Current Issues in Management of Adenotonsillectomy

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I have no financial disclosures relevant to this presentation.
Current Issues in the Management of Adenotonsillectomy

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Disclosures

• None
Learning Objectives

At the end of this presentation, participants will be able to:

• Name anesthetic issues for this procedure
• Identify patients at risk for OSA
• Describe anesthetic risks for this patient population
• Formulate a plan for managing the T&A patient using current knowledge
Current Issues in Management of Adenotonsillectomy: the Agenda

- Anesthetic technique
- Airway management
- Pain and agitation
- Considerations for kids with OSA
- Opiate management / selection
- Outcomes / adverse events
A Simpler Goal

Give everyone in the audience at least ONE NEW and USEFUL TOOL for enhancing SAFETY in pediatric T&A patients
Anesthetic Technique for Adenotonsillectomy

- Volatile vs TIVA
- NMB +/-
- One volatile over another
- One opioid over another
- No outcome data to show clear superiority of any particular technique
Airway management

• Cuffed ETT, or inflated LMA

• Avoid Nitrous oxide after induction

• Subramanyam’s T&A malpractice review: 26 claims for burns, none fatal
  
  - Airway fires = 7
  
  - Cautery burns = 26

ETT vs. LMA: Why?

- First described for Tonsillectomy in 1993
  - Demonstrated FEASIBILITY
  - More desaturation with insertion of LMA c/w ETT
  - More obstruction after placement of Davis mouth gag in LMA pts c/w ETT
  - LMA insertion faster than ETT
  - No blood in the larynx at end of surgery in LMA pts

Webster AC et al, Can J Anaesth, 1993
LMA: Predictors of success

• Retrospective review of ~ 1200 ENT cases
  - LMA 451
  - ETT 715
  - Failed LMA 33 (replaced with ETT)

• Complication rates:
  - ETT 7.7%
  - LMA 14.2%

LMA Predictors of success

• Adenoidectomy alone, fewer complications than T&A
• Older children had lower incidence of complications
• Spontaneous ventilation better than controlled
• Individual surgeon-dependent complications

Deep vs. Awake Extubation

• Why?
• Prospectively randomized 70 *healthy* children to awake or deep extubation.
• Higher SpO2 in early min after deep extubation
• No difference in incidence of laryngospasm, coughing, sore throat, arrhythmias

Deep vs. Awake Extubation

• Retrospective electronic data review of 110 children at a single surgical center, 1 surgeon
• Deep extubation = 62; awake extubation = 48
• No differences in out of OR time, anesthesia end time, or turnover time
• Complications: one laryngospasm (awake extub) and one airway obstruction (deep extub)

Menda SK et al (UCSF), Can J Anes 2012
PAIN and Agitation

• Best technique not defined

• Most individuals use non-opioids + opioids
  - Morphine or fentanyl in OR, oral opioid for home???
  - Acetaminophen—IV?
  - NSAIDS—are they coming back?
  - Local anesthetic? Ketamine? Dexmedetomidine?
Dexmedetomidine

• Nasal premed 2-3 mcg/kg
  Talon, MD, J Burn Res, 2009

• Onset 20-30 min

• Reduces emergence agitation

• May also reduce opioid requirement

I am not recommending any specific vendor’s product for nasal atomizer
IV Acetaminophen
“Ofirmev”

• FDA approved since Nov 2010
• Dose: 15 mg/kg Q 6h, max 1 gm Q6h; dose adjustments for the youngest infants—check package insert; or 10 mg/kg Q 4h
• Demonstrates opiate-sparing effects
• Good for OSA kids being admitted

CHEAP!
Wholesale,
1 gm = $10.60

I have no relationship to the manufacturer, and did not participate in research on this agent.
Ketorolac?

• Can we consider this agent again?
• 2010 Cochrane Review of 6 studies: no increase in risk of reoperation for post-tonsillectomy bleed
• 2013 Meta-analysis of 9 studies: Equivalent risk of post-tonsillectomy bleed.
  - Most studies only followed patients 1-2 days, missing secondary bleed.

Intravenous Ibuprofen

• Potential advantages over ketorolac
• Single dose 10 mg/kg at beginning of T&A, compared to placebo
  - Less postoperative fentanyl required
  - No difference in time to first analgesia, number of children who needed analgesia
  - No differences in bleeding or reoperation.

**Ketamine?**

- **Ketamine 0.5 mg/kg at end of case reduces pain scores and analgesic requirements.**

- **Fentanyl 1 mcg/kg + Ketamine 0.5 mg/kg**
  - Least pain on PACU admit, no N/V, no additional analgesia
Codeine

• Metabolized to morphine by CYP2D6, associated with 4 phenotypes, including: poor metabolizers (30%), ultra-rapid metabolizers (up to 30%)

• Unpredictable efficacy, high incidence of N/V

• Risk of toxicity

• Don’t use it!
Hydrocodone

• Reduced CYP2D6 function\(^1\): 5 yo died from excessive doses of hydrocodone during resp infection: no hydromorphone found in body

• Ultra-rapid metabolizer\(^2\): Child with OSA found dead following “normal” dose of hydrocodone

\(^1\)Madadi P, Pediatrics, 2010. \(^2\) Personal communication.
Oxycodone (OxyContin®)

- Multiple dosing forms
- Safer agent, multiple metabolic paths?
- Lower incidence of N/V, resp depression
- High abuse potential in community

**PEDIATRIC DOSE:**
0.05 – 0.15 mg/kg/dose Q 4-6hr prn, max 5 mg/dose
1 mg/ml solution
• Needing Oxygen at PACU discharge was PREDICTIVE of later opioid adverse event

• Oxygen tx DELAYS recognition of respiratory depression

Tonsillectomies in Obese Children

• 30% US children have BMIA > 85%
• 17% US children have BMIA > 95%
Anesthetic Challenges in the Obese

- More SDB, usually no sleep study
- VERY Sensitive to opioids
- More RAD
- More airway obstruction
- More co-morbidities

- Little-to-no preop assessment before surgery
- Expectation of same day discharge, pressure for PACU through-put
- Discharge instructions & follow-up
<table>
<thead>
<tr>
<th>Risk factor</th>
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<tbody>
<tr>
<td>Obesity as well as increasing obesity</td>
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<td>Positive family history</td>
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<td>Ethnicity (African American)</td>
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<td>History of reactive airway disease</td>
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<td>Congenital airway abnormality (e.g., mid facial hypoplasia)</td>
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<td>Congenital syndrome (e.g., Down syndrome)</td>
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<td>Male gender</td>
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<tr>
<td>Enlarged tonsils</td>
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<tr>
<td><strong>Symptoms</strong></td>
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<tr>
<td>Loud snoring (heard through closed door)</td>
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<td>Gasps at night</td>
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<tr>
<td><strong>Pauses in breathing at night</strong></td>
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<tr>
<td>Night terrors</td>
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<tr>
<td>Restless sleep</td>
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<tr>
<td>Confusion arousals</td>
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<tr>
<td>Mouth breathing</td>
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<tr>
<td>Drooling</td>
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<td>Sleep walking</td>
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<td>Unusual sleep positions</td>
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<td>Difficult to awaken in the morning</td>
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<td>Daytime irritability</td>
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<td>Morning headache</td>
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<td>Daytime somnolence</td>
<td></td>
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<td>Enuresis</td>
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<td><strong>Poor school performance</strong></td>
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<td>Frequent upper respiratory infections</td>
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</tbody>
</table>
Perioperative outcomes of severely obese children undergoing tonsillectomy

All were intubated without difficulty with a standard laryngoscope.

Management of Obese Children for Tonsillectomy: Best Practices

• Encourage preop clinic evaluation *prior to day of surgery*
• Early am case
• Maximize non-opioid pain strategies in hosp and at home
• Use short-acting opioids in OR and PACU
• Consider oxycodone for postop pain at home
• Strict DC criteria, instructions, and physician sign-out
• Low threshold for admission
111 cases of adverse events reported, 92 with adequate data for analysis (1990-2010, most after 2004)

86 (77%) died or had permanent neurologic injury

63 (57%) met criteria for OSA: obesity, +/- other comorbidities

### Tonsillectomy Deaths

#### Table 4. Sample Cases Describing Surgical and Anesthesia Adverse Events

<table>
<thead>
<tr>
<th>Case</th>
<th>Narrative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthesia event</td>
<td>A 3 year old was extubated, there was no blood pressure or oxygen saturation on arrival in PACU; the child died.</td>
</tr>
<tr>
<td>Anesthesia event</td>
<td>After extubation, a 3 year old developed laryngospasm, postobstructive pulmonary edema, required ECMO and died.</td>
</tr>
<tr>
<td>Possible rapid codeine</td>
<td>A 9 year old was discharged after overnight observation and found dead that night, high morphine levels found; possible rapid codeine metabolizer.</td>
</tr>
<tr>
<td>metabolizer</td>
<td></td>
</tr>
<tr>
<td>Anesthesia event</td>
<td>A 4 year old developed apnea in PACU, was given multiple doses of naloxone, and discharged on codeine. Apnea spells occurred at home but the parents decided not to go to the hospital and he was found dead the next morning.</td>
</tr>
<tr>
<td>Surgical/anesthesia</td>
<td>A 5 year old suffered cardiac arrest in the operating room due to kinking of tracheal tube by Dingman retractor; permanent neurologic injury resulted.</td>
</tr>
<tr>
<td>event</td>
<td></td>
</tr>
<tr>
<td>Nursing event</td>
<td>A 6 year old developed apnea and respiratory arrest 10 h after surgery on the ward with death as the outcome.</td>
</tr>
<tr>
<td>Anesthesia event</td>
<td>A morbidly obese 15 year old 250 kg teenager arrested on induction of anesthesia; death.</td>
</tr>
<tr>
<td>Anesthesia/surgical</td>
<td>An obese 2 year old child with a positive OSA history was found dead at home 2 h after discharge. The child left with the grandmother’s boyfriend while the mother and grandmother went shopping.</td>
</tr>
<tr>
<td>event</td>
<td></td>
</tr>
<tr>
<td>Anesthesia/surgical</td>
<td>An 8 year old obese child with a positive history for OSA spent the first night in the pediatric intensive care unit, was discharged home the next morning, and found dead that night.</td>
</tr>
</tbody>
</table>

PACU = postanesthesia care unit; ECMO = extracorporeal circulation membrane oxygenation; OSA = obstructive sleep apnea.
Avoidable deaths?

• 10 children died/suffered neurologic injuries at home within 24 hrs surgery
• 3 died on the ward
• 2 died in PACU
  - 5 yo, first stage PACU, received morphine and midazolam, monitors removed, “sleeping” in dad’s arms
  - 3 yo, 2nd stage PACU, no monitors, mom reclining on stretcher with child, thought he was “sleeping”
Tonsillectomy: Anesthesia- and Opioid-related Malpractice Risk

• 1984 – 2012 LexisNexis Jury Verdict and Settlement Database
• 242 Tonsillectomy cases
  - Fatal 40%, Nonfatal 60%
  - Median age 8.5 yrs
  - Dx sleep apnea 17% fatal cases, 10% nonfatal

## Tonsillectomy: Anesthesia- and Opioid-related Malpractice Risk

### Table 1: Categories of fatal and nonfatal injury claims

<table>
<thead>
<tr>
<th>Category</th>
<th>Fatal injury</th>
<th>Nonfatal injury</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>fatal</td>
<td>fatal claim n (%)</td>
</tr>
<tr>
<td>Surgery related</td>
<td>39 (39.8%)</td>
<td>101 (70.1%)</td>
</tr>
<tr>
<td>Anesthesia related</td>
<td>36 (36.7%)</td>
<td>32 (22.2%)</td>
</tr>
<tr>
<td>Opioid related</td>
<td>16 (16.3%)</td>
<td>6 (4.2%)</td>
</tr>
<tr>
<td>Uncategorized</td>
<td>17 (17.4%)</td>
<td>9 (6.3%)</td>
</tr>
</tbody>
</table>

Some claims had overlapping causes between the surgery-, anesthesia-, and opioid-related categories.

Tonsillectomy: Anesthesia- and Opioid-related Malpractice Risk

• Sleep apnea diagnosis
  - 17% of fatal cases
  - 10% of non-fatal cases

• Opioid-related claims had the largest median monetary awards
  - Fatal cases $1,625,892
  - Non-fatal cases $3,484,278

Best Practices

• Cuffed ETT or inflated LMA
• Control of bleeding, early re-op if needed
• Avoid codeine, ? avoid hydrocodone; use morphine, fentanyl oxycodone
• Reduce opioid doses for children with OSA
• Develop hospital protocol for age & criteria for same-day discharge, robust policy for monitoring children with OSA
Best Practices

• Deadly Triad
  - Obesity
  - History of, or consistent with, OSA
  - Need for postoperative opioid

• Recognize that airway obstruction and swelling may be worse postop, before it gets better