Cardiac Arrest in a Child with Down Syndrome and Sub-optimally Treated Hypothyroidism
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Epidemiology

- Trisomy 21: most common autosomal abnormality
- Incidence: 1 case in 800 live births; 6000 children/yr
- Accounts for 1/3 of all moderate and severe mental handicaps in school-aged children.
- Early research questioned hypothyroidism as cause
  - 1896, Telford Smith reported that giving thyroid hormone replacement “improved physical and mental conditions” of Down syndrome patients

Pertinent Characteristics and Anesthetic Considerations

- HEENT: micrognathia, macroglossia, subglottic stenosis
- OSA: increased airway resistance, pulmonary hypertension
- Hearing loss and recurrent ear infections
- CNS: cognitive impairment ranging from mild to severe
- Resp: increased risk of respiratory infections, post-extubation stridor
- Cardiac: congenital heart disease, i.e. ASD, VSD, AV canal defects
- Endocrine: hypothyroidism, growth retardation, insulin resistance
- GI: duodenal atresia, hirschprung disease, celiac’s disease
- MSK: short stature, hip dysplasia
- Atlanto-occipital and atlanto-axial instability
- Heme-onc: increased risk of leukemia

Hypothyroidism in the Down Syndrome patient

- Early screening via newborn screen in all states
- Elusive physical diagnosis given overlap of salient features

Case Description

- 5 year old female with chronic otitis media for bilateral myringotomy surgery
- Pertinent Hx:
  - 4 month old developmental capabilities
  - OSA on CPAP
  - Seizures on maintenance medications
  - Hypothyroidism - recently diagnosed and started on low dose Synthroid.
- Anesthesia team requested to draw TSH/T4 intraoperatively per PMD request
- Pre-operative Assessment
  - Vital signs: T 95.9, P 75, BP 110/90, 97% ORA
  - Appearance: well nourished, lethargic

Intraoperative and Post-operative course

- Inhalational Induction with Oxygen, Nitrous Oxide, and Sevoflurane
- Sevoflurane started at 2%, incrementally increased every 4-6 breaths
- Sudden decline in heart rate from 85 to 45, noted at 4% sevoflurane
- Atropine IM given, followed by immediate chest compressions
- Difficult IV access
- Immediate tracheal intubation; Epinephrine given via ETT
- Immediate increase in heart rate; spontaneous circulation restored
- PIV access secured
- Patient taken to PICU intubated
- Labs pertinent for TSH 11.4 (range 0.3-3 U/L)
- Patient extubated and discharged thereafter with endocrine follow-up for Synthroid titration

Discussion

- Bradycardia is a well known phenomenon concerning inhalational inductions using Sevoflurane in the Down Syndrome population
- Given the relative bradycardia caused by hypothyroidism in a patient with TSH levels nearly 4x the upper limit of normal, one should consider the additional risk of suboptimal thyroid function to the aforementioned risk of perioperative cardiac events

Future Considerations

- Should routine thyroid function tests be a part of the preoperative assessment in Down syndrome patients?
- How should anesthetic induction be altered in Down Syndrome patients noted to have suboptimal thyroid function?

References