The relevance of a junctional rhythm during neurocardiogenic reaction provoked by tilt testing

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Junctional rhythm

Occurrence of:

- Slowing of the sinus rhythm
- Acceleration of the subsidiary cells located in the atrioventricular node
- Both mechanisms
Lessons from previous studies

- Mehlsen et. al.: TT 60deg/20 min NTG: asystole was preceded by junctional rhythm in 10 and followed by junctional rhythm in 24 pts out of 70 subjects with a pause
- Oh J. et al.: TT 70deg/30min ISO: 32.2% junctional rhythm in positive response, 5.9% in negative response
Lessons from previous studies

- Carliaz et al.: 60°/30min ISO: 11 pts (61.5% of pts with positive TT) had junctional escape rate: 3 of them had rate<30 bpm, 8 of them had „very rapid junctional rate”
- Kim et al.: 70°/30min ISO: 547 pts had bradyarytmias (498 pts (92%) junctional rhythm, 28 pts a pause)
The aim of the study

- to assess whether the presence of junctional rhythm (JR) and its occurrence with or without a pause (P) during TT is related to:
  - clinical outcome of tilt testing (TT) (presyncope, syncope)
  - demographics and clinical characteristics
Material

- 532 patients aged 43.3+/-18.2 with positive TT
- 46 subjects aged 38.9+/-13.9 with negative TT and negative Hx (control negative group)
- Four groups of pts according to the rhythm during neurocardiogenic reaction:
  Group 1 - nodal rhythm present, a pause absent,
  Group 2 - nodal rhythm and a pause present,
  Group 3 - nodal rhythm absent, a pause present,
  Group 4 - nodal rhythm and a pause absent.
Methods

- TT according to italian protocol with NTG provocation if necessary
- Holter monitoring during entire procedure et at least 10 min after TT termination
- ECG and BP monitoring
Junctional rhythm before a ventricular pause
Junctional escape rhythm after a ventricular pause

* the sixth beat is an escape-capture beat
Junctional rhythm after sinus rhythm slowing at neurocardiogenic reaction; no ventricular pause.
25-year-old man with numerous presyncope but no syncope in medical history during TT presyncope with junctional rhythm occurred at sixth minute of TT; BP dropped to 91/80 mmHg, 5 min later BP was 73/53 mmHg; very intense prodromal symptoms
The same patient as in previous figure at night has even higher sinus rhythm slowing than during neurocardiogenic reaction but no junctional rhythm occurred.
Atropine administration because of prolonged hypotonia and bradycardia after neurocardiogenic reaction
## Results 1. Demographics and medical history

<table>
<thead>
<tr>
<th></th>
<th>Group 1 JR+ P- n=74</th>
<th>Group 2 JR+P+ n=101</th>
<th>Group 3 JR- P+ n=69</th>
<th>Group 4 JR-P- n=288</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AGE (years)</strong></td>
<td>37.3±16.3</td>
<td>41.4±14.4</td>
<td>41.7±16.8</td>
<td>45.8±18.9</td>
</tr>
<tr>
<td><strong>Female (%)</strong></td>
<td>60</td>
<td>58</td>
<td>69</td>
<td>67</td>
</tr>
<tr>
<td><strong>Syncope spell (median IQ)</strong></td>
<td>2.5 (1-6)</td>
<td>4 (2-12)</td>
<td>4 (2-10)</td>
<td>2 (0-5)</td>
</tr>
<tr>
<td><strong>Traumatic injuries (%)</strong></td>
<td>22#</td>
<td>45</td>
<td>39</td>
<td>27</td>
</tr>
<tr>
<td><strong>IIB (%)</strong></td>
<td>28</td>
<td>34</td>
<td>23</td>
<td>13</td>
</tr>
</tbody>
</table>

*-p<0.05 vs group 4; #- p < 0.05 vs group 2 and 3
Results 2. TT course and result; (* - p<0.05 vs group 2,3,4)

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</tr>
</thead>
<tbody>
<tr>
<td>NTG use (%)</td>
<td>81</td>
<td>73</td>
<td>78</td>
<td>86</td>
</tr>
<tr>
<td>syncope vs presyncope (%)</td>
<td>81* vs 19</td>
<td>96 vs 4</td>
<td>94 vs 4</td>
<td>62 vs 38</td>
</tr>
<tr>
<td>VASIS I (%)</td>
<td>81</td>
<td>0</td>
<td>0</td>
<td>83</td>
</tr>
<tr>
<td>VASIS II (%)</td>
<td>19*</td>
<td>100</td>
<td>100</td>
<td>7</td>
</tr>
<tr>
<td>VASIS III (%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>
Result 3. Control negative group

Sinus rhythm and no pause and junctional rhythm during entire examination
Mean junctional rate in Group 1 and Group 2

Group 1: P<0.01

Group 2:
Timing of JR occurrence in Group 2 (JR+P+)

JR - junctional rhythm; P - ventricular pause
Average pause duration in Group 2 (JR+P+) and Group 3 (JR-P+)

P<0.05
Receiver-operator curve (ROC) analysis; The junctional rate ≤ 49 bpm predicts loss of consciousness during TT.
Junctional rhythm during neurocardiogenic reaction

- **After moderate sinus rate slowing (Group 1):**
  - Imbalance of parasympathetic activation of sinoatrial and atrioventricular node
  - Co-activation of parasympathetic and sympathetic nervous system with prevalence of sympathetic activation of AV node and parasympathetic suppression of SA node
  - Subsidiary pacemaker remains parasympathetically suppressed

- **In the case of prolonged pause (Group 2):**
  occurrence of the escape rhythm which is slower than expected, due to the parasympathetic suppression and after atropine administration accelerates
Conclusions

1. Junctional rhythm occurs in 32% of positive TT

2. Relatively rapid, stable junctional rhythm during TT is associated with retaining consciousness; it may increase blood pressure through the heart rate increase or its presence may be a sign of lower vasodilatation.
3. Patients with stable junctional rhythm during neurocardiogenic reaction induced by TT have less syncopal spells and rarer sustain traumatic injuries related to syncope.

4. Ageing may decrease the ability to produce junctional rhythm during neurocardiogenic reaction but also decreases the susceptibility to the pause induction.
Clinical implications of the appearance of junctional rhythm during TT

- Junctional rhythm during TT with NTG provocation if necessary is related with neurocardiogenic reflex provocation
- Junctional rhythm during TT may be a criterion for TT termination at presyncope
- Beta-blockers should be used with caution in patients with junctional rhythm and presyncope at TT
THANK YOU FOR YOUR ATTENTION