Electrocardiographic (ECG) changes, such as arrhythmias, QT interval prolongation, and conduction abnormalities like bundle branch blocks, are commonly observed in SLE patients[7-10]. These cardiac disturbances can increase the risk of serious cardiovascular events, which are already elevated in individuals with SLE. Among the many autoantibodies associated with SLE, anti-Ro antibodies have been particularly linked to increased cardiovascular complications. However, the exact mechanisms influencing heart rhythm and conduction remain unclear[11-13]. Although some studies have suggested a connection between anti-Ro antibodies and cardiac involvement, the specific relationship between these antibodies and ECG abnormalities has not been comprehensively studied across different populations[14-16]. This study addressed this gap by investigating the correlation between anti-Ro antibody positivity and various ECG abnormalities in SLE patients, particularly within the Iranian population. The findings provided crucial insights into how SLE-related autoantibodies contributed to the high cardiovascular risk observed in these patients.

Methods

Study design and participants: This study was a cross-sectional investigation conducted among patients diagnosed with SLE who visited the rheumatology clinic at Imam Hossein Hospital in Tehran between 2023 and 2024. Patients were diagnosed according to the 2019 EULAR/ACR classification criteria, which are widely used to diagnose SLE based on clinical, immunological, and laboratory findings[17]. All patients in the study were positive for anti-Ro antibodies, which was used as an inclusion criterion. The inclusion criteria comprised patients aged 18 to 65 with a confirmed SLE diagnosis. Exclusion criteria included individuals with a history of cardiovascular disease, incomplete data, comorbid conditions such as malignancies, thyroid disorders, or diabetes, other autoimmune or inflammatory disorders like rheumatoid arthritis or scleroderma, and a history of smoking or substance abuse. The Research Ethics Committee of Shahid Beheshti University of Medical Sciences (IR.SBMU.MSP.REC.1403.305) granted the study's ethical approval.

Data collection: Patient data were collected and classified based on the presence of anti-Ro antibodies. Demographic and baseline information, including age, gender, disease duration, and clinical manifestations, were recorded. Laboratory data for anti-Ro antibodies were assessed using immunoblotting techniques. Additionally, 12-lead ECGs were performed to evaluate heart rhythm, the presence of arrhythmias, and other ECG abnormalities. ECG findings were then analyzed to assess any correlation with anti-Ro antibodies.

Statistical analysis: Data were analyzed using SPSS version 26. Descriptive statistics, including mean and standard deviation (SD), were used to summarize the data. The Shapiro-Wilk test was applied to assess data normality. For normally distributed data, independent samples t-tests were used to compare means, while for non-normally distributed data, the Mann-Whitney U test or Wilcoxon signed-rank test was applied. Chi-square tests were used to evaluate associations between categorical variables, and ANOVA was used for comparisons involving more than two means. A significance level of 0.05 was considered for all statistical analyses.

Results

A total of 85 patients were included in the study, with a mean age of 49 years (range: 41–57 years), and all were positive for anti-Ro antibodies.

ECG features and cardiac status: In this cohort, six patients (7.06%) exhibited sinus tachycardia, and one patient (1.18%) had premature ventricular contractions (PVC). Among the patients, 81.18% did not have QRS fragmentation, while 12.94% had fragmentation in the inferior region. Regarding ST changes, 69.41% of the patients showed no ST elevation, while the remainder presented positive changes in various regions. In terms of ST depression, 88.24% of the patients had normal results. Additionally, one patient had a right bundle branch block (RBBB), and one had a left bundle branch block (LBBB). Corrected QT intervals (QTc) were normal in 78.82% of the patients, while 9.41% had

shortened QTc, and 11.76% had prolonged QTc.

Comparison of age and qtc in patients with and without sinus tachycardia: Table 1 shows the independent t-test results comparing the mean age and QTc between patients with and without sinus tachycardia. The mean age for patients without sinus tachycardia was 48.81 years, with a standard deviation of 12.28 years, and for those with sinus tachycardia, it was 52.33 years (P = 0.496). No significant difference was found between the two groups in terms of age. Similarly, the QTc in patients without sinus tachycardia averaged 424.67 ms, while in those with sinus tachycardia, it was 446.50 ms (P = 0.073).

Table 1. Comparison of mean age and QT corrected between patients with and without sinus tachycardia.

Parameter	Sinus Tachycardia (-)	Sinus Tachycardia (+)	P-Value
Mean Age (years)	48.81 ± 12.28	52.33 ± 9.99	0.4
QT Corrected (ms)	424.67 ± 27.01	446.50 ± 44.32	0.07

Comparison of age and QTc in patients with and without PVC: As shown in Table 2, an independent t-test was conducted to compare the mean age and QTc between patients with and without PVC. The mean age for patients without PVC was 49.00 years, while the one with PVC was 54.00 years (P = 0.684). QTc in patients without PVC averaged 425.25 ms, while in patients with PVC, it was 507.00 ms (P = 0.004), indicating a significant difference in QTc between these two groups.

Table 2. Comparison of mean age and QT corrected between patients with positive and negative PVC.

Parameter	PVC (-)	PVC (+)	P-Value
Mean Age (years)	49.00 ± 12.18	54.00	0.6
QT Corrected (ms)	425.25 ± 27.50	507.00	0.004

Comparison of age and QTc in patients with and without QRS fragmentation: Table 3 compares mean age and QTc between patients with and without QRS fragmentation. The mean age in the group without fragmentation was 48.83 years, while 50.06 years in those with fragmentation (P=0.715). No significant difference was observed between the two groups in terms of age. Similarly, the QTc was 426.62 ms in the group without fragmentation and 424.44 ms in the group with fragmentation (P=0.786).

Table 3. Comparison of mean age and corrected QT between patients with positive and negative QRS fragmentation.

Parameter	Negative QRS Fragmentation (N=69)	Positive QRS Fragmentation (N=16)	P-Value
Mean Age (Years)	48.83 ± 12.68	50.06 ± 9.60	0.7
Corrected QT (ms)	426.62 ± 28.20	424.44 ± 31.80	0.7

Comparison of age and QTc in patients with and without ST elevation: The results in Table 4 indicate no significant difference in age and QTc between patients with and without ST elevation. The mean age was 48.90 years in the group without ST elevation and 49.42 years in the group with ST elevation (P = 0.855). The QTc was 425.81 ms and 427.12 ms in the groups without and with ST elevation, respectively (P = 0.849).

Table 4. Comparison of mean age and corrected QT between patients with positive and negative ST elevation.

Parameter	Negative ST Elevation (N=59)	Positive ST Elevation (N=26)	P-Value
Mean Age (Years)	48.90 ± 11.67	49.42 ± 13.32	0.8
Corrected QT (ms)	425.81 ± 29.82	427.12 ± 26.66	0.8

Comparison of age and QTc in patients with and without ST depression: As shown in Table 5, there were no significant differences between the patients with and without ST depression in terms of age or QTc. The mean age was 48.87 years in patients without ST depression and 50.50 years in those with ST depression (P = 0.691). QTc was 426.44 ms in the group without ST depression and 424.50 ms in the group with ST depression (P=0.842).

Comparison of age and QTc in patients with and without RBBB: Table 6 compares patients with and without RBBB. There was no significant difference in age between these two groups, with a mean age of 49.05 years in the group without RBBB and 50.00 years in the group with RBBB (P = 0.938). QTc was 426.62 ms in

Table 5. Comparison of mean age and corrected QT between patients with positive and negative ST depression.

Parameter	Negative ST Depression (N=75)	Positive ST Depression (N=10)	P-Value
Mean Age (Years)	48.87 ± 12.22	50.50 ± 11.87	0.6
Corrected QT (ms)	426.44 ± 29.98	424.50 ± 17.81	0.8

Table 6. Comparison of mean age and corrected QT between patients with positive and negative RBBB.

Parameter	Negative RBBB (N=84)	Positive RBBB (N=1)	P-Value
Mean Age (Years)	49.05 ± 12.19	50.00	0.938
Corrected QT (ms)	426.62 ± 28.67	392.00	0.233

patients without RBBB and 392.00 ms in patients with RBBB (P = 0.233).

Comparison of age and QTc in patients with and without LBBB: As shown in Table 7, no significant difference was found in age or QTc between patients with and without LBBB. The mean age in the group without LBBB was 48.85 years, while in the group with LBBB, it was 67.00 years (P=0.137). QTc was 426.10 ms in patients without LBBB and 436.00 ms in patients with LBBB (P=0.734).

Table 7. Comparison of mean age and corrected QT between patients with positive and negative LBBB.

Parameter	Negative LBBB (N=84)	Positive LBBB (N=1)	P-Value
Mean Age (Years)	48.85 ± 12.03	67.00	0.1
Corrected QT (ms)	426.10 ± 28.89	436.00	0.7

Comparison of age across QT corrected groups: Table 8 presents the independent t-test results comparing age across groups with short, normal, and prolonged QTc. The mean age was 47.00 years in the group with short QTc, 49.36 years in the group with normal QTc, and 48.70 years in the group with prolonged QTc (P = 0.872). There was no significant difference in age between these groups.

Table 8. Comparison of mean age between corrected QT groups.

Parameter	Short QT (N=8)	Normal QT (N=67)	Long QT (N=10)	P-Value
Mean Age (Years)	47.00 ± 14.15	49.36 ± 11.83	48.70 ± 13.57	0.8

Discussion

Our findings show that most patients exhibited normal ECGs. However, there were notable abnormalities, such as sinus tachycardia, PVC, and prolonged QTc intervals in a small subset of the cohort. These results provide further insight into the potential role of anti-Ro antibodies in cardiovascular manifestations in SLE, highlighting the need for continued monitoring of heart rhythm disturbances in these patients.

Sinus tachycardia was observed in 7.06% of patients in our study, though it was not significantly correlated with age or QTc. This result aligns with previous studies that suggest heart rate abnormalities, including sinus tachycardia, are relatively common in autoimmune diseases like SLE. However, its direct relationship with anti-Ro antibodies remains unclear. Additionally, one patient in our cohort exhibited PVC, which is also recognized as a potential arrhythmic events in SLE, albeit less commonly.

A key finding of this study is the QTc prolongation, with 11.76% of patients showing abnormal results. Prolonged QTc is a known risk factor for arrhythmias, including torsades de pointes, and has been observed in autoimmune diseases, including SLE. While we found no significant difference in QTc between the groups with and without other ECG abnormalities (such as sinus tachycardia, PVC, or bundle branch blocks), the high percentage of patients with prolonged QTc suggests a potential cardiac risk in anti-Ro-positive SLE patients that warrants further investigation.

The clinical implications of our study suggest that anti-Ro-positive SLE patients may be at an increased risk for developing ECG abnormalities, including prolonged QTc intervals, which can predispose them to potentially life-threatening arrhythmias[18-21]. Given the risk of arrhythmias, regular ECG screening should be considered as part of the routine monitoring for this patient population. Clinicians may also consider closely monitoring these patients for other cardiac complications, especially in prolonged QTc, which could require timely intervention to prevent adverse outcomes. Additionally, the findings highlight the need for personalized treatment strategies that take into account the potential cardiac risks associated with SLE, particularly in anti-Ro-positive individuals. Future studies should explore how specific therapies or management approaches may mitigate these risks and improve patient outcomes in SLE with a focus on cardiovascular health.

One limitation of this study is the lack of control over other contributing factors to ECG abnormalities, such as the use of medications (e.g., hydroxychloroquine or corticosteroids), renal involvement, or electrolyte imbalances, all of which can affect heart function in

SLE patients. Additionally, our cohort was exclusively anti-Ro positive, which limits the ability to compare with anti-La-negative SLE patients and may affect the generalizability of the findings.

Conclusion

Our study found some ECG abnormalities, including sinus tachycardia, PVC, and prolonged QTc, in anti-Ro-positive SLE patients, but these findings were not statistically significant. Despite the lack of significant associations, the presence of ECG abnormalities in this cohort still underscores the importance of regular cardiac monitoring in SLE patients, particularly those who are anti-Ro positive. Further research with larger sample sizes and longitudinal data is needed to understand potential cardiovascular risks better and refine the patient group's monitoring and treatment strategies.

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Conflict of interest

The authors further declare that they have no conflict of interest.

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