Brennan T. Dodson, MD
Bridger ENT

ENT PERSPECTIVES: THE AIRWAY

Introductions

- BA (anthropology): Colo. College, 1996
- MD: Univ. of Oklahoma, 2001
- Residency: UCHSC (Denver), 2006
- Bridger ENT: Univ. of Real World, 8/2006-present

Bridger ENT

Introductions

- What is ENT [Oto-(rhino)-laryngology]?
  - Diverse surgical specialty, wide range of disease and age groups
    - Ears (hearing, balance, infection, cancer)
    - Nose (breathing, sinus disease, cosmetic, cancer)
    - Throat (T/A problems, voice, swallowing, OSA, cancer)
  - 25% each: Facial plastics, Otology, Oncology, General (pediatrics, voice, sinus)

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Objectives

- Understand mechanisms and treatment of obstruction at the:
  - Nasal cavity
  - Oropharynx/Velopharynx
  - Retro-lingual and other
- Integration of concepts

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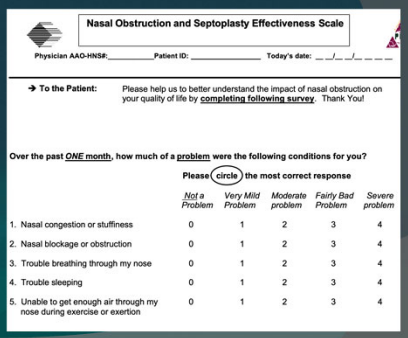
Nasal obstruction

- NOSE score
  - 100
  - 50
  - 30
  - <15



Nasal Obstruction and Septoplasty Effectiveness Scale

Physician AAO-HNS#:_____ Patient ID: _____ Today's date: __ __/__ __/__ __ __ __

→ **To the Patient:** Please help us to better understand the impact of nasal obstruction on your quality of life by **completing following survey**. Thank You!

Over the past *ONE* month, how much of a problem were the following conditions for you?

Please circle the most correct response

	Not a Problem	*Very Mild Problem*	*Moderate problem*	*Fairly Bad Problem*	*Severe problem*
1. Nasal congestion or stuffiness	0	1	2	3	4
2. Nasal blockage or obstruction	0	1	2	3	4
3. Trouble breathing through my nose	0	1	2	3	4
4. Trouble sleeping	0	1	2	3	4
5. Unable to get enough air through my nose during exercise or exertion	0	1	2	3	4

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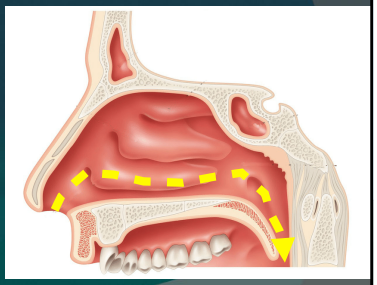
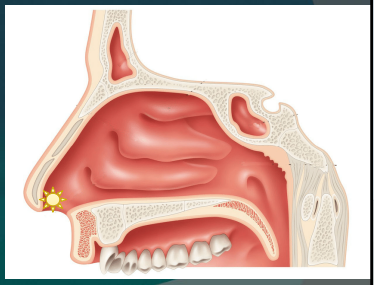
Nasal obstruction

- Airflow path is altered by:
  - External valve
  - Internal valve
  - Inferior turbinate
  - Adenoids
  - Septum



Nasal obstruction

- Zones
  - External valve
  - Internal valve
  - Inferior turbinate
  - Adenoids
  - Septum



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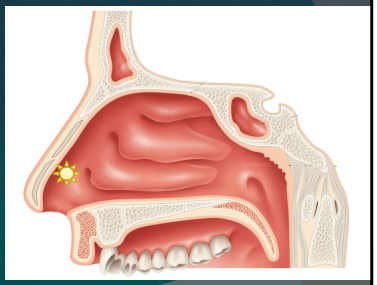

Nasal obstruction

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  - Internal valve
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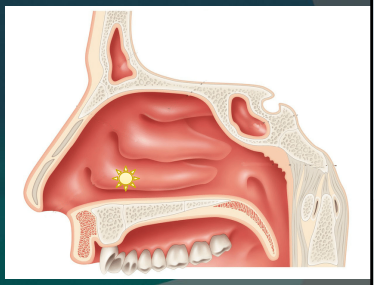

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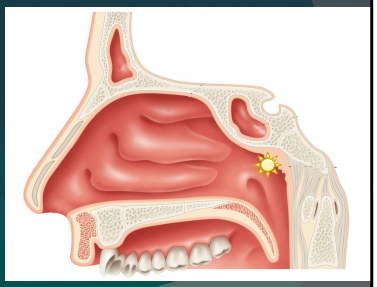

Nasal obstruction

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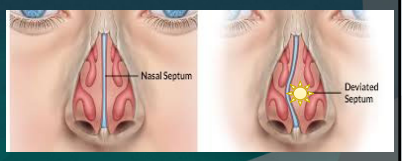
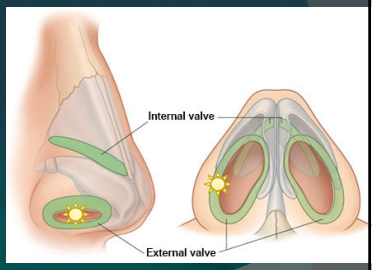


Nasal obstruction

- External valve
  - Nostrils
  - Columella
  - Caudal septum



https://cityfacialplastics.com/nasal-valve-repair/

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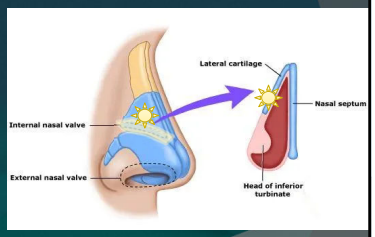
Nasal obstruction

- Internal valve
  - ULC
  - LLC
  - Septum
  - Inferior turbinate head



https://drturner.com.au/blogs/rhinoplasty-101-understanding-nasal-valve-collapse/

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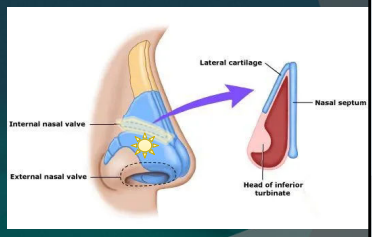
Nasal obstruction

- Internal valve
  - ULC
  - LLC
  - Septum
  - Inferior turbinate head



https://drturner.com.au/blogs/rhinoplasty-101-understanding-nasal-valve-collapse/

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Nasal obstruction

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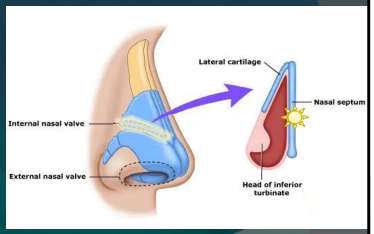

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Nasal obstruction

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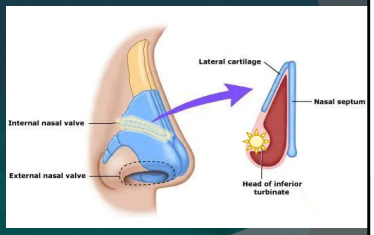

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Nasal obstruction

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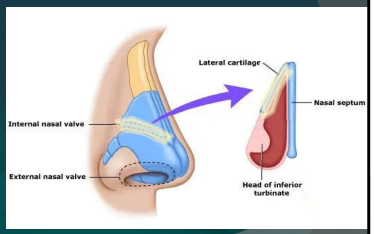

https://drturner.com.au/blogs/rhinoplasty-101-understanding-nasal-valve-collapse/

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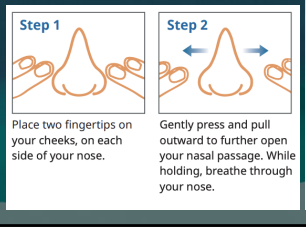
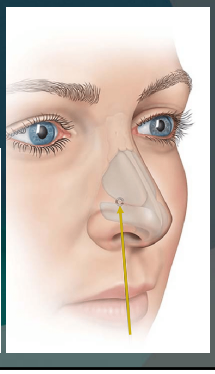
Nasal obstruction

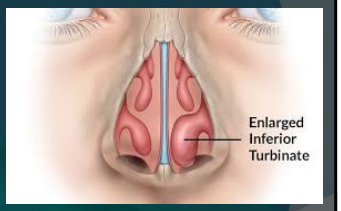
- Internal valve test
  - Cottle
  - Modified





Nasal obstruction

- Inferior turbinate
  - Sidewall
  - Heat/humidify
  - Enlargement
    - Inflammation
    - Genetics
    - Septal influence

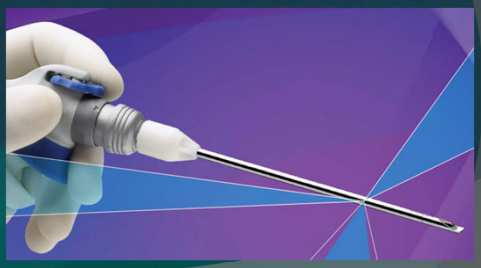


Nasal obstruction

- Inferior turbinate reduction: Coblation

Nasal obstruction

- Inferior turbinate reduction: Submucosal excision



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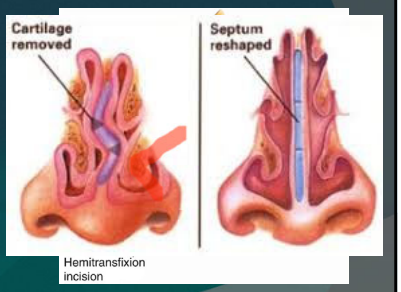
Nasal obstruction

- Septoplasty
  - OR, 1hr
  - Internal
  - High fidelity



Bioskas, S. (2021). Septoplasty: Standard Approach. In: Stavrakas, M., Khalil, H.S. (eds) Rhinology and Anterior Skull Base Surgery. Springer, Cham. https://doi.org/10.1007/978-3-030-66865-5_71

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Nasal obstruction

- Open Septo-Rhinoplasty (OSR)
  - Severe septal
  - Caudal septum
  - Nasal valve
  - Cosmetics

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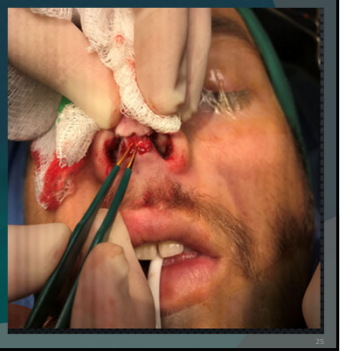
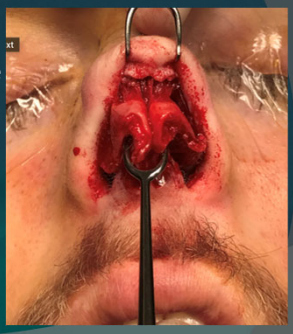
Nasal obstruction

- OSR
  - Trans columellar incision



Nasal obstruction

- OSR
  - Exposure cartilage infrastructure
  - OR: 3-5 hrs
  - Ultimate control
  - Brusing: fx
  - High fidelity

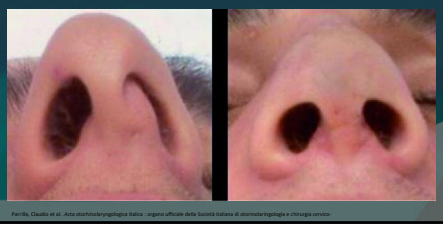


Nasal obstruction

- OSR, grafts
  - Nasal valve modification
    - Spreader
    - Batten
    - Lateral crural strut
  - Cosmetic
    - Dorsum
    - Tip

Nasal obstruction

- OSR
  - Caudal septum repair



Ferrilla, Claudio et al. Acta otorhinolaryngologica Italica : organo ufficiale della Società Italiana di otorinolaringologia e chirurgia cervico-

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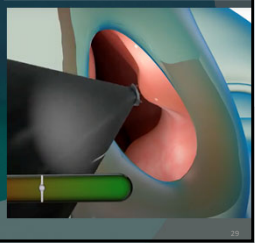
Nasal obstruction

- VivAer
  - RF, Minimal invasive, IO
    - Sidewall
    - Inf. Turbinate
    - Septal swell body
  - Fidelity: 5 yrs (+?)



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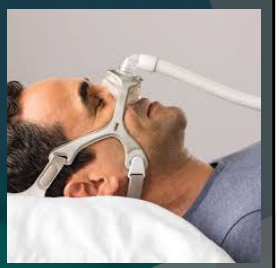
Nasal obstruction

- Better breathing = better sleep?
  - Subjectively: Yes
  - AHI: no change
  - CPAP comp.: Yes



Otolaryngol Head Neck Surg. 2015 Sep;153(3):326-33.
Otolaryngol Clin North Am. 2020 Jun;53(3):385-395.

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Nasal obstruction

- Revert to oral breathing
- SDB can arise
- SDB can worsen
- Peds: Oral breathing
  - Facial structural changes
    - SDB

Chest. Volume 124, Issue 6, 2003, Pages 2309-2323

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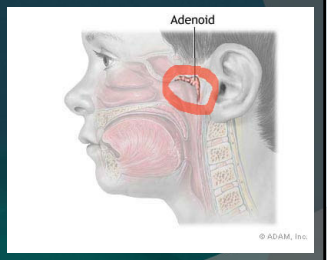
Nasopharyngeal obstruction

- Pharyngeal Tonsils
  - AKA adenoids
  - Posterior-superior wall nasopharynx (very back of the nose)
  - Origin: skull base prevertebral tissue



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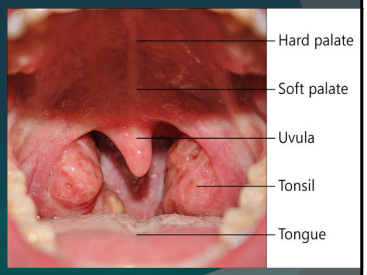
Oropharyngeal obstruction

- Palatine Tonsils
  - Lateral oropharynx
  - Muscular fossa
  - >5 arterial feeders



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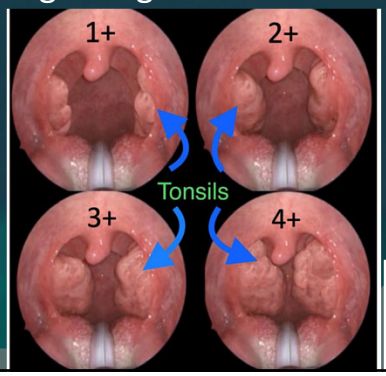
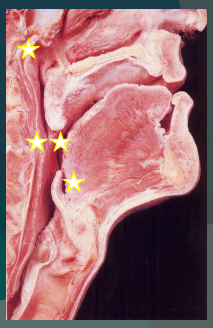
Tonsil grading



Waldeyer's Ring

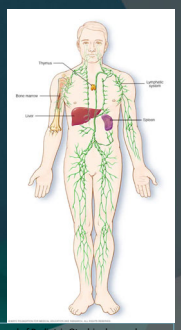
- Circle of lymphatic tissue
  - Adenoids
  - Tonsils
  - Lingual tonsils
  - Posterior pharyngeal wall
- Hypertrophy
- Infection
- Cancer



What is their purpose?

- Part of the immune system
  - Adult asthmatics and adenoids
- Sentinels
  - 1st Line of defense/warning
- Composed of lymphatic tissue
  - "open" lymph nodes, trap antigens
- Capable of rapid growth/shrinkage
  - Mono: hypertrophy
  - Adults and adenoids: regression

Long term deficits?



- Immune deficiency?
  - Alterations are measurable
  - No functional impairment
- Pulmonary disease? Maybe
  - Danish popu. <9, 1.2M, <30
    - T: 3x URI
    - A: 2x COPD
- Arguments: less than total?

Is immune system influenced by adenotonsillectomy in children? International Journal of Pediatric Otorhinolaryngology, Volume 66, Issue 3, Page 251.
Byars et al. Association of Long-Term Risk of Respiratory, Allergic, and Infectious Diseases With Removal of Adenoids and Tonsils in Childhood. JAMA Otolaryngol Head Neck Surg. 2018;144(7):594-603. doi:10.1001/jamaoto.2018.0614.

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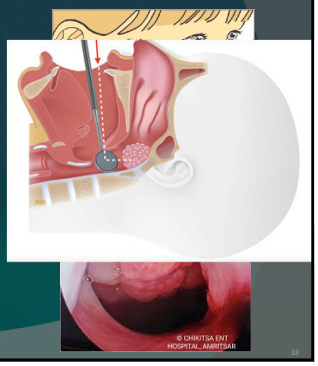
Adenoids



- Peds
  - Obstruction
    - +Adjacent (ear, sinus)
  - Infection
- Adults
  - Obstruction (rare)
  - Infection (rare)
  - Cancer (rare)

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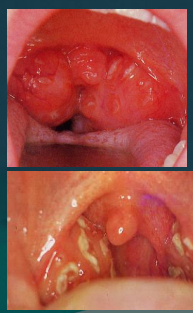
Tonsils



- Peds
  - Obstruction
    - 2-7 y/o (SDB), MCC
  - Infection
  - Dysphagia
- Adults
  - Infection
    - Chronic MCC > recurrent
  - Obstruction (rare)

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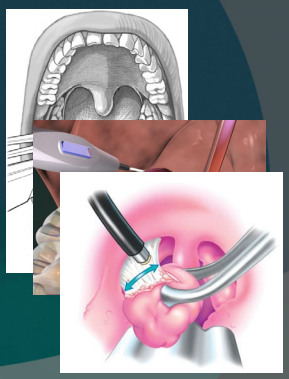
Tonsils: Surgery

- Cold
- Electrocautery
- Coblation

- Problems
  - Pain
  - Bleeding (delayed)



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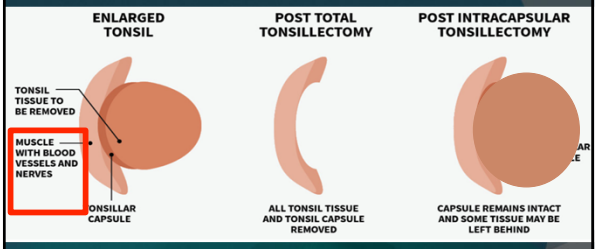
Tonsils: Intracapsular Tonsillectomy



- 50% reduction in recovery time and pain
- 50 times reduction in bleeding risk (from 1/20 to 1/1000)

https://lufkinent.com/tonsillectomy-and-adenoidectomy/

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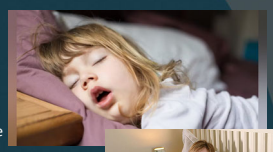
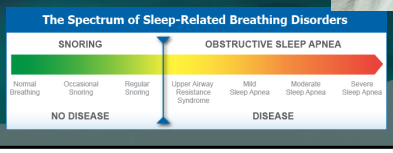
UARS, OSAS

- Socially disruptive snoring
  - Vibration flaccid tissue
- Upper airway resistance syndrome (UARS)
- Obstructive sleep apnea syndrome (OSAS)
  - Complex process
  - Deep stage sleep
  - Global effects





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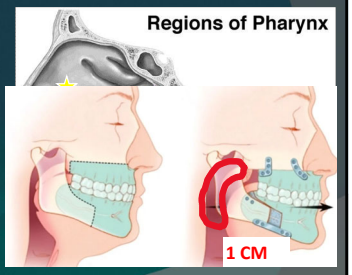
Adult OSAS Treatment

- Adult OSAS
  - Sleep study (PSG)
  - More complex
  - Multi-level Treatment
    - CPAP
    - MAD
    - Surgery
      - Tonsil (rarely curative)
      - Nasal (adjunctive)
      - Palate (rarely done)
      - Tongue (Inspire)
      - Maxillary expansion
      - MMA



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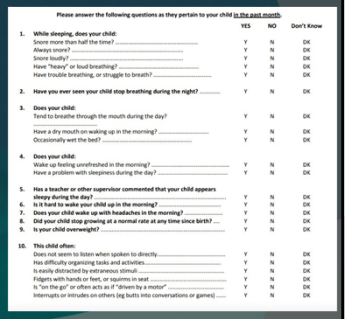
Peds SDB

- 2% of 1-9 y/o
  - Loud snoring
    - 5-12%
  - 3-6 y/o peak
  - Prepubertal: M=F
  - Adolescents: M>F
- No PSG usually
- Child → Adult



Please answer the following questions as they pertain to your child in the past month.

		YES	NO	Don't Know
1.	While sleeping, does your child:			
	Snore more than half the time?	Y	N	DK
	Always snore?	Y	N	DK
	Snore loudly?	Y	N	DK
	Have "heavy" or loud breathing?	Y	N	DK
	Have trouble breathing, or struggle to breath?	Y	N	DK
2.	Have you ever seen your child stop breathing during the night?	Y	N	DK
3.	Does your child:			
	Tend to breathe through the mouth during the day?	Y	N	DK
	Have a dry mouth on waking up in the morning?	Y	N	DK
	Occasionally wet the bed?	Y	N	DK
4.	Does your child:			
	Wake up feeling unrefreshed in the morning?	Y	N	DK
	Have a problem with sleepiness during the day?	Y	N	DK
5.	Has a teacher or other supervisor commented that your child appears sleepy during the day?	Y	N	DK
6.	Is it hard to wake your child up in the morning?	Y	N	DK
7.	Does your child wake up with headaches in the morning?	Y	N	DK
8.	Did your child stop growing at a normal rate at any time since birth?	Y	N	DK
9.	Is your child overweight?	Y	N	DK
10.	This child often:			
	Does not seem to listen when spoken to directly	Y	N	DK
	Has difficulty organizing tasks and activities	Y	N	DK
	Is easily distracted by extraneous stimuli	Y	N	DK
	Fidgets with hands or feet, or squirms in seat	Y	N	DK
	Is "on the go" or often acts as if "driven by a motor"	Y	N	DK
	Interrupts or intrudes on others (eg butts into conversations or games)	Y	N	DK

2025

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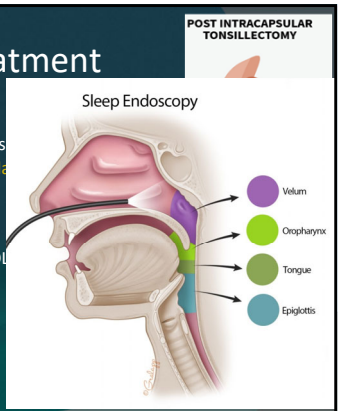
Peds SDB: Treatment

- Multi-specialty
  - ENT: Multi-level soft tis
  - DDS: Palatal/Mandibula expansion
  - SLP: Myofunctional
- Results
  - Big improvements: QOL health visits
    - Except: obese, syndromic
  - ?prevent adult OSA



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Ankyloglossia & SDB

- Associated with SDB?
  - Yes: Pediatric
    - +OSA, more likely tied
    - Ties alter craniofacial growth via maxilla and prevent ant/sup tongue placement
    - Release + myo = reduces snoring, mouth breathing, improves sleep and swallowing

Brazilian Journal of Otorhinolaryngology, Volume 88, Supplement 1, November–December 2022, Pages S156-S162
ERJ Open Res 2016; 0: 00043-2016
Children (Basel). 2023 Aug 21;10(8):1426. doi: 10.3390/children10081426

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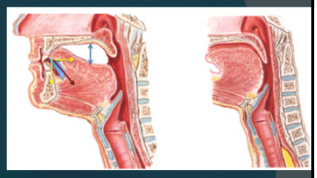
Ankyloglossia: Why?

- Tongue not opposing hard palate
  - Narrow maxilla
  - Narrow nasal cavity
  - No tongue space
- Tongue position is poor
  - Tongue base into airway
  - Open mouth breathing
    - Mandibular growth changes



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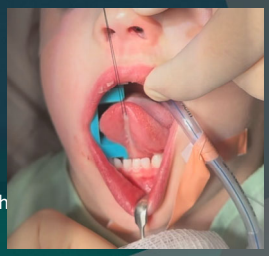
Ankyloglossia: Frenuloplasty

- Not just an incision!
- In OR, 10 min
  - Multi-level release
  - Primary closure
  - No recovery time
- Improve tongue position
  - Reduces retro-lingual obstruction
  - Redirects maxillary growth
  - Increases nasal breathing



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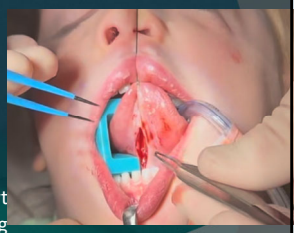

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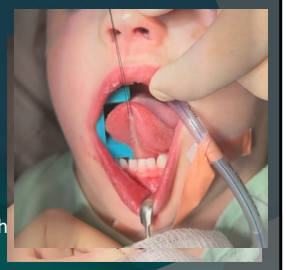

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THE AIRWAY PANDEMIC

- Advancements in technology and the regression of our face
- Moving from reactive to proactive

The fault of Industrialization 1760s-1900s

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- Pre-1800s
  - Diet: tough, unprocessed
  - Life: ground, no pillows
  - Skeleton
    - Robust mandible
    - Wide maxilla
    - Prognathic maxilla
  - Airway
    - Larger air column
    - Lower risk OSA

- Post-1800s
  - Diet: soft, processed; delayed hard food introduction
  - Life: beds, pillows
  - Skeleton
    - "Gracile" mandible: decr. ramus ht/ mandibular width/gonial angle
    - Narrower maxilla: U to V, crowding, impaction (3rd molars!),class 2 occlusion
    - Long Face Syndrome: vertical facial growth instead of horizontal
  - Airway
    - Narrow maxillary + retruded mandible= reduced naso/oro/hypopharyngeal airway
    - Snoring, OSA…
    - Popu. Density, Pollution: mucosal diseases (allergy, asthma), URIs

The fault of industrialization

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- More mouth breathing
- More airway obstruction
- Not all are failures…

The Post-Industrial Face

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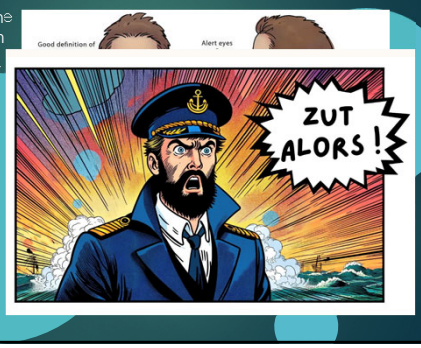
- Rapidly the new norm
- French-a-fication



Skeletal changes in short

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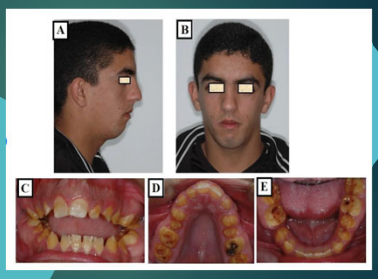
- Long face
- Retruded mandible
- Narrow high palate
- Narrow maxilla/nasal cavity
- Narrow mandible
- No tongue space



Pre-. (0.2% caries)

Weston A. Price DDS, 1937

56

Post-. (**25.0**% caries)

Weston A. Price DDS, 1937

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Pre- and Post-Industrial in 3 generations

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From the village to the city…

Changes in 1 generation from nasal obstruction

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How is this possible?

- Genetic changes? No
  - Too slow, hundreds of thousands of years

Epigenetic Changes

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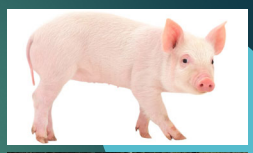
- The feral swine bomb
  - Months
  - Genetic Reversion: not evolution but a rapid, epigenetic reactivation of dormant genes to promote survival
- Key mechanisms
  - DNA methylation: transcription activation
  - Histone modification: open or close DNA loci changing gene expression
- Key aspects
  - Environment influences
  - Reversible nature
  - Inheritable



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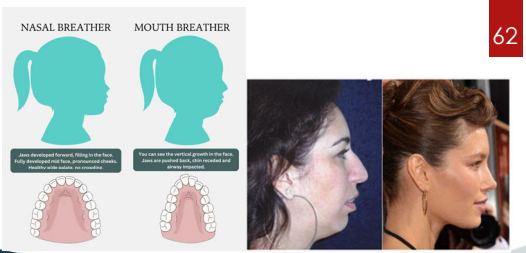

Skeletal changes in short

Pre-, Post-, Expansion

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Pre-, Post-

- Whitney was right…children are the future
- But…they need a little direction before they lead the way
- 60% facial growth is complete by age 6

So, what to do?

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https://kanneraleena.substack.com/

Connect the silos

- Primary care
- DDS
- Ortho DDS
- SLP/OMT
- Sleep med
- ENT

Be curious, share patients, share information, and continue to question

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Conclusions

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- Airway obstruction can be multifactorial
- Treatment of the airway may require multiple approaches/sites of treatment
- Early diagnosis and treatment can help prevent craniofacial changes
- Restoration of proper breathing patterns can positively augment dental/ortho outcomes
- Early interventions can override or prevent epigenetic changes and possibly their inheritance

References

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Kahn S, Ehrlich P, Feldman M, Sapolsky R, Wong S. The Jaw Epidemic: Recognition, Origins, Cures, and Prevention. Bioscience. 2020 Jul 22;70(9):759-771. doi: 10.1093/biosci/biaa073. PMID: 32973408; PMCID: PMC7498344.

Temani P, Jain P, Rathee P, Temani R. Volumetric changes in pharyngeal airway in Class II division 1 patients treated with Forsus-fixed functional appliance: A three-dimensional cone beam computed tomography study. Contemp Clin Dent. 2016 Jan-Mar;7(1):31-5. doi: 10.4103/0976-237X.177102. PMID: 27041897; PMCID: PMC4792052.

Ponnaiah SR, Ganugapanda VR, Perumalla KK, Naqeed MA, Harini T, Mandaloju SP. Airway Analysis in Skeletal Class I and Class II Subjects with Different Growth Patterns: A 2D Cephalometric Study. J Pharm Bioallied Sci. 2020 Aug;12(Suppl 1):S161-S167. doi: 10.4103/jpbs.JPBS_49_20. Epub 2020 Aug 28. PMID: 33149449; PMCID: PMC7595453.

Rando C, Millson S, Antoine D. Changes in mandibular dimensions during the mesolateral to post-mediaeval transition in London: a possible response to decreased masticatory load. Arch Oral Biol. 2014 Jan;59(1):73-81. doi: 10.1016/j.archoralbio.2013.10.001. Epub 2013 Oct 15. PMID: 24169163.

What You Eat Shapes Your Airway. https://breatheworks.com/

New Light on Modern Physical Degeneration From Field Studies Among Primitive Races Author: Weston A. Price, DDS. Date: April 28, 1937 Read before the Second Session Ohio State Medical Association 91st Annual Meeting, Dayton, Ohio, April 28-29, 1937. Published in *The Ohio State Medical Journal*, Vol. 33, No. 9, September 1937.