Conflict of Interest Declaration

No financial support or sponsorship received associated with this presentation by speaker nor speaker’s business affiliates and family.
Understanding the airway patency in normal development.

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Airway Evolution.....

No mouth breathers- so what happened?
Airway/Facial Evolution

The theory of evolution constructed by Charles Darwin is believed by the majority of the academic society. The theory consists of two main points: “All life on Earth is connected and related to each other”; the diversity of life that is seen in the current world is a product of the “modifications of population by natural selection, where some traits were favored in specific environments over others”.
Airway Evolution.....

Homo Neanderthalensis

Scientists from Germany, USA, Romania and Canada, discovered that a 37,000 – 42,000-year-old modern human from Peştera cu Oase, Romania had the order of 6–9% of the genome derived from Neanderthals, more than any other to date. 


Mark's Neanderthal variants

277

This is more than 53% of 23andMe Customers

You have more Neanderthal variants than 53% of 23andMe customers. However, your Neanderthal ancestry accounts for less than 4% of your overall DNA.
The farmers who came from the Near East about 7800 years ago and the Yamnaya pastoralists who came from the steppes 4800 years ago lacked the version of the LCT gene that allows adults to digest sugars in milk. It wasn't until about 4300 years ago that lactose tolerance swept through Europe.

When it comes to skin color, the team found a patchwork of evolution in different places, and three separate genes that produce light skin, telling a complex story for how European's skin evolved to be much lighter during the past 8000 years. The modern humans who came out of Africa to originally settle Europe about 40,000 years are presumed to have had dark skin, which is advantageous in sunny latitudes. And the new data confirm that about 8500 years ago, early hunter-gatherers in Spain, Luxembourg, and Hungary also had darker skin: They lacked versions of two genes—SLC24A5 and SLC45A2—that lead to depigmentation and, therefore, pale skin in Europeans today.

But in the far north—where low light levels would favor pale skin—the team found a different picture in hunter-gatherers: Seven people from the 7700-year-old Motala archaeological site in southern Sweden had both light skin gene variants, SLC24A5 and SLC45A2. They also had a third gene, HERC2/OCA2, which causes blue eyes and may also contribute to light skin and blond hair. Thus ancient hunter-gatherers of the far north were already pale and blue-eyed, but those of central and southern Europe had darker skin. The paper doesn't specify why these genes might have been under such strong selection.

But the likely explanation for the pigmentation genes is to maximize vitamin D synthesis, said paleoanthropologist Nina Jablonski of Pennsylvania State University (Penn State), University Park, as she looked at the poster's results at the meeting. People living in northern latitudes often don't get enough UV to synthesize vitamin D in their skin so natural selection has favored two genetic solutions to that problem—evolving pale skin that absorbs UV more efficiently or favoring lactose tolerance to be able to digest the sugars and vitamin D naturally found in milk.
Airway Evolution

- Nasal development
  - Nares width
  - Length of honker

- Pharyngeal development
  - Standing upright, humidifying and speech

- Oral development
  - Mouth width and length
  - Tongue placement
  - Diet
Airway Evolution

• Nasal development
  – Climate and the airway
We find that width of the nares is correlated with temperature and absolute humidity, but not with relative humidity. We conclude that some aspects of nose shape may indeed have been driven by local adaptation to climate, but this is a simplified explanation of a very complex evolutionary history, which possibly also involved other non-neutral forces such as sexual selection.
Evolutionary Malocclusion

• Variation in nasal cavity shape is correlated with a cline from cold–dry climates to hot–humid climates, with a separate temperature and vapor pressure effect. The bony nasal cavity appears mostly associated with temperature, and the nasopharynx with humidity.
Treatment of OSA requires a thorough understanding of the biomechanics, biochemistry, pathophysiology and morbid consequences of this complex phenomenon, but more than that, the human airway is part of our complex evolution. Evolution can be illogical and evolution is often quite strange. The thought is that understanding the history of what was may lead to clues to cope better with what is. Curved airway and small nose.
• Does the angle of the airway matter that much?
Moreover, there is a growing recognition that regions of the cranium differ in the extent to which they fit a neutral model of microevolutionary expectation, allowing for a more detailed assessment of patterns of adaptation and phenotypic plasticity within the human skull. Taking an historical perspective, the current state of knowledge regarding patterns of cranial adaptation in response to climatic and dietary effects is reviewed.
Evolution and Airway

The advent of the modern birth canal, the shape and alignment of which require fetal rotation during birth, allowed the earliest members of our species to deal obstetrically with increases in encephalization while maintaining a narrow body to meet thermoregulatory demands and enhance locomotor performance.
Birth Adaptations

• Humans have evolved a complex link between pelvis shape, stature, and head circumference that was not recognized before. The identified covariance patterns contribute to ameliorate the "obstetric dilemma.”

Females with a large head, who are likely to give birth to neonates with a large head, possess birth canals that are shaped to better accommodate large-headed neonates. Short females with an increased risk of cephalopelvic mismatch possess a rounder inlet, which is beneficial for obstetrics.
By 100,000 years ago our ancestors had evolved essentially modern brain size and pelvic morphology. It can thus be concluded that these archaic humans probably gave birth much as modern humans do, but also in the behaviour associated with birth (i.e. obligate midwifery).
In summary, modern human birth differs from modern non-human primate birth in three fundamental ways: (1) the neonatal head and body generally pass through a series of rotations during birth in response to the close correspondence between neonatal head and shoulder dimensions and maternal pelvic dimensions; (2) the neonate usually exits the birth canal in an occiput anterior position; and (3) human birth occurs in a social context with others in attendance.
The evolution of the nose: why is the human hooter so big?

It’s an evolutionary mystery that’s literally as plain as the nose on your face. Why did our ancestors develop a prominent protruding nose when most primates have flat nasal openings?
Long pharyngeal region

- Scans of the noses of six human volunteers, four chimpanzees and six macaques. Then, using computers, modelled the flow of inhaled air through the nasal passages. The results suggest that the nasal passages of chimps and macaques condition inhaled air much more effectively than our nasal passages. The pharyngeal region of the throat, which is much longer in humans than in other primates, may have begun to lengthen at this time. For speech!!!
Airway Evolution

• Oral development
  – Diet and speech,
  – Airway
  – ?
The supralaryngeal vocal tracts of newborn Homo sapiens and chimpanzee are similar and resemble the reconstructed vocal tract of the fossil La Chapelle-aux-Saints Neanderthal man. Vocal tract area functions that were directed toward making best possible approximations to the human vowels [a], [i], and [u], as well as certain consonantal configurations, were modeled by means of a computer program.
On bulldogs and humans

Man and microevolution - breeding, sexual selection

Most Bulldogs can't breed without human intervention, both in the actual mating & birthing process. If it weren't for this intervention in breeding the Bulldog as it stands now would become extinct. As many as 95% of Bulldogs are delivered by Cesarean section. Their head has been bred to become larger over the years, and as a result these dogs cannot birth them naturally through the pelvic canal.
“Canary” CPAP

• How would ever have survived as a species if we always needed positive pressure oxygen to survive?? Animals who need CPAP?
• Additionally, how would we have survived as a species if males had E.D.?
• Something does not make “logical” sense.
Erectile dysfunction (ED) is an evolving health problem with growing incidence in the ageing male population with potentially predictive value for cardiovascular and other chronic diseases. ED shares the common cardiovascular risk factors.

Erectile dysfunction - overview from a cardiovascular perspective. Baumann F, Hehli D, Makaloski V, Schumacher M, Schönhofen H, Diehm N.
Take Home- airway!

- Airway problem due to adaptations for speech, diet, and possibly microbiome shifts
- Immune and lymph
The jaws and teeth of Homo sapiens have evolved, from the last common ancestor of chimpanzee and man to their current form. Many factors such as the foods eaten and the processing of foods by fire and tools have effected this evolution course. The evolution of the masticatory complex is related to other anatomical features such as brain size and bipedal posture, and leads to important proceedings like the formation of speech and language.
Reduction in the jaws and teeth of human populations have been previously reported in early Holocene populations from various regions. This reduction was linked to transition from hunter gatherer community to a fully Neolithic (agriculturist) community by some authors. When compared to the whole human evolution, these changes in the human masticatory complex have occurred in a very short period of time.
Airway has been a developing "problem" for a long time - first beginning in the Neolithic period.
• In agreement with the hypotheses of DuBrul & Sicher (1954) and Enlow (1990), our results suggest that the presence of a prominent mental region responds to the space restriction at the back of the vocal tract, and to the packaging of the tongue and suprahyoid muscles in order to preserve the functionality of the laryngopharynx during respiration, feeding and speech.

Overall, *homo sapiens* are unique in the sense that they are the only species among hominids who have chins. The difference from the modern human beings skull and the Neanderthal-era human being skull is apparent as the modern human being has a point on the chin whilst the Neanderthal-era human being does not.
Humans are empirically the shortest sleeping primates and have the highest percentage of REM. A major evolutionary transition in sleep likely occurred in the ancestor of the great apes: humans, orangutans, gorillas, chimpanzees and bonobos all build platforms (or ‘nests’) upon which to sleep.
Evolutionary Maloccusion • Not prehistoric - time of Roman conquest!

The remains were found at the archaeological site of Roaix, located in the south of France. Radiocarbon dating indicated that the lower layer was from 2150 ± 140 years and the upper level from 2090 ± 140 years BC. The Gallic Wars were a series of military campaigns waged by the Roman proconsul Julius Caesar against several Gallic tribes. Rome's war against the Gallic tribes lasted from 58 BC to 50 BC and culminated in the decisive Battle of Alesia in 52 BC, in which a complete Roman victory resulted in the expansion of the Roman Republic.

Vercingetorix - After the Siege of Alesia
The dentitions of **23 skulls, mostly excavated from a 'plague pit' dating from 1348**, were investigated using a Reflex Metrograph. The measurements obtained were compared with those from a **modern control sample**. It was found that in the **medieval dentitions the arch widths were significantly wider, arch lengths and tooth lengths smaller, and the degree of irregularity of the teeth was greater than a modern group**.
The mandibular intercanine distance was smaller in the skulls compared with the modern groups. The transverse intermaxillary difference between the molars was larger in the skull group than in the 1980s Oslo group. The difference between the maxillary and mandibular intercanine distances was larger in the skulls compared with the modern groups.
Evolutionary Malocclusion

A cephalometric comparison of skulls from the fourteenth, sixteenth and twentieth centuries.

Lateral cephalometric radiograms were obtained from skulls of three groups of subjects: 30 skulls were from the remains of those who died in the London Black Death epidemic of 1348, 54 skulls were recovered from the wreck of the Mary Rose which sank in 1545 and 31 skulls were representative of modern cephalometric values. Cranial vault measurements were significantly higher (P=0.000) in the twentieth century skulls, especially in the anterior cranial fossa. Results suggest that our medieval ancestors had more prominent faces and smaller cranial vaults than modern man.
In conclusion, the results of this study underline the concept that a rapid transition in the prevalence of malocclusion has occurred during the recent generations, probably due to the changing lifestyle and inherent effects.

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Secular trends in malocclusion in Austrian men

Microbiome changes!
Immune mediated airway changes!
Diet!
Take Home- airway!

- Evolutionary changes- adaptations to climate, diet, mobility, and speech. **ARE NOT STOPPING!**
- What is **OUR FUTURE**?
Normal Vaginal Delivery

STAGES of PREGNANCY

FEAR

Woohoo.
Breathe.
Barf.

FEAR & ACCEPTANCE

Dumping.
Welcome.
I got.

FEAR & FOOD STAINS

Top.
Burger.
Now.

Obnoxious.

Violet.

I will cut.

Boom.

Food.

Wine.

>I'm far.

Cheese.

Comments.

Regarde.

You.
Fetal Development

• In human development, a fetus or foetus (/ˈfiːtəs/; plural fetuses or foetuses) is a prenatal human between the embryonic state and birth. The use of the term “fetus” generally implies that an embryo has developed to the point of being recognizable as a human; this is the point usually taken to be the ninth week. A fetus is also characterized by the presence of all the major body organs, though they will not yet be fully developed and functional and some not yet situated in their final anatomical location.
The birth process…

- Normal Spontaneous Vaginal Delivery  
  versus  
  Caesarean Section
The link between mode of delivery and subsequent childhood pathology is an important one. This becomes even more important as maternal desire for primary cesarean delivery is on the rise and rates of vaginal birth after cesarean (VBAC) are declining in this country. This new information about colonization differences with differing modes of delivery seems to be taking the hygiene hypothesis to an entirely new level.
Human infants are commonly described as obligate nasal breathers as they prefer breathing through their nose rather than mouth. Most infants, however, are able to breathe through their mouth if their nose is blocked. The infant initially attempts to breathe through the nose, and is unable to; hypercapnia occurs, and many babies instinctively begin to cry. While crying, oral ventilation occurs and cyanosis subsides.

The main functions of the nasal airway are respiration and olfaction. The nose and sinuses condition air before reaching the lower respiratory tract by providing almost 100% humidification, warming, filtering and trapping of foreign particles. Any alteration of this clearance system may produce significant problems, particularly in neonates, who are obligate nasal breathers until they are at least two months old. Most cases of nasal obstruction in neonates and infants are due to generalized nasal airway obstruction associated with neonatal rhinitis, viral upper respiratory tract infections, and possibly milk/soy allergies.
The most common causes of nasal obstruction and runny nose in infants and children are infections, mainly of viral origin, or allergies. In neonates and infants, viral upper respiratory tract infections (URTI) are frequently observed during episodes of nasal obstruction. The use of isotonic and hypertonic saline solutions to relieve nasal congestion is widespread; it is a safe and valuable therapeutic support, and can reduce the use of medications (antihistamines, decongestant, antibiotics, corticosteroids) during the treatment of URTIs.
The Developing Brain

• Needs oxygen…
The environment we are born into...
Environmental Influences

- Babies crawl on carpet....
But what if you don’t have normal respiration? What about Obstructive Sleep Apnea?
Cardiac Disease and OSA

Summary—
- OSA and cardiovascular disease commonly co-aggregate. Multiple studies indicate that OSA contributes to or exacerbates cardiovascular disease, and thus may be a novel target for cardiovascular risk reduction. While the supports screening and treatment of OSA in patients at risk for cardiovascular disease, it also underscores a need for well powered clinical trials to examine the role of CPAP and other therapies in these populations.

Sources:
2) Gami et al, J Am Coll Cardiol 2013;
3) Young et al, J Sleep 2008;
4) Li et al, Europace 2014
Growth Failure

Sleep Bruxism, Behavior Issues and Sleep Apnea

Obesity and failure at school

Children are different!
Screening for obstructive sleep apnea (OSA) with in-laboratory polysomnography is recommended for children with sleep disordered breathing. **Adenotonsillectomy is the first-line therapy for pediatric OSA, although intranasal steroids and montelukast (Singulair) can be considered for those with mild OSA and continuous positive airway pressure for those with moderate to severe OSA** awaiting surgery, poor surgical candidates or persistent OSA. **Weight loss and oral appliance therapy are also useful. A multi-modality approach to diagnosis and treatment is preferred.**
Pediatric Sleep Apnea

• **BACKGROUND:**
  Adenotonsillar hypertrophy is the most common etiologic agent for the obstruction of the upper airways in children, which might be associated with attention-deficit hyperactivity disorder (ADHD), one of the most common psychiatric disorders of childhood. Despite the concurrence of these two conditions, i.e., obstruction of the airways and ADHD, no exact etiologic relationship has been established between adenotonsillectomy (AT) and ADHD symptoms. *This study was undertaken to evaluate the effect of AT on the ADHD symptoms in children with adenotonsillar hypertrophy and sleep disordered breathing (SDB).*
**METHODS:**

The design of the present study consisted of pre-test and post-test, followed by post hoc tests. **Fifty-three children aged 3-12** were included in this study. The scores of ADHD symptoms were evaluated before AT and at **3- and 6-month postoperative** intervals based on Conner's Parent Rating Scale-Revised (CPRS-R) Questionnaire. Repeated-measures ANOVA and Fisher's exact test were used for data analysis.
Effect of adenotonsillectomy on ADHD symptoms of children with adenotonsillar hypertrophy and sleep disordered breathing.

Amiri S¹, AbdollahiFakhim S², Lotfi A³, Bayazian G⁴, Sohrabpour M⁵, Hemmatjoo T⁶.

Results:
AT resulted in a significant decrease in the severity of ADHD symptoms (oppositional behavior, cognitive disorders, inattention, hyperactivity and ADHD index) at 3- and 6-month postoperative intervals (P<0.001), with more significant decreases at 6-month postoperative interval compared to 3-month interval (P<0.001).

Conclusions:
Based on the results of this pilot study, AT in children with SDB associated with ADHD resulted in a significant decrease in the severity of ADHD symptoms.
Pediatric Sleep Apnea

A number of references, studies….
Early Diagnosis

- Facial profile and maxillary width, always exam thoroughly
Early Diagnosis

- Facial profile and maxillary width - always exam thoroughly
Take Home - airway!

- Early diagnosis
- ENT evaluation
- Sleep study
- AT if indicated
Objectives: It has been hypothesized that pediatric sleep bruxism (P-SB) may be presented due to sleep respiratory disorders, which can result in the possible exhibit of attention deficit disorder or hyperactivity disorder (ADHD). The relationship between pediatric sleep bruxism and ADHD is still unknown. The objective of this study is to estimate a relation between P-SB and ADHD.

Methods: 40 Children with sleep bruxism diagnosis (possible P-SB), aged 4 to 11 years (mean age 6.52, SD 2.15), were recruited for a cross-sectional study from the Pediatric Dentistry Clinic, Universidad Andres Bello, Chile. Parents were asked to fill in the Pediatric Sleep Questionnaire (PSQ) for sleep apnea score; parents and children’s teachers filled in SNAP IV Survey (Swanson, Nolan and Pelham Scale Version IV) for attention deficit and hyperactivity disorders. A single calibrated evaluator performed a clinical analysis on pharyngeal obstruction, tonsillar hyperplasia, body fat index, lips competence, tongue size and breathing habit. Variables were analyzed by Z Test.

Results: P-SB were positively related to Sleep apnea (p=0.0009), but not with ADHD (parents p=0.29 and teachers p=0.06). Sleep Apnea and ADHD were positively related (p=0.01).

Conclusions: These results suggest that Sleep apnea and ADHD should be positively related to sleep bruxism in children individually, mostly in patients with frequent SB episodes. There is a slight relation between P-SB and ADHD that should be further studied.
Pediatric Sleep Apnea

Let’s check the internet for recommendations.

- Approach Considerations. Adenotonsillectomy. ...
- Positive-Pressure Ventilation. An important distinction must be made between continuous positive airway pressure (CPAP) and bilevel (or biphasic) positive airway pressure (BiPAP).
- Oral Appliances.
- Nasal Strips.
- Sleeping Position.
- Nasal Fluticasone.
- Nasal Steroids.
- Adenotonsillectomy.

Shop for treatment for pediatric sleep on Google

- PIXI™ Pediatric Nasal CPAP ... $119.00
- PureSom Ruby ... $19.95
- Mirage Kidsta Pediatric ... $99.00
- Softcap - Child Blue Mesh ... $31.00
- Philips Respironics ... $149.00
- Apnea No More ... $3.82
Conclusions: These results indicate that, despite suboptimal adherence use, there was significant improvement in neurobehavioral function in children after 3 months of positive airway pressure therapy, even in developmentally delayed children. The implications for improved family, social, and school function are substantial.
Pediatric Sleep Apnea

- What good is CPAP? What good is “behavior management”? Or Psychotropic drugs? IF the airway is totally blocked?
Treatment: Team Work

• Consultations:
  – Information sharing
• Pediatrician
  – AT
  – Deviated septum
  – Turbinates
• ENT
  – AT
  – Deviated septum
  – Turbinates
• Pediatric Dentist
  – Expanders
  – Nasal sprays
  – Probiotics

Why should we get involved?
What is the prevalence?
What can we do?
Mallampati Score

- Pretty easy to use- significant correlation to airway status...

Canadian Anaesthetists’ Society Journal
A clinical sign to predict difficult tracheal intubation; a prospective study.
A significant correlation was found between Mallampati score, tonsillar size, and AHI. For every point increase in the Mallampati score, the odds ratio of having OSA increased by more than 6-fold. For every point increase in tonsillar size, the odds ratio of having OSA increased by more than 2-fold.

Mallampati score and tonsillar size are independent predictors of OSA. Oral examination including Mallampati score and tonsillar size should be considered when evaluating a patient for OSA. They can be used to prioritize children who may need PSG (Sleep study).
- The Brodsky grading scale offered the highest interobserver and intraobserver reliability when compared with the Friedman and novel 3-grade scales. The results of this study would support the uniform use of the Brodsky scale for future clinical and research work.
Inadequate or poor quality sleep in early childhood impairs social–emotional and cognitive function via effects on the developing brain and increases obesity risk via hormonal and endocrine effects. The prevalence of short sleep duration, behavioral sleep problems, and sleep-disordered breathing among children aged 3 to 5 years is 20% to 50%. Healthy sleep habits increase sleep duration and prevent behavioral sleep problems. Awareness of sleep-disordered breathing symptoms leads to its timely treatment.
Results

Children with the worst SDB symptoms vs. asymptomatic children, had increased odds of overweight at 7 (OR=2.08, 95% CI=1.04-4.17), 10 (OR=1.79, 95% CI=1.02-3.16), and 15 years (OR=2.25, 95% CI=1.27-3.97) in models adjusted for sleep duration.

Similarly, short sleep duration at ≈5-6 years was associated with overweight at 15 years, independent of SDB. Children with short sleep duration at 4.75 years were more likely to be overweight at 15.
• Conclusion
• Both **SDB** and short sleep duration significantly and independently increase children’s odds of becoming overweight.
Antibiotics, acid suppressants and the combination of multiple medications in the first 2 years of life are associated with a diagnosis of **childhood obesity**. Microbiota-altering medications administered in early childhood may influence weight gain.
• RESULTS:
The SDB clusters predicted ≈20% to 100% increased odds of problematic behavior, controlling for 15 potential confounders.

Early trajectories predicted problematic behavior at 7 years equally well as at 4 years.

The 2 clusters with peak symptoms before 18 months that resolve thereafter still predicted 40% to 50% increased odds of behavior problems at 7 years.

CONCLUSIONS:
Findings suggest that SDB symptoms may require attention as early as the first year of life.
• **Age One visit**- Airway evaluation very important
• Question parents as to **snoring and behavior**
• Examine the **profile**
• Family history and Allergies
In 2005, pediatricians recommending “save your child’s life”

Therefore, we recommend that pacifiers be offered to infants as a potential method to reduce the risk of SIDS. The pacifier should be offered to the infant when being placed for all sleep episodes, including daytime naps and nighttime sleeps. This is a US Preventive Services Task Force level B strength of recommendation based on the consistency of findings and the likelihood that the beneficial effects will outweigh any potential negative effects. In consideration of potential adverse effects, we recommend pacifier use for infants up to 1 year of age, which includes the peak ages for SIDS risk and the period in which the infant's need for sucking is highest. For breastfed infants, pacifiers should be introduced after breastfeeding has been well established.
SIDS- and pacifiers- AAP

-SIDS babies may not have been able to use a pacifier to begin with!
-Positioning is more important.
-Sleeping with parent, breastfeeding, all factors had to be considered.
-What are the long term effects of pacifiers? Skeletal changes, adenotonsillar hypertrophy?
CONCLUSIONS: Breastfeeding is protective against SIDS, and this effect is stronger when breastfeeding is exclusive. The recommendation to breastfeed infants should be included with other SIDS risk-reduction messages to both reduce the risk of SIDS and promote breastfeeding for its many other infant and maternal health benefits.
Pacifiers and Infections

The risk of ear infections is up to three times higher in those who use a pacifier and there does appear to be a ‘dose response’ with continual users more at risk than occasional users.
Children whose parents “cleaned” their pacifier by sucking it (n = 65) were less likely to have asthma, eczema, and sensitization at 18 months of age than children whose parents did not use this cleaning technique (n = 58). Protection against eczema remained at age 36 months. Vaginal delivery and parental pacifier sucking yielded independent and additive protective effects against eczema development. The salivary microbiota differed between children whose parents cleaned their pacifier by sucking it and children whose parents did not use this practice.
Pacifier cleaning practices and risk of allergy development

Children whose parents cleaned the pacifier by sucking it (n=65) may reduce the risk of allergy development possibly by the salivary microbiome transfer.
Volatile N-nitrosamines are very potent carcinogens. They can be approximately 5 million times more powerful than saccharin. When 16 types of baby-bottle nipples and children's pacifiers were tested recently, relatively high levels of nitramines, nitrosamines, and nitrosatable precursors were found. Infants who use products like those tested may, therefore, be exposed daily to < 100 times more of these carcinogens than are adults.
A dose-dependent relationship was noted between AE scores and allergic symptoms. For current wheeze and current rhinitis, the association was significant after adjustment for potential confounding variables. After the adjustment, the association between current eczema and AE score disappeared. These findings suggest that frequent use of antimicrobial household products was associated with current wheeze and current allergic rhinitis.


For example, a marketplace study of the US showed that nearly half of all commercial soaps contained triclosan (76% of liquid soaps and 29% of bar soaps, a total of 45.5% of all soaps investigated). The popularity of antibacterial consumer products has led to increased consumer use of triclosan. Triclosan and its metabolites were omnipresent in the analyzed plasma and milk of 36 Swedish nursing mothers. The concentrations were higher in both the plasma and milk from mothers who used personal care products containing triclosan than in the plasma and milk from mothers who did not. This result suggested that personal care products were a main source of exposure to triclosan.
In contrast to sleep-disordered breathing or sleep apnea in adults, which is predominantly associated with obesity, sleep-disordered breathing symptoms in this pediatric cohort were primarily associated with adenotonsillar hypertrophy, morphologic features related to a long and narrow face (dolichofacial, high mandibular plane angle, narrow palate, and severe crowding in the maxilla and the mandible), allergies, frequent colds, and habitual mouth breathing.
Chronic snoring is considered abnormal in a pediatric population. This disorder is often attributed to enlarged tonsils and adenoids, but multiple anatomic obstructions should also be considered.
The mouth-breathing children showed a deeper palatal vault, a larger mandibular width, and a larger mandibular arch length in comparison with the nasal-breathing children. After airway clearance, the adenotonsillectomy group showed a significant maxillary transverse width gain compared with the control subgroup. The control subgroup showed a significant deepening of the palatal height when compared with the adenotonsillectomy subgroup after 1 year.
In the ALTE group (n = 107), snoring, restless sleep, and habitual mouth breathing were significantly more common (P < 0.05) than in the control group (n = 115). The ALTE group also displayed a higher frequency of Angle class II, narrow palate, and Friedman tongue position (grades III–IV) than the control group.
• SDB, ADHD, OSA, Obesity, Sleep bruxism, TMD, and Migraines…….
RESULTS: Attentional deficits have been reported in up to 95% of OSA patients. In full syndromal ADHD, a high incidence (20% to 30%) of OSA has been shown. All 6 interventional studies reported improvements in behavior, inattention, and overall ADHD after treatment of OSA.

Is obstructive sleep apnea associated with ADHD?

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BACKGROUND: It has been suggested that obstructive sleep apnea (OSA) may result in symptoms similar to those experienced in attention-deficit/hyperactivity disorder (ADHD). Because this may have important public health implications, we reviewed the literature regarding this association, with a focus on interventional studies examining the effect of OSA treatment on change in ADHD symptoms.
• Facial exam
  – Do they look and function normally?
  – Allergies - Morgan Dennie Lines and venous pooling

Extra-Oral Examination
- Skin
- Lips
- Swelling
- Asymmetry
- Allergic Shiners

OSA - obstructive sleep apnea - parental history
Take Home- airway!

- Early diagnosis
- ENT evaluation
- Sleep study
- Expansion early!
Obstructive Sleep Apnea

Sleep Medicine Center

The Sleep Medicine Center at Lurie Children’s is the only comprehensive sleep center in Illinois dedicated solely to children. The center provides clinical evaluation, diagnosis and management of children with all forms of sleep disorders. Sleep disorders treated by our staff include sleep-disordered breathing, sleep apnea, nightmares, insomnia, parasomnias, narcolepsy and circadian rhythm disorders. Since its opening in 1995, the sleep specialists have seen more than 5,000 patients, and more than 14,000 patient studies have been conducted.

male with anterior and posterior crossbites

• Maxillary hypoplasia
Wilson Quadhelix for maxillary arch development

• Expand both anterior and posterior segments
• Post operative view with upper arch expansion evident

Chair of the combined departments of Pediatric Dentistry and Orthodontics at the new School of Dental Medicine at Southern Illinois University Edwardsville (SIUE), from 1971 until 1987. For 17 years he organized and taught undergraduate Orthodontics and supervised the undergraduate program in Pediatric Dentistry. He also taught clinical orthodontics to the General Practice Residents one day each week in the SIU East St. Louis Dental Clinic.

Dr. Sim’s widely used text, Minor Tooth Movement in Children was brought out in two editions, 1971 and 1977.
• Four year old girl with anterior crossbite and prognathic profile
  • Patient bites edge to edge and slides anteriorly
  • Parents concerned about profile
  • No family history of Class III relationships
  • OSA!! Sleep Study
• Frontal view in full occlusion- pre-operative photo
• **Sleep apnea reported**- snoring/ sleep issues
• **Wilson Quadhelix** cemented and then expansion
Child no longer appears prognathic and crossbite corrected, mother quite happy no snoring/OSA
Anterior crossbite with retrognathic profile
Treated with **Wilson Quadhelix appliance**
Snoring with sleep apnea episodes- ENT “normal”
• Anterior crossbite corrected
• Molars bands left on for one year post treatment
• Arch form restored to normal
• No snoring!!!
Expansion Appliances

- Mixed dentition - airway patient, anterior and posterior expansion
Expansion Appliances

- Expand the posterior but then closing the anterior and retracting?
Take Home - airway!

**Key Takeaway**

- Early treatment
- Fixed expanders due to young age
The purpose of the present study was to calculate the average anteroposterior size of the nasopharyngeal airway in 109 children (54 mouth breathers, in whom adenoidectomy was indicated for nasal obstruction, and 55 nose breathers) from 6 to 12 years of age, in order to obtain cephalometric standard; from these standards, one is able to judge the extent to which nose breathing may be obstructed. The results show when planning orthodontic therapy, in which it is desirable to assess the ability of the patient to breath through the nose, a clinical record of the mode of breathing can be supplemented with radiocephalometric data on the anteroposterior size of the nasopharyngeal airway.
Diagnosis-Anatomic Airway Analysis

- ENT, Pediatric Dentist - Airway Analysis
Abstract
Numerous indices have been proposed to alleviate crowding. The purpose of this investigation was to validate McNama’s rule of thumb. Records of 155 consecutive pretreatment records. The discrepancy between the indices were correlated against measures of crowding: (1) males had more significant correlation between maxillary premolar widths. (2) Premolar widths were more strongly correlated than intermolar widths of 2.5 mm to 4.7 mm and 2.7 mm to 3.7 mm. (3) Premolar widths were only 2.5 mm to 4.3 mm but was reasonable. The discrepancy between indices potentially overestimate the arch expansion.

Key words
Maxilla • Expansion • Pont • Schwarz

Take Home - airway!

- Upper and Lower Schwarz appliances
- Restore the width
- Requires patient cooperation
Airway- cooperative pre-teen

• Snoring but ENT evaluation is WNL’s. Narrow arches, blocked out upper lateral incisors
Post expansion
No snoring, swallowing is easier
Typical Airway Patient

- Would prefer no treatment, but has fan expander for posterior width collapse. Obvious mouth breather, “adenoidal” facies “LFS” or dolichocephalic appearance.
Diagnosis-Anatomic Airway Analysis

Current Technology

Palatine tonsils

16.52 mm

Palatal height index = 39%

42.47 mm

Total Volume: 6.1 cc

Min Area: 41.32 mm²

Airway Dimensions

CBCT volume alignment for airway analysis.

The hard palate was oriented as horizontal as possible. The ossicles of the inner ear were oriented parallel to each other in the coronal and axial planes for reliability and reproducibility purposes. In the sagittal view, parallel lines were made from the level of the posterior nasal spine – basion landmarks, and at the superior most aspect of the body of the C1 vertebrae. The airway was then measured between these parallel markers.
Diagnosis-Anatomic Airway Analysis

- Current Technology
Diagnosis-Anatomic Airway Analysis

Airway: The minimum cross-sectional dimension is ~54 mm. The accepted minimum cross-sectional airway dimension is ~100 mm². The dimension recorded in the scan is subnormal and puts the patient at risk for obstructive breathing disorders, such as obstructive sleep apnea.

- Adenoids and palatine tonsils: This is a common finding in patients of this age. However, this may contribute to restricted airflow through the nasal cavity, oropharynx, and nasopharynx areas, and may contribute to mouth breathing. Correlate clinically.
- The C1/ramus relationship indicates a possible retrognathic position of the mandible, which may contribute to constriction of the airway.
- Palatal height index: The dimension is subnormal (normal is 42%), and possibly indicates a shallow palate.
- The normal ANB angle is 2° +/- 2. The angle recorded in the scan is above the range of normal, and indicates a possible anteroposterior skeletal discrepancy.
- The remainder of the CBCT scan is unremarkable for any significant abnormalities.
Take Home - airway!

Key Takeaway

- Early treatment
- Expand to airway - not to “occlusion”
- CBCT analysis
The SDB and periodontitis relationship remained statistically significant, but was attenuated in strength and no longer dose-response. Compared with the nonapneic referent, **adjusted odds of severe periodontitis were 40% higher with subclinical SDB** (OR = 1.4, 95% CL: 1.0, 1.9), 60% higher with mild SDB (OR = 1.6, 95% CL: 1.1, 2.2) and 50% higher with moderate/severe SDB (OR = 1.5, 95% CL: 1.0, 2.3) **demonstrating an independent association between SDB and severe periodontitis.**
Video inspection - blocked nares, tonsils, turbinates, etc.
Video Inspection
Video Inspection
<table>
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<th>Inhaled Xylitol Versus Saline in Stable Subjects With Cystic Fibrosis</th>
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<td>ClinicalTrials.gov Identifier:</td>
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<tr>
<td>Ann &amp; Robert H Lurie Children's Hospital of Chicago</td>
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<td>Northwestern University</td>
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<td>Information provided by (Responsible Party):</td>
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<td>Joseph Zabner, University of Iowa</td>
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Airway and Polyols

- Sleep Apnea
- Chronic rhinosinusitis
- Cystic fibrosis
- Allergies
Xylitol and chronic “nose”

Xylitol 5% and 10% significantly reduced biofilm biomass (S. epidermidis), inhibited biofilm formation (S. aureus and P. aeruginosa) and reduced growth of planktonic bacteria (S. epidermidis, S. aureus, and P. aeruginosa).
Xylitol nasal irrigation in the management of chronic rhinosinusitis: a pilot study.
Weissman JD, Fernandez F, Hwang PH.

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Erratum in

OBJECTIVES/HYPOTHESIS: To determine the tolerability of xylitol mixed with water as a nasal irrigant and to evaluate whether xylitol nasal irrigation results in symptomatic improvement of subjects with chronic rhinosinusitis.

STUDY DESIGN: A prospective, randomized, double-blinded, controlled crossover pilot study.

METHODS: Twenty subjects were instructed to perform sequential 10-day courses of daily xylitol and saline irrigations in a randomized fashion, with a 3-day washout irrigation rest period at the start of each treatment arm. Collected data included patient characteristics, along with Sino-Nasal Outcome Test 20 (SNOT-20) and Visual Analog Scale (VAS) scores reported at the beginning and end of each irrigation course.

RESULTS: Fifteen of the 20 subjects (75%) returned their SNOT-20 and VAS data for analysis. There was a significant reduction in SNOT-20 score during the xylitol phase of irrigation (mean drop of 2.43 points) as compared to the saline phase (mean increase of 3.93 points), indicating improved sinonasal symptoms ($P = 0.0437$). There was no difference in VAS scores. No patient stopped performing the irrigations owing to intolerance of the xylitol, although its sweet taste was not preferred by three subjects (21%). One patient reported transient stinging with xylitol.

CONCLUSIONS: Xylitol in water is a well-tolerated agent for sinonasal irrigation. In the short term, xylitol irrigations result in greater improvement of symptoms of chronic rhinosinusitis as compared to saline irrigation.
Xylitol enhances bacterial killing by ASL- antimicrobials
Polyols have been reported to reduce inflammation and can improve airway.
Alzheimer's in Young Adults

Brain plaque buildup, long linked to the onset of Alzheimer's disease, has been identified in the brains of men and women as young as 20, researchers say. "One thing this means is that the resource, the machinery, for making the clumps of plaque we see among Alzheimer's patients is already available in young individuals," said study co-author Changiz Geula, a research professor at the Northwestern University Feinberg School of Medicine in Chicago.
“Finding Connor Deegan.”

–Valerie Deegan