Patients with NSTEMI have prolonged QT as compared to patients with Unstable Angina

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No Conflict of Interest

Patients with NSTEMI have prolonged QT as compared to patients with unstable angina
Background

- Patients with Non ST Elevation Myocardial Infarction (NSTEMI) are at increased risk of cardiac death and subsequent infarctions, compared to patients with Unstable Angina Pectoris (UAP).

- An early diagnosis and treatment may improve outcome and reduce complications.
Objectives

We aimed to investigate if QT interval prolongation may differentiate between NSTEMI and UAP.
Patients with NSTEMI have prolonged QT as compared to patients with unstable angina.

**Methods**

- Patients hospitalized for NSTE-ACS were included in the study if they had at least three digitized ECG tracings*:
  - upon admission
  - after 24 hours
  - pre-discharge.

- **QTc measurements**:
  - QTc was calculated using the Bazett’s formula
  - QT intervals were measured in V5
  - Results were divided into deciles for further analyses.

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• Prolonged QTc was defined as ≥440 msec/√sec for males and ≥450 for females.

• Follow-up ECGs were recorded in the outpatients clinic at least 90 days after the event.
Study Population

• 2033 patients with NSTE-ACS were admitted to the cardiology department between 2006-2011.

• 802 patients had at least 3 digitized ECGs and comprised our study population.

• Patients were dichotomized to NSTEMI or UAP by troponin-I levels (0.08 μg/L).
### Baseline Patients Characteristics

<table>
<thead>
<tr>
<th></th>
<th>ALL 802</th>
<th>UAP 234 (29%)</th>
<th>NSTEMI 568 (71%)</th>
<th>p-value°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>210(26 %)</td>
<td>52 (25%)</td>
<td>158 (75%)</td>
<td>0.09</td>
</tr>
<tr>
<td>Age ≥ 65 years</td>
<td>449(55%)</td>
<td>106(24%)</td>
<td>343 (76%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hypertension</td>
<td>541 (67%)</td>
<td>172 (32%)</td>
<td>369 (68%)</td>
<td>0.02</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>301 (37%)</td>
<td>91 (30%)</td>
<td>210 (70%)</td>
<td>0.641</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>493 (61%)</td>
<td>172 (35%)</td>
<td>321 (65%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Family History of IHD</td>
<td>171 (21%)</td>
<td>70 (41%)</td>
<td>101 (59%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Smoker</td>
<td>309 (38%)</td>
<td>102 (33%)</td>
<td>207 (67%)</td>
<td>0.065</td>
</tr>
</tbody>
</table>

° Chi-square test

Patients with NSTEMI have prolonged QT as compared to patients with unstable angina
Mean QTc levels (msec/√sec) were 427 ± 43 in V5 and 427 ± 43 in V3.

A high correlation was found between the two leads.

Therefore V5 only was used for analyses.

Patients with NSTEMI have prolonged QT as compared to patients with unstable angina.
### Results – QTc in NSTEMI vs. UAP

<table>
<thead>
<tr>
<th></th>
<th>All n=802</th>
<th>UAP n=234</th>
<th>NSTEMI n=568</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1st ECG</strong></td>
<td>424.6±41</td>
<td>411.1±32</td>
<td>430.1±42</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>2nd ECG</strong></td>
<td>426.6±44</td>
<td>414.1±35</td>
<td>432.5±45</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>3rd ECG</strong></td>
<td>420.8±40</td>
<td>411.5±36</td>
<td>424.9±41</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Patients with NSTEMI have prolonged QTc as compared to patients with unstable angina.
Patients with NSTEMI have prolonged QT as compared to patients with acute coronary syndrome without MI.
**Multivariate Analysis: Independent Predictors for NSTEMI**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>OR</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age over 65 years</td>
<td>1.52</td>
<td>1.05 - 2.21</td>
<td>0.027</td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.50</td>
<td>0.34 - 0.74</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>0.48</td>
<td>0.34 - 0.69</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Family history</td>
<td>0.61</td>
<td>0.41 - 0.91</td>
<td>0.017</td>
</tr>
<tr>
<td>QTc prolongation in 1st ECG</td>
<td>2.43</td>
<td>1.61 - 3.69</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Multivariate logistic model with NSTEMI as a dependent variable and QTc prolongation in 1st ECG as explanatory variable, adjusted for age, gender, hypertension, hyperlipidemia, diabetes mellitus, family history of ischemic heart disease and smoking.

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Mechanism of QT prolongation:

- ???
- Damage to subendocardial layer and exposure of M cells which cause prolongation of repolarization.
- Abnormal sensitivity to catecholamine.
- Parasympathetic effect
- Abnormal calcium influx during action potential
Conclusions

• QTc prolongation in the first ECG in the emergency ward, usually obtained before the results of Troponin levels, contributes to an early diagnosis of NSTEMI versus UAP.

• These results may have important implications regarding revascularization strategy in these patients.

• Further studies are needed to confirm our findings.