Counterintuitively, Higher Continuous Infusion Rate of Dexmedetomidine Shows the Tendency to Retain Both Hypoglossal and Phrenic Nerve Activities Compared to Lower Rate in Anesthetized Rabbits.

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- DISCLOSURE: The authors have declared no conflict of interests. -
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Overview of Our Experiment

At SASM 2015, we have reported that bolus injections of dexmedetomidine (Dx) induce balanced inhibition in hypoglossal and phrenic nerve activities (HGA and PNA). It’s thought to be one of the main reasons for sedation with Dx achieved without serious pharyngeal collapse.

This time, we have studied the effects of continuous infusion of Dx on HGA and PNA in anesthetized rabbits.

We found that the high infusion rate of Dx more preserved respiratory-related nerve activity compared to the lower.
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How did we Examine the Effects of Dx on “Respiratory-Related Nerve Activity”?

We estimated the effects of two infusion rates of Dx on HGA and PNA (Low Rate; 10 mcg/kg/hr., Dx10, n=6: High Rate; 30 mcg/kg/hr., Dx30, n=5) until 10 mcg/kg Dx was reached, or severe hypotension would occur. We measured the root mean square (RMS) on the integrated neurogram before and after Dx infusion (control, 2.5, 5.0, 7.5 and 10.0 mcg/kg in total). To compare the respiratory effects of Dx on HGA and PNA, percentage changes in RMS were calculated using a value of 100% for the activity before Dx infusion (control).

Rabbits Sample Size: n=11
Anesthetized with sevoﬂurane, N2O, O2 to prevent any nociceptive pain
Pancronium-Paralyzed
Mechanically Ventilated to keep CO2 constant and avoid hypoxia
Bilaterally Vagotomized to interrupt pulmonary reflex

HGA : Hypoglossal Nerve Activity, keeping upper airway patency
PNA : Phrenic Nerve Activity, making inspiratory negative force
Dx10: 10 mcg/kg/hr. (Low Infusion Rate of dexmedetomidine)
Dx30: 30 mcg/kg/hr. (High Infusion Rate of dexmedetomidine)

Dx10 or Dx30 Continuous Infusion
Dosage Levels

Start
End

HGA
PNA
Int.HGA
Int.PNA
ECG
ABP

1 sec

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Results: Unexpected Consequences!
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**HGA**

<table>
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<th>control</th>
<th>60sec.</th>
<th>5'</th>
<th>10'</th>
<th>15'</th>
<th>20'</th>
<th>25'</th>
<th>30'</th>
<th>35'</th>
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<th>50'</th>
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<tbody>
<tr>
<td>Dx10: n=6</td>
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<td>97.2</td>
<td>94.1</td>
<td>94.2</td>
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<td>79.9</td>
<td>76.9</td>
<td>72.7</td>
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<td>64.1</td>
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<tr>
<td>Dx30: n=5</td>
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<td>99.5</td>
<td>94.2</td>
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<td>88.9</td>
<td>83.2</td>
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**PNA**

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Conclusions and Implications

At the same dosage of Dx the **Higher** infusion rate of Dx preserved respiratory activities more than the Lower one, which may be attributed to **time**-dependent changes in the effects of Dx.
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So our finding may help us to better understand the clinical practice of Dx sedation. However, there is insufficient evidence concerning optimal infusion rates of Dx for the induction, and thus may not be directly applicable to humans.

That’s all. Thank you for your attention.