Melatonin Prevented Early Activation Slowing and Ventricular Fibrillation in a Porcine Model of Acute Myocardial Ischemia

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Methods

40 minutes LAD occlusion in anesthetized pigs (n=25)

- Melatonin group: I.V. injection of melatonin (4 mg/kg) at the 1st minute of ischemia (n=12)
- Control group: I.V. injection of saline at the 1st minute of ischemia (n=13)

Recordings were done at baseline and at 1, 2.5, 5, 10, 15, 20, 25, 30, 35, 40 min of coronary occlusion

- Myocardial electrophysiological parameters:
  - Activation time (AT)
  - Repolarization time (RT)
  - Activation-repolarization intervals (ARI)

- ECG parameters:
  - QRS duration
  - Tpeak-Tend

Ischemia induced changes of myocardial (AT in the interventricular septum (IVS) base and DOR) and ECG (QRS and Tpeak-Tend) parameters in the control (blue) and melatonin-treated (green) animals. * - p<0.05 for ischemia-related changes; § - p<0.05 between the control and melatonin groups.

Melatonin treatment blunted the early AT delay in the IVS and QRS duration and prevented 1A phase VF. DOR and Tpeak-Tend predicting 1B phase VFs were not modified by melatonin, and 1B phase VFs were not prevented by melatonin.

Results

During acute myocardial ischemia, a total of 13 animals experienced VF (control – blue, melatonin – green). VF episodes clustered in early (1–5 min, five cases) and delayed (17–40 min, eight cases) phases, which are referred to as 1A and 1B phase, respectively:

The myocardial electrophysiological and ECG parameters were shown to predict VF in logistic regression analysis:

<table>
<thead>
<tr>
<th>Predictors</th>
<th>OR (95% CI) and p</th>
<th>OR (95% CI) and p</th>
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<tbody>
<tr>
<td></td>
<td>Early VF</td>
<td>Delayed VF</td>
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<tr>
<td>AT delay</td>
<td></td>
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<td>Myocardial</td>
<td>1.049 (1.018 – 1.080); p=0.002</td>
<td>1.071 (1.023 – 1.121); p=0.003</td>
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<tr>
<td>DOR</td>
<td>1.015 (1.005 – 1.026); p=0.003</td>
<td>1.020 (1.005 – 1.036); p=0.010</td>
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<tr>
<td>QRS</td>
<td>1.040 (1.002 – 1.080); p=0.038</td>
<td>NS</td>
</tr>
<tr>
<td>ECG</td>
<td>Tpeak-Tend</td>
<td></td>
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<td>1.025 (1.003 – 1.048); p=0.027</td>
</tr>
</tbody>
</table>

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Conclusion

Melatonin attenuated ischemia-related increases in the duration of myocardial activation and thereby prevented early but not delayed VF development.