Interdisciplinary management between orthodontists, dentists and otolaryngologists of patients with Sleep Disordered Breathing (SDB)

(Breathing Disordered Sleep or Sleep Related Breathing Disorders)

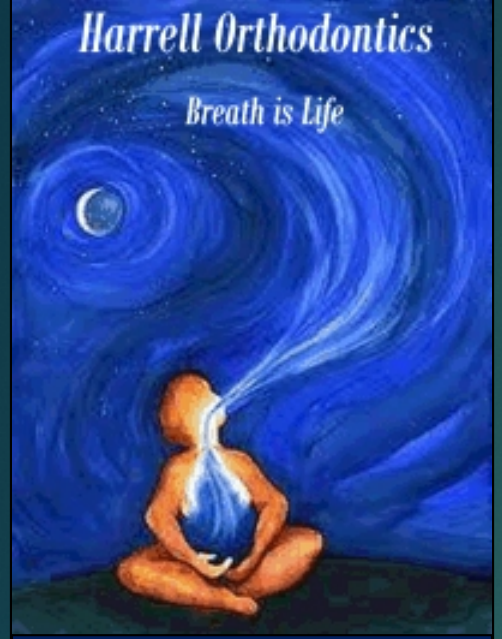
2:40

4:40

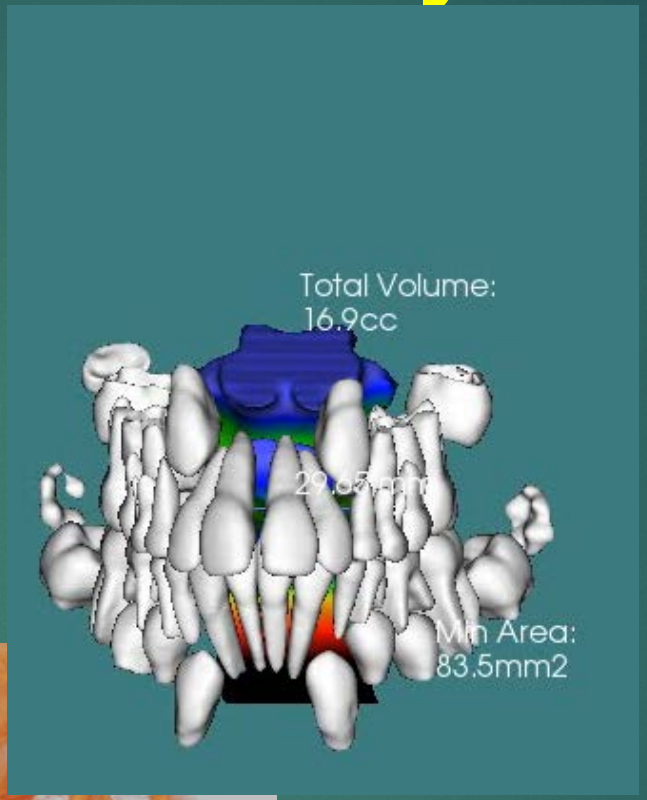
Learning Objectives

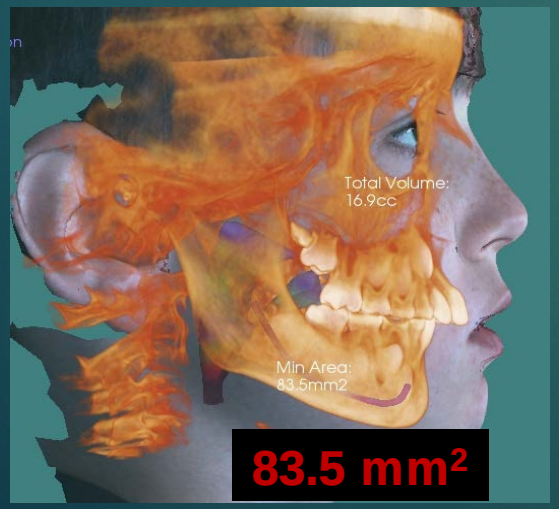
- How alterations in respiration, early in life, can alter cranio-facial growth and leading to common malocclusions, altered airway dimensions and potential health issues later in life. (ref: Myer Marks, MD, Ped Allergy, U Miami & C. Guilleminault, father of SM, Stanford University)
- Screening and detection of 3D facial Biomarkers (color & geometry) of breathing / sleep issues.
- Understand where orthodontic / dento-facial orthopedic therapy fits into the treatment of pediatric patients (as early as 2-5 years) who may have or develop potential SDB (BDS) issues which may lead to cranio-facial growth alterations and malocclusions.
- THE MEDICAL / DENTAL TEAM approach to diagnosis and treatment
- Airway and TMJ Disorders

“So what’s orthodontics got to do with Airway ?”

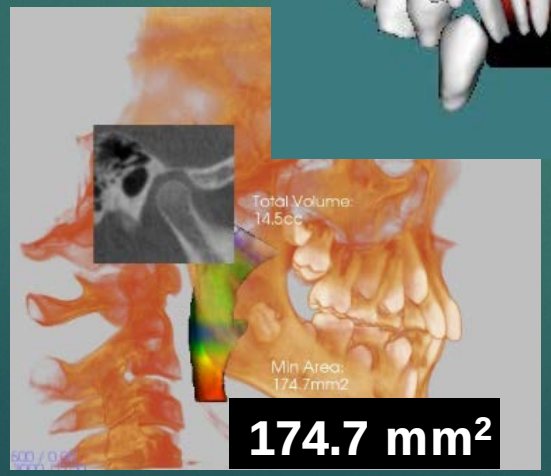


Quality & Quantity of life issue





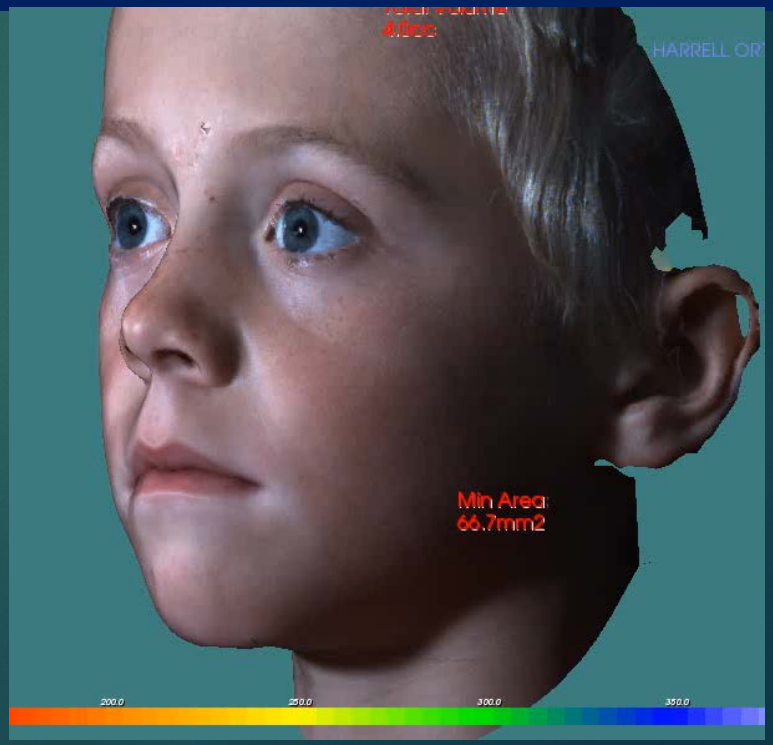
83.5 mm²



174.7 mm²

New Paradigm in Orthodontic Diagnosis & Treatment Planning using 3D Imaging

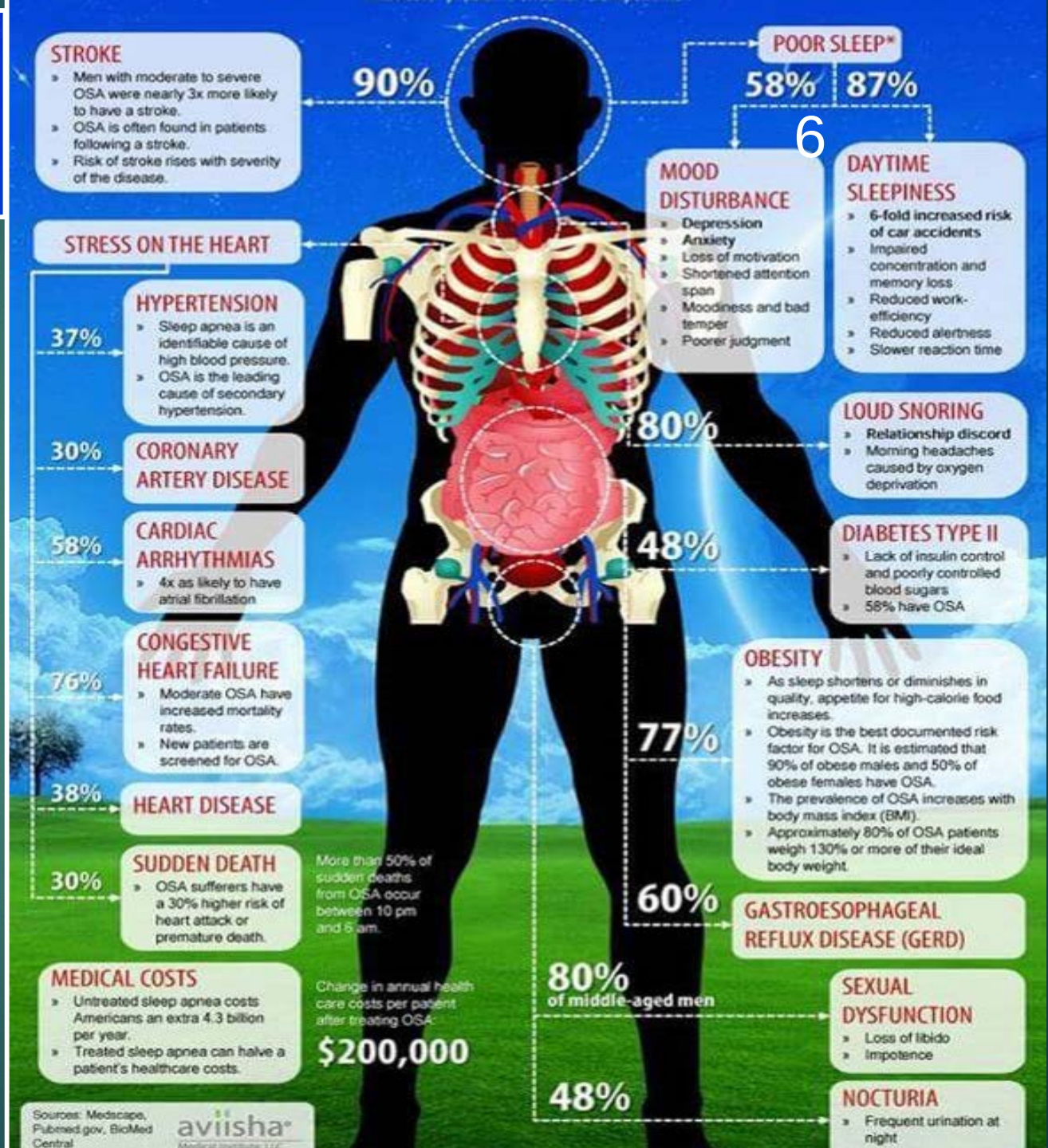
Image Fusion of CBCT & 3D Facial Imaging PSAR



Why Orthodontists and Otolaryngologists should be "tied at the hip" when it comes to SDB

The Consequences of Obstructive Sleep Apnea

- **The SIGNS (Biomarkers) begin to show up EARLY in LIFE**
- **Alteration of Cranio-facial Growth**
  - **Cause ?**
  - **Effect ?**
  - **Or Both ? (Merri-go-round)**



Primate experiments on oral respiration

Harvold EP, Tomer BS, Vargervik , Chierici G Am J Orthod 1981 Apr;79(4):359-72

- Abstract
  - Oral respiration associated with obstruction of the nasal airway is a common finding among patients seeking orthodontic treatment.
  - The primate experiments reported here are part of a series designed to test some of the current hypotheses regarding the relationship between mouth breathing and dental malocclusions, that is, between deviations in orofacial muscle recruitment and jaw morphogenesis.
  - Mouth-breathing was developed in the animals of this experiment by obstruction of the nasal passages with silicon nose plugs.
  - The experiments showed that the monkeys adapted to nasal obstruction in different ways. In general, the experimental animals maintained an open mouth. Some increased the oral airway rhythmically, while others maintained the mandible in a lower position with or without protruding the tongue.
  - All experimental animals gradually acquired a facial appearance and dental occlusion different from those of the control animals.
  - (ie. Class I, Class II, Class III malocclusions with Narrow arches, narrow and recessive Naso-Maxillary Complex, retruded mandible, open bite, anterior tongue thrust, etc.)

Primate experiments on oral respiration

Harvold EP, Chierici G, Vargervik , Am J Orthod Jan 1972

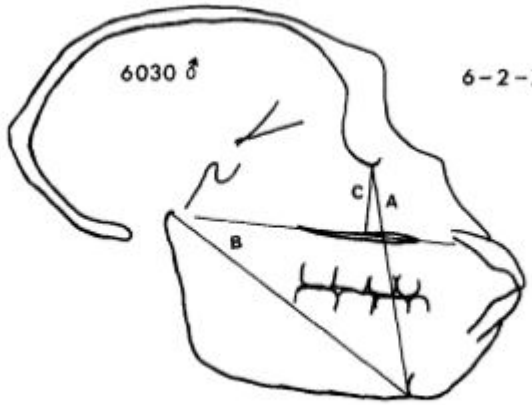


Fig. 1. Tracing of oriented lateral head film, male rhesus monkey. **A,** Distance from infraorbital border to mandibular symphysis, indicating face height. **B,** Distance from mandibular condyle to symphysis, indicating mandibular length. **C,** Distance from infraorbital border to palatal plane.

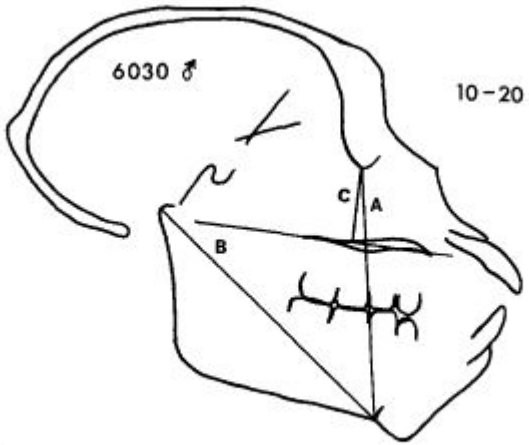


Fig. 2. Tracing of oriented lateral head film displaying morphologic changes during experiment from June 2 to Oct. 20, 1970.

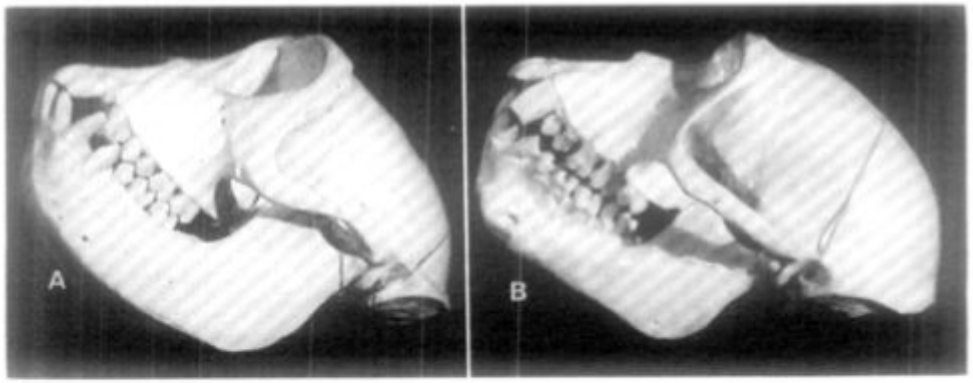
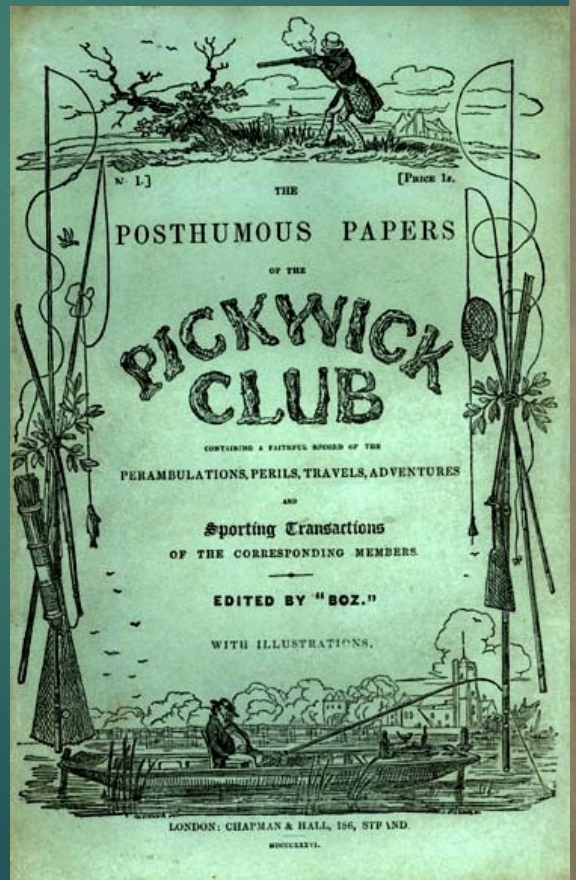


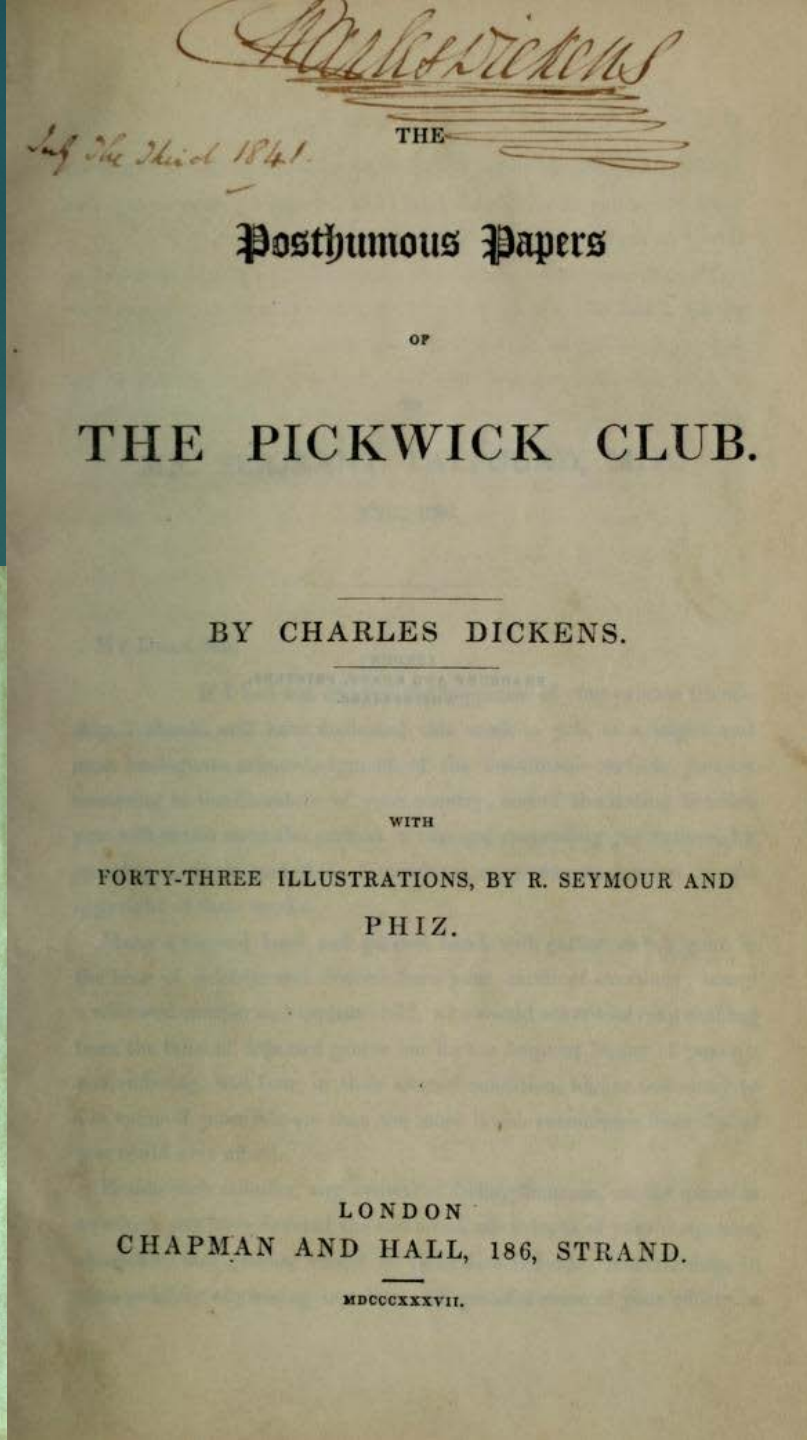
Fig. 3. A, Skull of male control monkey. **B,** Skull of male experimental monkey. Note irregular bone surface where platysma is attached to mandible.

Fig. 4. Unanesthetized male rhesus monkey showing abnormal facial profile subsequent to experimentally induced lowering of mandible. Animal has an Angle Class II, Division 1 malocclusion.

Obesity hypoventilation syndrome (aka Pickwickian syndrome)

- Charles Dickens
-
  - *The Posthumous Papers of the Pickwick Club* (also known as *The Pickwick Papers*) 1836
  - "Joe" the little fat boy who ate and slept all the time
  - Considered lazy





In 1889, pediatric surgeon William Hill

- was removing the tonsils from children with obstructed airways to alleviate their struggles with breathing when he noticed unforeseen side effects of the procedure. The tonsillectomies unexpectedly cleared up the children's chronic headaches and problems paying attention in school.

- In the British Medical Journal, Dr. Hill noted that "children, the victims of nasal and pharyngeal obstructions ... frequently demonstrate a marked inability to fix their attention on their lessons or work for any length of time."

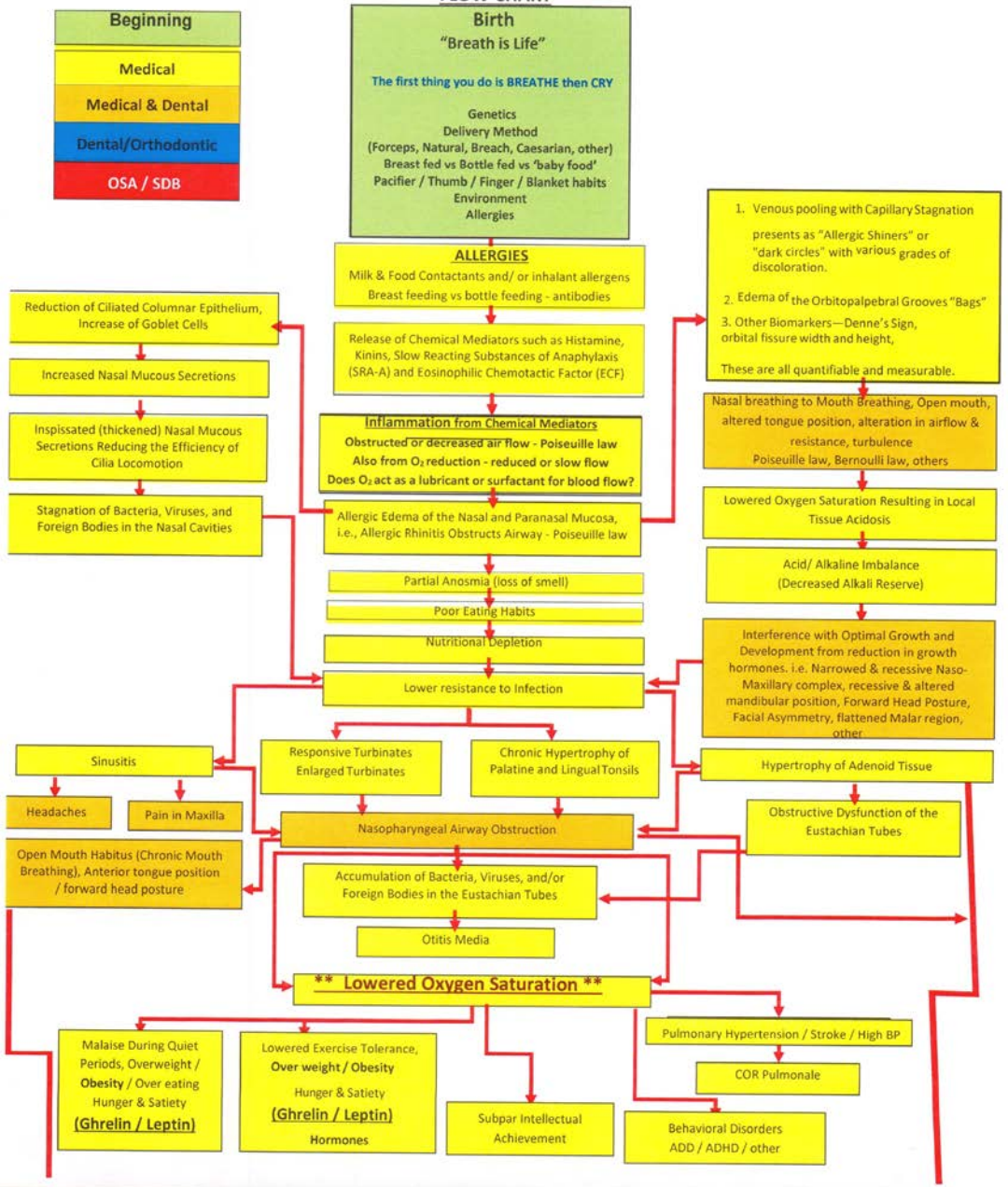
- His description of the symptoms are the same as the ones we now associate with ADD & ADHD. These have accelerated to epidemic proportions in the past two decades for unknown reasons.

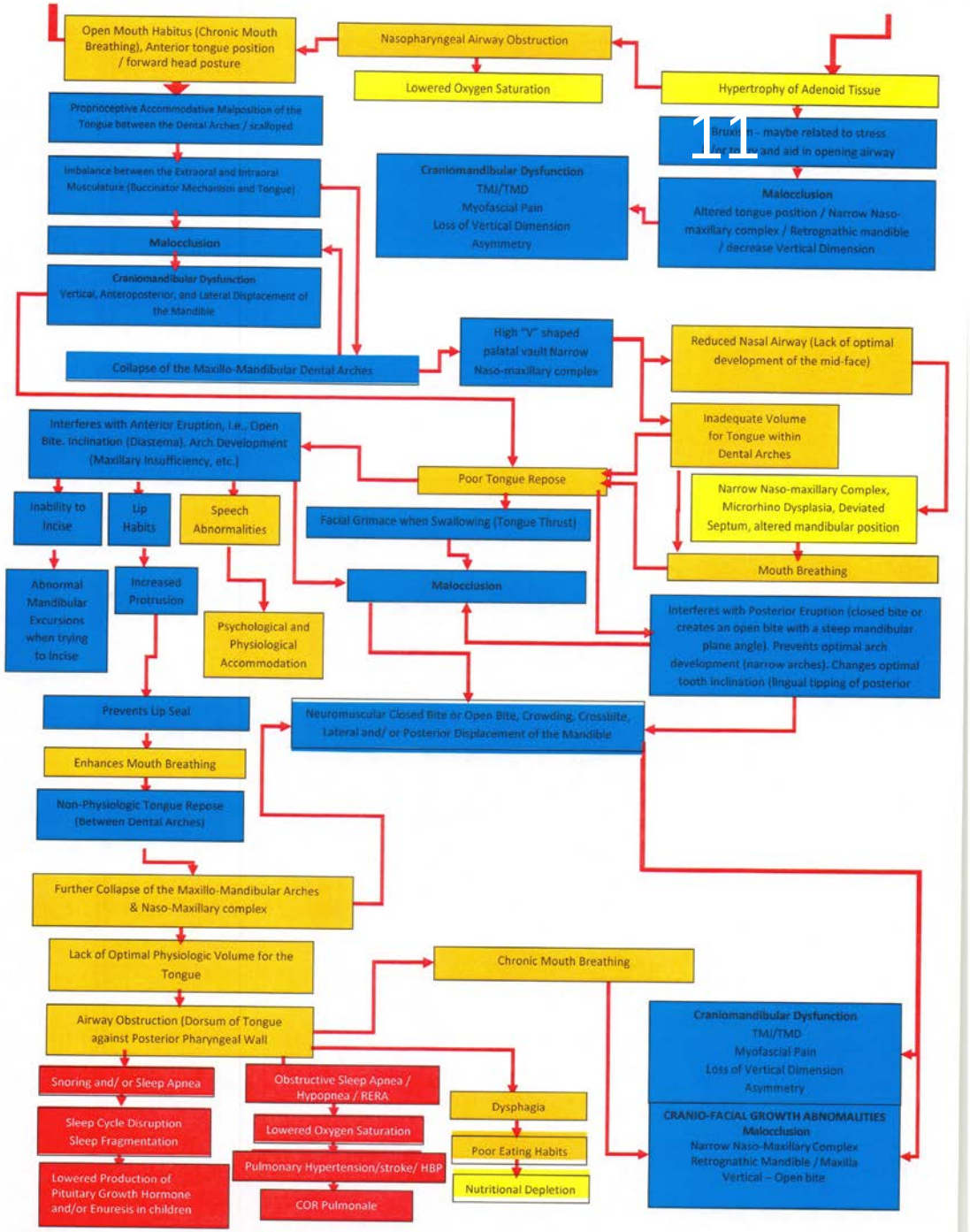
Development of Malocclusion & Craniomandibular Dysfunction Resulting from Upper Respiratory Allergies & Obstructive Airway Disorders

Adapted from the work of Vernon D. Gray, MD, James F. Garry, DDS, FICD, FAAHD and Myer B. Marks, MD

Expanded & Modified by William E. Harrell, Jr, DMD , C.DSM (© 2005)

FLOW CHART





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FLOW CHART

Beginning

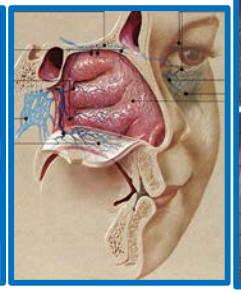
- Medical
- Medical & Dental
- Dental/Orthodontic
- OSA / SDB

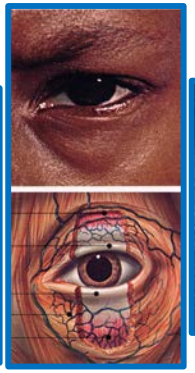
Birth

"Breath is Life"

The first thing you do is BREATHE then CRY

Genetics
Delivery Method
(Forceps, Natural, Breach, Caesarian, other)
Breast fed vs Bottle fed vs 'baby food'
Pacifier / Thumb / Finger / Blanket habits
Environment
Allergies





ALLERGIES

Milk & Food Contactants and/ or inhalant allergens
Breast feeding vs bottle feeding - antibodies

Release of Chemical Mediators such as Histamine, Kinins, Slow Reacting Substances of Anaphylaxis (SRA-A) and Eosinophilic Chemotactic Factor (ECF)

Inflammation from Chemical Mediators

Obstructed or decreased air flow - Poiseuille law
Also from O_2 reduction - reduced or slow flow
Does O_2 act as a lubricant or surfactant for blood flow?

Allergic Edema of the Nasal and Paranasal Mucosa, i.e., Allergic Rhinitis Obstructs Airway - Poiseuille law

Partial Anosmia (loss of smell)

Poor Eating Habits

Nutritional Depletion

Lower resistance to Infection

Reduction of Ciliated Columnar Epithelium, Increase of Goblet Cells

Increased Nasal Mucous Secretions

Inspissated (thickened) Nasal Mucous Secretions Reducing the Efficiency of Cilia Locomotion

Stagnation of Bacteria, Viruses, and Foreign Bodies in the Nasal Cavities

1. Venous pooling with Capillary Stagnation presents as "Allergic Shiners" or "dark circles" with various grades of discoloration.
2. Edema of the Orbitopalpebral Grooves "Bags"
3. Other Biomarkers—Denne's Sign, orbital fissure width and height,

These are all quantifiable and measurable.

Nasal breathing to Mouth Breathing, Open mouth, altered tongue position, alteration in airflow & resistance, turbulence
Poiseuille law, Bernoulli law, others

Lowered Oxygen Saturation Resulting in Local Tissue Acidosis

Acid/ Alkaline Imbalance
(Decreased Alkali Reserve)

Interference with Optimal Growth and Development from reduction in growth hormones. i.e. Narrowed & recessive Naso-Maxillary complex, recessive & altered mandibular position, Forward Head Posture, Facial Asymmetry, flattened Malar region, other

Sinusitis

Responsive Turbinates
Enlarged Turbinates

Chronic Hypertrophy of
Palatine and Lingual Tonsils

Hypertrophy of Adenoid Tissue

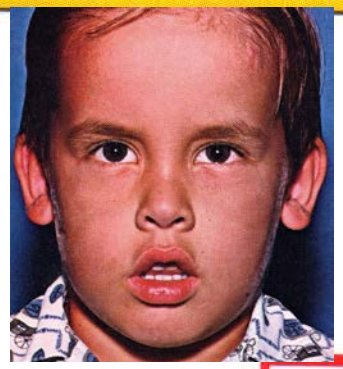
Headaches

Pain in Maxilla

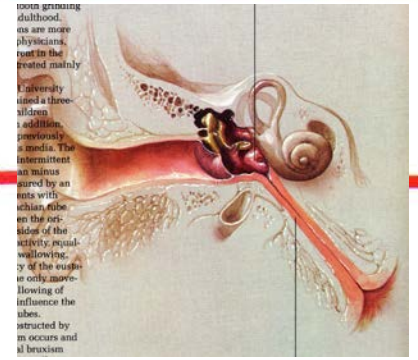
Nasopharyngeal Airway Obstruction

Obstructive Dysfunction of the
Eustachian Tubes

Open Mouth Habitus (Chronic Mouth
Breathing), Anterior tongue position
/ forward head posture



Accumulation of Bacteria, Viruses, and/or
Foreign Bodies in the Eustachian Tubes



Otitis Media

** Lowered Oxygen Saturation **

Malaise During Quiet
Periods, Overweight /
Obesity / Over eating
Hunger & Satiety
(Ghrelin / Leptin)

Lowered Exercise Tolerance,
Over weight / Obesity
Hunger & Satiety
(Ghrelin / Leptin)
Hormones

Subpar Intellectual
Achievement

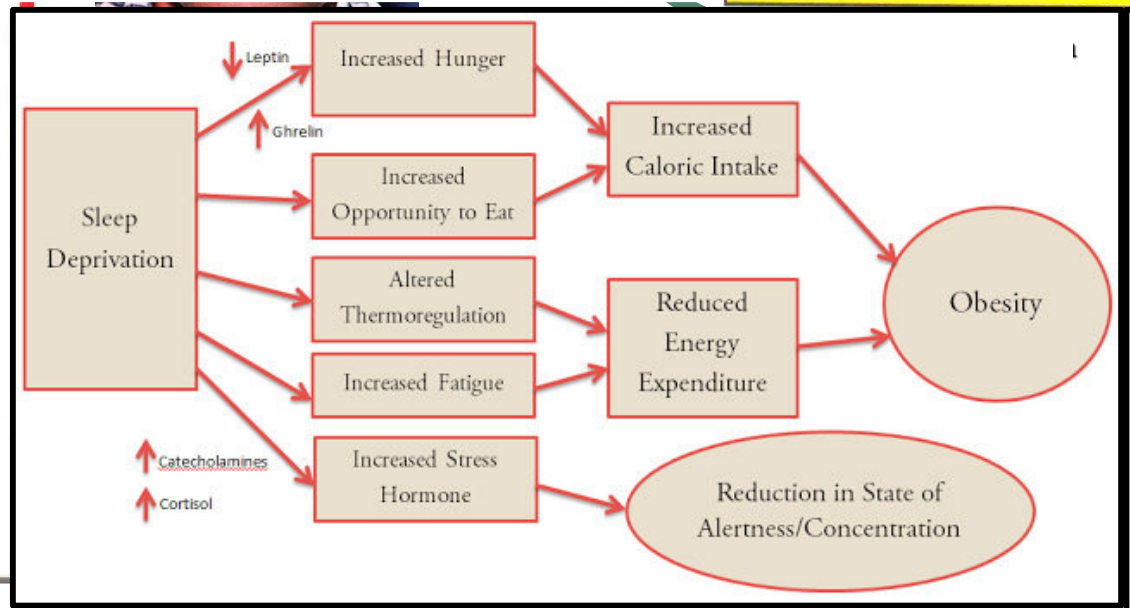
Pulmonary Hypertension / Stroke / High BP

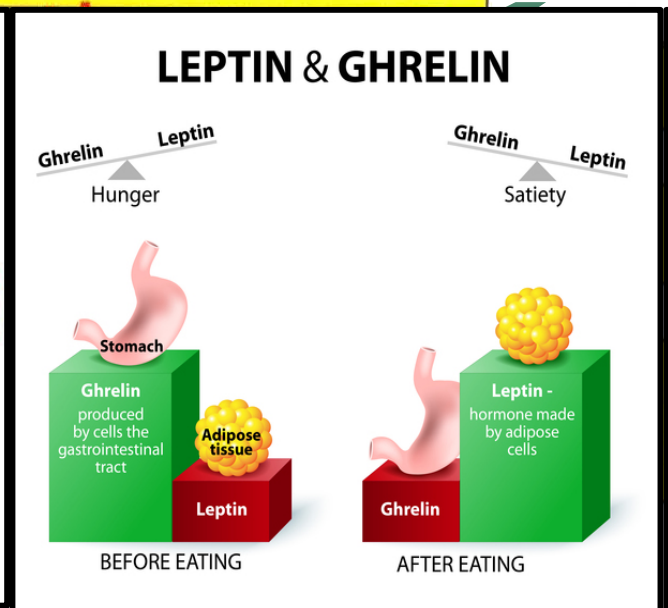
COR Pulmonale

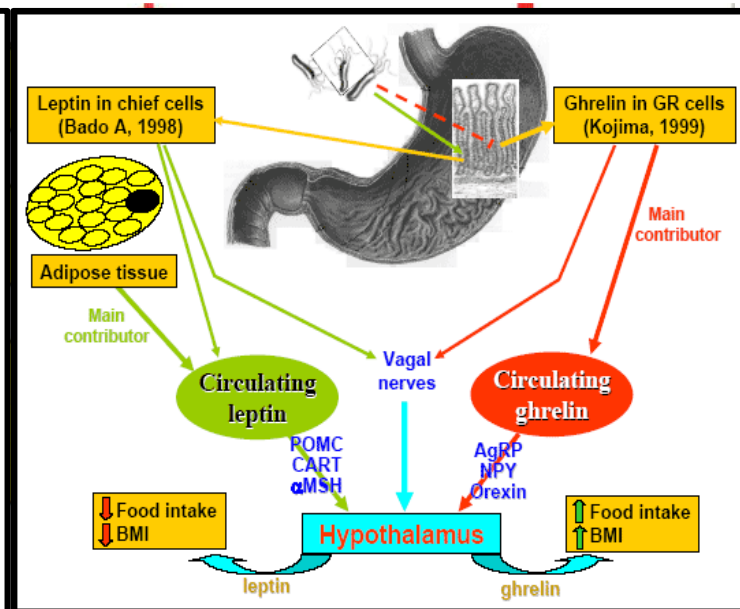
Behavioral Disorders
ADD / ADHD / other

Is obesity the cause of OSA or effect of alteration of Ghrelin & Leptin leading to obesity or BOTH?

** Lowered Oxygen Saturation **







Open Mouth Habitus (Chronic Mouth Breathing), Anterior tongue position / forward head posture

Nasopharyngeal Airway Obstruction

Lowered Oxygen Saturation

Hypertrophy of Adenoid Tissue

Proprioceptive Accommodative Malposition of the Tongue between the Dental Arches / scalloped

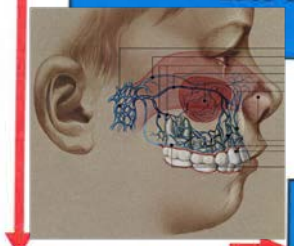
Bruxism - maybe related to stress &/or to try and aid in opening airway

Imbalance between the Extraoral and Intraoral Musculature (Buccinator Mechanism and Tongue)

Craniomandibular Dysfunction
TMJ/TMD
Myofascial Pain
Loss of Vertical Dimension
Asymmetry

Malocclusion
Altered tongue position / Narrow Naso-maxillary complex / Retrognathic mandible / decrease Vertical Dimension

Malocclusion



Craniomandibular Dysfunction
Vertical, Anteroposterior, and Lateral Displacement of the Mandible

Collapse of the Maxillo-Mandibular Dental Arches

High "V" shaped palatal vault Narrow Naso-maxillary complex

Reduced Nasal Airway (Lack of optimal development of the mid-face)

Interferes with Anterior Eruption, i.e., Open Bite. Inclination (Diastema). Arch Development (Maxillary Insufficiency, etc.)

Inadequate Volume for Tongue within Dental Arches

Poor Tongue Repose

Narrow Naso-maxillary Complex, Microrhino Dysplasia, Deviated Septum, altered mandibular position

Inability to Incise

Lip Habits

Speech Abnormalities

Facial Grimace when Swallowing (Tongue Thrust)

Mouth Breathing

Abnormal Mandibular Excursions when trying to Incise

Increased Protrusion

Malocclusion

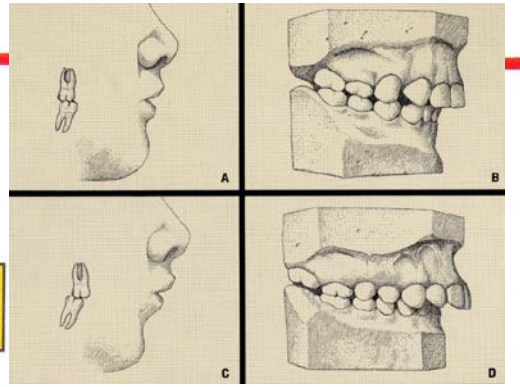
Interferes with Posterior Eruption (closed bite or creates an open bite with a steep mandibular plane angle). Prevents optimal arch development (narrow arches). Changes optimal tooth inclination (lingual tipping of posterior

Psychological and Physiological Accommodation

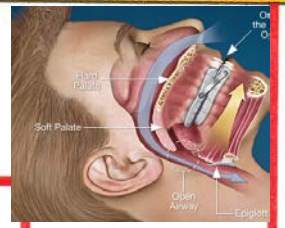
Prevents Lip Seal

Enhances Mouth Breathing

Neuromuscular Closed Bite or Open Bite, Crowding, Crossbite, Lateral and/ or Posterior Displacement of the Mandible



Chronic Mouth Breathing



Snoring and/ or Sleep Apnea

Sleep Cycle Disruption
Sleep Fragmentation

Lowered Production of Pituitary Growth Hormone and/or Enuresis in children

Obstructive Sleep Apnea / Hypopnea / RERA

Lowered Oxygen Saturation

Pulmonary Hypertension/stroke/ HBP

COR Pulmonale

Dysphagia

Poor Eating Habits

Nutritional Depletion

Craniomandibular Dysfunction
TMJ/TMD
Myofascial Pain
Loss of Vertical Dimension
Asymmetry

CRANIO-FACIAL GROWTH ABNOMALITIES
Malocclusion
Narrow Naso-Maxillary Complex
Retrognathic Mandible / Maxilla
Vertical – Open bite

Interdisciplinary Treatment TEAM

- **MD**
  - Otolaryngologist / ENT (AASM)
  - Sleep Physician (AASM)
  - Pulmonologist (AASM)
  - Pediatrician
  - Family Practice
  - Neurologist
  - Plastic & Reconstructive Surgery
  - Other
- **DMD / DDS**
  - trained in DSM (AADSM)
    - Orthodontist
    - Dentist
    - Oral-Maxillofacial Surgeon
    - Other
- **Other Health Care Professionals**

Medicine & Dentistry should work & train together for improved health of our patients

Flow Chart of how Medical/Dental professionals work together on patients with OSA/OAD Modified by William E. Harrell, Jr, DMD (Canadian Dental J Dec 2007 - Jan 2008)

Dentist (DMD, DDS)

Medical professionals (MD)

Does the patient have risk factors or show signs or symptoms of Allergies, Obstructive Airway Disorders (OAD) or Obstructive Sleep Apnea (OSA)?

If indicated, 3D Cranio-facial / skeletal / dental / airway analysis from CBCT

Is Dental Treatment required?

NO

Is Medical Treatment required?

COOPERATION

YES

Dental Therapy

Dento-skeletal problems / altered cranio-facial growth / malocclusion / Early Treatment

- Mandibular advancement devices for children
  - Correct Class II malocclusion
  - Improve airway & tongue position
- Extra-oral face masks for Maxillary Deficient cases
  - Correct Class III malocclusion
  - Improve airway & tongue position
- Palatal / Nasal Expansion (Children & Adults)
  - RPE / SARPE / Slow Expansion
- Oral Appliance Therapy (OAT) for adults with OSA and CPAP intolerant
- Other

Medical Therapy

- Treatment of Allergies / Medications
- Weight Loss
- ENT Surgery
  - adenoidectomy, tonsillectomy
  - UP3
  - other
- CPAP / BIPAP / other
- Cranio-Maxillary Surgery (MMA)
- Inspire ("Sleep Pace Maker")
- Other

Treatment refused or Problem not solved

Treatment refused or Problem not solved

Success - Monitor, Re-evaluate and/or follow-up

Adapted from Canadian Dental Association Journal Dec 2007 - Jan 2008

Not a competition between CPAP and OAT

Schendel S, et al @ Stanford

46 – 54 % do not wear CPAP efficiently < 4 hours / night

=

Lowe A, et al University of British Columbia

80-85 % wear 6 -8 hours / night

THE GOLD STANDARD

ADA American Dental Association®
America's leading advocate for oral health

Proposed Policy Statement on the Role of Dentistry in the Treatment of Sleep-Related Breathing Disorders

Sleep related breathing disorders (SRBD) are disorders characterized by disruptions in normal breathing patterns. SRBDs are potentially serious medical conditions caused by anatomical airway collapse and altered respiratory control mechanisms. Common SRBDs include snoring, upper airway resistance syndrome (UARS) and obstructive sleep apnea (OSA). OSA has been associated with metabolic, cardiovascular, respiratory, dental and other diseases. In children, undiagnosed and/or untreated OSA can be associated with cardiovascular problems, impaired

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4. When oral appliance therapy is prescribed by a physician through written or electronic order for an adult patient with obstructive sleep apnea, a dentist should evaluate the patient for the appropriateness of fabricating a suitable oral appliance. If deemed appropriate, a dentist should fabricate an oral appliance.

5. Dentists should obtain appropriate patient consent for treatment that reviews the treatment plan and any potential side effects of using OAT and expected appliance longevity.

6. Dentists treating SRBD with OAT should be capable of recognizing and managing the potential side effects through treatment or proper referral.

7. Dentists who provide OAT to patients should monitor and adjust the Oral Appliance (OA) for treatment efficacy as needed, or at least annually. As titration of OAs has been shown to affect the final treatment outcome and overall OA success, the use of unattended cardiorespiratory (Type 3) or (Type 4) portable monitors may be used by the

1. Dentists are encouraged to screen patients for SRBD as part of a comprehensive medical and dental history to recognize symptoms such as sleepiness, choking, snoring or witnessed apneas and an evaluation for risk factors such as obesity, retrognathia, or hypertension. These patients should be referred, as needed, to the appropriate physicians for proper diagnosis.

2. In children, screening through history and clinical examination may identify signs and symptoms of deficient growth and development, or other risk factors that may lead to airway issues. If risk for SRBD is determined, intervention through medical/dental referral or evidenced based treatment may be appropriate to help treat the SRBD and/or develop an optimal physiologic airway and breathing pattern.

3. Oral appliance therapy is an appropriate treatment for mild and moderate sleep apnea, and for severe sleep apnea when a CPAP is not tolerated by the patient.

Evidence Brief: Oral Appliances for Sleep-Related Breathing Disorders

Key Points

- The evidence reviewed in this brief consists of a 2015 clinical practice guideline from the American Academy of Sleep Medicine/American Academy of Dental Sleep Medicine (AASM/AADSM, based on a systematic review and meta-analysis), as well as a 2015 consensus guideline co-authored by dental sleep medicine societies in Italy; 6 randomized trials of oral appliances (OAs) published since the last literature search date of the 2015 AASM/AADSM guideline and that were not already included in the guideline; a 2015 review of systematic reviews; and 8 systematic reviews/meta-analyses published in 2015/2016, two of which were focused on pediatric populations.
- The evidence shows that oral appliances, specifically custom-made, titratable devices, can improve obstructive sleep apnea (OSA) in adult patients compared to no therapy or placebo devices.
- OAs are generally less effective than continuous positive airway pressure (CPAP), but have a role in patients who are intolerant of or who reject CPAP.
- The AASM/AADSM guideline/systematic review found that patient adherence with OAs was better than that for CPAP and that OAs have fewer adverse effects that result in discontinuation of therapy, compared with CPAP.
- The two recent systematic reviews evaluating the data for oral appliances in pediatric OSA found very limited published evidence for their use and called for additional short- and long-term evidence, especially for health outcomes, such as neurocognitive and cardiovascular function.
- Another gap identified is the lack of published comparative evidence evaluating comprehensive management of oral appliance therapy for OSA (i.e., diagnosis, treatment, and monitoring/titrating therapy) in dental versus other contexts.

Objective

The objective of this brief narrative review is to provide a summary of recent literature published in 2015 and 2016, including systematic reviews (SR), meta-analyses (MA), and selected randomized trials, for the use of oral appliances (e.g., mandibular advancement devices) in the management of sleep-related breathing disorders, principally obstructive sleep apnea/hypopnea syndrome (OSAHS or OSA). In addition, this brief will review and grade the clinical practice guidelines (CPGs) published in 2015: a SR/MA/CPG from the American Academy of Sleep Medicine (AASM) and the American Academy of Dental Sleep Medicine (AADSM) on the

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treatment of obstructive sleep apnea and snoring with oral appliances[1] and a consensus guideline co-authored and published in 2015 from dental sleep medicine societies in Italy.[2]

This evidence brief was developed in response to ADA Resolution 96H-2015 – Development of ADA Policy on Dentistry's Role in Sleep-Related Breathing Disorders, which directed the Council on Scientific Affairs (CSA) to collaborate with other appropriate ADA agencies to develop policy on "dentistry's role in sleep-related breathing disorders." This brief narrative review is intended to provide a "state of the science" for oral appliances in the management of sleep-related breathing disorders, and will be shared with other ADA Councils (e.g., Council on Dental Practice) to inform discussion regarding the development of policy, as directed by the Resolution. This document was reviewed by a CSA-assembled workgroup (Appendix Table 1) of identified subject-matter experts, as well as members of the ADA Council on Dental Practice.

Background: Sleep-Related Breathing Disorders

Description. Sleep-related breathing disorders comprise a variety of diagnoses, including simple snoring, upper airway resistance syndrome (UARS), central sleep apnea/hypopnea syndrome (CSAHS), and obstructive sleep apnea/hypopnea syndrome (OSAHS or OSA).[3,4] Both snoring and OSA are common sleep disorders resulting from repetitive narrowing and collapsing of the upper airway.5 In the U.S. the prevalence of OSA is estimated to be 3% to 7% in men and 2% to 5% in women.6 Prevalence is higher, i.e., greater than 50%, in patients with cardiac or metabolic disorders, relative to the general population.[7]

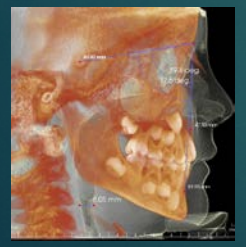
Risk factors for OSA include obesity (the strongest risk factor), upper airway abnormalities, male sex, menopause, and age.[7] Untreated OSA is associated with multiple adverse sequelae, including systemic hypertension, coronary artery disease, stroke, atrial fibrillation, increased motor vehicle accidents, congestive heart failure, daytime sleepiness, decreased quality of life, and increased mortality.[7,8] Snoring is also a significant social problem and contributes to decreased quality of life for bed partners through disrupted sleep and may have an independent negative effect on health (e.g., increased risk for cardiovascular disease or Type II diabetes mellitus).[9-11]

Diagnosis. Apneas are defined as temporary cessation of breathing of 10 seconds or more, while hypopneas are periods of shallow breathing that result in oxygen desaturation.[7] OSA is defined by the presence or absence of symptoms (e.g., daytime sleepiness, fatigue, snoring, choking during sleep, nocturia, alterations in performance) and objective assessment of the respiratory disturbance index (RDI; the number of apneas, hypopneas, and arousals from sleep because of respiratory efforts per hour of sleep).[7] OSA is the presence of subjective symptoms plus an RDI of 5/hr or greater or an RDI of 15/hr in the absence of symptoms.[7] OSA severity is classified by the number of apneas and/or hypopneas per hour of sleep as detected by polysomnography, known as the Apnea/Hypopnea Index (AHI); an AHI of 5 to 15/hr is considered mild, 16 to 30 moderate, and greater than 30/hr severe OSA). Another measure of OSA severity is the oxygen desaturation index (ODI).[12] The ODI, which is also evaluated during sleep studies, measures the number of times per hour of sleep that the blood's oxygen level drops by a certain percentage from baseline.[12]

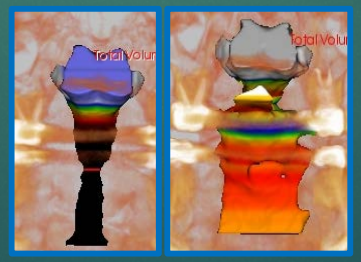
23 pages

Obstructive Airway Disorders in the Pediatric population

- **Craniofacial growth alterations**
  - **Malocclusions**



    - "Crooked teeth"
      - Narrow Naso-maxillary Comp
      - Narrow / constricted mandib
    - Class II malocclusion
      - Recessive Mandible - majorit
      - Prognathic Maxilla
    - Class III malocclusion
      - Recessive Maxilla
      - Prognathic Mandible
    - Recessive Maxilla & Mandible
      - Class I
      - Class II
    - The Transverse dimension of the Airway is the most important dimension



- "Breath is Life"
  - Mouth breathing
    - Alteration in CF growth
    - Long face / narrow NMC
    - Recessive mandible
  - Nasal breathing
- Symptoms of SBD in children
  - ADD / ADHD
  - Bed wetting
  - Alteration in growth
    - Growth Hormone is released during REM sleep
    - Cranio-Facial & Total Body
  - Sleep Issues
  - Other

Table 1 - Partial list of Facial Biomarkers

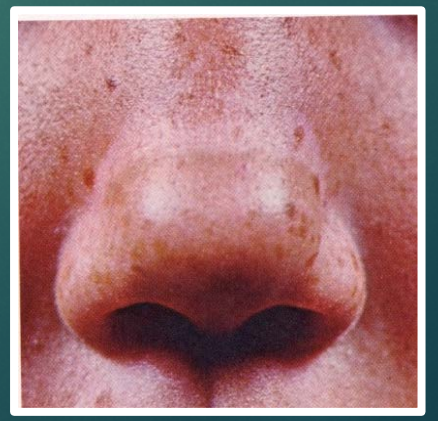
		Color / Luminance (brown, blue, reflection, etc.)	Geometry (Shape, contour, size, linear, angular, slope, depth, height, width)
1.	Allergic Shiners Figure 1A	C/L	
2.	Bags, Orbitopalpebral edema, swelling Figure 1B	C/L	G (shape, contour)
3.	Orbital Aperture Figure 1C		G (height/width)
4.	Nares (Nasal opening) Figure 1A		G (size of opening)
5.	Nose width Figure 1A		G (linear)
6.	Transverse Nasal Crease ("Allergic Salute") Figure !E & 1F	C	G (linear, depth)
7.	Malar region Figure 1D		G (shape, contour)
8.	Lips Figure 1A	C	G (size, shape)
9.	Open mouth Figure 1A		G (size, height, width, shape)
10.	Cheeks Figure 1A & 1D	C	G (shape, contour)
11.	Dennie's Sign Figure 1C		G (shape, depth, slope)
12.	Face Height (long) Figure 1A		G (linear, angular)
13.	Facial width Figure 1D		G (linear, angular)
14.	Facial Depth Figure 1D		G (linear, angular)
15.	Mandibular Position (retrognathic)		G (size, angular, depth)
16.	Asymmetry (Mandible, Maxilla)		G (shape, linear, angular)
17.	Eye angulation Figure 1A		G (angular, slope)
18.	Other 3D facial geometric landmark data		G (all of above)
19.	Other Color / Luminance Data	C/L	

Facial 'Biomarkers' – Airway/Allergies

A. Clinically recognizable and quantifiable on 3D facial imaging (Adapted from the work of the late Meyer B. Marks, MD, Director Pediatric Allergy, University of Miami Medical Center)

1. "Adenoid or Allergic facies"
   a. "Long Face"
   b. Mouth Breather
      i. "Allergic Gaper"
   c. Anterior Tongue position

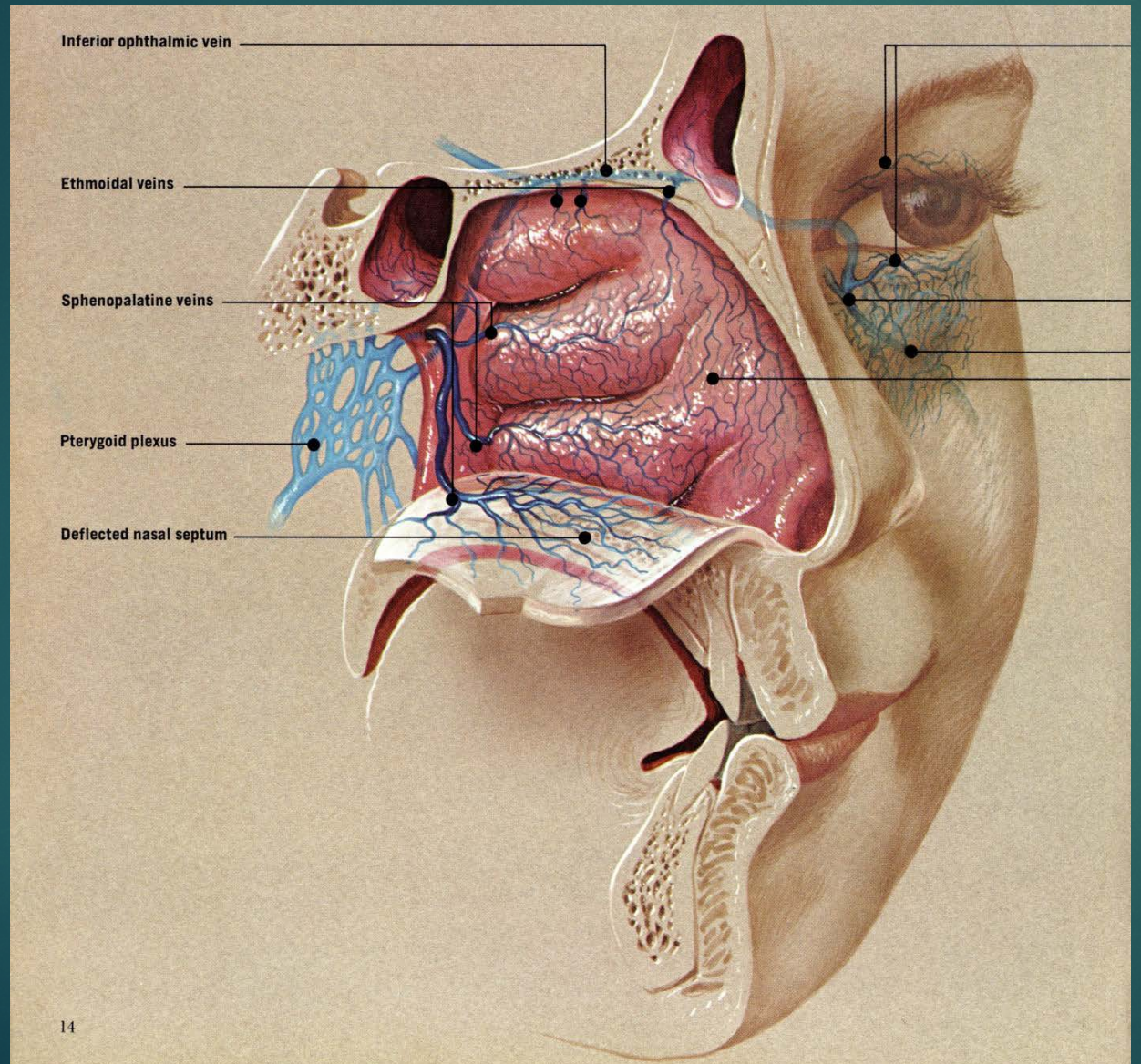
2. Allergic Shiners (dark circles)
   a. Takes about 1 year to develop

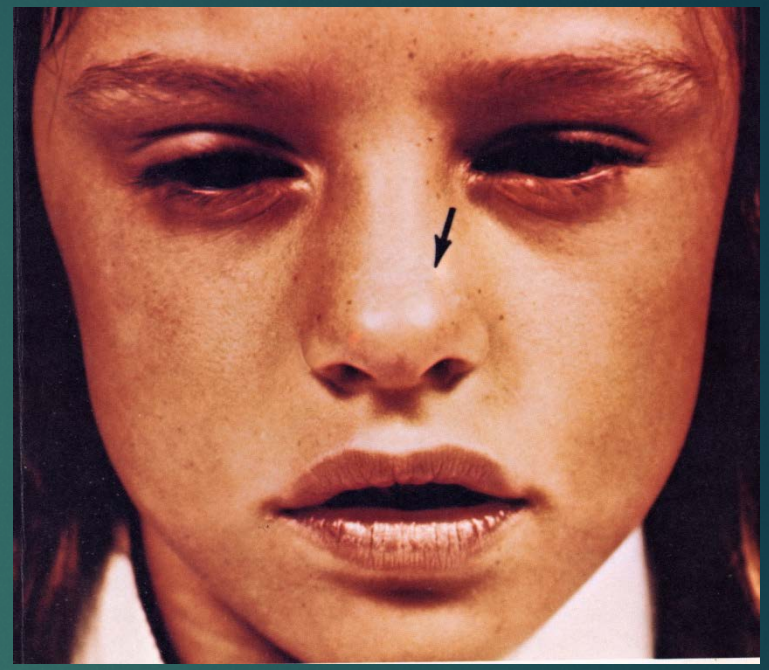


3. Narrow Naso-Max, Nares & Nose

4. Transverse nasal crease
   a. The "allergic salute"

Anatomy and Pathogenesis of the Allergic Shiner

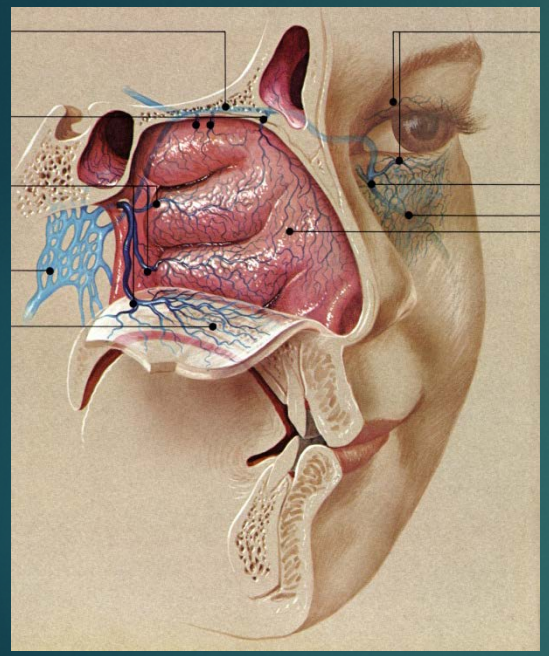


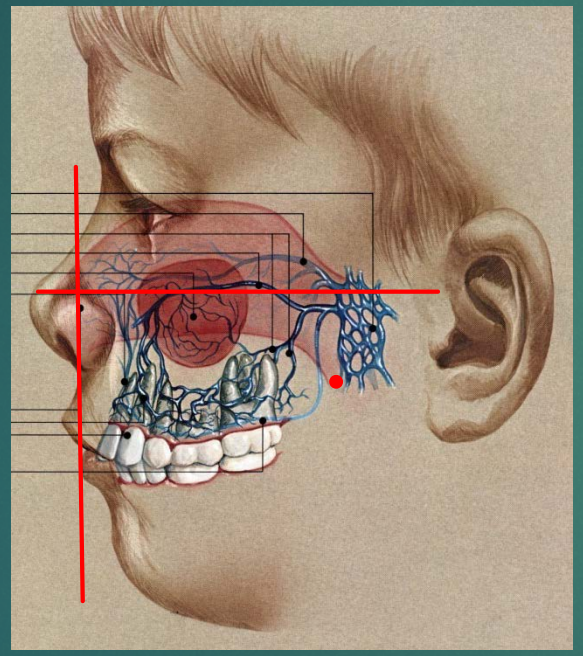


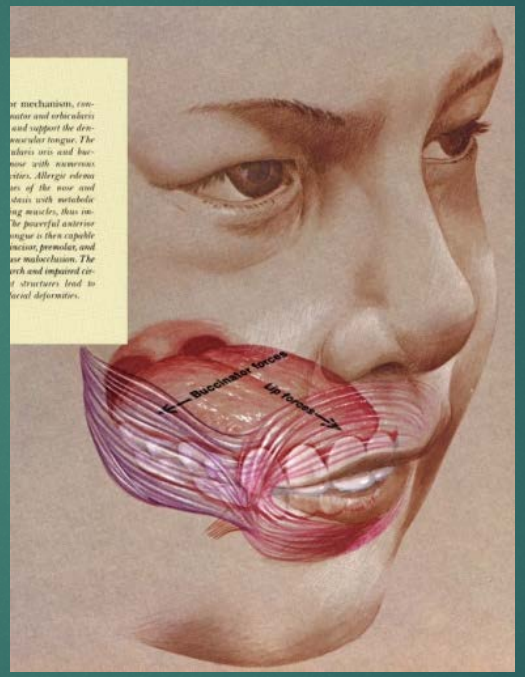
Adapted fro the research of the late Myer B. Marks, MD former Chair Pediatric Allergy University of Miami "Stigmata of Respiratory Tract Allergies in Children"

Permission of use by Pfizer

Orofacial dental deformity secondary to Allergic Respiratory Disease & Airway Obstruction

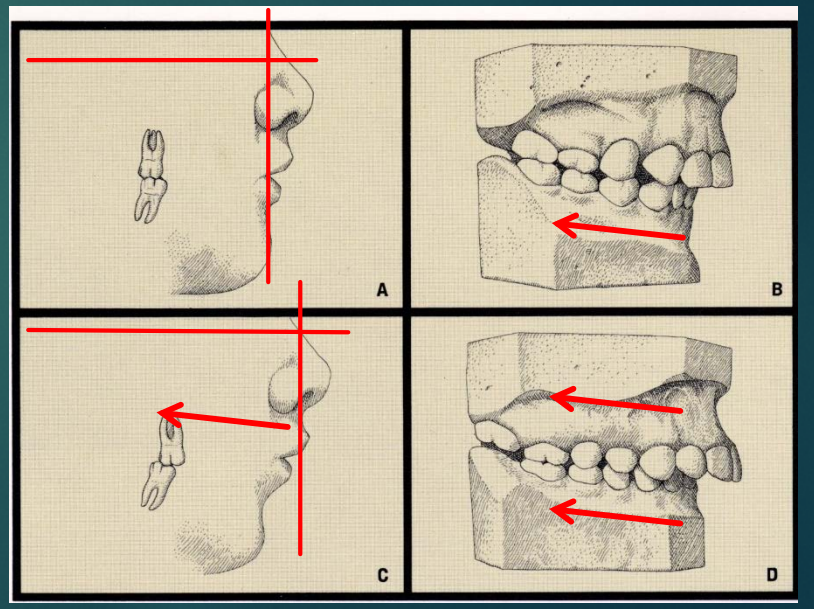






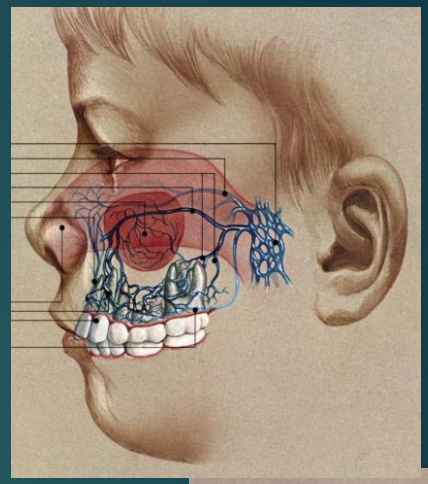
Typical Class II Malocclusion

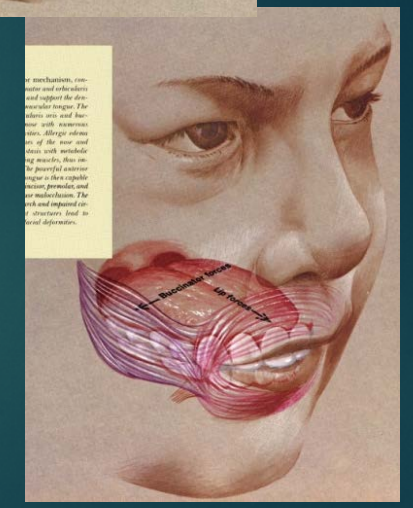
a. Narrow Naso-Maxillary Complex (NMC)
b. Retrognathic Mandible
c. AND Retrognathic Maxilla (NMC)

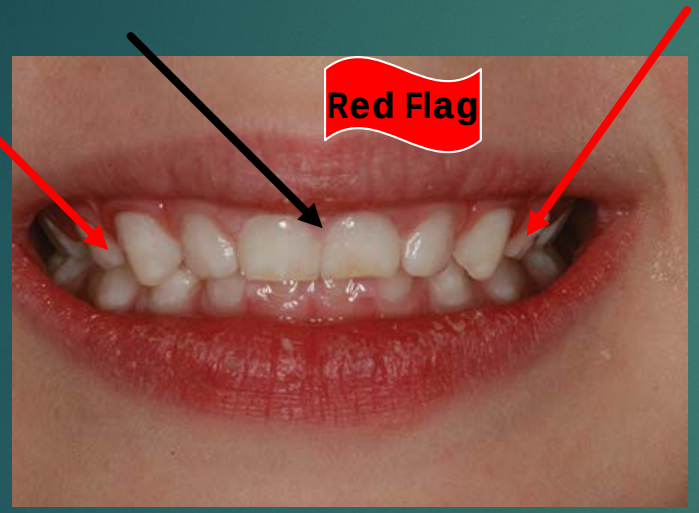


Early Diagnosis in the Primary Dentition

* 50 - 65 % of CF Growth Completed by 4 - 6 years
* 70 - 80 % of CF Growth Completed by 7 – 8 years
* 90 – 95 % of CF Growth Completed by 12 -14 years







Age 2 - 5

<u>Narrow dental & skeletal arches</u>

Primary dentition "looks aligned"

Arch length problem (crowding)

Narrow skeletal structure

<u>Lingual frenum</u>

Lack of proper tongue mobility

Tongue cannot reach roof of mouth during swallow

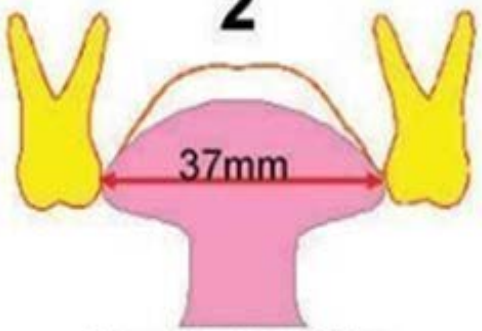
No natural maxillary and mandibular expansion

Different tongue positions and their malocclusions

1

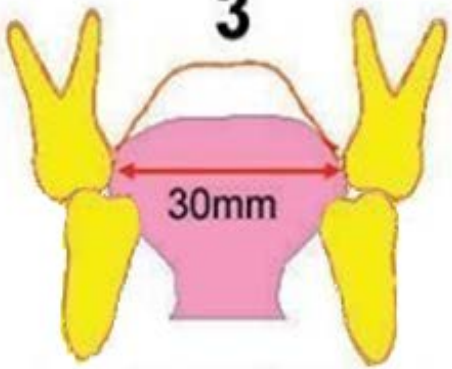
Tongue in the Palate during swallowing expands the Naso-Maxillary complex

2



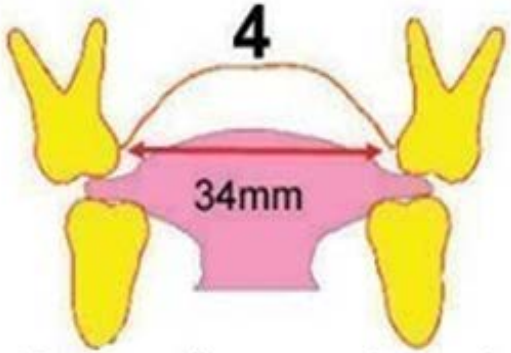
Tongue not reaching roof of the mouth. Narrowing the Maxilla and Naso-Max Complex

3



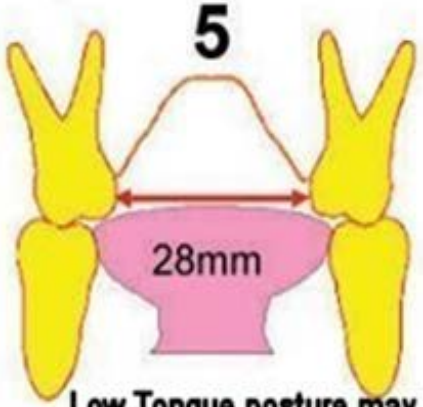
Tongue not reaching roof of the mouth. Narrowing the Maxilla, Mandible and the Naso-Max Complex

4

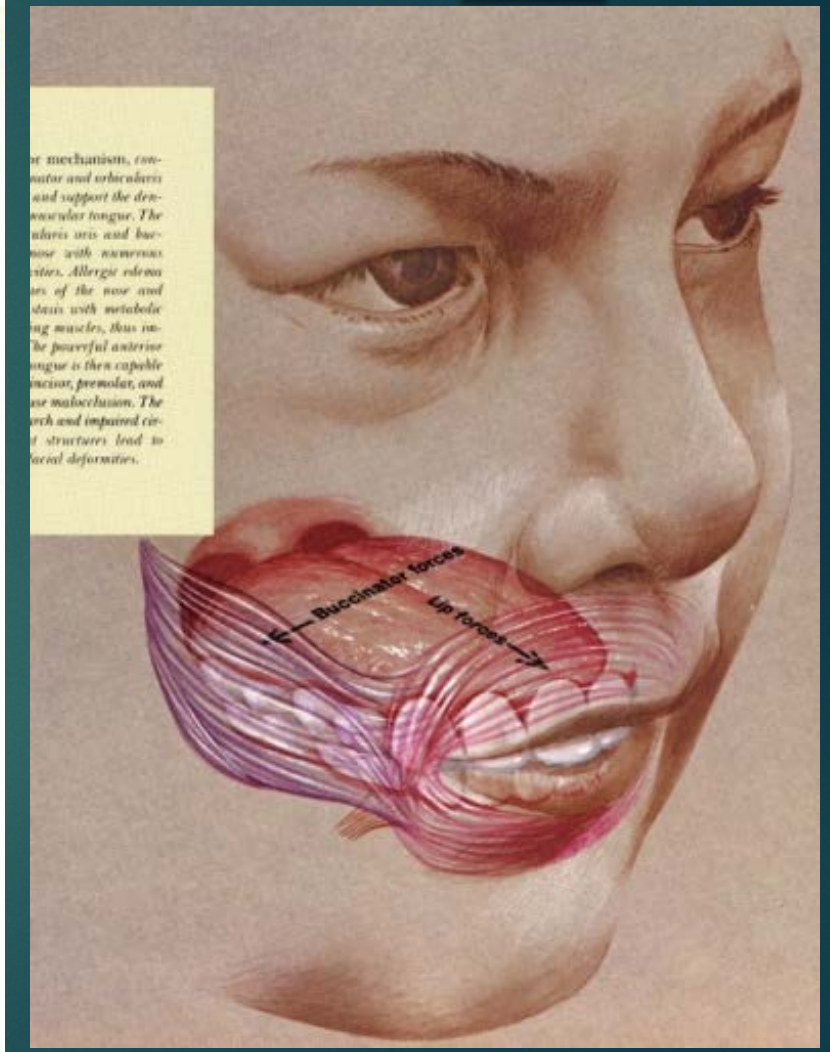


Tongue position over occlusal surface. May lead to Open Bite (Anterior / posterior) or Deep bites, depending on tongue posture.

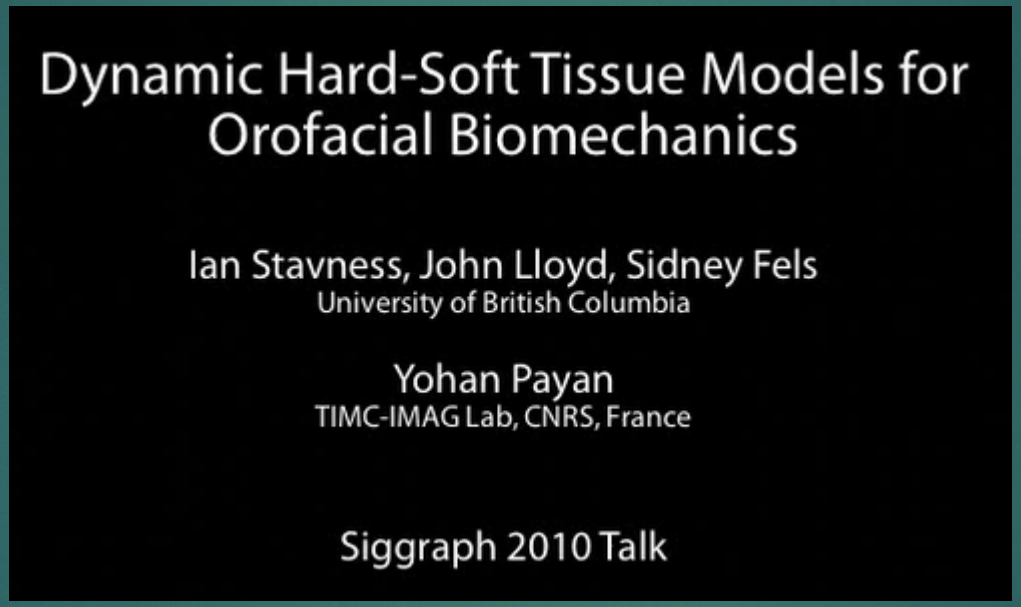
5



Low Tongue posture may lead to Maxillary Cross Bite. Very Narrow Naso-Maxillary Complex. Vaulted High Palate. May be associated with Class III.

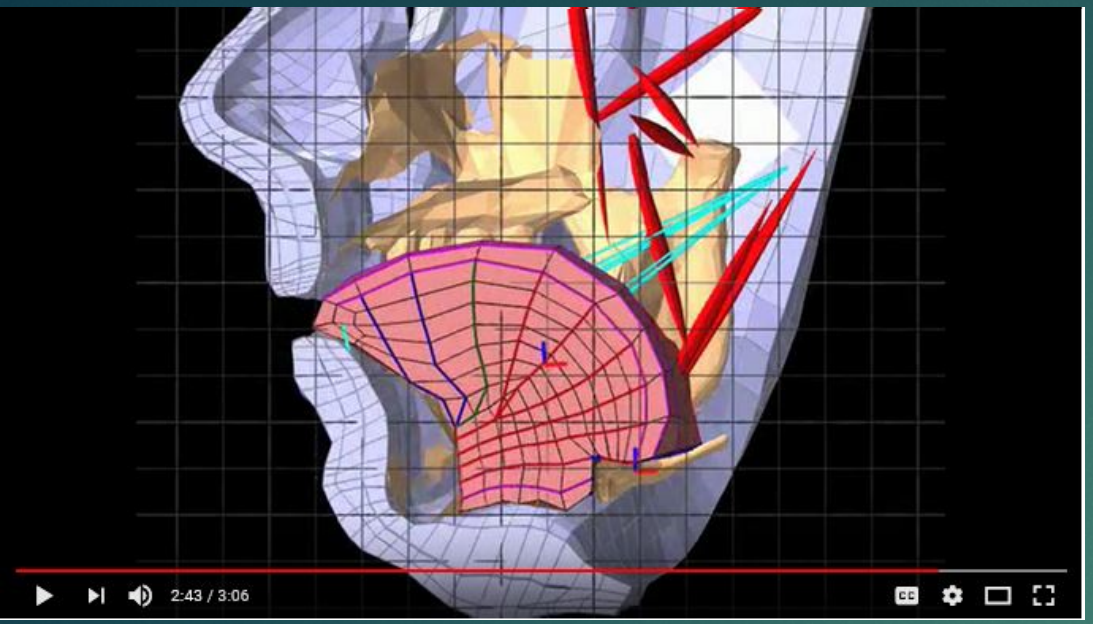


University of British Columbia
3D Modeling



- https://youtu.be/1rSjCsjRgDE

To 62
END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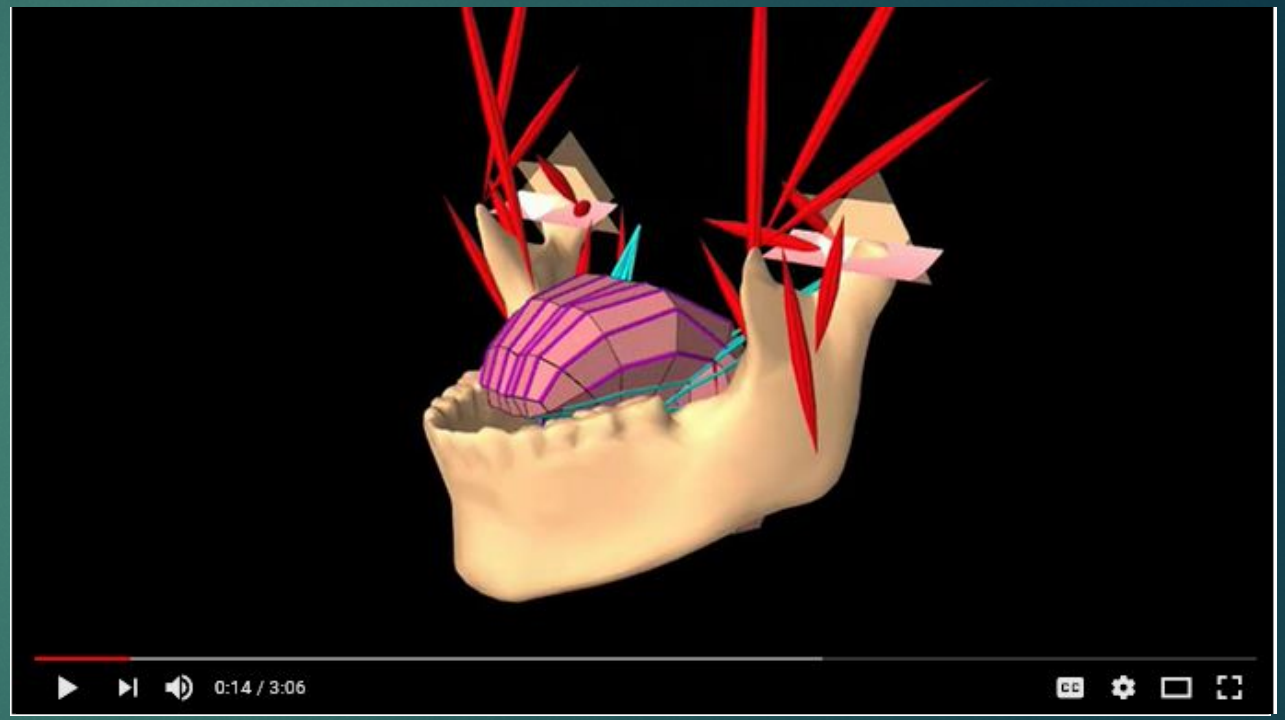
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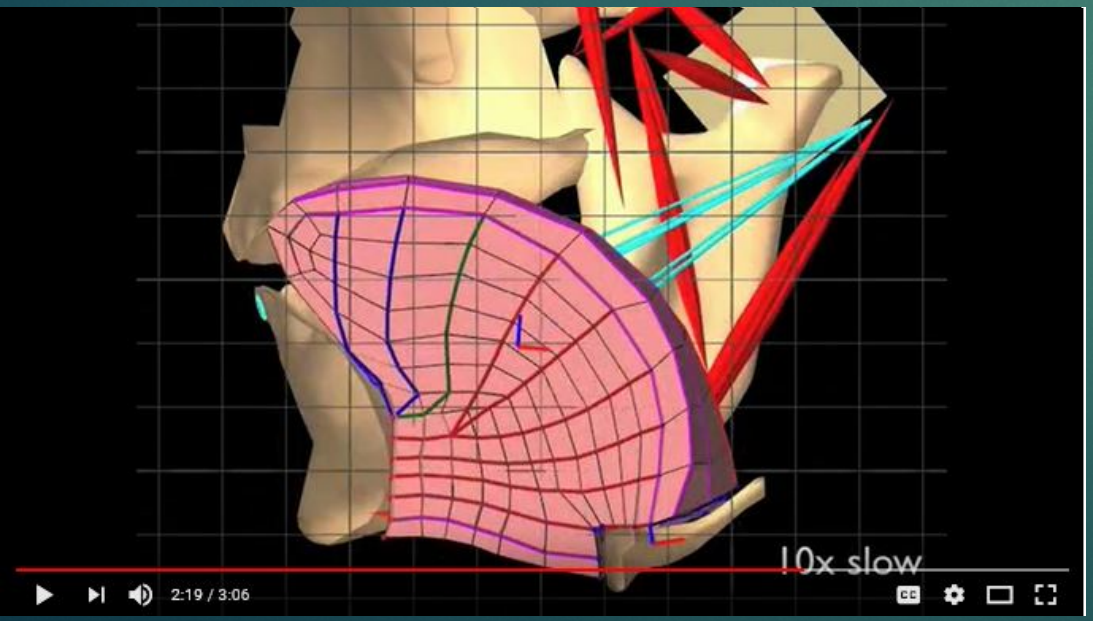
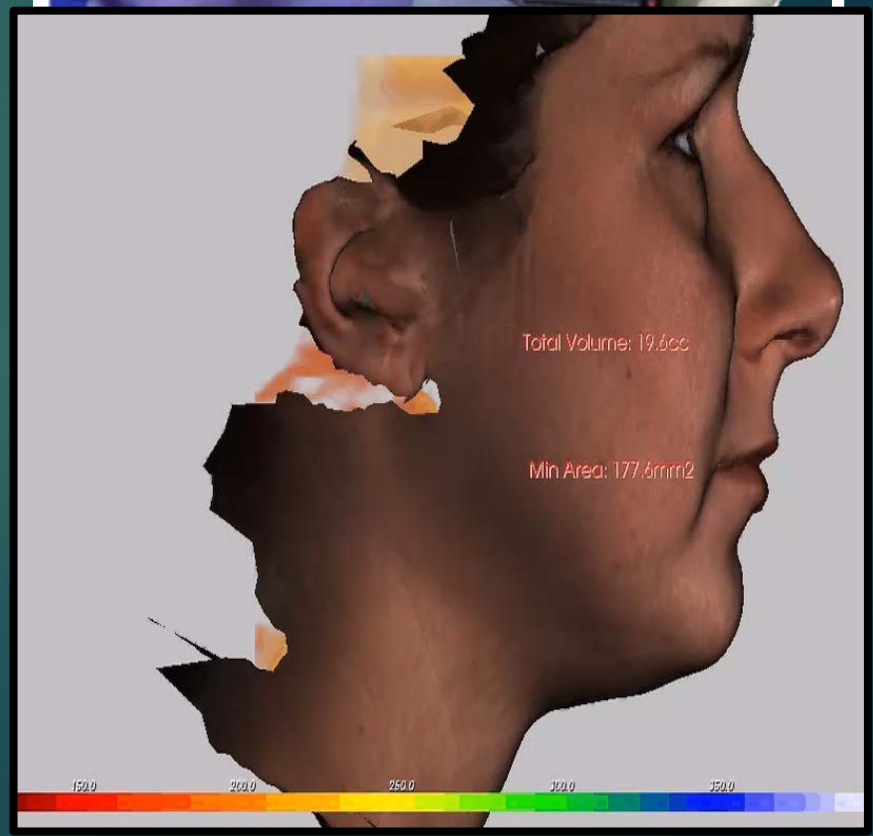

10x slow
2:19 / 3:06

"Completing the 3D picture"

- AJODO April 2008
  - William E. Harrell, Jr., DMD
  - Chris Lane

AJO-DO
Volume 133
Number 4
April 2008
American Journal of Orthodontics
& Dentofacial Orthopedics

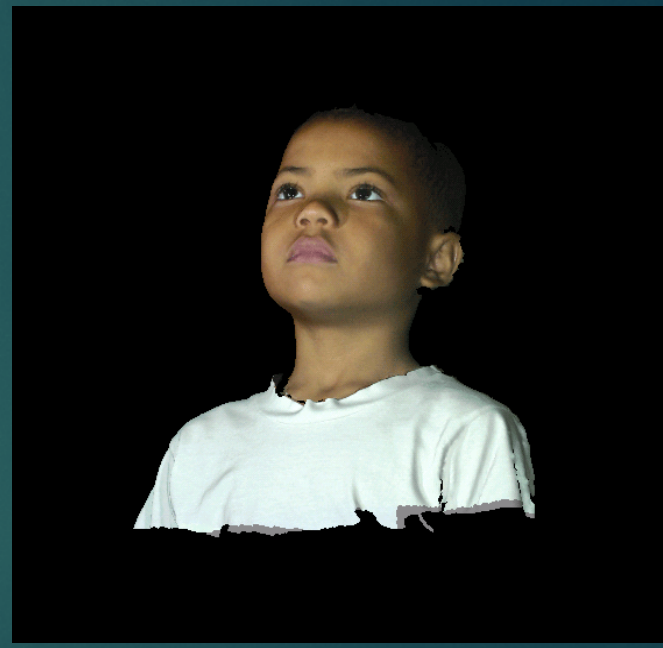


3D facial imaging is the "Sister" technology to CBCT

3D facial surface image capture and co-registration to CBCT in one patient-specific interactive 3D model (PSAR)

Non-Radiographic detection of Facial Biomarkers related to OAD & Cranio-facial growth alterations in Children

- Clinical Exam
  - Signs or biomarkers which maybe clinically significant for Respiratory Allergy, Obstructive Airway Disorders & Sleep Disordered Breathing (SDB)
  - Subtle signs may be overlooked or considered “not clinically significant”
  - “COMMONNESS is NOT NORMALNESS “
  - Observational Disregard



- Do children “grow out of it?” or do they “grow into it?”
  - Sleep Disordered Breathing, sleep deprivation, OSA, etc.
  - Decrease in growth hormones & oxygenation - especially @ night
  - Permanently alters Cranio-facial growth & development (Naso-Max-Mand)
  - Orofacial & craniofacial Malocclusions (Open bite, Class II, narrow NM)

- 3D Facial Biomarkers to aid in screening, recognition and early treatment of children with signs or biomarkers of Obstructive Airway Disorders (OAD)

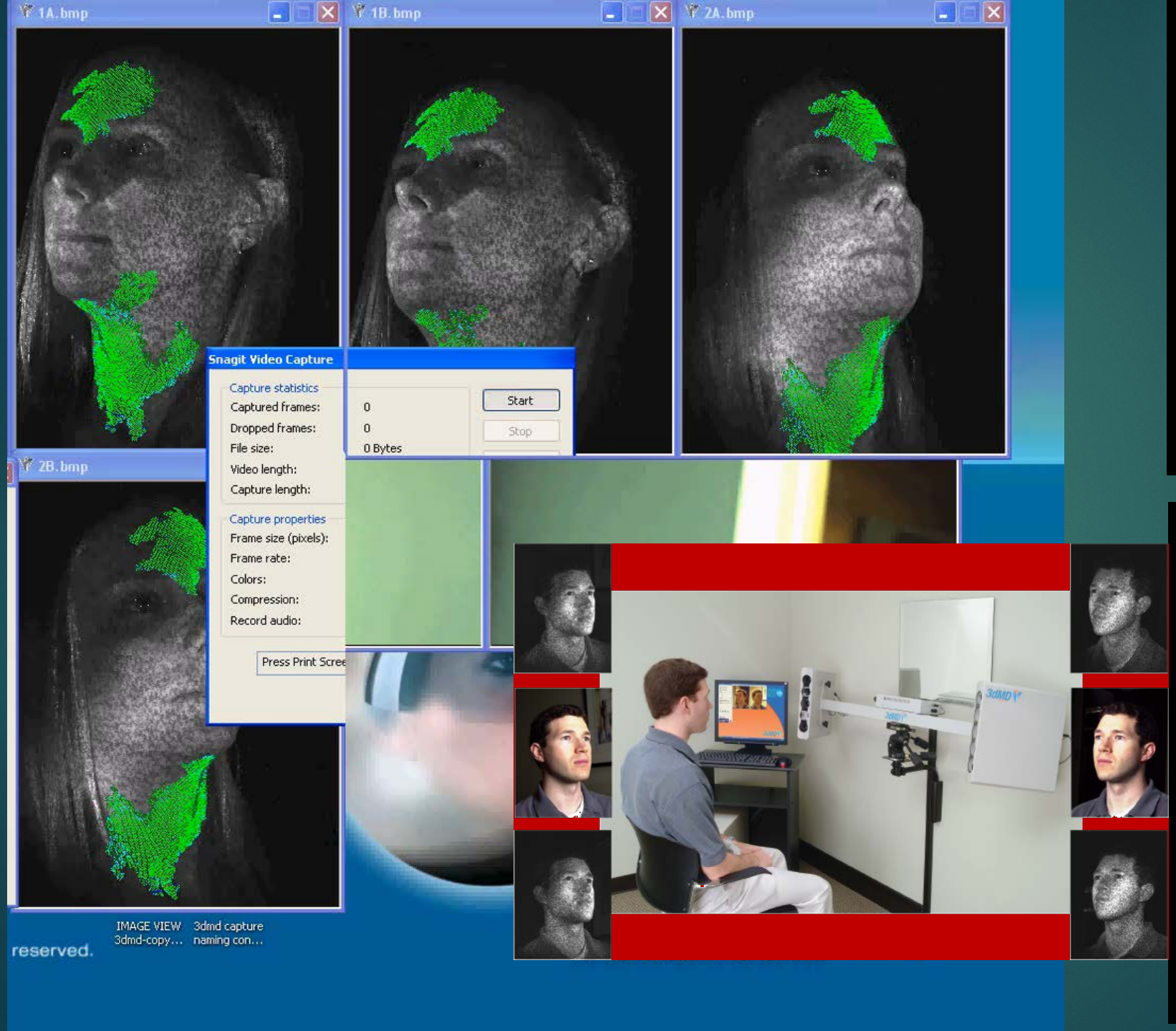
3D Facial Imaging allows for:

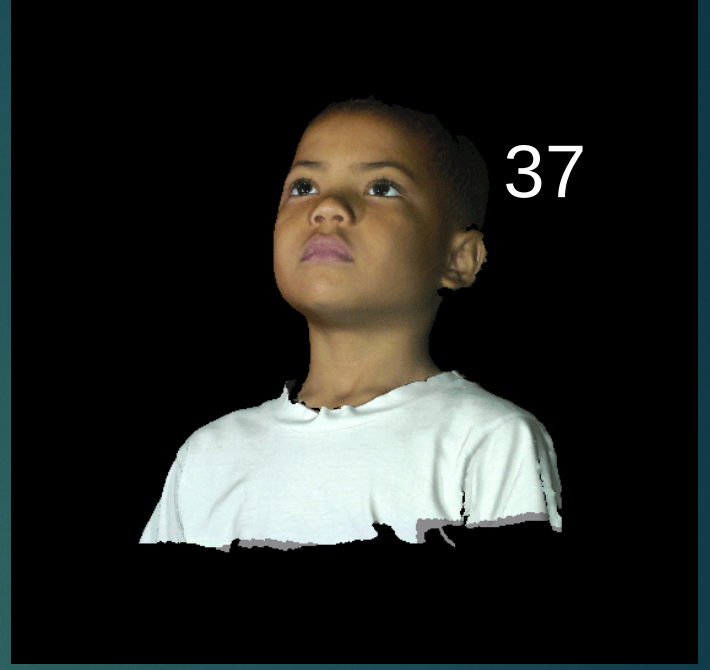
- **Analysis of Facial Form & Facial "Biomarkers"**

  for analysis of signs of potential Airway/Allergy Issues

- **A Morphometric Facial Analysis**
  - **Facial "Biomarkers"**

3D imaging Represents the "Anatomic Truth"





Builds <u>ONE continuous point cloud</u> with <u>ONE coordinate system</u>.

"GREEN"

Verifies the accuracy 99+%

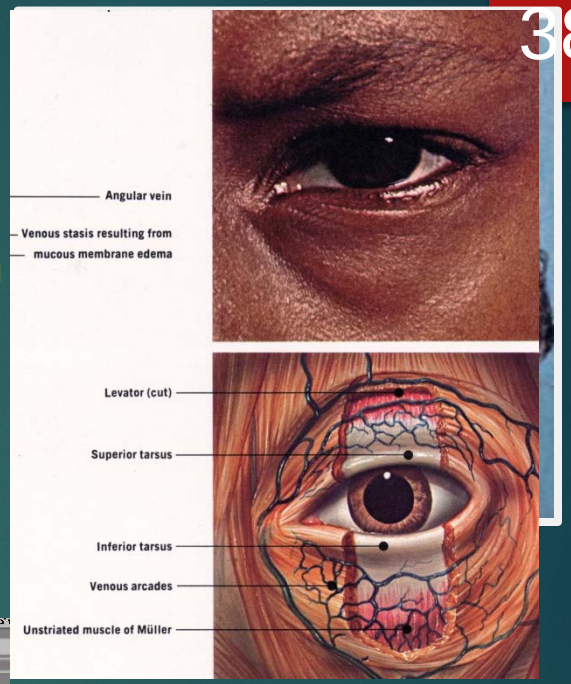
(p < .01)

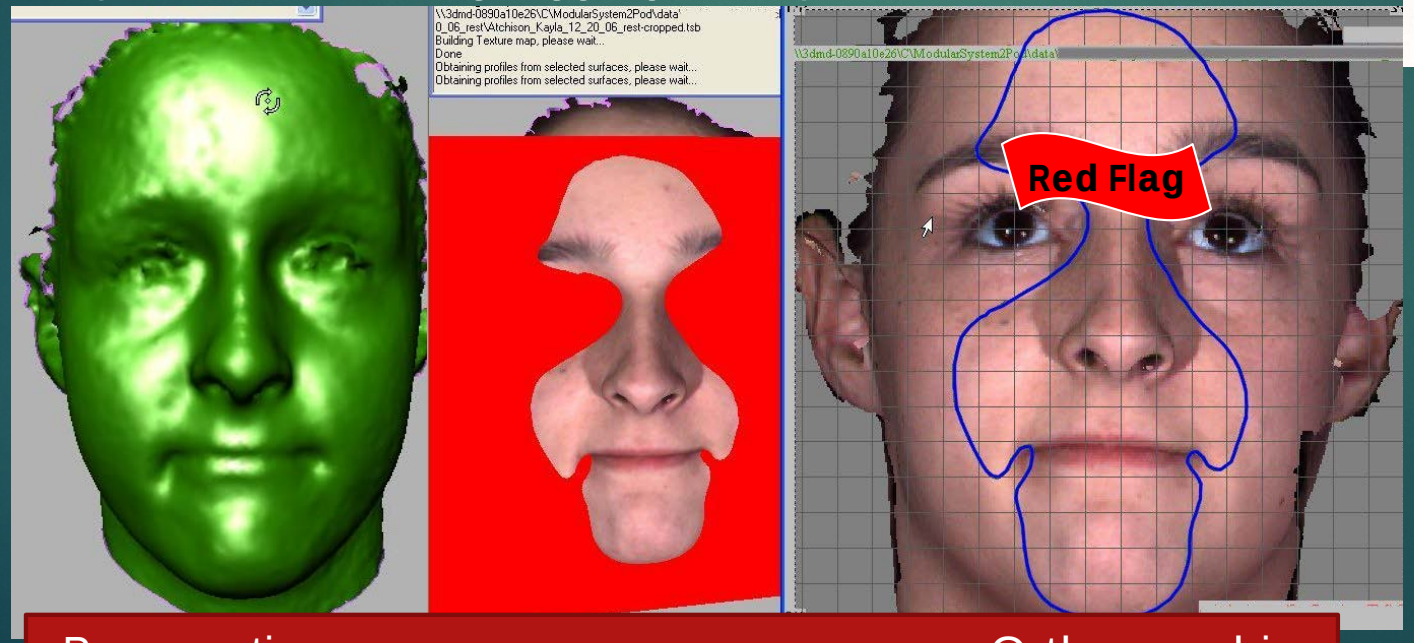
correspondence between the points

Facial 'Biomarkers' – Airway/Allergies

4. Edema and discoloration of the lower orbito-palprebral grooves (Bags)
   a. The lower eye lid edema results chiefly from spasm of the unstriated 'muscle of Müller' and venous stasis / pooling.

5. Flattened Malar Region (naso-maxillary hypoplasia)

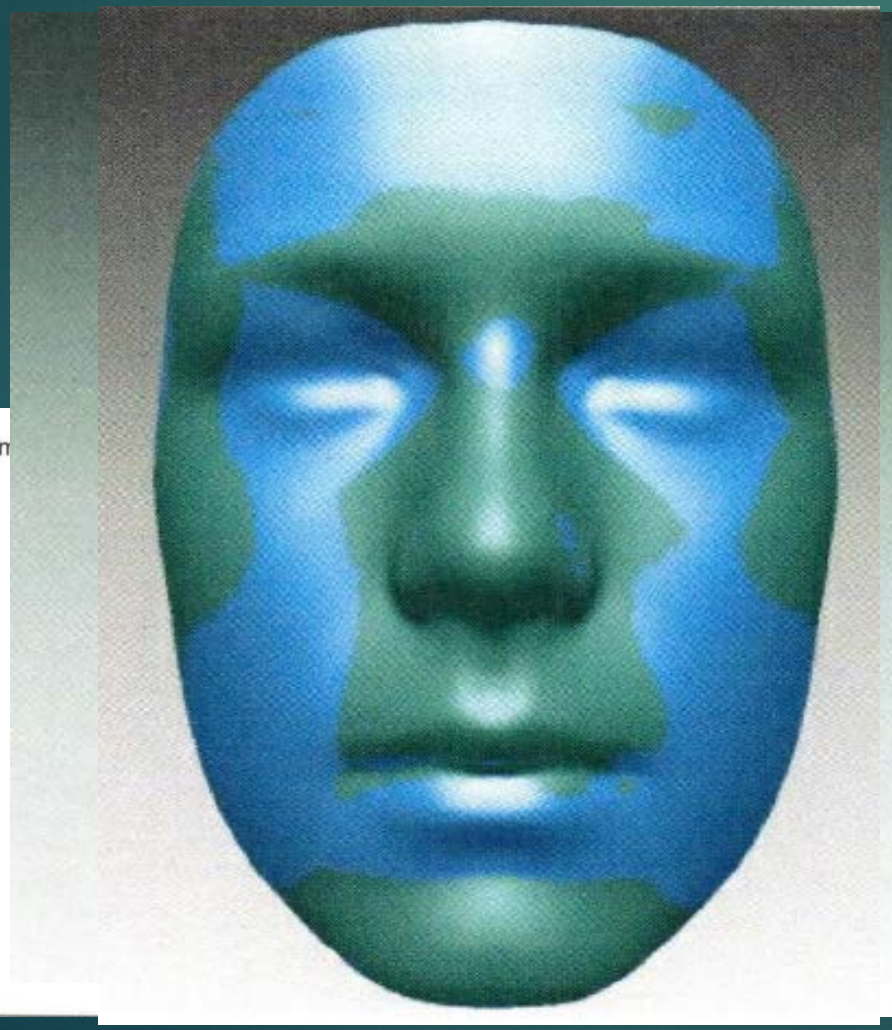


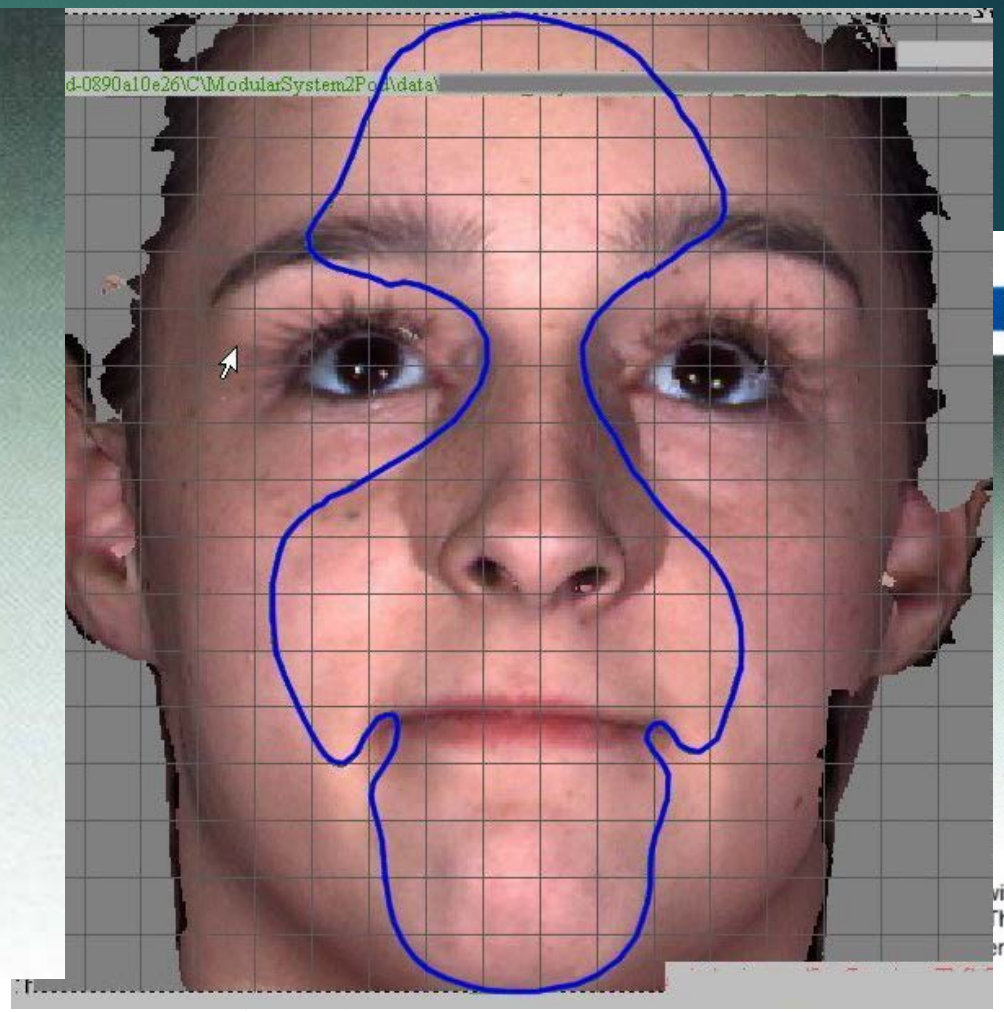


Perspective Orthographic

The Influence of Snoring, mouth breathing and Apnoea on facial morphology in late childhood – A Three-Dimensional Study

- Ali, AA, Richmond, S, et al. BMJ Open, Sept 2015
- Cardiff University, Wales, UK





The influence of snoring, r

Figure 5 Superimposition of average facial shells of sleep disordered breathing and healthy children.

without sleep disordered
The blue areas represent
r facial retrusion in the SDB

Airway Growth and Development: A Computerized 3-Dimensional Analysis

Stephen A. Schendel, MD, DDS, FACS, Richard Jacobson, DMD, MS, and Sadri Khalessi, MS, PhD
J Oral Maxillofac Surg 70:2174-2183, 2012

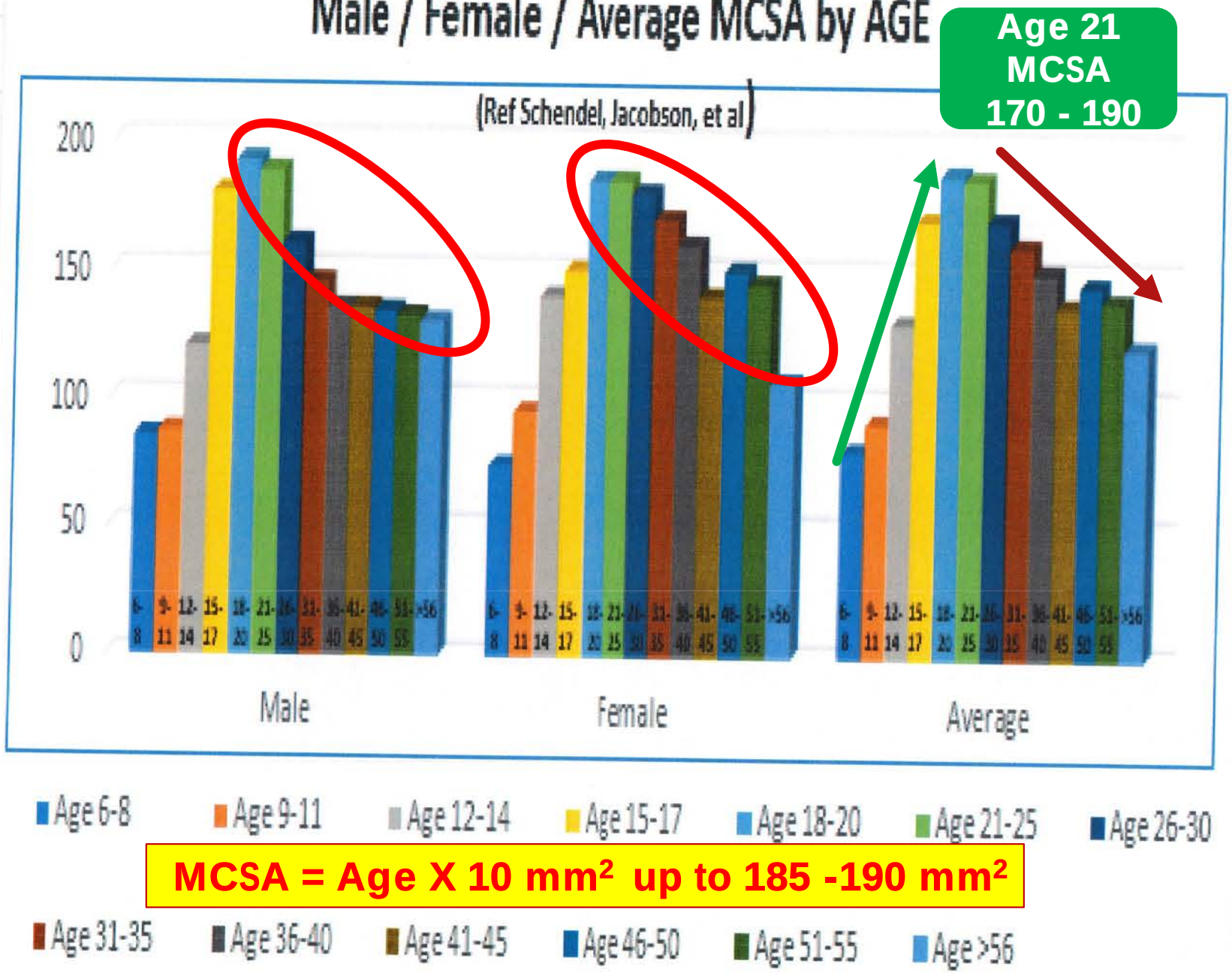
Purpose: The present study was undertaken to investigate the changes in the normal upper airway during growth and development using 3-dimensional computer analysis from cone-beam computed tomography (CBCT) data to provide a normative reference.

Methods: The airway size and respiratory mode are known to have a relationship to facial morphology and the development of a malocclusion. The use of CBCT, 3-dimensional imaging, and automated computer analysis in treatment planning allows the upper airway to be precisely evaluated. In the present study, we evaluated the growth of the airway using 3-dimensional analysis and CBCT data from age 6 through old age, in 1300 normal individuals from 6 – 56 years of age.

Results: The airway size and length increase until age 20 at which time a variable period of stability occurs. Next, the airway at first decreases slowly in size and then, after age 40, more rapidly. Normative data are provided in the present study for age groups from 6 to 60 years in relation to the airway total volume, smallest cross-sectional area and vertical length of the airway.

Conclusions: This 3-dimensional data of the upper airway will provide a normative reference as an aid in the early understanding of respiration and dentofacial anatomy, which will help in early treatment planning.

Male	Female	Average	Age range
85	74	80	6 - 8
87	95	91	9-11
120	140	130	12-14
180	150	170	15-17
192	185	188	18-20
188	185	186	21-25
160	180	170	26-30
145	170	160	31-35
135	160	150	36-40
135	140	137	41-45
134	150	145	46-50
132	145	139	51-55
130	107	121	>56



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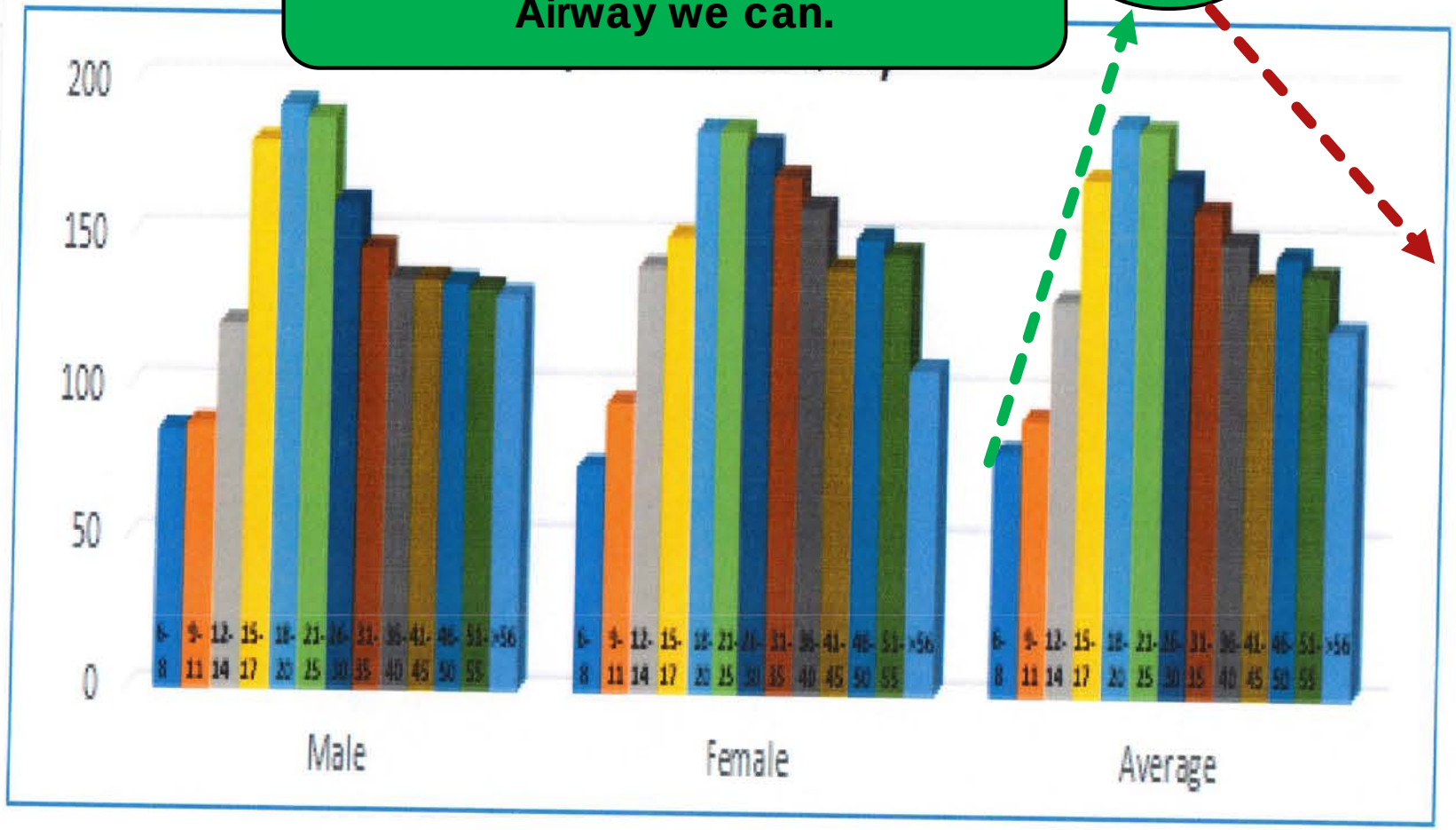
160	180	170	26-30
145	170	160	31-35
135	160	150	36-40
135	140	137	41-45
134	150	145	46-50
132	145	139	51-55
130	107	121	>56

Maybe our goal in orthodontics should be to create the largest Airway we can.

200 +



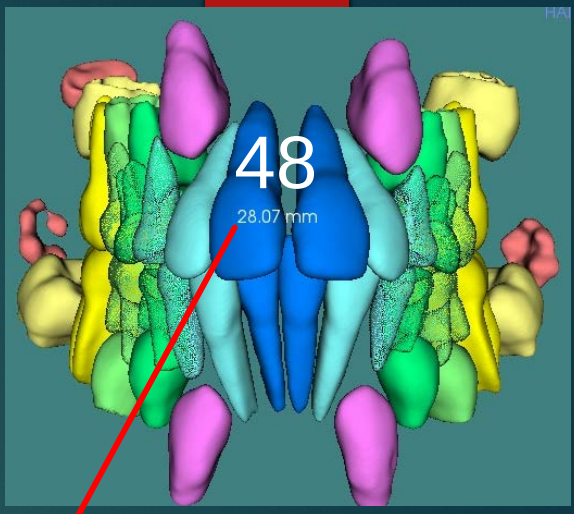
MCSA = Age X 10 mm^2 up to 185 -190 mm^2

Airway changes in obstructive sleep apnoea patients associated with a supine versus an upright position examined using cone beam computed tomography

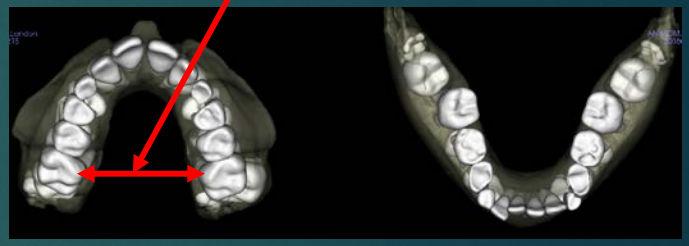
- Schendel S, Camacho M, Capasso R
  - The Journal of Laryngology & Otology 128(9) · August 2014
    - "Normal" Airway decreases ~ 15 % LD vs UR
    - OSA patient Airway decreases ~ 46 % LD vs UR

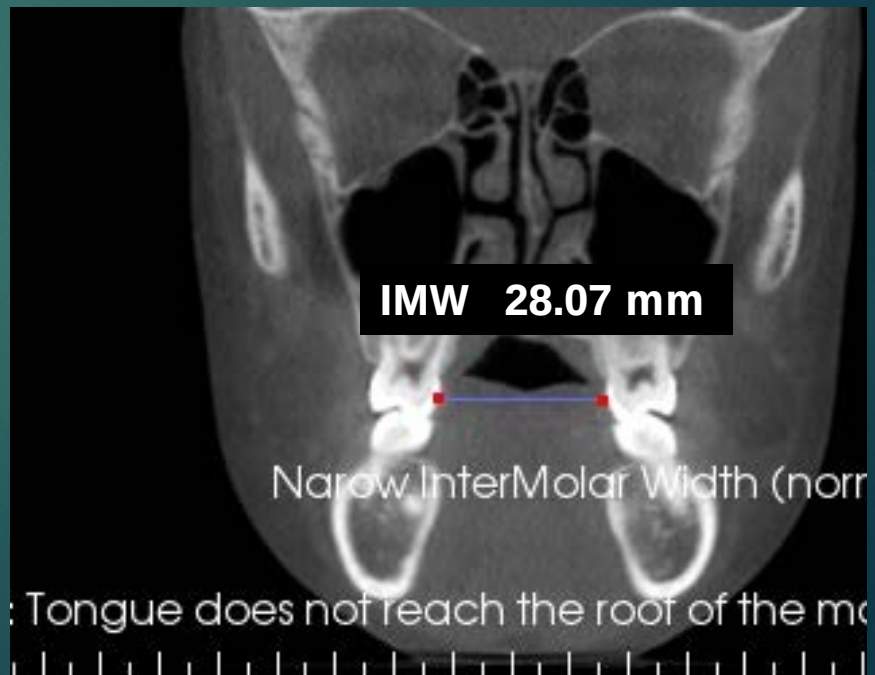
Obstructive Airway Disorders in the Pediatric population

- Craniofacial growth alterations
  - Malocclusions
    - Narrow / Constriction
      - Naso-maxillary Complex
      - Narrow Mandible
    - Arch Length Problem
      - “Crooked teeth”
      - Mismatch between the skeletal supporting structures and the size of the teeth
      - Transverse Dimension
      - Room for the tongue



IMW 28.07 mm
Norm 36-42 mm





Patient/Chief Complaint(s)/ Symptoms	Clinical exam / Diagnostic Parameters / Problem List	Treatment Plan & Treatment

PATIENT INFO

- Male
- 10 yrs 0 mo

CHIEF COMPLIANT

- "severe overbite"
- Snores
- Labored breathing at night
- Difficulty breathing at night
- Grinds his teeth "badly" at night

SYMPTOMS

- Labored breathing at night
- ADD
- ADHD - Hyperactive
- Mouth breather
- Allergies
- Bed wetting
- Speech problems (nasal)
- Headaches in AM
- Ear infections Right

Severity (0-5)
5
5
3
3
4
3
3
4
4
3
3
2
3
3
4

BEARS ALGORITHM

- The 'BEARS' questionnaire (Figure 1) is to screen for Sleep Disorders Breathing issues in children from 2 to 18 years of age
- For young children the questions are answered by parent(s) or guardian
- For older children, the questions are answered by the child, EXCEPT for snoring or gasping as these must be witnessed by another individual usually by a parent.

CLINICAL EXAM

- Severe Class II div 1
- Retrognathic profile
- Retrognathic mandible
- Narrow arches
- Allergic Shiners
- Mouth breather

DIAGNOSTIC RECORDS

- Low dose CBCT
  - Pan reconstructed
  - Ceph reconstructed
  - 3D Airway Evaluation
  - 3D TMJ evaluation
  - 3D Skeletal & dental relationships
- 3D face scan
- 2D Facial & IO photos

DIAGNOSIS

- Maxillary left 3rd molar position over the occlusal of upper left 2nd molar.
-

OTHER INCIDENTAL FINDINGS

- Metal object found in right ear
- Low tongue position at rest

PROBLEM LIST

1. Symptoms of SDB
2. Metal object in right ear
3. Position of upper left 3rd molar

TREATMENT (TX) PLAN / TX OPTIONS

REFERRALS

- ENT / pediatrician
  - Had right ear checked 1 week prior
  - Treated with antibiotics for ear infection
  - The metal object (small screw) was covered by soft tissue so it was never seen clinically.
  - Evaluation and removal of "metal object"
  - After removal, no subsequent infections.
- Oral Surgeon
  - Maxillary left 3rd molar developing occlusally to the maxillary 2nd molar. Blocking further eruption
  - Early extraction needed

ORTHODONTIC TX PLAN(S)

1.
2.
3.
4.

TREATMENT

1.
2.
3.
4.

BEARS SLEEP SCREENING ALGORITHM for CHILDREN 2 - 18 Years

Child's name L M Male Age 10 Y : 0 Mo Parent(s) name(s) S M Date 02/08/2016

The "BEARS" instrument is divided into five major sleep domains, providing a comprehensive screening for the major sleep disorders affecting children in the 2- to 18-year old range.
Each sleep domain has a set of age-appropriate "trigger questions" for use in the clinical interview.
Please answer as accurately as you can. Sleep and Breathing Disorders, in children, can lead to major health issues later in life. (i.e. Sleep Apnea, etc.). PLEASE CIRCLE THE YES OR NO QUESTIONS.
You may write any further explanations to the YES or NO questions in the space provided or on the other side of this page.

Thank You. Dr Harrell and staff

B = Bed Time Problems
E = Excessive Daytime Sleepiness
A = Awakenings during the night
R = Regularity and duration of sleep
S = Snoring / gasping / stopping breathing

(P) Parent directed question

(C) Child directed question

BEARS	Toddler/preschool (2-5 years)	School-aged (6-12 years)	Adolescent (13-18 years)
1. Bedtime problems	A. Does your child have any problems going to bed? Yes No B. Falling asleep? Yes No	A. (P) Does your child have any problems at bedtime? Yes No B. (C) Do you have any problems going to bed? Yes No	A. Do you have any problems falling asleep at bedtime? Yes No B. Do you have any problems going to bed? Yes No
2. Excessive Daytime Sleepiness	A. Does your child seem overtired or sleepy a lot during the day? Yes No B. Do they still take naps Yes No	A. (P) Does your child have difficulty waking in the morning, seem sleepy during the day or take naps? Yes No B. (C) Do you feel tired a lot? Yes No	A. Do you feel sleep a lot during the day? Yes No B. In school? Yes No C. While driving? Yes No
3. Awakenings during the night	A. Does your child wake up a lot at night? Yes No B. Any sleepwalking, Nightmares or Night terrors? Yes No	A. (P) Does your child seem to wake up a lot at night? Yes No B. (P) Any sleepwalking or nightmares? Yes No C. (C) Do you wake up a lot at night? Yes No D. (C) Have trouble getting back to sleep? Yes No	A. Do you wake up a lot at night? Yes No B. Have trouble getting back to sleep? Yes No
4. Regularity and duration of sleep	A. Does your child have a regular bedtime and wake time? Yes No B. What are they?	A. (P) What time does your child go to bed and get up on school days? 10 PM / 6 AM B. Weekends? 11 PM C. Do you think he/she is getting enough sleep? Yes No	What time do you usually go to bed on school nights? _____ Weekends? _____ How much sleep do you usually get? _____
5. Snoring ********** (Parents answer these questions on Snoring, gasping or stopping breathing)	A. Does your child snore a lot or have difficult breathing or gasping at night? Yes No B. Has anyone in the family witnessed your child snoring or stopping breathing during the night? Yes No C. Who ?	A. (P) Does your child have loud or nightly snoring or any breathing difficulties at night (gasping, stop breathing)? Yes No B. (P) Has anyone in the family witnessed your child snoring, gasping or stop breathing @ night? Yes No C. Who ? Mother	A. (P) Does your teenager snore loudly at nightly? Yes No B. (P) Does your teenager gasp or stop breathing during the night? Yes No C. (P) Has anyone in the family witnessed your teenager snoring, gasping or stop breathing @ night? Yes No D. Who ? _____

Source: "A Clinical Guide to Pediatric Sleep: Diagnosis and Management of Sleep Problems" by Jodi A. Mindell and Judith A. Owens; Lippincott Williams & Wilkins

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

- **The best parallel in humans of why early diagnosis and treatment is critical in children, is to compare children who have 'club feet' or *talipes equinovarus* .**

- **<u>When is the best time to intervene with treatment?</u> Extremely early (birth - 3 months), Very early (2-5 years), 'Early Tx' (6-9 years), or later at 12-14 years of age after growth is almost complete.**

- **Treatment for clubfoot usually starts <u>soon after birth</u> (Figures 1 & 2) due to rapid growth potential and the ability to slowly normalize the feet into their normal positions so that when the child begins to walk, their feet and legs are now in their correct position Figure 3.**

- **<u>THEY DO NOT GROW OUT OF IT !! THEY GROW INTO IT !!</u>**

- **Nonsurgical 'early' treatments such as casting or splinting are usually tried first. The foot (or feet) is moved (manipulated) into the most normal position possible and held (immobilized OR 'RETAINED') in that position until the further corrective treatment is needed, see Figure 4.**

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

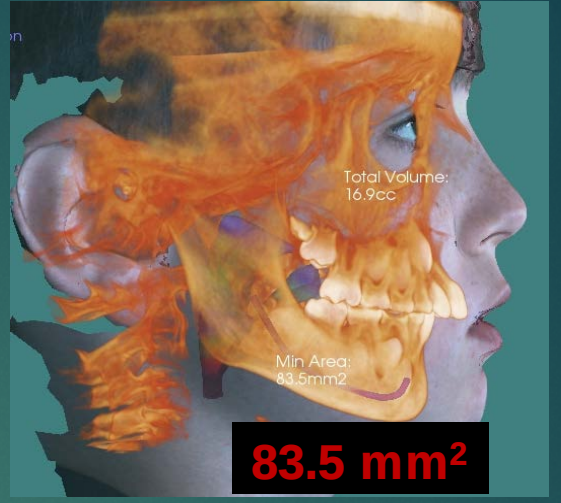
- **This manipulation and immobilization procedure is repeated every 1 to 2 weeks for 2 to 4 months, moving the foot a little closer toward a normal position each time. Some children have enough improvement that the only further treatment is to keep the foot in the corrected position by splinting it as it grows (i.e. retention) .**

- **‘Corrective shoes’ are sometimes used to ‘fine tune’ the feet after ‘growth guidance’ is done. This is similar to early orthodontic intervention at 3 - 8 years of age using growth guidance, expansion, mandibular advancement, etc. and then using braces to ‘fine tune’ and detail the occlusion at a later date.**

- **Surgery would be the only option if we waited until growth was complete and the results would be a significant compromise see Figure 5. Extraction of permanent teeth IS SURGERY and in my opinion, is a COMPROMISE.**

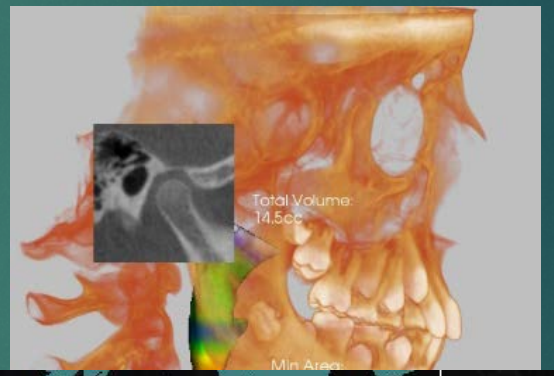
To 62
TMJ / OAD
END

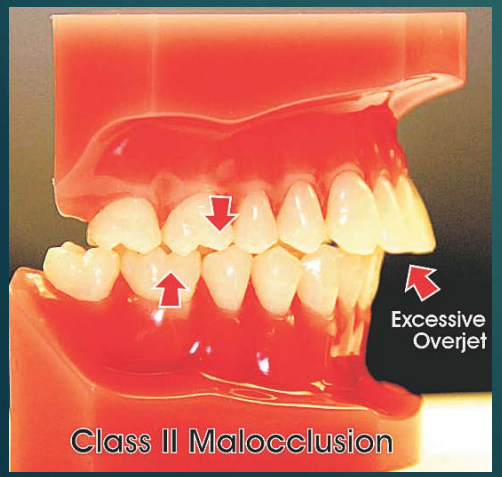
Obstructive Airway Disorders in the Pediatric population



- Craniofacial growth alterations
  - Malocclusions
    - Class II malocclusion
    - Recessive Mandible – majority
      - Herbst
    - Prognathic Maxilla

83.5 % of Normal (100+ for 10 yr old) or 16.5% smaller





63 %

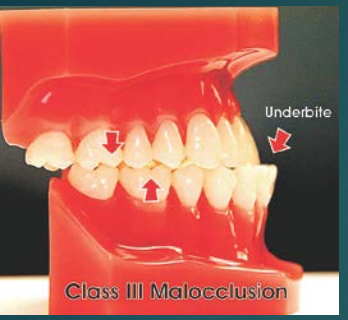
MCS

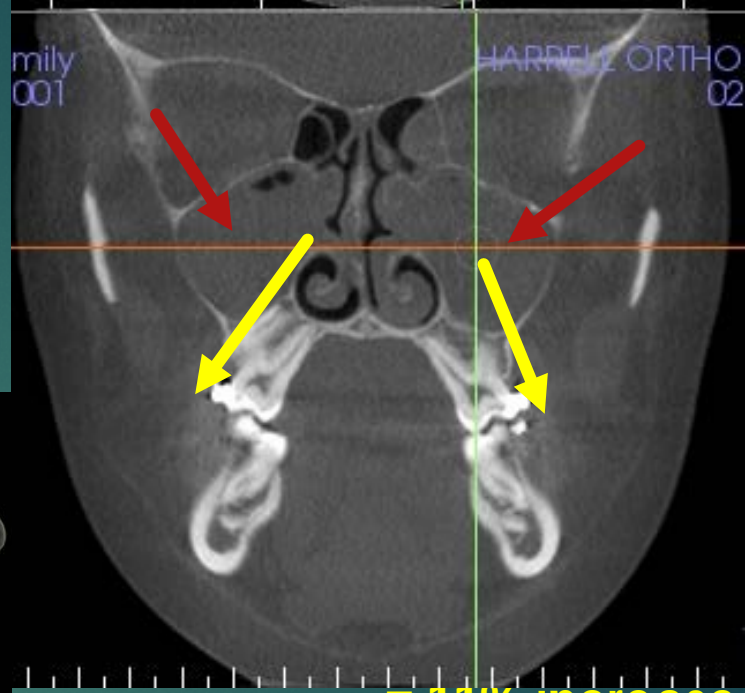
TMJ / OAD

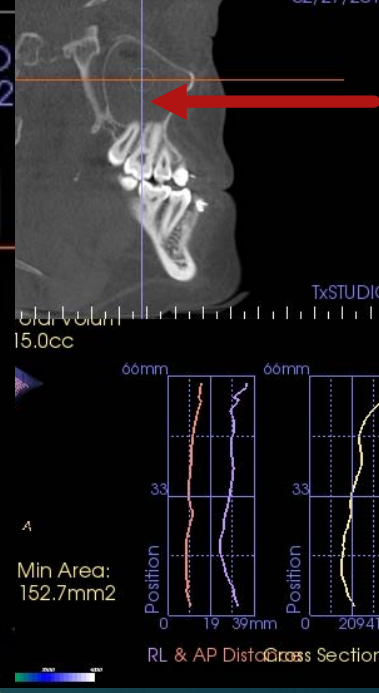
END

Obstructive Airway Disorders in the Pediatric population

- Craniofacial growth alterations
  - Malocclusions
    - Class III malocclusion
      - Recessive Maxilla
      - Prognathic Mandible
      - Combination

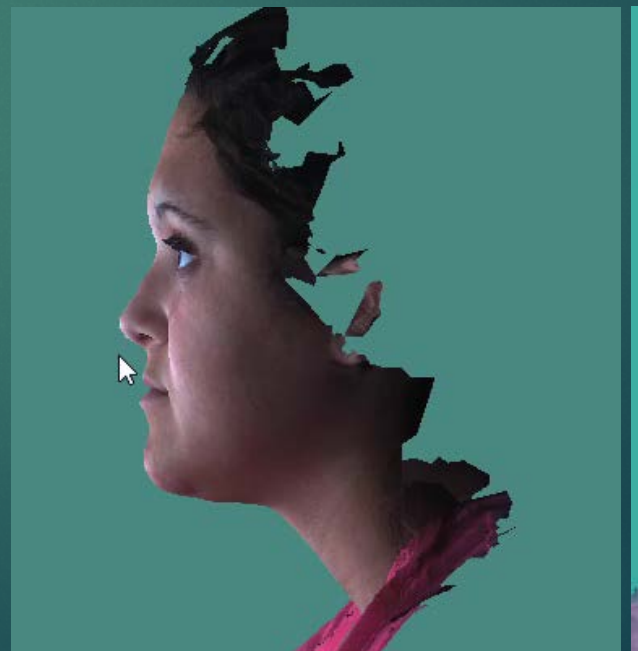






= 11% increase

Orthodontic pre-surgical preparation



SNA = 78.4º (Norm 82 +- 2)

SNB = 83.9 º (Norm 80 +-2)

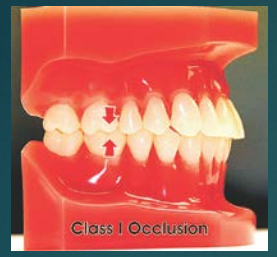
ANB = - 5.5 º (Norm + 2 +-2)

To 62

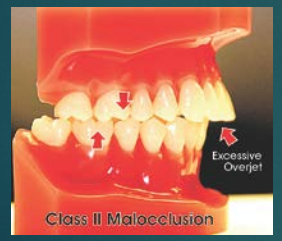
END

Obstructive Airway Disorders in the Pediatric population

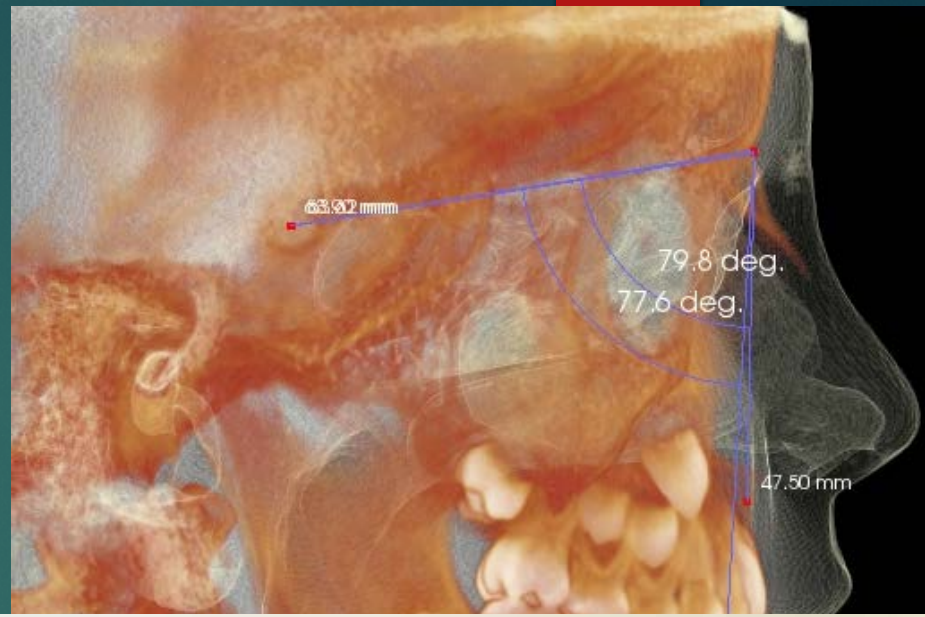
- Craniofacial growth alterations
  - Malocclusions
    - Recessive Maxilla & Mandible



      - Class I
        - Tx = MMA / Expansion / growth

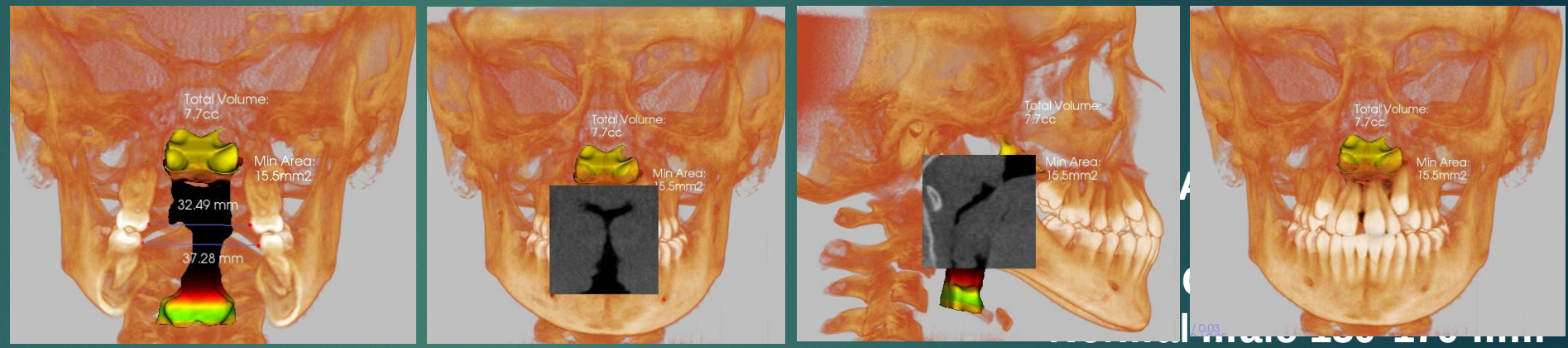


      - Class II
      - Cross Bite
        - with or without crossbite
        - RPE
        - Expansion / uprighting

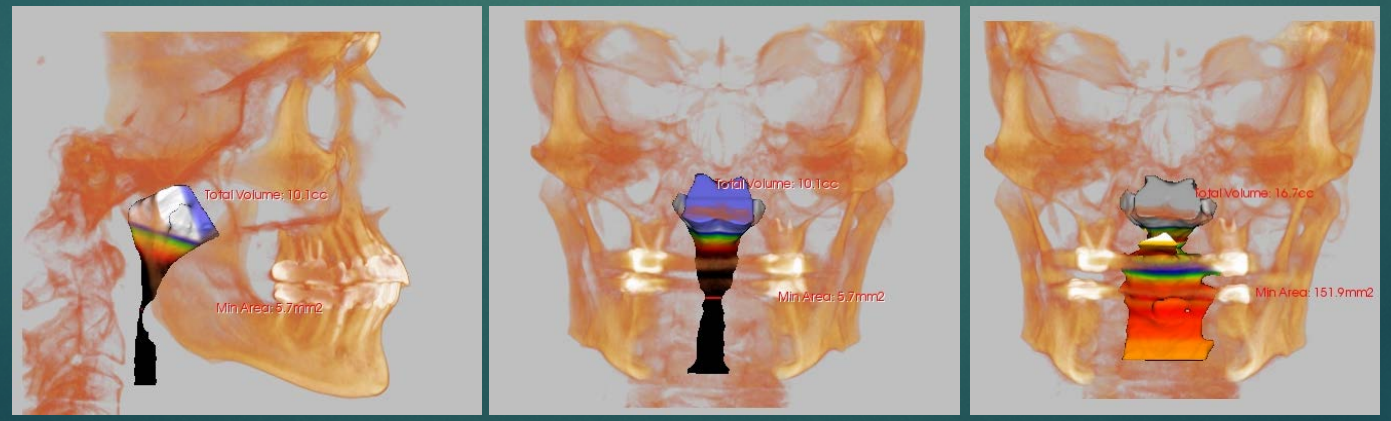


Obstructive Airway Disorders in the Pediatric population

- **Craniofacial growth alterations**
  - **Soft tissues**
    - Tonsils
    - Adenoids
    - Tongue
    - other
  - **Airway**



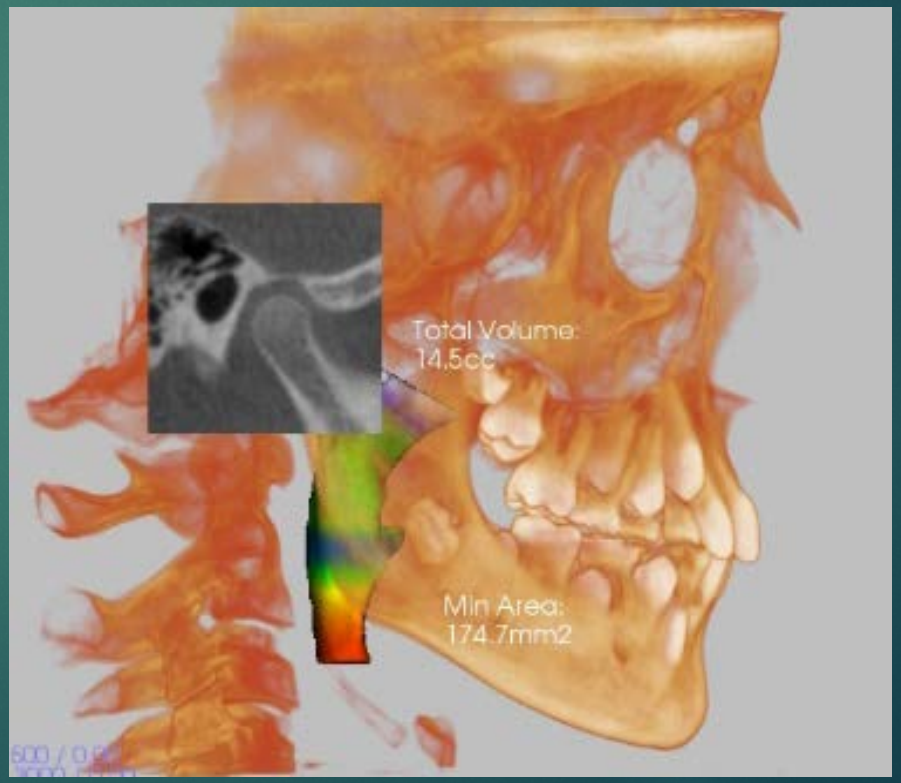
(Schendel, Jacobson, et al)



1 month follow up OAT
AHI 4
MCSA = 151.9 mm²

2,665 %
Poiseuille's law
Double Radius = 16 X

What do TMJ Disorders (TMD) have to do with airway problems ?



To 54
To 59
To 62
END

Is Centric Relation always the position of choice for Temporomandibular Joint Disorders (TMD)?

A Case Report of how TMD and Airway dimension may be associated

Harrell, William (Orthodontist),
Tatum, Tim (General Dentist),
Koslin, Michael (Oral Surgeon)

Compendium, vol. 38 # 4, April 2017

To 54
To 59
To 62

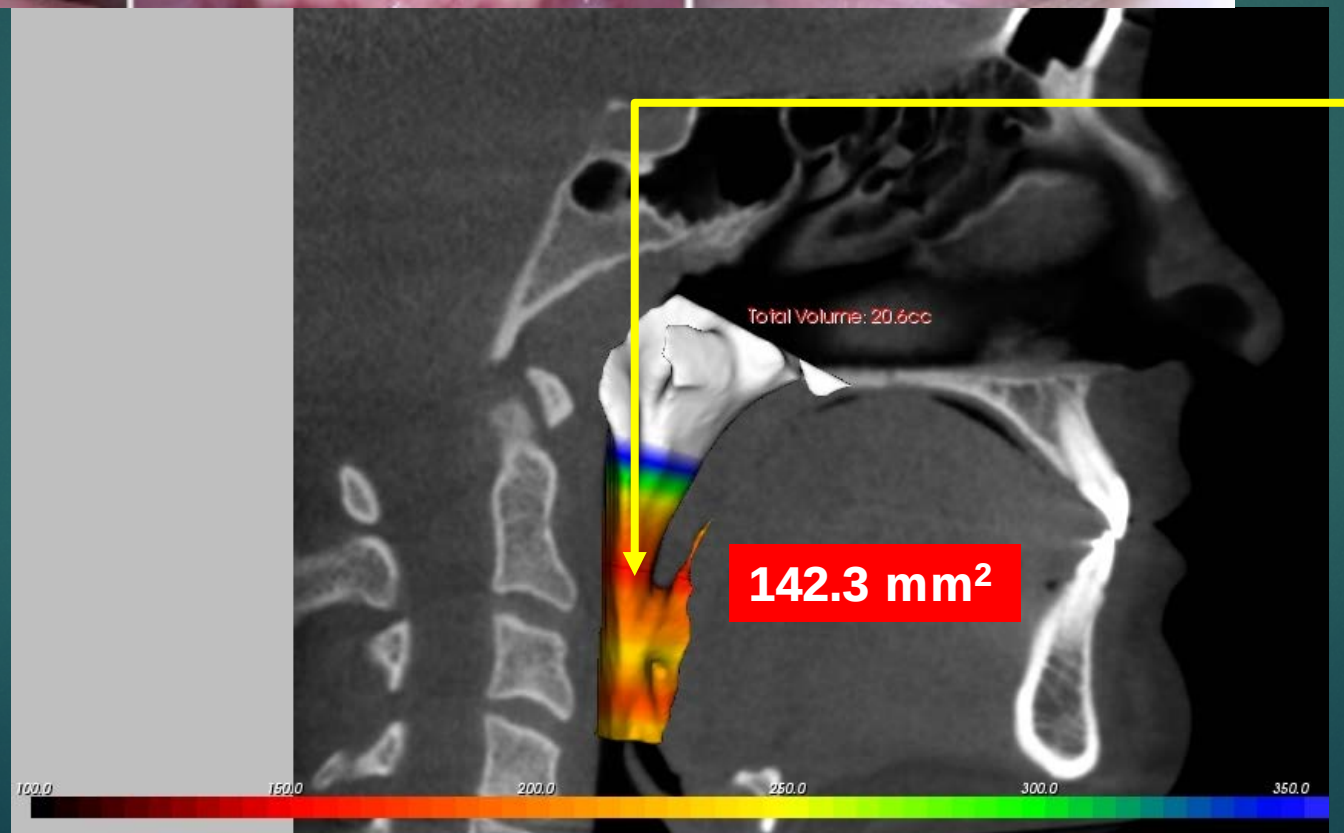
Facial & IntraOrals
Centric Occlusion (her 'normal bite')

- Previous Ortho from another practitioner
  - Finished in 2012
- Initially Impacted UR Cuspid
- Medical/Dental History
  - WNL

Chief Complaint?

- Her New Dentist picked up a “problem” with her occlusion
- PAIN
  - Pain level = 7 (0-10)
  - Right TMJ
    - Right clicks & locks @ times and painful to move
  - Pain in Left Masseter and Left Temporalis
- ROM – Difficult to open for 2 years
  - MO = 35 mm (40+), RL = O mm (10), LL = 5 mm (10)
  - Deviates to Right on opening and Left on closure
- “Bite feels off”
- Does not sleep well
  - Epworth Sleep Scale (ESS) = 10
    - 10 and > One Red Flag
    - 18 and > Two Red Flags

Airway Volume in Centric Occlusion (CO)
Minimal Cross-sectional area = 142.3 mm²

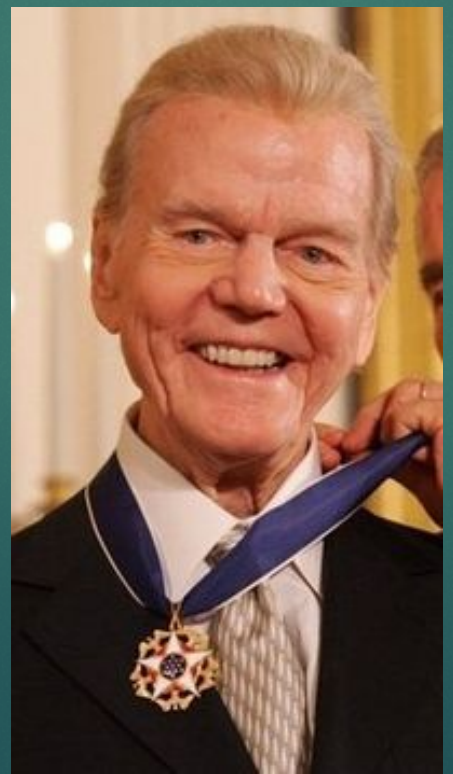


So What is the problem ?

.....

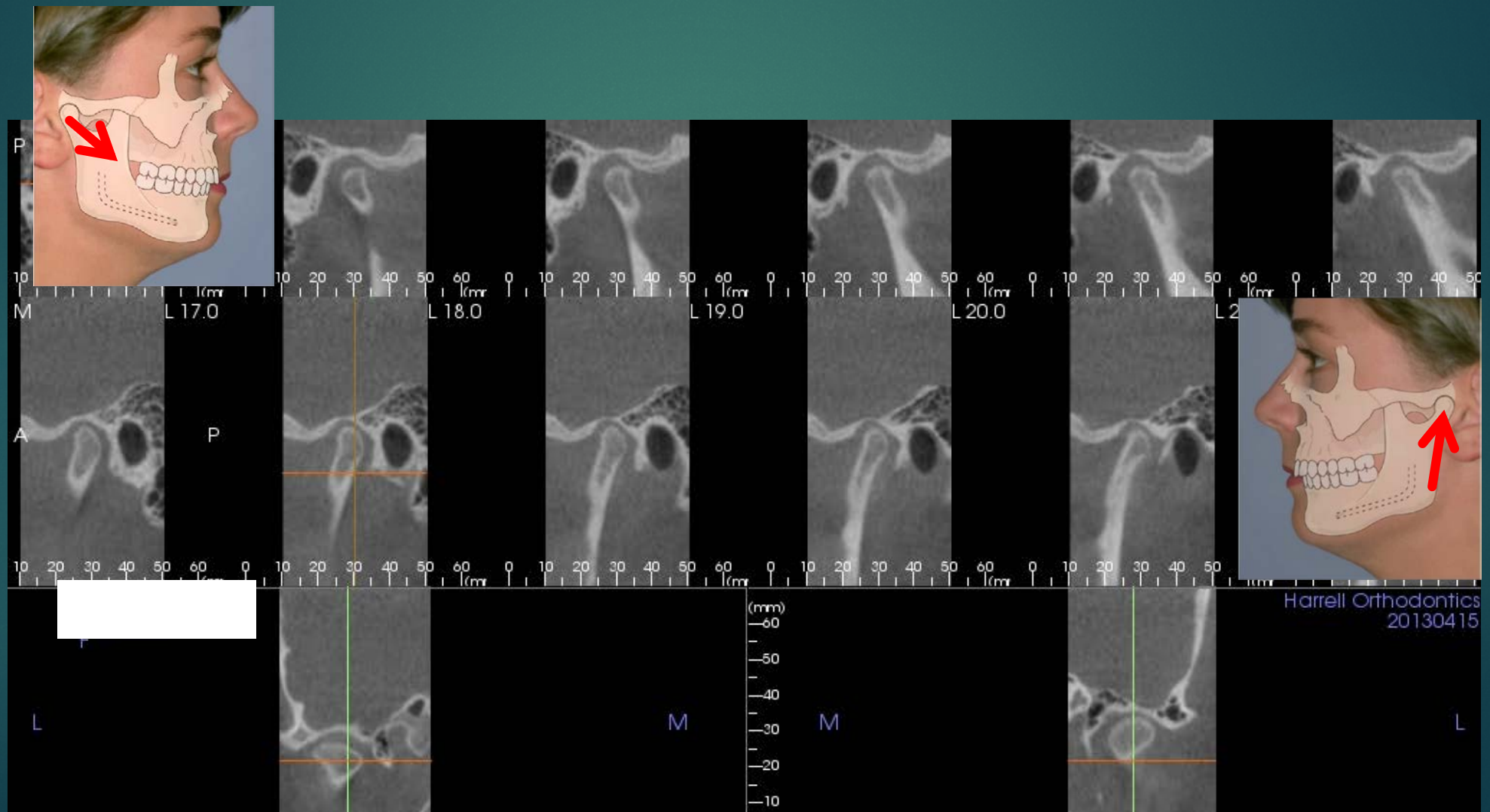
“And now for the Rest of the Story”

– Paul Harvey



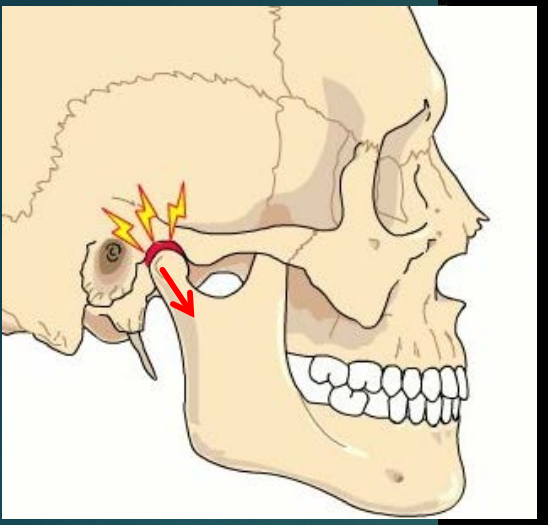
TMJ Views from iCAT CBCT

Note: Right Condyle distracted in CO and Degenerative.



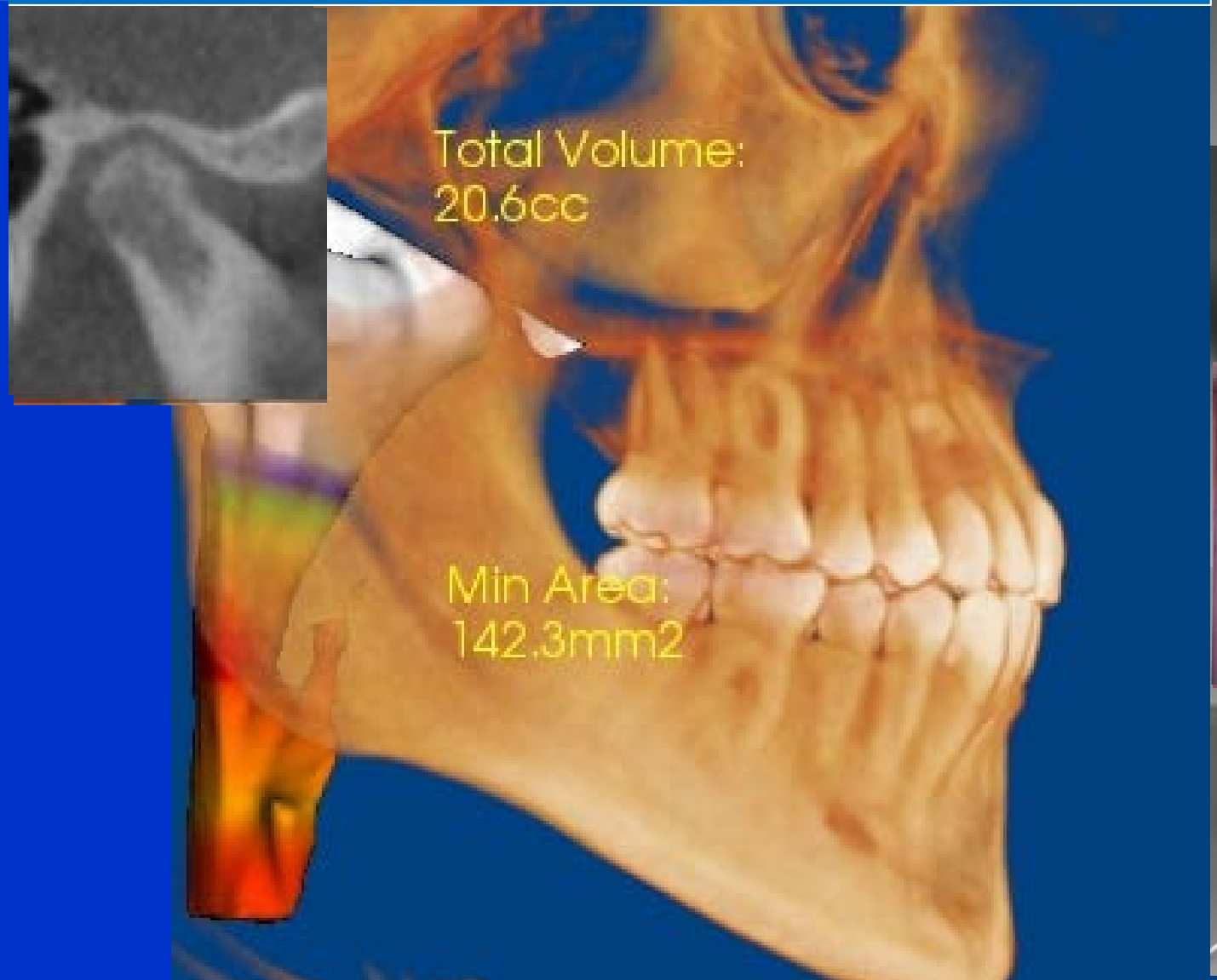
Panoramic View reconstructed from CBCT in CO

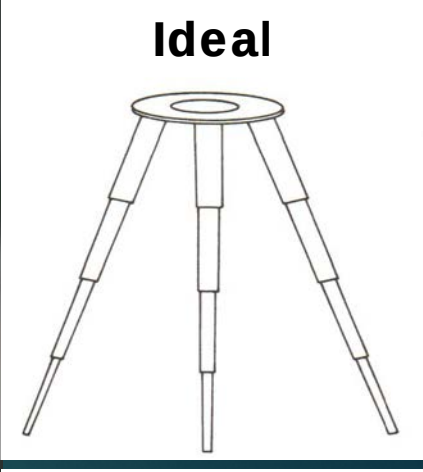
Orthographic from iCAT CBCT Pan oriented to Mid-Sagittal Plane

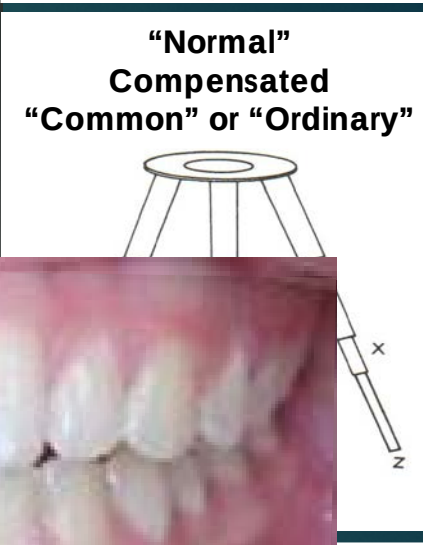


Airway Minimal Cross-Sectional Area CO = 142.3 mm^2
Airway Minimal Cross-Sectional Area CR = 97.2 mm^2 (68.3 %)

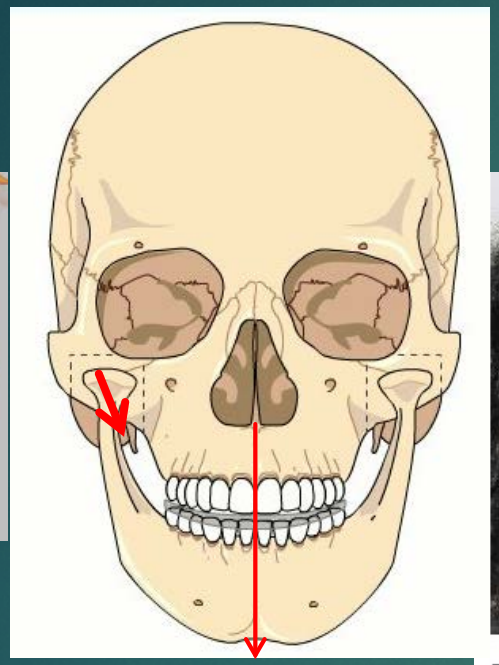
CR airway MCSA **31.7 %** less than CO airway !!







Maxillary CO Splint to support the Right Condylar position AND the AIRWAY to Treat to the CO Position with MMA



Dr. Allen Lowe
Orthodontist
UBC

Problem
Palatal coverage
Maxillary Occlusal Splints for TMJ.

Increase in AHI by 50 % in ½ of the patients.

Even with Maxillary Orthodontic Retainers.

Decrease in tongue space.

Pre – Surgery Maxillary Advancement & BSSO (MMA) Surgery 7/17/2014

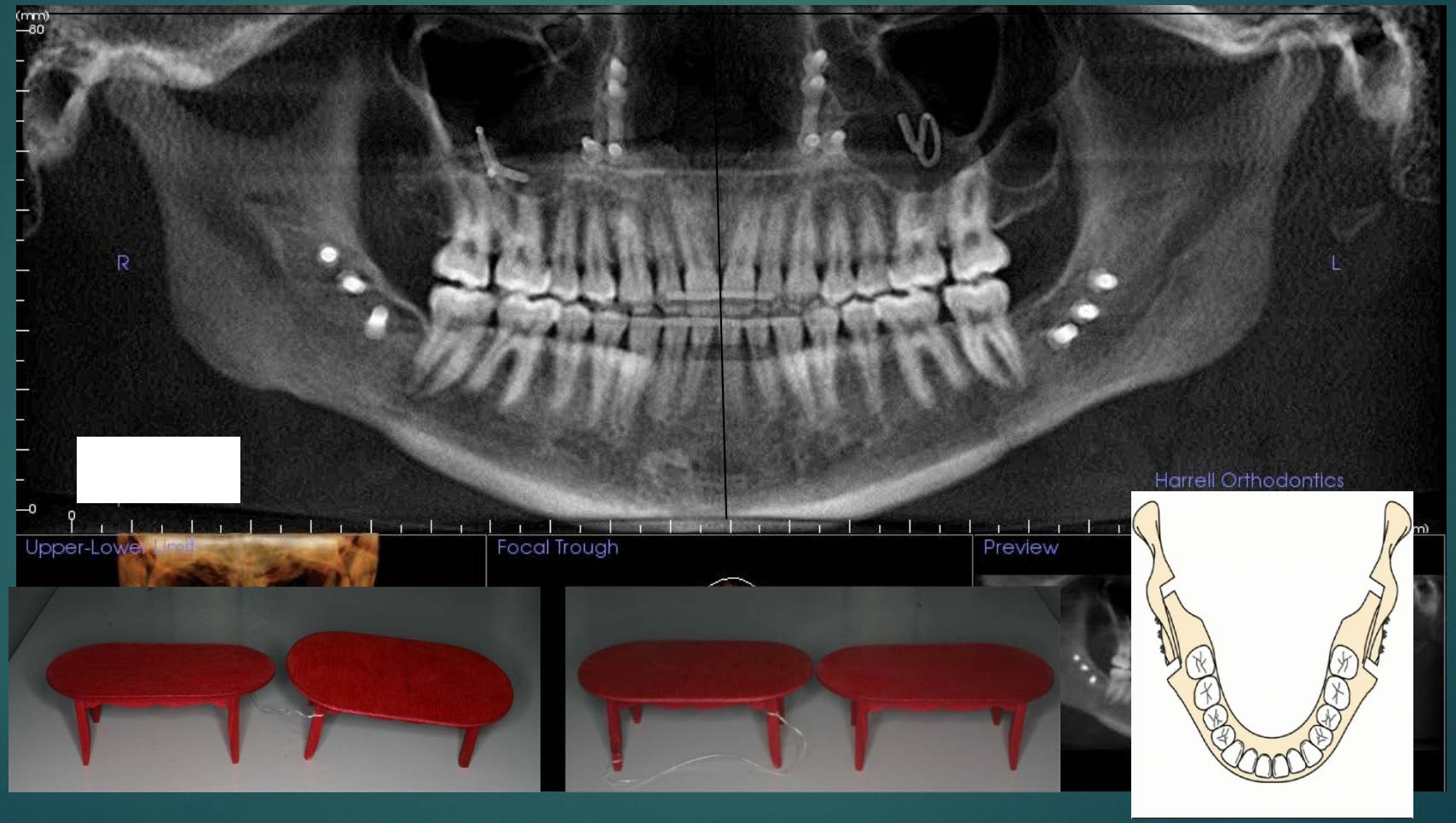




HARRELL
ORTHODONTICS



Final CBCT Reconstructed Panoramic Oriented to Mid-Sagittal



Final 1/22/2014





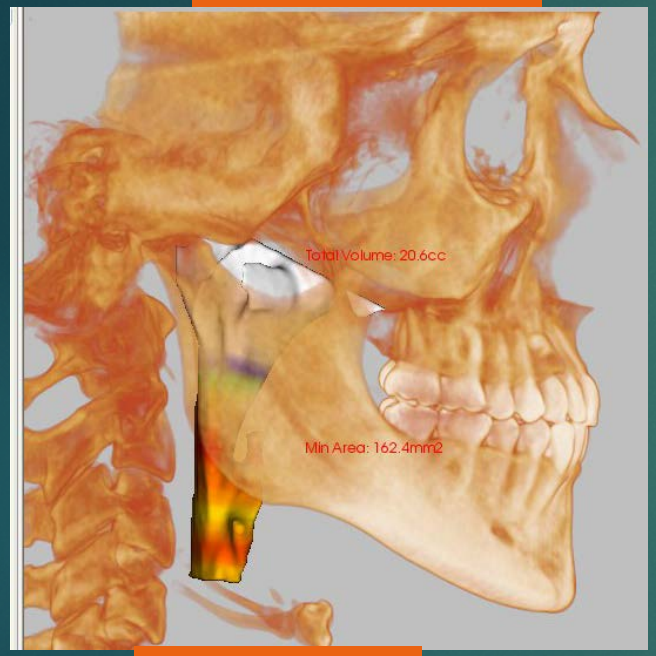
HARRELL
ORTHODONTICS



Airway Measurements

Initial CO

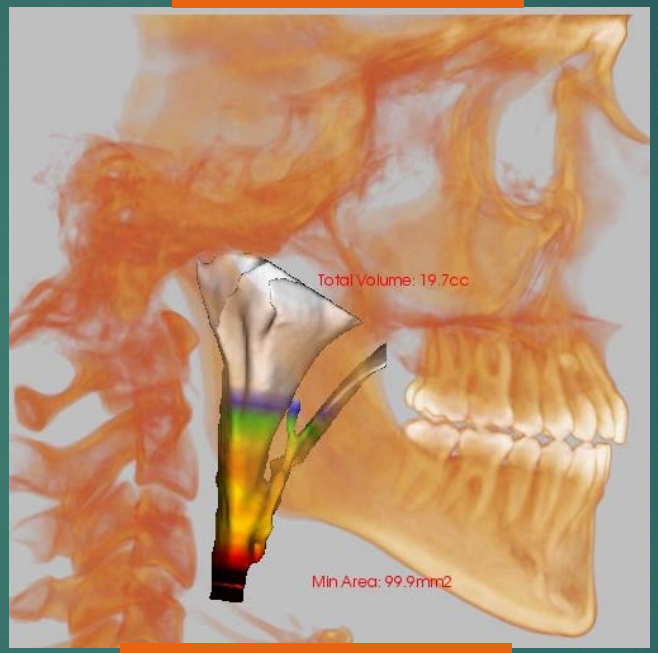
Initial CO
4/15/2013



142.3 mm²

Initial CR

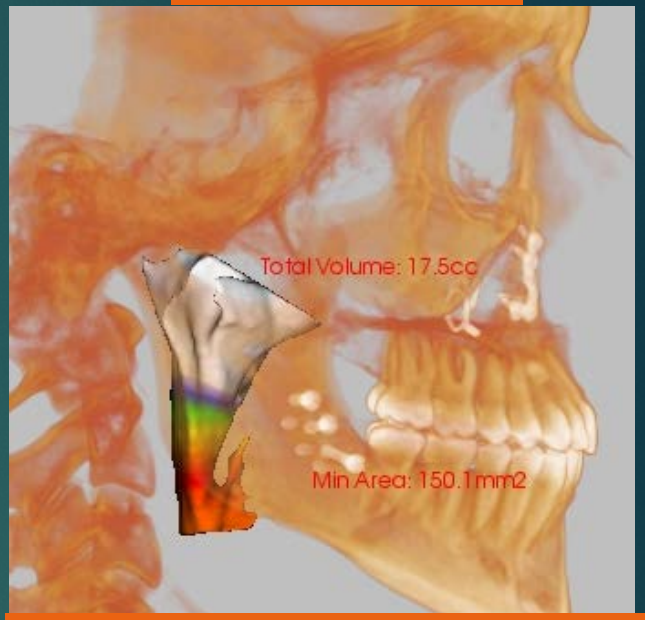
Initial CR
4/15/2013



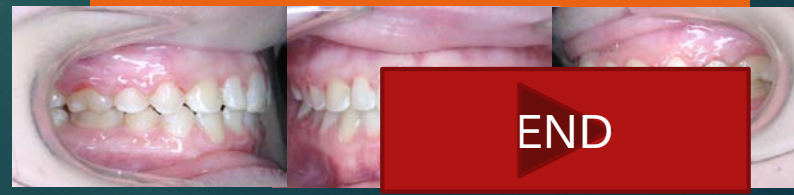
99.9 mm²
31% Decrease

Final CR=CO

Final CO=CR
1/22/2014



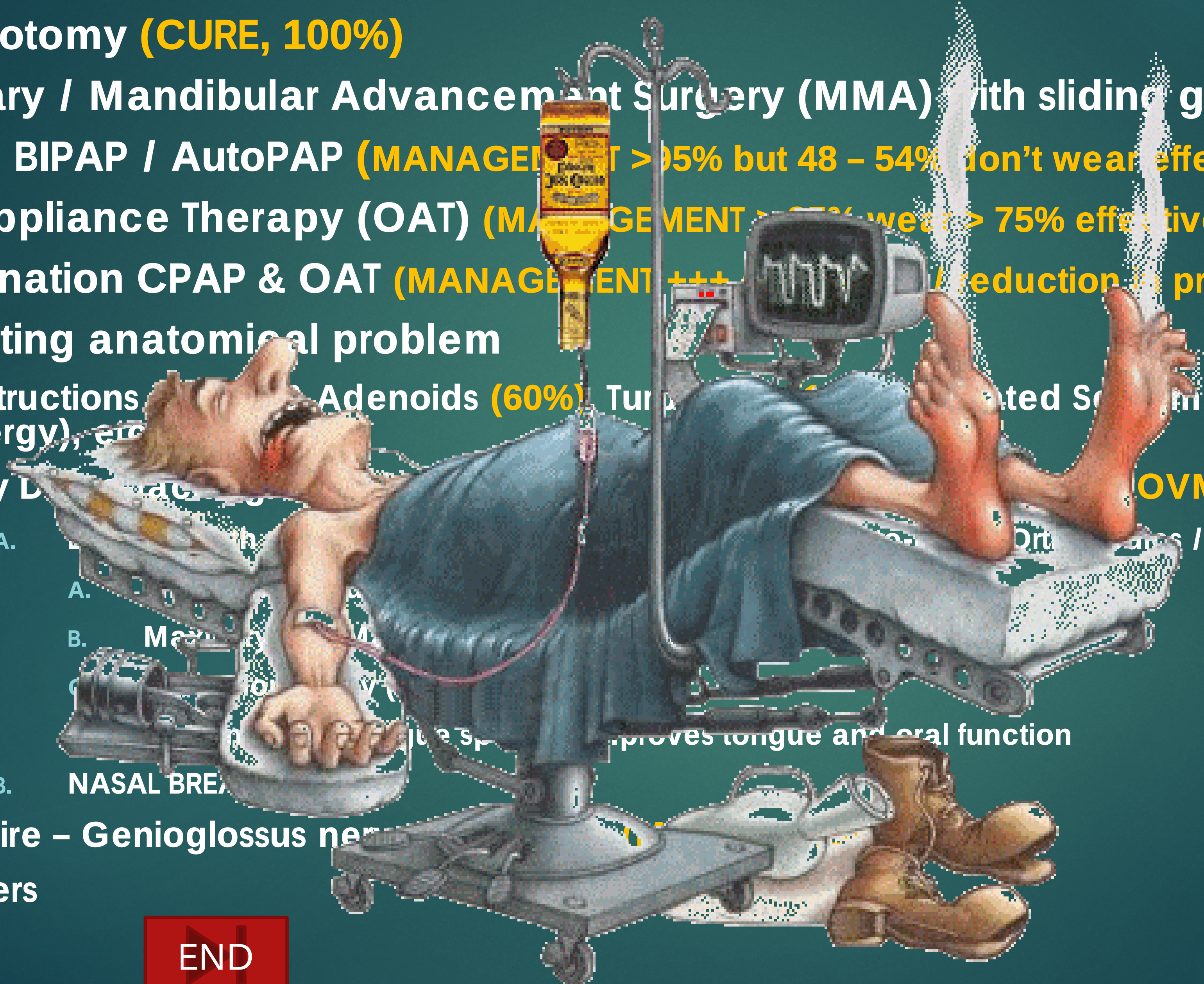
150.1 mm² Surgical Edema
50.25 % increase from CR
5.5 % increase from CO



END

"Cure" for OSA ?

1. Tracheotomy (CURE, 100%)
2. Maxillary / Mandibular Advancem… Surgery (MMA) …ith sliding genioplasty (CURE, >95%)
3. CPAP / BIPAP / AutoPAP (MANAGE… >95% but 48 – 54% don't wear effectively)
4. Oral Appliance Therapy (OAT) (MA…GEMENT … > 75% effe…tive)
5. Combination CPAP & OAT (MANAGE…ENT +++ … reduction … pressure of CPAP)
6. Correcting anatomical problem
   1. Obstructions … Adenoids (60%), Tur… …ted S… (10-15%), Sinuses, Inflammation (allergy), etc
   2. Early D… …OVMENT)
      A. … Ort… / Myo-functional / habit correction
         A. …
         B. Ma…
         C. …
         … improves tongue and oral function
      B. NASAL BRE…
   3. InSpire – Genioglossus ne…
   4. Others



END

Detect Adult & Pediatric SDB / monitoring cooperation and risks

- **Urine Biomarkers of OSA**
  - Dr. David Gozal – Dept Pediatrics Chicago **"Urine test for pediatric obstructive sleep apnea possible."** American Thoracic Society December 2009.
    - **Nine proteins were increased and three were decreased in those with OSA. There was no difference in protein levels between children who snored and those with no obstructive sleep apnea.**
    - **Levels of just four of those proteins provided a highly accurate test for apnea and "can potentially be used to screen children with habitual snoring in the future," the authors wrote.**
    - **Several of the proteins that were elevated in children with OSA are associated with inflammation and are considered sensitive indicators of mild kidney damage. The researchers suspect that the "intermittent hypoxia and globally increased oxidative stress and inflammatory processes activated by OSA may lead to mild renal dysfunction."**
    - **The next steps, Gozal said, are to validate these findings in urine samples from many children from laboratories around the country and to "develop a simple color-based test that can be done in the physician office or by the parents."**

Detect Adult & Pediatric SDB / monitoring cooperation and risks

- **Blood Biomarkers of OSA**
  - "Biomarkers associated with obstructive sleep apnea and morbidities: a scoping review"
  - Sleep Medicine vol 16, # 3, March 2015, Pages 347-357
  - Canto G de L, Major P, Gozal D, et.al
- **3D Facial Biomarkers of SDB / OSA**
  - **Harrell in progress**
- **Pediatric night time Pulse Ox**
  - **"Development of a screening tool for sleep disordered breathing in children using the phone Oximeter™"**
  - PLoS One, 2014 Nov 17;9(11)
  - Garde A, Dehkordi P, Karlen W, Wensley D, Ansermino JM, Dumont GA

END

Detect Adult & Pediatric SDB / monitoring cooperation and risks

- 4D Imaging 60 fps of 3D surface
  - Speaking / talking / chewing
- "Mass Springs" Stanford BioComp Center

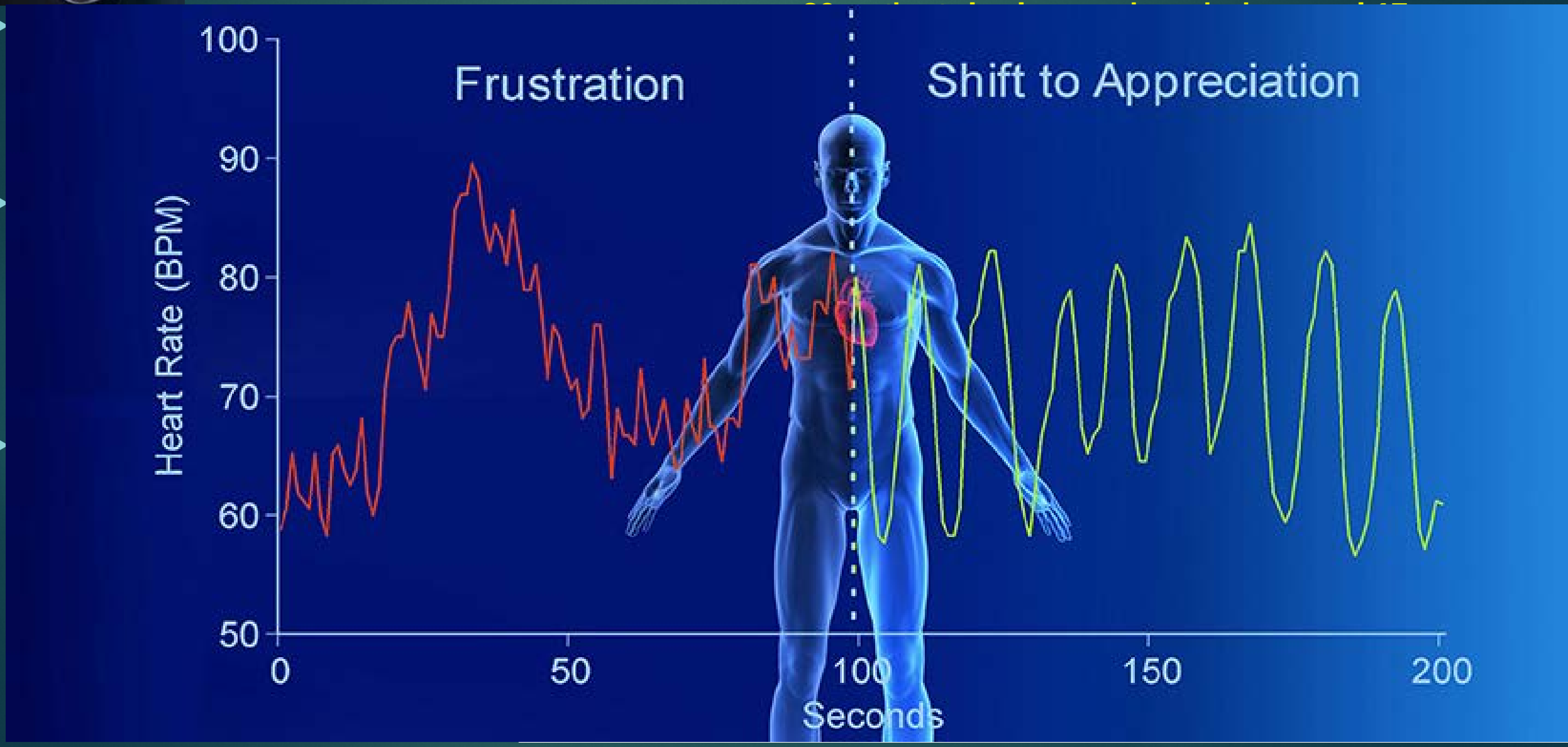
- Smart Phone APP

  University of Washington - Nathaniel Watson, MD

  Apnea App http://apnea.cs.washington.edu/

- Tele-Monitoring
  1. Treatment response
  2. Cooperation
  3. 3D Dental & Jaw monitoring of occlusal & jaw changes using 3D Intra-Oral imaging and a Smart Phone App (Dental Monitoring ™) In development.

Heart Rate Variability (HRV) Malocclusion



Didgeridoo

- The didgeridoo (also known as a didjeridu) is a 'wind instrument' developed 1,500 years ago by indigenous Australians of northern Australia and still in widespread use today.
- Requires to learn "Circular Breathing" - breathing in through the nose and out the mouth simultaneously. "Like a reverse CPAP". Majority of individuals cannot learn circular breathing.
- Published study "Didgeridoo playing as alternative treatment for obstructive sleep apnoea syndrome: randomized controlled trial" (BMJ 2006) on 25 patients & controls / avg AHI 21 / Epworth 11.8 – 20 min / day - 5.9 days week - 4 months AHI decreased avg - 6.2 & Epworth decreased – 4.4

Airway Centered Team Approach

"Breath is Life"

Orthodontist / Dentist / Oral Surgeons / ENT / Pulmonary / Sleep Doc / Sleep Lab / Pediatrician / Pediatric Dentist

CHILD

- Early Recognition
  - Allergy & Airway issues
- Early Treatment
  - Growth Guidance
    - Expansion
    - Maxillary & Mandibular growth
- Orthodontics
  - Retraction vs forward growth guidance
    - Healthy Start Myo-functional Therapy
    - Herbst appliance
    - Maxillary & Mandibular Growth
  - Expansion vs Extraction to resolve dental and skeletal problems

ADULT

- CPAP Intolerance
  - (J Clin Sleep Med 2007 "50% of patients who are recommended for CPAP therapy are noncompliant within 1 year")
- Oral Appliances
  - Posture the mandible forward
  - Opens the Airway
  - Documented in 3D (CBCT)
  - Titration evaluated by further Sleep Study
  - Monitoring "Bite" Changes / controlling
  - Follow up
- Orthodontic / Oral Surgery Alternatives
  - Expansion vs extraction (3D)
  - Minimally invasive surgical expansion
- MMA Surgery (Orthodontic preparation)
- UPPP (UP3) Surgery / Reversible UP3, RF cauterize, other
- Inspire ® "Sleep Pacemaker" implanted to stimulate Genioglossus – STAR Project

Learning Objectives

- How alterations in respiration, early in life, can alter cranio-facial growth and leading to common malocclusions, altered airway dimensions and potential health issues
  - The Influence of Snoring, mouth breathing and Apnoea on facial morphology in late childhood – A Three-Dimensional Study
  - Richmond S, et al. Cardiff University
- Screening and detection of 3D facial Biomarkers (color & geometry)
- Understand where orthodontic, dento-facial & early myo-functional therapy fits into the treatment of pediatric patients
- THE MEDICAL / DENTAL TEAM approach to diagnosis and treatment
- Airway and TMJ

Thank You

THE END

QUE?TION?

Our grand kids
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