COMMON PROCEDURES
IN CHILDREN

BAPA Refresher Course 2015
Dr Noël Emmanuel
CHU TIVOLI
I.V. or Inhalation induction

PRO–CON DEBATE

Pro–con debate: intravenous vs inhalation induction of anesthesia in children

THE CASE FOR INTRAVENOUS INDUCTION
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THE CASE FOR INHALATION INDUCTION
Helen Holtby
Department of Anaesthesia and Pain Medicine, Hospital for Sick Children, Toronto, ON, Canada

Pro–Con Debate
Inhalational anesthesia vs total intravenous anesthesia (TIVA) for pediatric anesthesia

JERROLD LERMAN MD FRCPC FANZCA* AND MARTIN JÖHR MD†
Ideal induction

- Safe
- Painless
- Smooth
- Quick
- Friendly
- No circulatory or respiratory disturbances
- Associated with less postoperatives complications: vomiting, delirium, ...
No choice

**IV**
- Full stomach
- Malignant hyperthermia
- Muscular dystrophy (probably)
- Inappropriate delivery system
- < 1 Month(!)
- Child’s preferences

**Volatile**
- Absence of available veins
- Difficult airway
- Child’s preferences
Key arguments in favor

I.V.

- Fear of mask
- Bad smell
- Rapid onset
- Reduced PONV
- No epileptiform EEG activity
- Quality of emergence
- Less pollution
- Limited access to airway
- Remote locations

inhalation

- Painless
- Increments
- Reversible
- Difficult airway
- Fear of needle
- Less manual dexterity
- Less individual variability
Anesthesia-related neurotoxicity
Neurotoxicity

Pediatric Anesthesia

REVIEW ARTICLE

Anesthesia-related neurotoxicity and the developing animal brain is not a significant problem in children

Tom G. Hansen¹²

Currently, there is no need to change current anesthetic clinical practice or to postpone or cancel truly urgent surgeries in young children.
Anesthesia-related neurotoxicity
ENT Surgery

- Myringotomy and insertion of ear tubes
- Tympanoplasty
- Otoplasty
- Tonsillectomy and adenoidectomy
- Nasal and sinus surgery
- Laryngoscopy and bronchoscopy
Myringotomy and ear tubes

• Inhalation anesthetics
• N2O
• I.V. access? Not routinely in U.S.
• Good airway management (adenoidal hypertrophy)
• Pain management: Arnold block, pre-operative analgesia
Auricular branch of the vagus nerve
Tonsillectomy and adenoidectomy

- Most common procedures
- Pain and nausea management
- Corticoids?
- NSAIDS?
- OSA
Tonsillectomy and adenoidectomy

• Tonsillectomy: first described in 1000 BC
• Common procedures: 3-10Y (90%<15Y)
• Risks procedures:
  – Bleeding (< 10 d.)
  – Airway obstruction
  – OSA
  – Share airway
  – Death or neurologic injury
Airway management

LMA

• Paralysis not required
• Smooth emergence
• Minimize trauma airway
• May impair surgical access
• Less secure airway

Tracheal tube

• More secure airway
• Good surgical access
• Risk of airway trauma
• Complications of extubation
Analgesia

• Depending on surgical technique used: diathermy, cold dissection,...
• Intraoperative opiates: fentanyl, sufentanyl
• Paracetamol: IV or oral before operation
• Dexamethasone
• NSAIDS
• Infiltration of L.A. of tonsillar beds (not effective)
Surgical techniques

Guillotine versus dissection tonsillectomy: randomised, controlled trial.

Frampton SJ, Ward MJ, Sunkaraneni VS, Ismail-Koch H, Sheppard ZA, Salib RJ, Jain PK.
NSAIDS

A 2013 updated systematic review & meta-analysis of 36 randomized controlled trials; no apparent effects of non steroidal anti-inflammatory agents on the risk of bleeding after tonsillectomy.

Lewis SR1, Nicholson A, Cardwell ME, Siviter G, Smith AF.

• Cochrane Database Syst Rev. 2013 Jul

Nonsteroidal anti-inflammatory drugs and perioperative bleeding in paediatric tonsillectomy.

Lewis SR1, Nicholson A, Cardwell ME, Siviter G, Smith AF.
PONV

• Incidence high: 70%
• Minimizing starvation
• Avoiding N2O
• Prophylactic antiemetics
  – Dexamethasone: 0,1-0,5 mg/kg
  – Ondansetron: 0,1-0,2 mg/kg
  – Combination
Perioperative corticoids?

- Recommended by AA of otolaryngology
- Improve pain control
- Reduce airway swelling
- Faster return to diet
- Reduce PONV
- Risk for hemorrhage increased?
Effect of dexamethasone on nausea, vomiting, and pain in paediatric tonsillectomy

V. Hermans¹*, F. De Pooter¹, F. De Groote¹, S. De Hert² and P. Van der Linden¹

** Fig 2 ** Incidence of early (day of surgery or postoperative day (D1)] and late (D2) PONV in the three study groups. **P<0.01 vs placebo group.

** Fig 3 ** Incidence of severe postoperative pain during the study period in the three groups. PACU, upon arrival in the post-anaesthesia care unit; PACU +30 min and PACU +90 min, 30 and 90 min after admission to the PACU; D0 evening, the evening of the surgery; D1 and 2, postoperative days 1 and 2. **P<0.01 vs placebo group.
Corticoids and bleeding

Dexamethasone and risk of bleeding in children undergoing tonsillectomy.

The steroid controversy: where are we?
Keller M1, Brigger MT.

Perioperative dexamethasone administration and risk of bleeding following tonsillectomy in children: a randomized controlled trial.
OSA

• Common indication in younger child
• Symptoms
  – Heavy snoring
  – Apnea
  – Extended neck extension during sleep
  – Daytime hypersomnolence
  – Behaviour problems
  – Cor pulmonale: rare
OSA

• Higher incidence postoperative complications
• 16-27%>1%

• Complications:
  – Desaturation
  – Laryngospasm
  – Airway obstruction (induction)
  – Increased to respiratory depression effect opioids, sedatives
  – Death or neurologic injury
OSA pre-operative assessment

- History, physical examination (obesity)
- Nocturnal polysomnography: gold standard
- Overnight oximetry: McGill Oximetry Score
- Polycythemia, ECG: long standing OSA
- Audio/video tape

- NO snoring ≠ NO sleep disordered breathing
Management

• Risk factors:
  – Age <3y
  – Medical comorbidities (obesity)
  – OSA

• Hospital stay
• Monitoring
• Adjust opioids dosage!!
## Insufflation vs intubation during esophagogastroduodenoscopy in children

**CLIFFORD O. HOFFMANN MD**, **PAUL J. SAMUELS MD**,

Distribution of airway adverse events by treatment group for subjects not receiving midazolam premedication

<table>
<thead>
<tr>
<th>Event</th>
<th>Intubation</th>
<th>Insufflation</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 93 Group A</td>
<td>N = 92 Group D</td>
<td>N = 175 Group I</td>
<td></td>
</tr>
<tr>
<td>Desaturation &lt;95%</td>
<td>3.2%</td>
<td>4.3%</td>
<td>9.1%</td>
</tr>
<tr>
<td></td>
<td>4.3%</td>
<td>2.2%</td>
<td></td>
</tr>
<tr>
<td>Laryngospasm</td>
<td>0.5%</td>
<td>0%</td>
<td>3.4%</td>
</tr>
<tr>
<td></td>
<td>0%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Any airway adverse event</td>
<td>6.5%</td>
<td>7.5%</td>
<td>12.1%</td>
</tr>
<tr>
<td></td>
<td>7.5%</td>
<td>5.4%</td>
<td></td>
</tr>
</tbody>
</table>
Airway management

- Intubation
- LMA
- Proseal LMA (drain tube)
- Nasal cannula
- Endoscopic mask
Our practice

• > 12 Y
• Infant< 3-4 m.: without anesthetist.
• Difficult airway, interventional P., GERD: intubation

• Simple procedures:
  – Inhalation sevo.
  – Iv line
  – Shift to propofol
  – Spontaneous breathing
  – Small size of the endoscope
Complications

• Desaturation
• Cough
• Laryngospasm
• Aspiration?
• Rescue intubation: rare
• Operator-dependent
Abdominal and urologic surgery

- Inguinal and umbilical herniorrhaphy
- Orchidopexy
- Laparoscopy
- Circumcision
- Cystoscopy
- Hypospadias
- Ureteral reimplantation
Preterm infants

- Inguinal herniorrhaphy
- Risk operative and postoperative apnea < 60 PCA
- Awake spinal or caudal anesthesia (emla)
- RA with GA or sedation
- GA
Classification

- Late-preterm: 34 to 36 weeks’ gestation
- Moderate prematurity: 32 to 33 w
- Severe prematurity: 28 to 31 w
- Extreme Prematurity: < 28 w
Caudal anesthesia and GA
• Apnea: 7/91 during operation
• Apnea + desaturation: 1/7
• Apnea + desaturation + bradycardia: 3/7
• Bradycardia in recovery room: 2/7
• Bradycardia at feeding: 1/7
Caudal anesthesia and GA

• Cochrane Database Syst Rev. 2003

• Regional (spinal, epidural, caudal) versus general anaesthesia in preterm infants undergoing inguinal herniorrhaphy in early infancy.

  • Craven PD1, Badawi N, Henderson-Smart DJ, O'Brien M.
Caudal anaesthesia under sedation: a prospective analysis of 512 infants and children


512 children: 45.5% preterm, 9.2% < 46 PCA
Iv sedation: nalbuphine, propofol: bolus and continuous
Adverse events not higher in the group op. < 46PCA
No correlation between continuous inf. and incidence of AE
No correlation between coexisting disease and incidence of AE
<table>
<thead>
<tr>
<th>Spinal block</th>
<th>Caudal block</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Beter motor block</td>
<td>• Longer duration block</td>
</tr>
<tr>
<td>• Short duration: clonidine?</td>
<td>• Common block</td>
</tr>
<tr>
<td>• Caudal block for POA</td>
<td>• L.A high dosage</td>
</tr>
<tr>
<td>• Higher incidence of failed blocks: 16-19%</td>
<td>• Ultrasonography</td>
</tr>
<tr>
<td>• GA as rescue: higher risk.</td>
<td>• Less motor block</td>
</tr>
</tbody>
</table>
Caudal with sed. or G.A.

- caudal easier to perform
- Less stress child
- Surgeon happy
- Less vessels puncture
Risks factors

- Bronchopulmonary dysplasia
- Apnea
- PDA
- Birth weight <1,5 KG
- PCA <60 Weeks
- Neurologic disorders
Caudal block and light anesthesia

- Safe alternative to awake spinal or caudal anesthesia
- Post-operative monitoring
- Neurotoxicity??
Dental procedures

- Physically handicapped patients
- To young to cooperate
- Syndromes and cardiac malformations
# Endocarditis guidelines prophylaxis

## Table 4  Cardiac conditions at highest risk of infective endocarditis for which prophylaxis is recommended when a high risk procedure is performed

<table>
<thead>
<tr>
<th>Recommendations: prophylaxis</th>
<th>Class(^a)</th>
<th>Level(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antibiotic prophylaxis should only be considered for patients at highest risk of IE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Patients with a prosthetic valve or a prosthetic material used for cardiac valve repair</td>
<td>III</td>
<td>C</td>
</tr>
<tr>
<td>2. Patients with previous IE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Patients with congenital heart disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. cyanotic congenital heart disease, without surgical repair, or with residual defects,</td>
<td>Ila</td>
<td>C</td>
</tr>
<tr>
<td>palliative shunts or conduits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. congenital heart disease with complete repair with prosthetic material whether placed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>by surgery or by percutaneous technique, up to 6 months after the procedure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. when a residual defect persists at the site of implantation of a prosthetic material or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>device by cardiac surgery or percutaneous technique</td>
<td></td>
<td></td>
</tr>
<tr>
<td>**Antibiotic prophylaxis is no longer recommended in other forms of valvular or congenital</td>
<td>III</td>
<td>C</td>
</tr>
<tr>
<td>heart disease</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Endocarditis guidelines prophylaxis
### Table 6  Recommended prophylaxis for dental procedures at risk

<table>
<thead>
<tr>
<th>Situation</th>
<th>Antibiotic</th>
<th>Single dose 30–60 minutes before procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>No allergy to penicillin or ampicillin</td>
<td>Amoxicillin or ampicillin*</td>
<td>Adults 2 g p.o. or i.v.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Children 50 mg/kg p.o. or i.v.</td>
</tr>
<tr>
<td>Allergy to penicillin or ampicillin</td>
<td>Clindamycin</td>
<td>Adults 600 mg p.o. or i.v.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Children 20 mg/kg p.o. or i.v.</td>
</tr>
</tbody>
</table>

*Alternatively cephalexin 2 g i.v. or 50 mg/kg i.v. for children, cefazolin or ceftriaxone 1 g i.v. for adults or 50 mg/kg i.v. for children.
Ophtalmic surgery

- Lacrimal apparatus dysfunction
- Strabismus
- Retinopathy of prematurity
- Cataracts
- Glaucoma
Strabismus challenges

- Syndromes, cardiac and neurologic disorders
- Oculocardiac reflex
- PONV
- Postoperative pain
- Bleeding
- Malignant hyperthermia?
Increased incidence of masseter spasm in children with strabismus anesthetized with halothane and succinylcholine.

Carroll JB1.

Malignant hyperthermia in strabismus surgery: A survey of AAPOS members

Mary O’Hara, Mitchell J. Goff, David J. Woods, Jason E. Karo, Frank W. Scribbick
Our protocol

• Inhalation induction: sevoflurane
• Tiva maintenance
  – Propofol: 8-15 mg/kg/h
  – Remifentanil: 0.25-0.75mcg/kg/h (key !)
• LMA >> endotracheal tube
• Pain: paracetamol, nsaids, tramadol, topic corticoids
• Ponv: ondansetron 0.15 mg/kg, max 8 mg or with dexamethasone
Our protocol

• Avoid NMBA: succinylcholine
• Bleeding: deep anesthesia but not too deep
• Atropine: rare
• Good cooperation with the surgeon:
  – wake up time
  – OCR
NO WE DO NOT HAVE WIFI TALK TO EACH OTHER!