

The Risks of OSA in Children

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CHILDHOOD OBESITY



Big MAC Attacks!



Obesity is Pandemic

1991



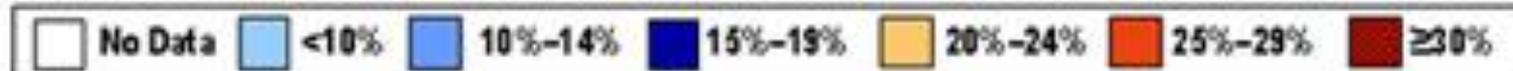
1996



2003



2010



How do we assess risk?

- **Polysomnogram** = gold standard

Apnea = pause in breathing ≥ 10 seconds

Hypopnea = shallow breathing

Apnea/hypopnea index – combined with desaturation events
(Karen Brown desaturation events)

Mild = 1-5 events/hour

Moderate = 6-10 events/hour

Severe = >10 events/hour

Cardiac evaluation

ECHO RVP/pulmonary hypertension???

How do we assess risk?

- **History**

- Observed pauses or gasps
- Snoring heard through a closed door (1/3 of children who snore will progress to OSA)
- New onset enuresis
- Night terrors
- Sleeping in odd positions
- Sleep walking
- Daytime somnolence (difficult to awaken in morning)
- Ethnicity (African American, Hispanic)
- Residence in disadvantaged neighborhood
- Premature birth

How do we assess risk?

- **Physical Examination**
 - **>95% for age and gender**
 - **Large tonsils**
 - **Neck to waist ratio (only teenagers)**
 - **Craniofacial abnormality, especially cleft lip/palate (~30%)**
 - **Down syndrome**
 - **Hypertension**

How do we assess risk?

- **Associated conditions**
 - **Type 2 diabetes (altered glucose/insulin regulation)**
 - **Elevated markers of inflammation e.g., TNF**
 - **Abnormal polymorphisms of NOS (nitric oxide synthase) and END (endothelin) genes**
 - **Hypertension**
 - **RVH/pulmonary hypertension**
 - **Ectopic cardiac arrhythmias**
 - **Atopic dermatitis**
 - **Opioid sensitivity**

Practice Guidelines for the Perioperative Management of Patients with Obstructive Sleep Apnea

An Updated Report by the American Society of Anesthesiologists Task Force on Perioperative Management of Patients with Obstructive Sleep Apnea

Anesthesiology 120: Feb 2014

Two important tables:

1. Identification

2. OSA Perioperative Risk Score

(invasiveness of surgery and need for postoperative opioids)

Death or Neurologic Injury After Tonsillectomy in Children with a Focus on Obstructive Sleep Apnea: Houston, We Have a Problem!

Charles J. Coté, MD,* Karen L. Posner, PhD,† and Karen B. Domino, MD, MPH†

**Anesthesia & Analgesia 2014:
118; 1276-83
+ accompanying editorial**

**The impetus was 3 deaths,
I had been consulted on for malpractice**

Survey
Sent to all 2,377 SPA members



731 surveys returned



129 surveys met inclusion criteria
1 duplicate & 36 insufficient data



92 met inclusion criteria +
sufficient data

Closed Claims Database
n= 9214



45 pediatric ENT cases



23 did not meet inclusion criteria
3 insufficient data



19 met inclusion criteria +
sufficient data



**111 Included in final
analysis**

Identification OSA Risk

- Positive polysomnogram
- Labelled as OSA by anesthesiologist, surgeon or parent
- ASA-OSA guideline
 - Obesity + snoring + at least one other risk factor e.g., daytime somnolence

Indications (N = 111)

Indication	At Risk	Not at Risk
OSA	45 (71%)*	0
Recurrent tonsillitis + obstruction	9 (14%)	17 (35%)
Obstruction or noisy breathing	9 (14%)	6 (13%)
Recurrent tonsillitis	0	8 (17%)
Not provided	0	17 (35%)

*** P < 0.0001**

Results:

Age (years)	At Risk	Not at Risk
1-3	19 (31%)	10 (22%)
4-8	29 (48%)	24 (54%)
9-12	8 (13%)	5 (11%)
13-19	5 (8%)	7 (15%)

ASA Status

ASA Status	At Risk (N=60)	Not at Risk (N=43)
I	7 (12%)	26 (60%)
II	34 (57%)	13 (31%)
III	18 (30%)*	4 (10%)
IV	1 (2%)*	0

*** P < 0.0001**

Results:

Obesity	P < 0.0001
Ethnicity	P < 0.0001
Higher ASA status	P < 0.0001
Those considered "at risk" for OSA death attributed to apnea	P = 0.016
Those not considered at risk for OSA death attributed to hemorrhage	P = 0.006

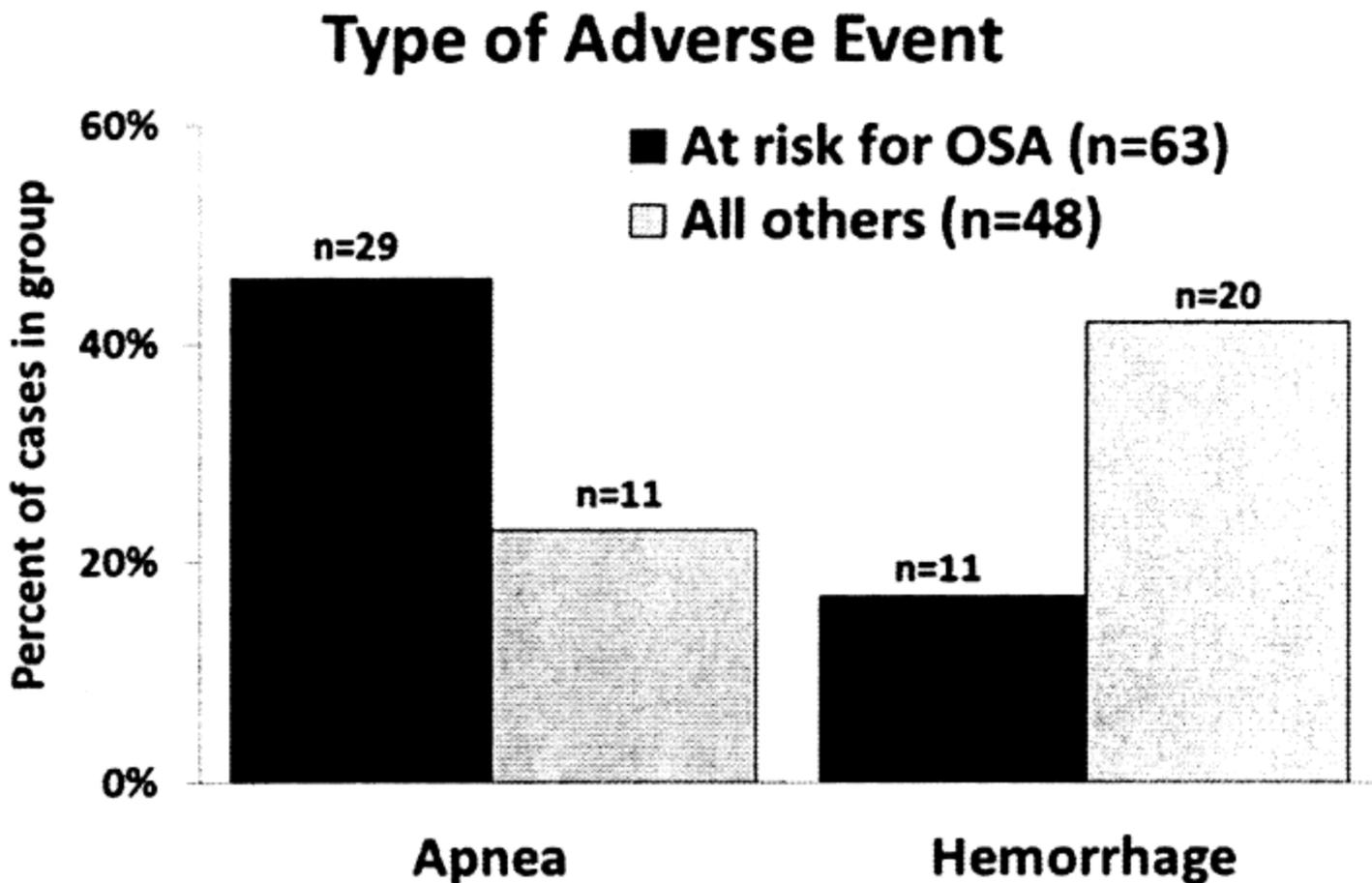


Figure 2. A larger proportion of at risk for obstructive sleep apnea (OSA) children had the event attributed to apnea ($P = 0.016$) whereas all others had a larger proportion of events attributed to hemorrhage ($P = 0.006$). P -values by Fisher exact test.

Problems: Anesthesia

Missed extubations: 3

Tube kink: 1

Esophageal misplacement missed: 1

Laryngospasm: 3

Laryngospasm in PACU

Arrest on induction (morbid obesity)

Arrest on induction and emergence (William's): 2

Duchenne MD arrested at end: 1

Sickle cell not transfused: 1

Deaths/Neurologic Injury & Obesity (28/111)

Cause	N
Apnea	19
Hemorrhage	6
Unknown	3

Deaths 2° Apnea < 24 Hours

Venue	N
PACU	2
Ward	3
At home	10

Sample cases

- 1) 3 year old was extubated, there was no blood pressure or oxygen saturation upon arrival in PACU; the child died. **ANESTHESIA EVENT**
- 2) After extubation, a 3 year old developed laryngospasm, post obstructive pulmonary edema, required ECMO and died **ANESTHESIA EVENT**
- 3) A 9 year old was discharged after overnight observation and found dead that night, high morphine levels found; **POSSIBLE CODEINE RAPID METABOLIZER EVENT**

Sample Cases

- 4) 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 **ANESTHESIA EVENT**
- 5) A 5 year old suffered cardiac arrest in the operating room due to kinking of tracheal tube by Dingman retractor; permanent neurologic injury resulted. **SURGICAL/ANESTHESIA EVENT**

Sample Cases

- 6) A 6 year old developed apnea and respiratory arrest 10 hours after surgery on the ward with death as the outcome. **NURSING EVENT**
- 7) A morbidly obese 15 year old 250 kg teenager arrested on induction of anesthesia; death. **ANESTHESIA EVENT**

Sample Cases

- 8) An obese 2 year old child with a positive OSA history was found dead at home 2 hours after discharge. The child left with the grandmother's boyfriend while the mother and grandmother went shopping. **SURGICAL/ANESTHESIA EVENT**
- 9) 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. **SURGICAL/ANESTHESIA EVENT**

PACU Deaths

- 5 YO first stage PACU given morphine and midazolam for emergence agitation. Left in father's arms **WITHOUT** monitors
- 3 YO second stage PACU in stretcher with mom **NO MONITORS** but this is what we normally do!!!

ENT Survey

- **40 pediatric deaths**
 - **Bleeding: 6**
 - **“med narcotic”:9**
 - **Unexplained: 16**
 - **15 at home**
 - **1 in hospital**
- **10 in children with OSA**

Risk of Hemorrhage

- **Increased in obese children in Cote survey**
- **?Increased in ENT survey**
- **Increased 3 fold over tonsillitis (4.9% vs 15.6%)**

(Achar et al: Int J Pediatr Otorhinolaryngol 2015)

Opioid Sensitivity

- **The codeine story**
- **Hypoxia induced opioid sensitivity**
 - **Covered by Karen Brown**

Maybe change technique?

- **Tonsillotomy not tonsillectomy**
 - **Pro: = Less pain (reduced need for opioid)**
 - **Con: = May need repeat procedure**
- **Hopefully Dr Green will shed light!**

Conclusions

- **Tonsillectomy is not a benign surgery**
- **Obesity is a major risk factor for apnea and hemorrhage**
- **A careful + detailed history is required, particularly if no formal sleep study**
- **Have a low threshold for admission**

Tonsillectomy Patients

(extended or overnight observation)

- **Age < 3 years**
- **Abnormal coagulation values**
- **Evidence of OSA**
- **Systemic disorders that ↑ risk**
- **Craniofacial or airway anomaly**
- **Peritonsillar abscess**
- **Living long distance**
- **Adverse social conditions**