

## Title: Incidence of Bradycardia during Induction with Sevoflurane in Children with Down Syndrome

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**Introduction:** Most children presenting for elective surgical procedures at CHOP have anesthesia induced with an inhaled volatile agent. Inhaled anesthetics have well-described cardiovascular depressant effects.<sup>1</sup> Anesthesia induction with sevoflurane produces less severe cardiovascular depressant effects than its predecessor, halothane.<sup>1</sup> Consequently, halothane has been supplanted by sevoflurane as the volatile anesthetic of choice for inhaled anesthetic induction in children. The incidence of bradycardia in association with inhaled anesthetic induction in children with Down syndrome was reported as being 3.7% by Borland *et al* in 2004.<sup>2</sup> However, this study focused on patients receiving halothane and isoflurane. While hemodynamically significant bradycardia occurring in this population with sevoflurane induction has been reported,<sup>3</sup> its incidence is presently unknown.

Our primary hypothesis is that the incidence of bradycardia with sevoflurane induction is greater in children with Down syndrome than in healthy children.

**Methods:** The study was a retrospective review of electronic anesthesia record data. All anesthetic encounters with patients with Down syndrome who presented from 1/1/1998 to 11/15/2006 for general anesthetics at The Children's Hospital of Philadelphia or one of its satellite ambulatory surgery facilities were eligible for study. Anesthetic encounters over the same time period in age-matched healthy children (ASA physical status I) served as controls. Only encounters in which patients had inhaled anesthetic induction with sevoflurane were studied. The electronic anesthesia records (CompuRecord) reviewed contained data stored in fifteen second intervals. The time period starting sixty seconds prior to the start of anesthetic induction up to six minutes following the start of anesthetic induction was studied. Preoperative vital signs and demographic data were also recorded. The use of anticholinergic premedication, its dose, and route of administration were recorded. Heart rate and blood pressure over the study interval were recorded in all patients. Bradycardia was defined by age group as follows:

- Infants (<1 year) <100 bpm
- Ages 1-2 years <90 bpm
- Ages 3-5 years <80 bpm
- Ages 6-12 years <70 bpm
- Ages 13-18 years <60 bpm

Children were determined to be bradycardic if the above criteria were met for 30 seconds or more. In children experiencing bradycardia, inhaled anesthetic dosages as well as treatment strategies and their efficacy were recorded.

**Results:** We reviewed 50 encounters of children with down syndrome and 50 encounters of age-matched healthy controls. The incidence of bradycardia in the study group was 52% (26/50) and 16% (8/50) in the control group. In the study group, bradycardia occurred an average of 103± 48 seconds (range 30-180 seconds) after the start of anesthetic induction. Treatment strategies in this group included decreasing the inspired sevoflurane concentration 19 patients (74%), IM atropine 3 patients (12%), IV atropine 4 patients (15%), IV glycopyrrolate 1 patient (4%), and no intervention in 5 patients (19%). In the control group, treatment strategies included decreasing inspired sevoflurane concentration in 3 patients (38%) and no treatment in 5 patients (62%). No patient in the control group had bradycardia treated with an anticholinergic. No patient in the study or control group received anticholinergic premedication.

**Discussion:** We found the incidence of bradycardia during inhaled induction of anesthesia with sevoflurane in children with down syndrome to be 52%. The incidence in healthy age-matched controls was 16%. This is considerably higher than the incidence of this complication previously described with halothane.

### References:

1. Kataria B, Epstein R, Bailey A *et al*. A comparison of sevoflurane to halothane in paediatric surgical patients: results of a multicentre international study. *Paediatr Anaesth* 1996; 6: 283-92.
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3. Roodman S, Bothwell M, Tobias JD. Bradycardia with sevoflurane induction in patients with trisomy 21. *Paediatr Anaesth* 2003; 13: 538-40.