Sleep Apnea in Children

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WARNING!!

• No agenda! No disclosures!
• I have a STRANGE sense of humor!
  • You can’t take the Arkansas out of the boy!
• I may not tell you what you want to hear, but I will always tell you the truth! “Truth and Nothing But the Truth”
• SARCASM- It’s just another service that I provide !!!
Qualifications

• 1980 Graduate - University of Tennessee School of Dentistry
• 1995 Graduate - University of Arkansas Little Rock School of Law
• Diplomate American Sleep & Breathing Academy
• Diplomate (Candidate) AADSM
• Full Partner - Travis, Borland and Berley Attorneys at Law
• Over 5 years experience in the treatment of Sleep Related Breathing Disorders
• Over 25 years experience in the treatment of TMD
• Member of the Bar in Arkansas and Texas
Personal

• Married to my lovely wife Patty!
• 3 Girls
  • Steph
  • Megan FOR SALE - best offer $$
  • Haley
• 2 Dogs
  • Prince Charles NOT FOR SALE!
  • Lady Dianna
• 1 Fish
  • George Rest in Peace
Northwest Arkansas

• Home to:
  • WalMart
  • JB Hunt Transport Inc.
  • Tyson Foods Inc.
  • University of Arkansas Baseball and Track Teams
WARNING II (True Confession)

• I know little or nothing about the treatment of children with OSAS!

• Dentistry appears to be in its infancy regarding the treatment of Childhood OSAS!
  • We don’t know, what we don’t know!

• Unlike adult OSAS, there appears to be NO GOLD STANDARD!
  • No treatment modality appears to correct all or most patients!
Goal!

- Discuss the prevalence and likely causes of Childhood OSAS
- Evaluate screening techniques
- Review available literature on the treatment of Childhood OSAS.
- Look at available treatments modalities.
- Present a possible dental approach for the treatment of these patients.
Case Study: Max
- Mouth Breathing
- Tongue Posture
- Bad Breath
- Large Non-Infected Tonsils
- Forward Head Posture
- Dental Crowding
- High Palatal Vault
- Allergic Shiners
- Nasally Voice
- Vacant Look to Eyes - Tears and Very Shiny

Warning Signs for the Clinician
Interview The Parents

- History of Mouth Breathing
- Wet Pillow in the Morning
- Snoring
- Witnessed Apneas
- History of Allergies
- Frequent Colds
- Frequent Ear Infections
- Frequent Sore Throats
- Medications
- Excessive Tiredness
Narrow Upper Arch

28mm at molars
High Palatal Vault
Childhood OSA-Intro

• Proper breathing is essential to a child’s health, development, and educational success
  • Prudent practitioners should screen all patients for sleep disordered breathing, whether adult or child.
    • SNORE Screening
    • BEARS Screening
  • Early detection and correction of airway problems by utilizing comprehensive airway screening program
    • 3D imaging CBCT
Pediatric OSA Complications

- Complications of Obstructive Sleep Apnea in children
  - ADD / ADHD
    - One study concluded that 75% of ALL ADHD could be eliminated if children’s habitual snoring and sleep related breathing disorders were effectively treated. (Chervin et. al, Sleep)
  - Poor growth and development
  - Orthodontic problems
  - Increased chance of OSA as an adult
• Prevalence of SDB in children is estimated to be between 4-11%
• OSA- prevalence estimated to be 1-4%
• Habitual Snoring 5-12%
  • Reports as high as 30%
Childhood OSA - Intro

- Higher Prevalence in:
  - Boys
  - Obesity
  - African-American ethnicity
  - Atopy
• OSA can occur at any age:
  • SDB - In infants and young children
    • Large tonsils and adenoids
    • Large body habitus
    • Craniofacial abnormalities
  • SDB - In older teenagers
    • Large body habitus
    • Oral airway crowding
Childhood OSA-Int

• OSA- Risk Cont.
  • Adenotonsilar hypertrophy- exacerbated by upper airway infections
  • Genetic Syndromes
    • Pierre-Robins sequence
    • Treacher-Collins syndrome
    • Achondroplasia
    • Midface hypoplasia
    • Micrognathia
    • Retrognathia
    • Malocclusion
Screening for Childhood OSA

• SNORE Screening Survey
  • S: Does your child SNORE or have loud breathing when asleep?
  • N: Does your child have NASAL congestion or breath mostly through his or her mouth?
  • O: Have you ever OBSERVED your child pause in his or her breathing during sleep, even for just a few seconds?
  • R: Is your child RESTLESS in sleep? Does your child move around a lot, sweat a lot, wake up frequently at night, or seem to be uncomfortable in sleep?
  • E: Is your child EXCESSIVELY sleepy, hyperactive, aggressive, or inattentive during the daytime?
Screening for Childhood OSA

• SNORE Screening:
• Specificity and Selectivity
  • “If any of the above questions are answered positively, directing the child to his or her pediatrician and getting a referral to a Sleep Medicine Specialist is advised.”

  • Physician’s Perspective- Pediatric Sleep Disorders Dental Sleep Practice: Winter 2014
Bears Sleep Screening Algorithm

• Toddler/Preschool (2-5) years
  • Bedtime Problems- Does your child have any problems going to bed? Falling asleep?
  • Excessive daytime sleepiness- Does your child seem overtired or sleepy during the day? Does she still take naps?
  • Awakenings during the night- Does your child wake up frequently during the night?
  • Regularity and duration of sleep- Does your child have a regular bedtime and wake time?
  • Snoring- Does your child snore frequently or have difficulty breathing at night?
Screening for Childhood OSA

1. Snoring
2. Labored breathing in Sleep
3. Witnesses apnea in sleep
   • Restlessness in sleep
   • Recurrent nocturnal awakenings
   • Diaphoresis
   • Mouth-breathing
   • Drooling
   • Nocturnal enuresis
Screening for Childhood OSA

• Daytime Symptoms of Childhood OSA
  • Hyperactivity-ADHD
  • Difficulty focusing at school/home
  • Poor academic performance
  • Mood Disorders
  • Aggressiveness
  • Poor appetite
  • Daytime Sleepiness
Childhood OSA-Intro

• Adult OAT-FDA clearance for Oral Appliances
  • More than 100 appliances FDA approved for the treatment of OSA

• Childhood OAT for OSA
  • “0” appliances FDA approved for the treatment of Childhood OSA
  • FDA clearance of Oral appliances to treat SDB does not extend below the age of 18.
  • Herbst oral appliance is FDA approved for the treatment of “mandibular growth deficiencies” at any age or as early as recognized by the dentist!
• **Metabolic and glycemic sequelae of sleep disturbances in children and adults.**

  Koren D¹, O'Sullivan KL, Mokhlesi B.


• The prevalence of obesity in adults and children has increased greatly in the past three decades, as have metabolic sequelae, such as insulin resistance and type 2 diabetes mellitus (T2DM).
Prevalence and documentation of overweight and obesity in hospitalized children and adolescents.


A retrospective chart review was conducted of 8- to 18-year-olds admitted to an inpatient pediatric unit during 6 months in 2012.

The study included 603 patients. Approximately one-third (36.5%) of patients were either overweight or obese, and nearly one-fifth (19.7%) were obese.
Protocol for the Treatment of Children

American Academy of Pediatrics, AAP


Protocol for Treatment of Childhood OSAS

• Clinical Practice Guideline. Diagnosis and Management of Childhood Obstructive Sleep Apnea Syndrome. Pediatrics, 2002; 109(4): 704-712

• 1 Adenotonsillectomy
  • First-line treatment for an otherwise healthy child with OSA symptoms with adenotonsillar hypertrophy.

• 2 CPAP
  • Option for children who are not candidates for TA surgery or do not respond to surgery.

• 3 Referral to specialist for high-risk, medically complex children
AAP Guidelines for Management of Childhood OSAS


- Adenotonsillectomy:
  - First-line treatment for the otherwise healthy children
  - Severity OSAS was improved post-operatively in most patients
  - 13-29% of low-risk patients showed residual symptoms of OSAS after surgery
  - 73% of obese patients had residual symptoms of OSAS after surgery
AAP Guidelines for Management of Childhood OSAS


- Conclusion:
  - OSAS may improve after AT even in obese children, thus supporting surgery as a reasonable initial treatment.
  - A significant number of obese patients required intubation or CPAP postoperatively which reinforces the need for inpatient observation.
  - CPAP was effective in the treatment of OSAS but adherence was a major barrier.
  - CPAP is not recommended as first-line therapy when AT is an option.
  - Intranasal steroids may ameliorate mild OSAS, but follow-up is needed.
  - Data were insufficient to recommend Rapid Maxillary Expansion.
Treatment of Childhood OSA

- **Sleeping too close together: obesity and obstructive sleep apnea in childhood and adolescence.**
  - Mathew JL¹, Narang I².
  - Treatment options for obesity related OSA includes adenotonsillectomy, but it does not cure OSA in over 50% of obese children.
  - Positive airway pressure (PAP) therapy delivered through continuous or bi-level modes is successful, but limited by generally poor compliance.
Treatment of Childhood OSA


- Adenotonsillectomy (AT) has long been the treatment of choice for obstructive sleep disordered breathing (SDB) in children.

- AT is usually considered a safe procedure, which cures 80% of children with SDB. Accumulated data have however challenged this overly simplistic view.

- Some recent results suggest that complete SDB cure is not achieved in as much as 75% of cases after AT.
Treatment of Childhood OSA

• Praud JP et al. Continued.

• Continuous positive airway pressure (CPAP) is now suggested in children with remaining SDB after AT; however, compliance and suitability of equipment remain important hurdles, especially in small children and infants.

• Anti-inflammatory treatments, including nasal glucocorticoids and/or the anti-leukotriene montelukast, appear to hold great promise.

• Finally, orthodontic treatments are an appealing option, with recent results in children suggesting that it is possible to improve or perhaps even cure SDB in a durable manner by enlarging the nasal passages and/or the oropharyngeal airspace.
Treatment of Childhood OSA


- **PURPOSE:** Rapid maxillary expansion (RME) is an additional treatment in pediatric obstructive sleep apnea (OSA). The aim of this study was to present data about the outcome of adenotonsillectomy (AT) and of RME in a clinical sample of pediatric OSA.

- **METHODS:** We consecutively enrolled children with OSA to undergo RME or AT. The age and the severity of OSA are the main factors involved in the choice of treatment. A polysomnography was performed at the baseline (i.e., before treatment, T0) and 1 year after treatment (T1).
Treatment of Childhood OSA

- *Adenotonsillectomy and orthodontic therapy in pediatric obstructive sleep apnea*. Villa MP¹,

- A total of 52 subjects fulfilled the inclusion criteria. Twenty-five children underwent AT (group 1) and 22 children underwent RME (group 2). Five children underwent both treatments (group 3).

- Children in group 2 were older, had a longer disease duration, a higher body mass index (BMI), a lower apnea-hypopnea index (AHI), and a lower arousal index at T0 than children in group 1.

- After 1 year, BMI percentile and overnight mean saturation increased in group 1 while AHI and arousal index decreased.

- In group 2, mean overnight saturation increased while AHI decreased.
Treatment of Childhood OSA

- *Adenotonsillectomy and orthodontic therapy in pediatric obstructive sleep apnea.* Villa MP

- Children in group 3 displayed a significant decrease in AHI from T0 to T1.

- Our data demonstrate that both treatments help to improve OSA, and a multidisciplinary approach to treatment is suggested.
Treatment of Childhood OSA

- *Efficacy of rapid maxillary expansion in children with obstructive sleep apnea syndrome: 36 months of follow-up.*

**PURPOSE:** In view of the positive outcome of orthodontic treatment using rapid maxillary expansion (RME) on sleep-disordered breathing, data was generated on RME in children with obstructive sleep apnea (OSA) by evaluating objective and subjective data over a 36-month follow-up period, to determine whether RME is effective in the long-term treatment of OSA. All patients selected had dental malocclusions and OSA syndrome (OSAS) confirmed by polysomnography.
Treatment of Childhood OSA

- *Efficacy of rapid maxillary expansion in children with obstructive sleep apnea syndrome: 36 months of follow-up.*

- **METHODS:** Ten of the 14 children who completed the 12-month therapeutic trial using RME were enrolled in a follow-up study. The study was performed 24 months after the end of the RME orthodontic treatment. All children presented with deep, retrusive or crossbite at the orthodontic evaluation. All subjects underwent an overnight polysomnography at the baseline, after 1 year of treatment and 24 months after the end of the orthodontic treatment. The children's mean age was 6.6 ± 2.1 years at entry and 9.7 ± 1.6 years at the end of follow-up.
Treatment of Childhood OSA

- **Efficacy of rapid maxillary expansion in children with obstructive sleep apnea syndrome: 36 months of follow-up.**
  

- **RESULTS:** After treatment, the apnea hypopnea index (AHI) decreased and the clinical symptoms had resolved by the end of the treatment period. Twenty-four months after the end of the treatment, no significant changes in the AHI or in other variables were observed.

- **CONCLUSIONS:** RME may be a useful approach in children with malocclusion and OSAS, as the effects of such treatment were found to persist 24 months after the end of treatment.
Treatment of Childhood OSA


• When both narrow maxilla and moderately enlarged tonsils are present in children with obstructive sleep apnea, the decision of which treatment to do first is unclear.

• Thirty-one children, 14 boys, diagnosed with OSA based on clinical symptoms and polysomnography (PSG) findings had presence of both narrow maxillary complex and enlarged tonsils.
Treatment of Childhood OSA

- Adeno-tonsillectomy and rapid maxillary distraction in pre-pubertal children, a pilot study. Guilleminault C¹.

- They were scheduled to have both adeno-tonsillectomy and RME for which the order of treatment was randomized:
  - group 1 received surgery followed by orthodontics,
  - group 2 received orthodontics followed by surgery.

- RESULTS: The mean age of the children at entry was 6.5 ± 0.2 years (mean ± SEM).

- Overall, even if children presented improvement of both clinical symptoms and PSG findings, none of the children presented normal results after treatment 1, with the exception of one case.
Treatment of Childhood OSA


- **Results:** There was no significant difference in the amount of improvement noted independently of the first treatment approach.

- Thirty children underwent treatment 2, with an overall significant improvement shown for PSG findings compared to baseline and compared to treatment 1, without any group differences.
Treatment of Childhood OSA

• Correction of severe obstructive sleep apnea with bimaxillary transverse distraction osteogenesis and maxillomandibular advancement. Conley RS1, Am J Orthod Dentofacial Orthop. 2006 Feb;129(2):283-92

• The most favorable treatment for patients with OSA is multidisciplinary care by a team that represents various dental and medical disciplines.

• Prescribed therapies might include weight loss, behavior modification, oral appliances, soft tissue surgery, skeletal surgery, or some combination of approaches.
Treatment of Childhood OSA

• Correction of severe obstructive sleep apnea with bimaxillary transverse distraction osteogenesis and maxillomandibular advancement. Conley RS¹, Am J Orthod Dentofacial Orthop. 2006 Feb;129(2):283-92

• When orthognathic surgery has been used, often only the anteroposterior dimension is addressed, and the transverse dimension is overlooked.

• The treatment presented demonstrates the important role that transverse expansion of the maxillary and mandibular arches can have for patients with severe OSA. An initial stage of maxillary and mandibular transverse distraction osteogenesis was performed, followed immediately by fixed orthodontic treatment.
Treatment of Childhood OSA

• **Correction of severe obstructive sleep apnea with bimaxillary transverse distraction osteogenesis and maxillomandibular advancement.** Conley RS¹, Am J Orthod Dentofacial Orthop. 2006 Feb;129(2):283-92

• After appropriate orthodontic alignment, leveling, and coordination, a second surgical stage consisting of maxillary and mandibular advancement was performed.

• Marked enhancements in occlusion and facial morphology, and a profound improvement in the OSA, were obtained.
Ken’s Treatment for Childhood OSA

1. Document presence of OSA with PSG
2. If indicated, remove tonsils and adenoids.
3. PSG/HST to document improvement or lack thereof.
4. Mandibular and maxillary expansion.
5. Bionator/orthopedic corrector for mandibular advancement and increased facial height.
6. PSG/HST to document improvement in final position.
Ken’s Treatment for Childhood OSA

• Two Separate Orthodontic functional appliance therapies for different purposes:
  • Phase 2. Bionator/Orthopedic Corrector- for Mandibular advancement and facial height growth
Hyrax
Hyrax
Three-way Appliance
Three Way Appliance
Schwartz Appliance
Lower Schwartz
Lower Schwartz (Non-Removable)
Phase 1

• Upper three-way/Schwartz Appliance
  • Maxillary expansion
    • Maxillary anterior protrusion
      • Determined by lateral cephalometric recording

• Lower Schwartz
  • Mandibular expansion
Phase 1 (Expansion)

• Phase 1- Subjective Symptom Should Improve!
  • Initial treatment in Phase 1 should not last more than 6 months.
    • Rapidly expand the maxillary for maximum OSA response.
      • Track subjective symptom improvement as treatment progresses.
      • Do HST if needed to quantify subjective improvements.
      • Do not over-expand the maxilla.
      • Do not cause lateral flaring or tipping of the maxillary molars.
  • Expand the mandible at a rate of 1-1.5mm/month.
  • Expand the mandible to fit the Maxilla.
Phase 1 (Expansion)

• HST after Phase 1 is complete to determine if Phase 2 is necessary.
  • If residual symptoms persist - Phase 2
  • If the patient has a significant class 2 (retrognathic occlusion) - Phase 2
  • If the patient has a decreased lower facial height - Phase 2
Phase 2 (Mandibular Advancement)

- Phase 2. Bionator/Orthopedic Corrector or fixed herbst bar
  - Mandibular advancement
  - Facial height
Bionator
Bionator
Patient CW

• 12 year old male who presents to our office for evaluation for MAD after T & A.
• Pre-surgery AHI 82
• Post surgery AHI 41
• Chief complaint- Snoring, CPAP intolerance, excessive daytime sleepiness
• Class 2 malocclusion
• Deep overbite
Patient CW

• Treatment Plan
  • Maxillary and Mandibular Schwartz appliances for expansion for 6 months
  • Bionator for increased facial height and correction of Class II malocclusion
Patient CW
Patient CW
Patient CW

• Orthodontic correction of facial and dental malocclusion
  • Snoring was eliminated
  • Excessive daytime sleepiness was eliminated
  • Final AHI - 1.1
Conclusion

• Maxillary and mandibular expansion combined with mandibular advancement and supra-eruption of posterior teeth can create adequate tongue space to potentially cure pediatric OSA.

• Dental Orthopedics appears to be viable therapy for the treatment of childhood OSA as a primary treatment or in combination with T & A surgery.

• More research is needed to verify the viability of dental therapy for the treatment of Childhood OSA.
Thank You!

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