Effects of Dexmedetomidine on the QT Interval in Pediatric Patients

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Introduction
Dexmedetomidine is an α2-adrenergic agonist that is being used with increasing frequency in pediatric patients. It has several desirable properties such as sedation, minimal respiratory effects, and decreased analgesic requirements. The primary drawback of dexmedetomidine is its complex cardiovascular effects of hypertension, hypotension, and bradycardia. Although it has been shown to have anti-arrhythmic properties, its effects on the QT interval have not been conclusively studied. The current study evaluates the effect of dexmedetomidine on the QT interval in the pediatric population.

Methods
This study was approved by the IRB of Nationwide Children’s Hospital. It was a prospective, case-controlled study consisting of two groups: dexmedetomidine (D) and control (C), based on whether the anesthetic technique was to include dexmedetomidine.

Three ECG’s were obtained on each patient at fixed time intervals:
1. A baseline ECG (T1) prior to anesthetic induction
2. After the induction of general anesthesia and placement of an IV cannula with end-tidal sevoflurane = 4-5% (T2)
3. 2-3 minutes after the administration of 0.5 µg/kg of dexmedetomidine (T3D) in the D group and in the C group, 2-3 minutes after placement of an IV cannula (T3C). In both of these groups, the end-tidal sevoflurane was maintained at 4-5%.

No other medications were administered during the study period.

Statistical analysis included an analysis of variance.

Results
The study cohort included 28 patients ranging in age from 1.6 to 16 years (8.2 ± 4.3 years). There were 13 patients in group C and 15 in group D. There were no differences in the demographics between the 2 groups.

In both groups, there was progressive lengthening of the QTc during the administration of sevoflurane (T2 or T3C versus T1, P<0.05).

There was a decrease in the QTc duration following the administration of dexmedetomidine when compared to the prior ECGs (T3D versus T1 and T2). The QTc of the dexmedetomidine group was also less than that in the control group at point 3 (T3D versus T3C, P<0.05) (Table 1).

Discussion
1. There a progressive lengthening of the QT interval following the administration of sevoflurane.
2. The QTc returned to baseline (awake) values following dexmedetomidine.
3. Given its complex effects on the conduction system, it is unknown if this accounts for the anti-arrhythmic effects of dexmedetomidine.
4. Dexmedetomidine decreases the QTc in pediatric patients undergoing general anesthesia.
5. Our data suggest that there are no concerns using dexmedetomidine in patients with congenital or acquired QT prolongation.

<table>
<thead>
<tr>
<th>Group</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
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<tbody>
<tr>
<td>Dexmedetomidine</td>
<td>424</td>
<td>14</td>
<td>431 27*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>420 17</td>
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<td>Control</td>
<td>417</td>
<td>17</td>
<td>425 20*</td>
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<tr>
<td></td>
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<td>429 24*</td>
</tr>
</tbody>
</table>

*P<0.05 versus baseline; *P=NS versus baseline and P<0.05 versus T3C.

References