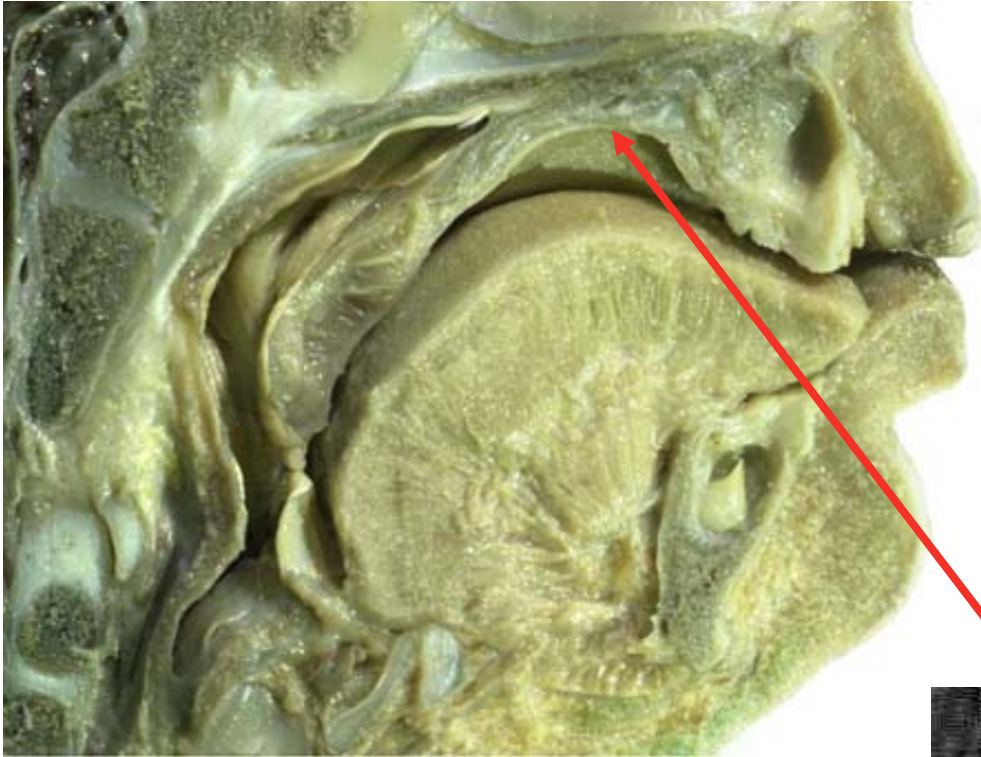
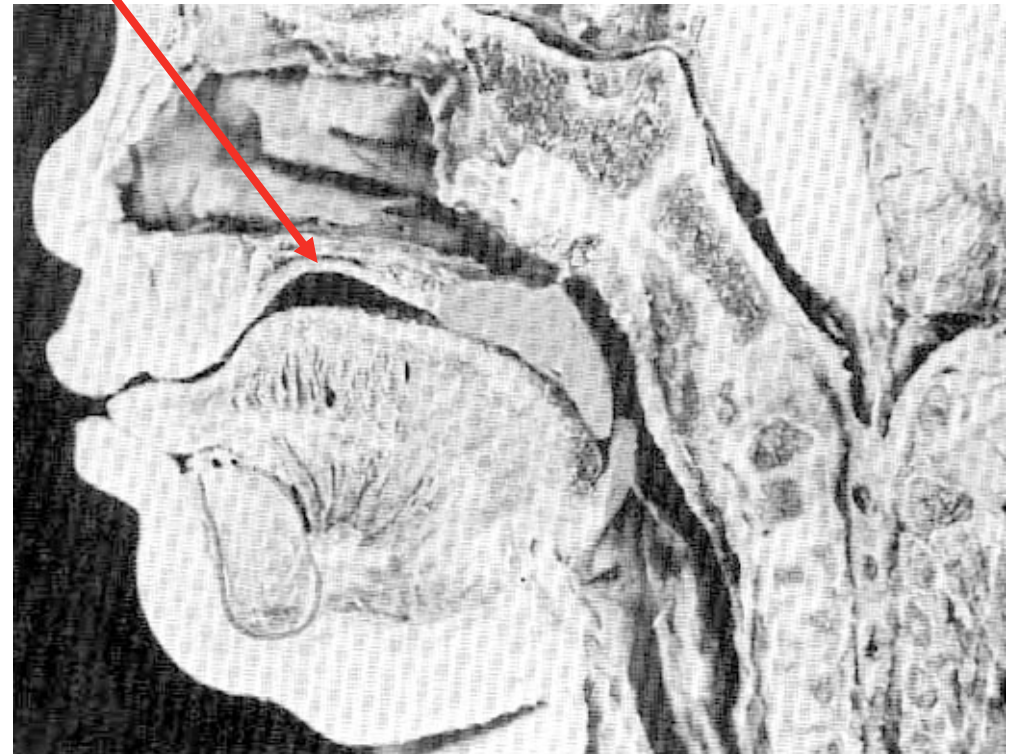


More reasons for high palates.



Born with high palates due to
tongue pressure in utero.

© Brian Palmer, DDS

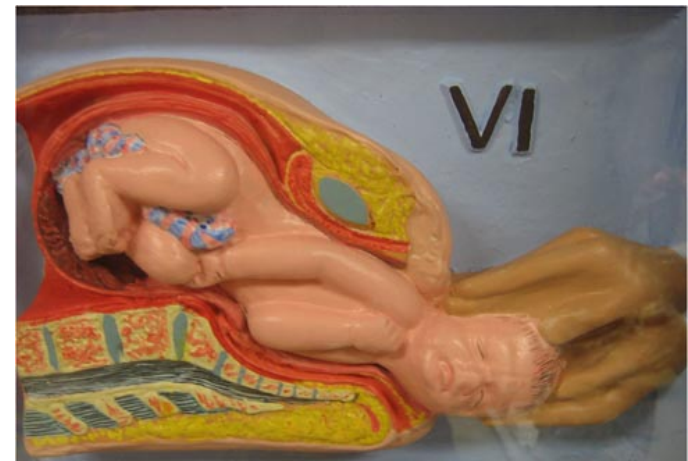


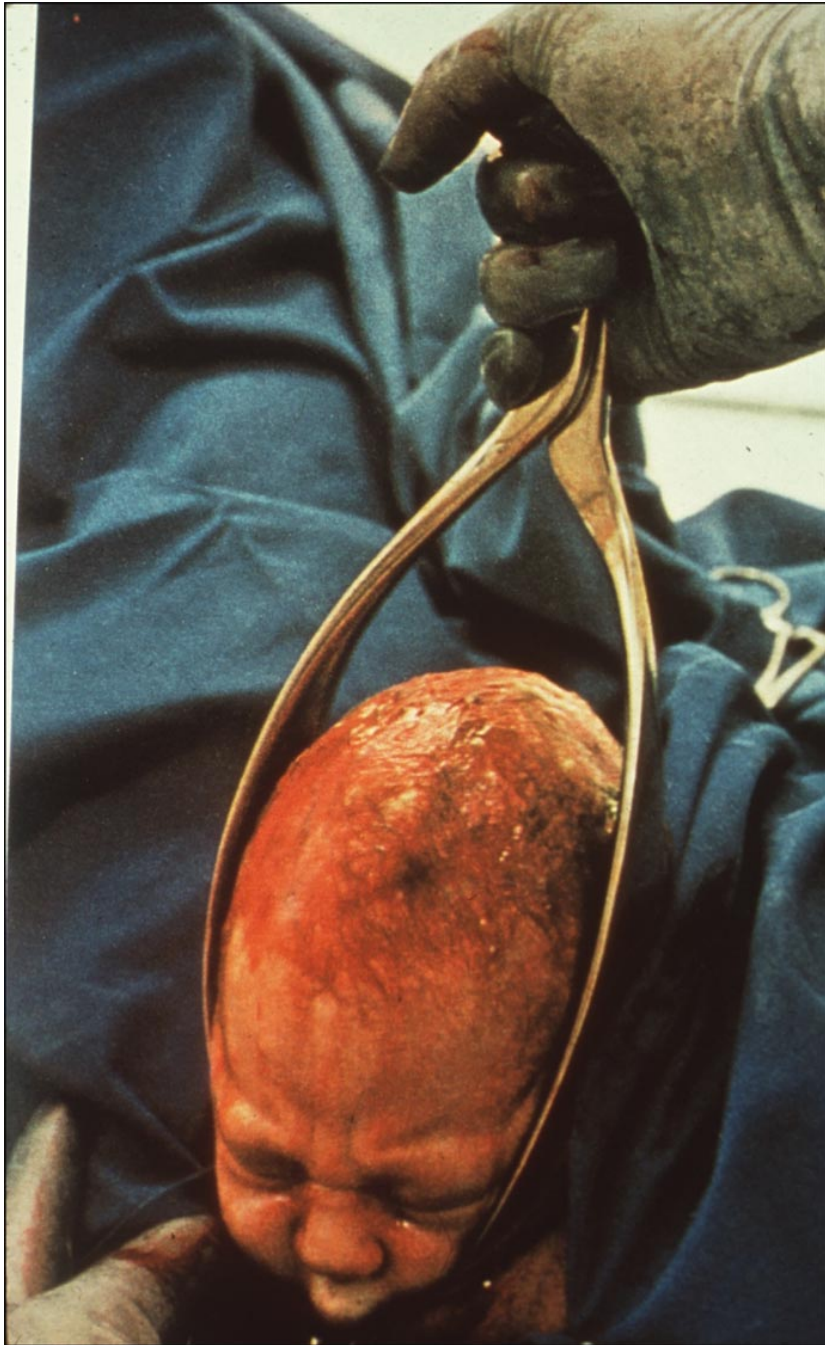
Possible reasons for high palates.

- Delivery challenges
 - Extended time in birthing canal?
 - Use of forceps?
- Tight lingual frenums
- Genetics



Pressures on the skull
during delivery.





Forces on head
from forceps.


The Baby's Experience Matters
(photos courtesy Mary Kroeger)

Factors **NOT** included in
the Stanford formula!!



4 Bicuspid-extraction cases

4 Bi-extraction cases - Possible major contributor to OSA!



Full suitcase
Like a large tongue in the mouth
What options do you have?

Websites to check out:

Dr. John Mew (UK): www.orthotropics.com

Dr. Bill Hang (CA): www.facefocused.com/

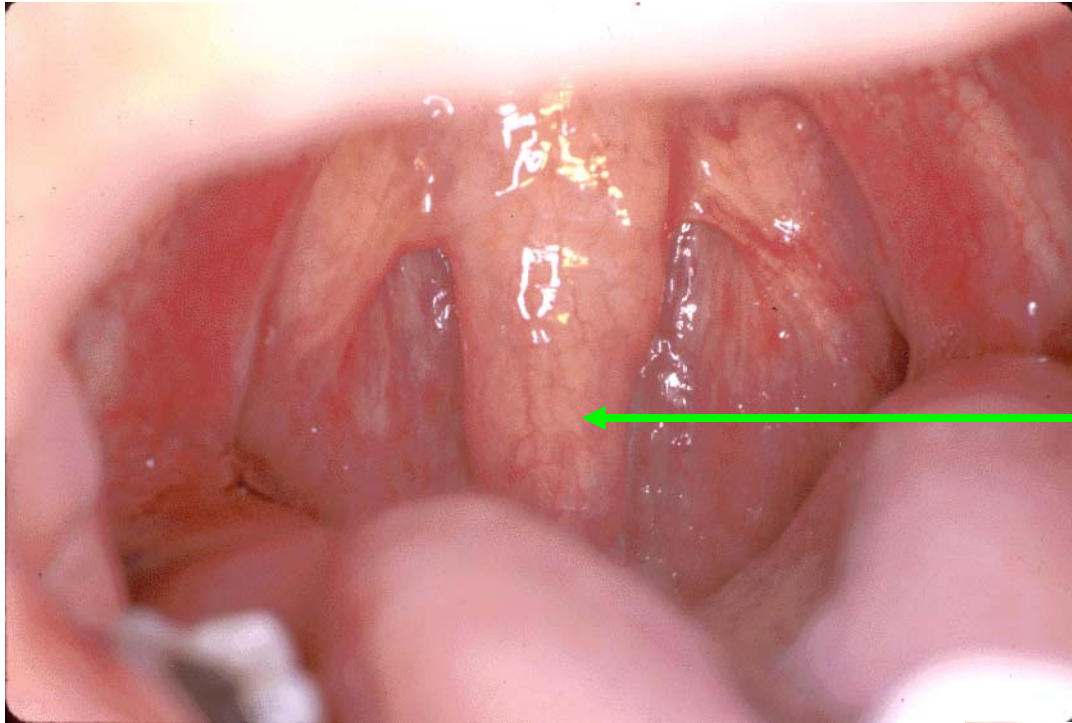
Dr. Barry Raphael (NJ): www.alignmine.com

Int'l Functional Assoc www.ifuna.info/

IFUNA



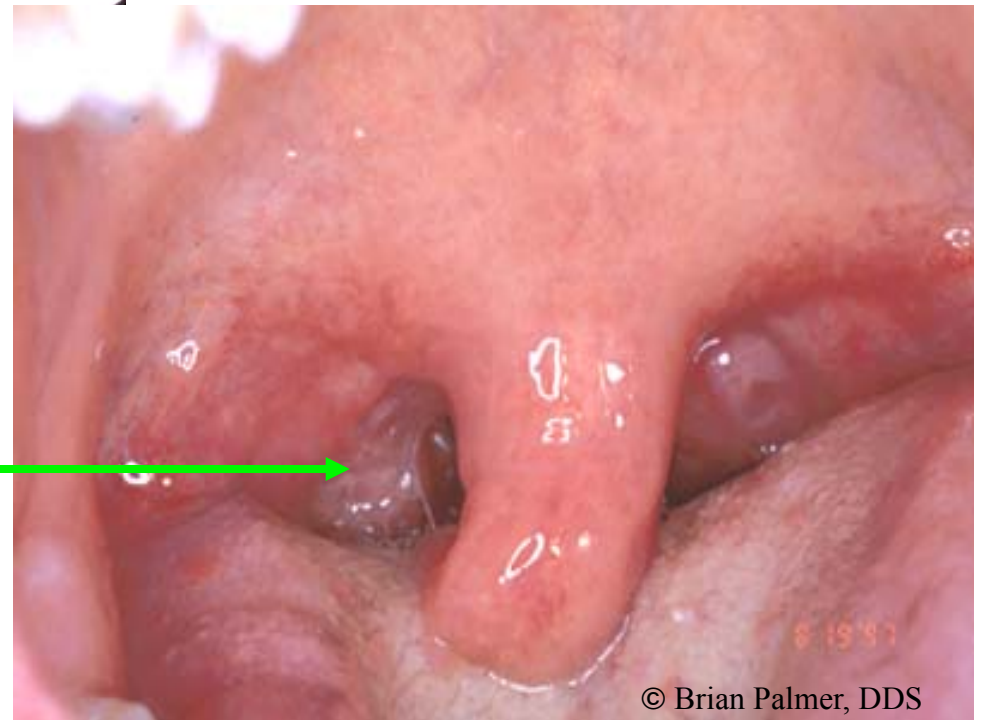
Large tonsils!

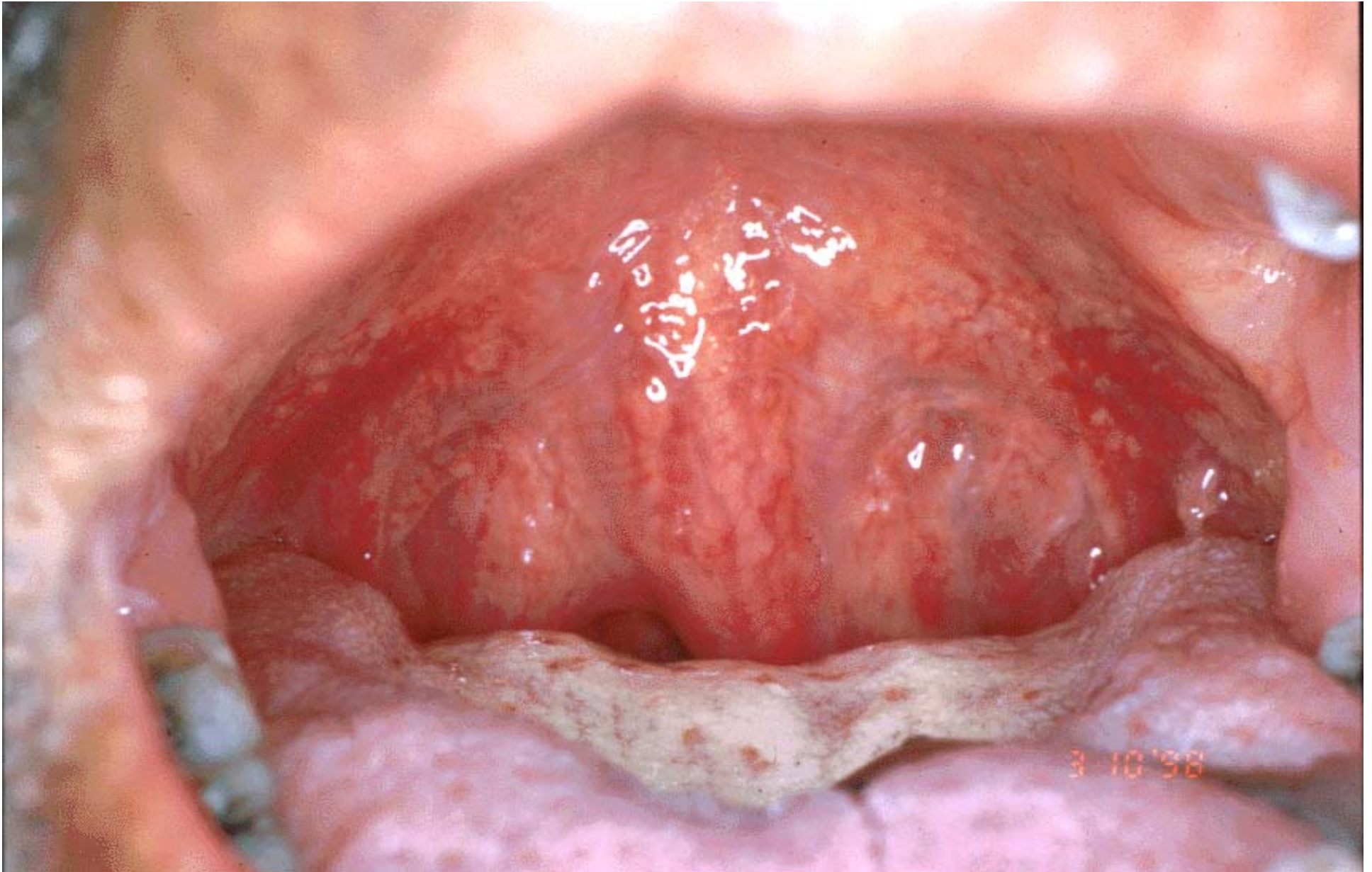


Massive uvula

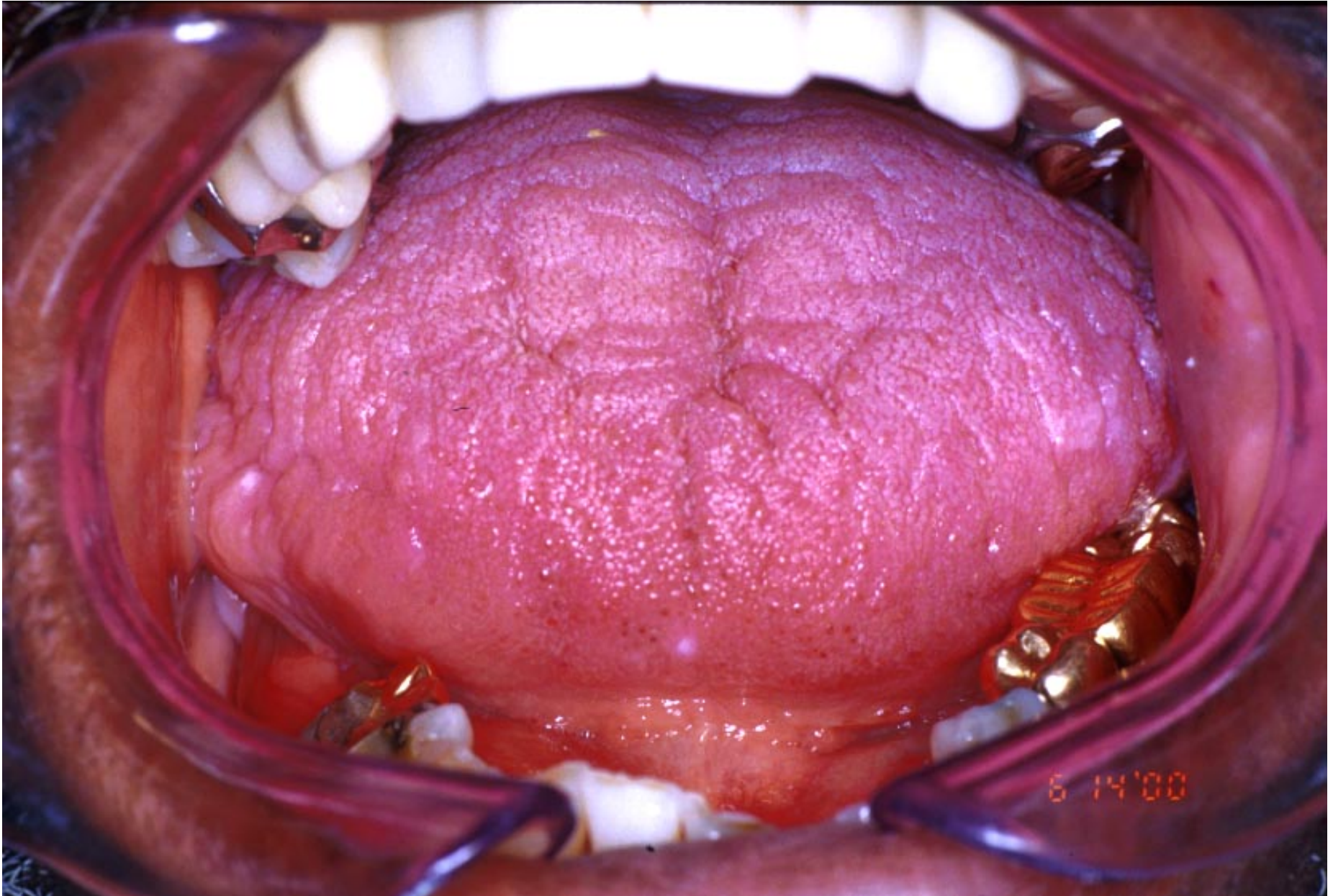
Crowded oropharynx
of 14-year old.

Ended up being Bipolar!

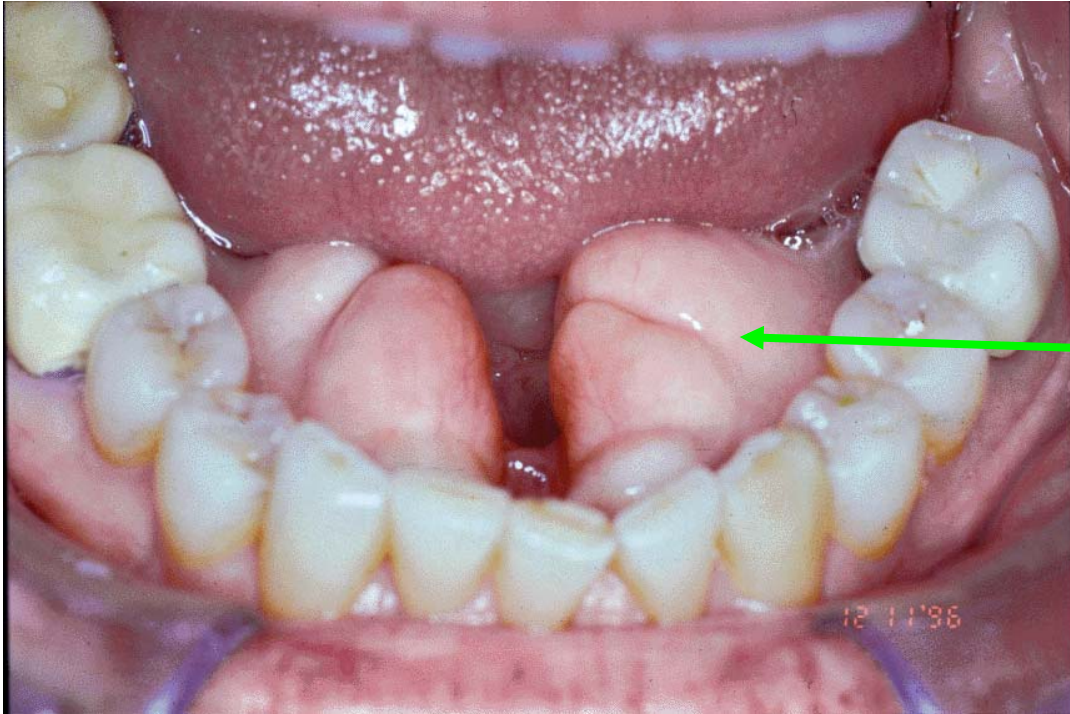




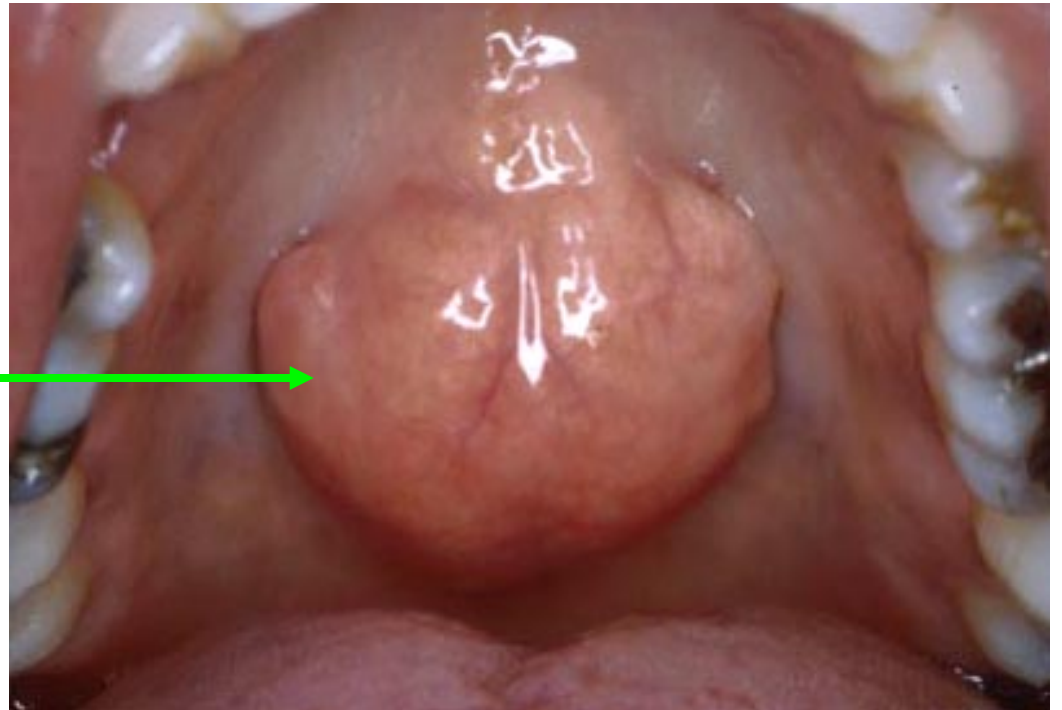
Elongated soft palate - long uvula!



A large tongue can obstruct the oropharynx.



Tori take up space



Treatment options

- Loose weight
- Nasal strips
- Ball in sock on back
- CPAP
- Oral Appliances
- Surgery
- Tongue exercises
- Early diagnosis and treatment

Only 100% 'cure'!



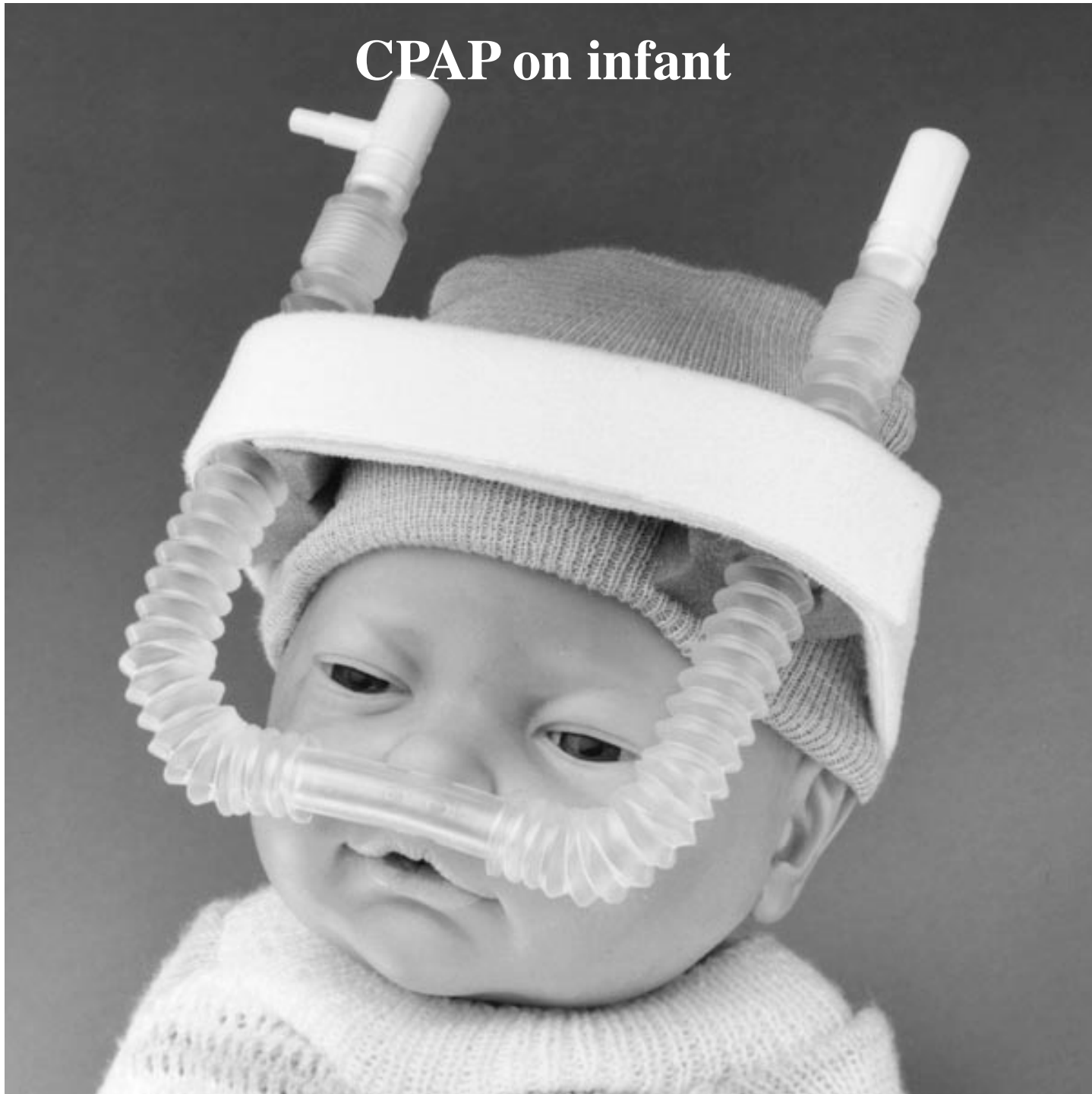
My brother with trach after stroke in 1995.

© Brian Palmer, DDS

‘Gold standard’
CPAP



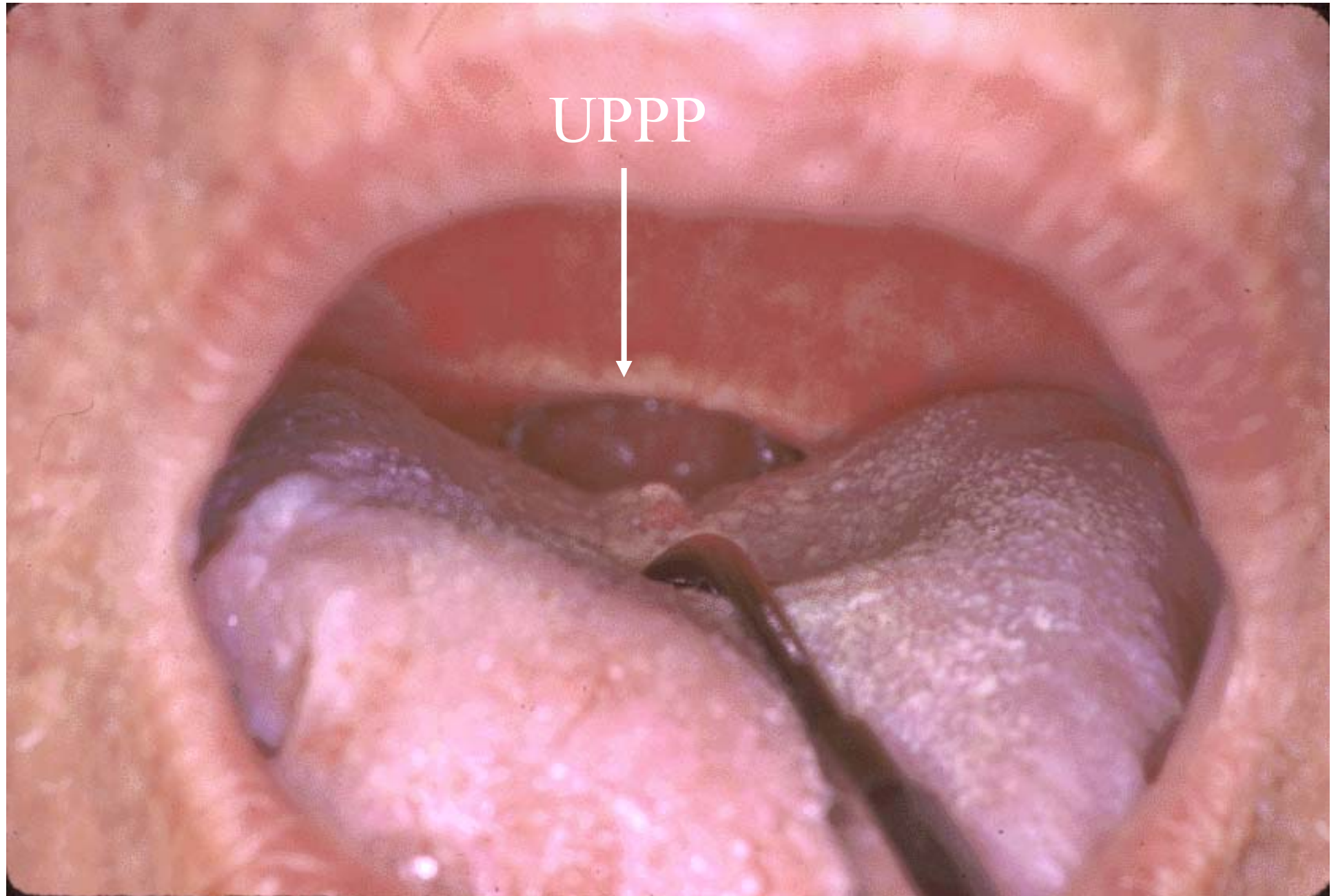
CPAP on infant



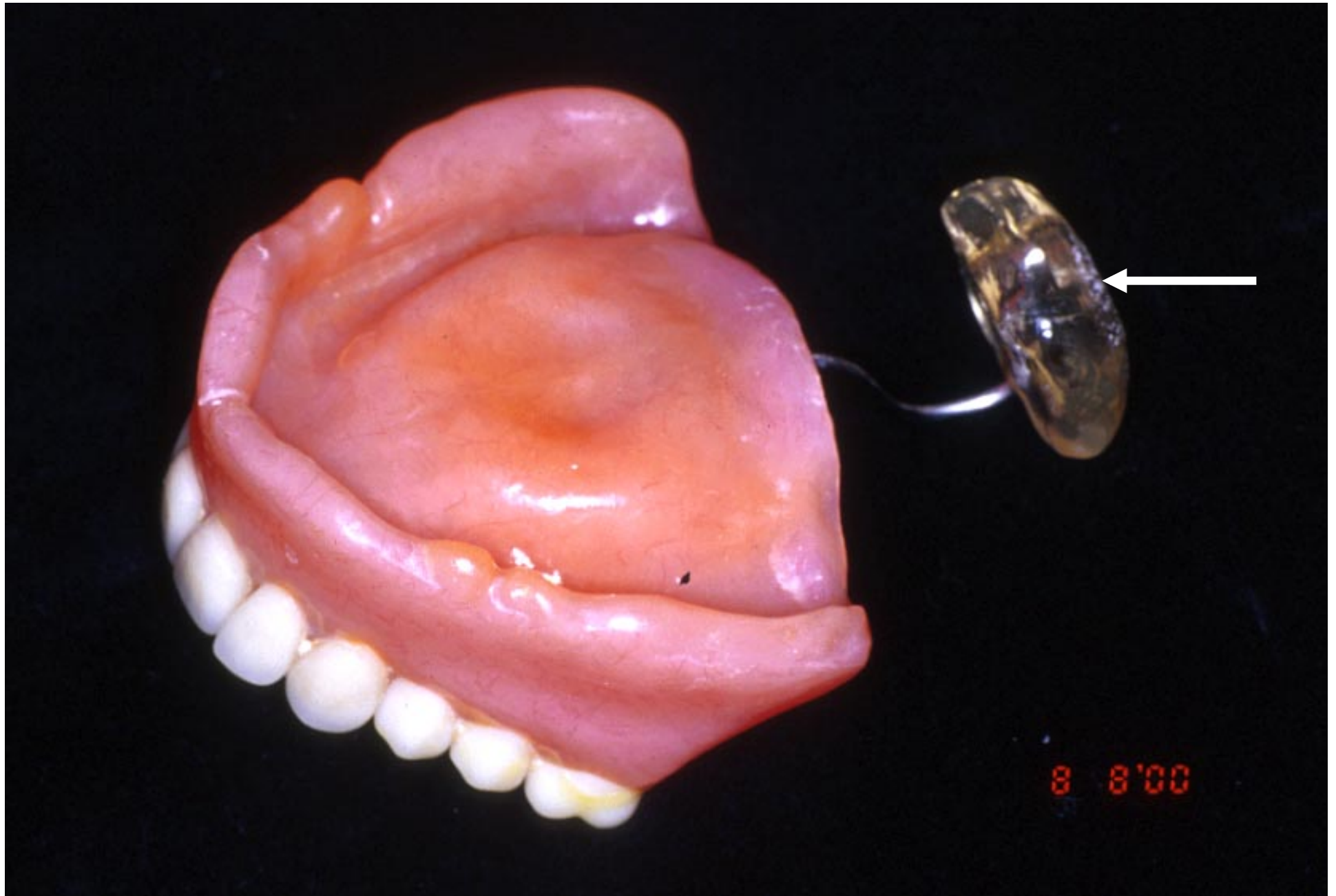


Large tongue was contributing factor to OSA.

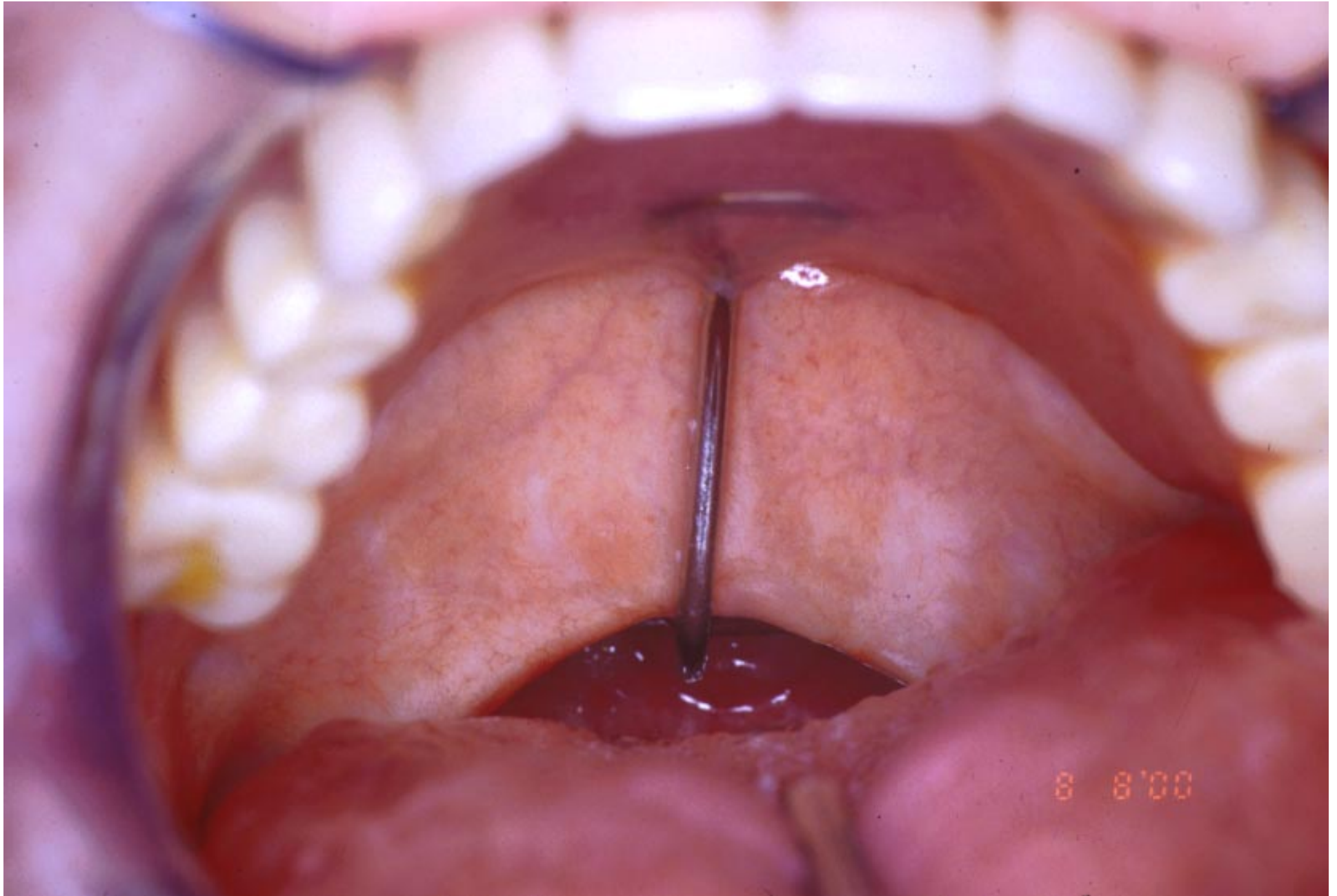
© Brian Palmer, DDS



UPPP made OSA worse.



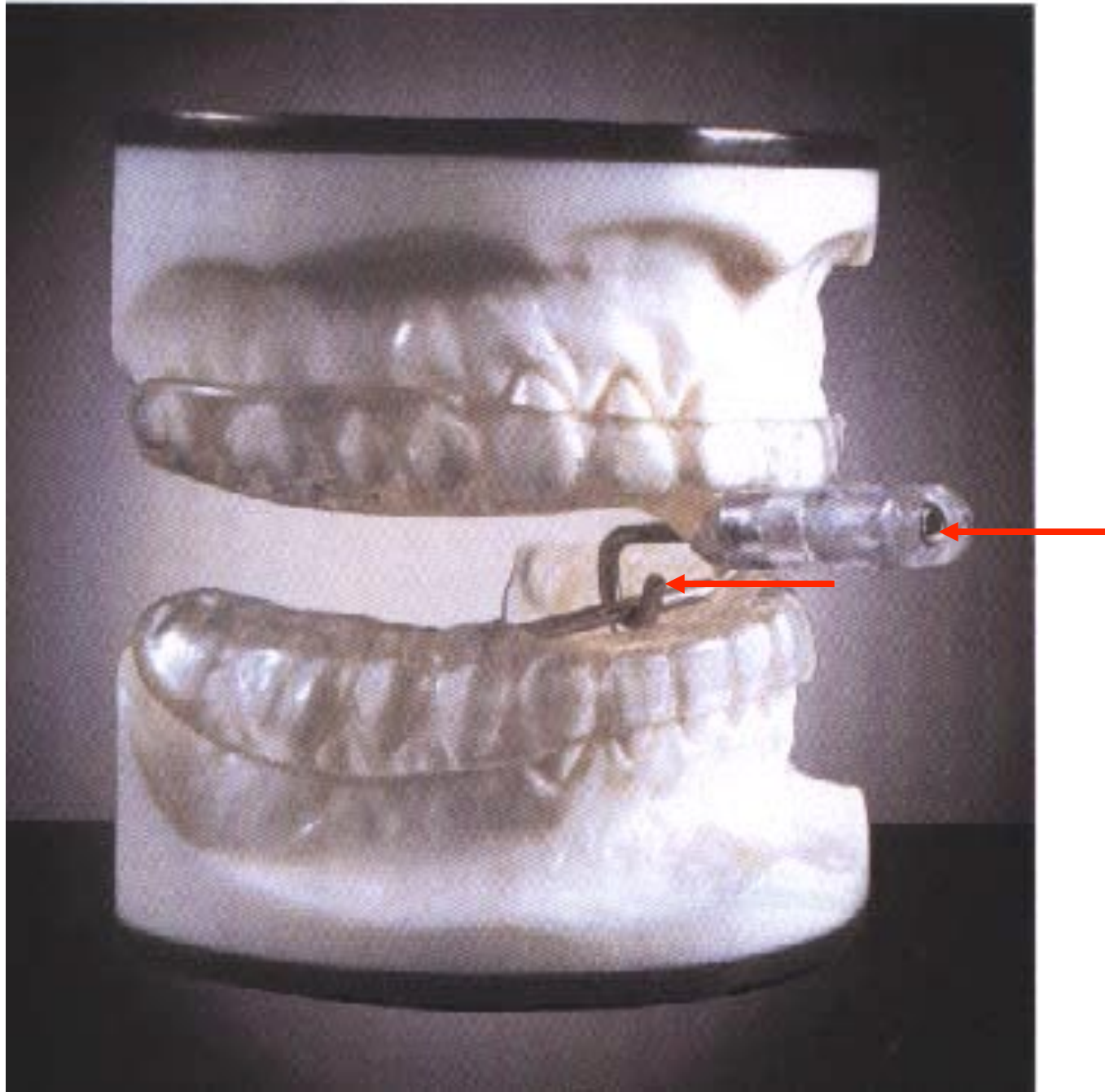
Obturator attached to upper denture. © Brian Palmer, DDS



Obturator and denture in mouth.



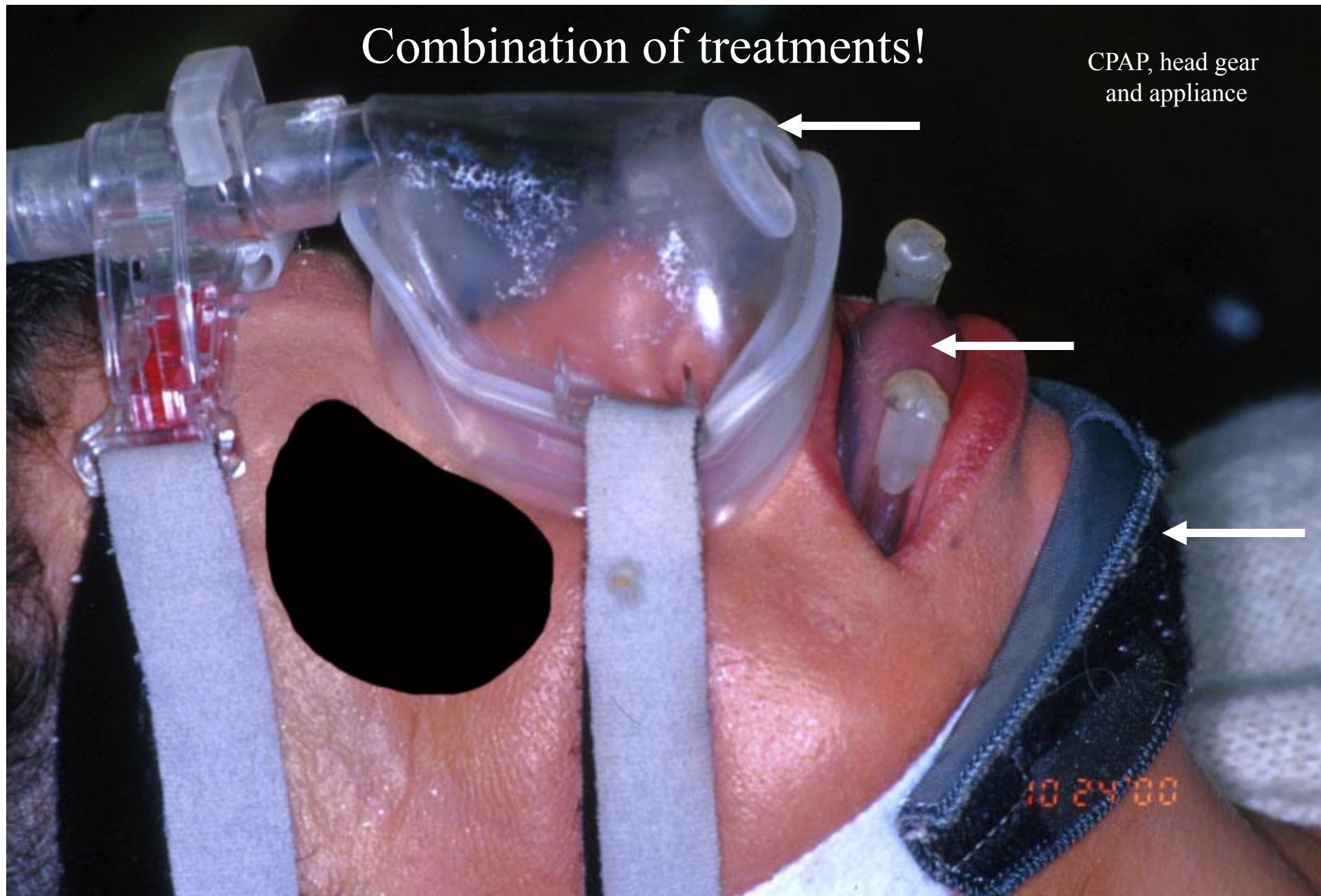
Snor-X in mouth.



2001 version of TAP appliance.

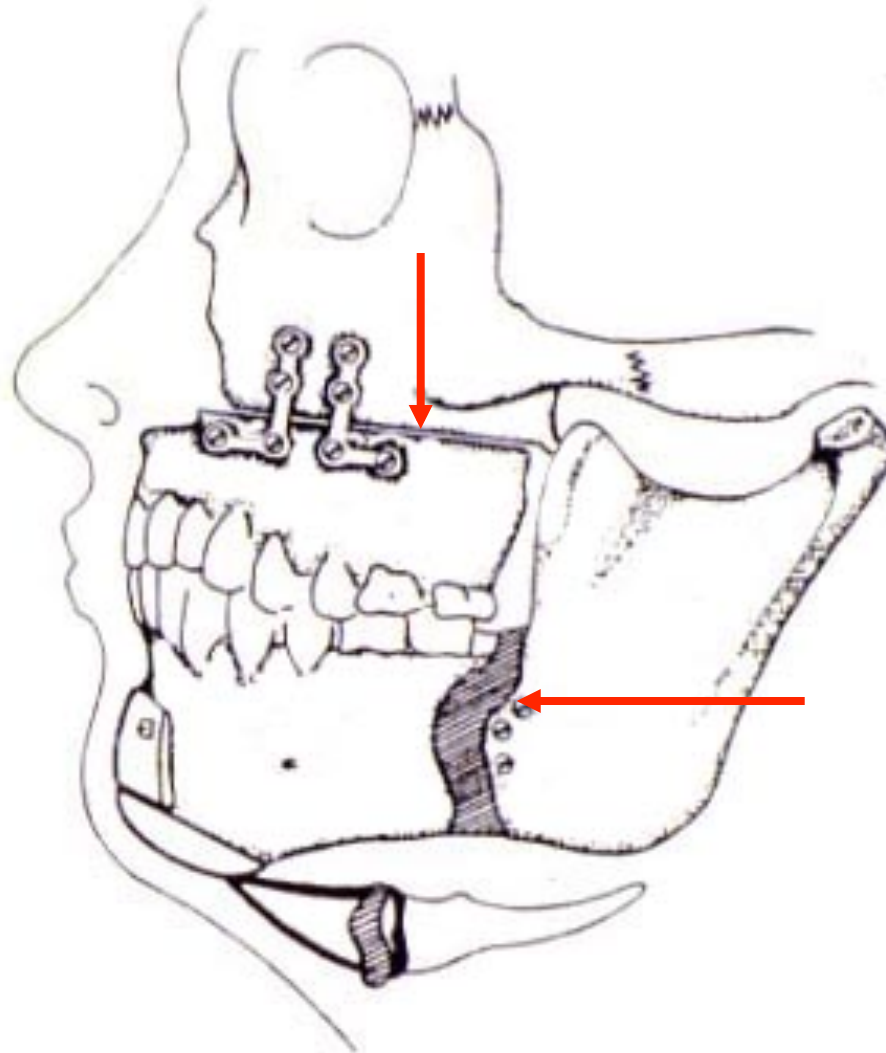


Herbst appliance in the mouth.



Combination of CPAP, appliance, surgery and chin strap may be needed!

Maxillary and Mandibular Osteotomy



Surgery illustrations coming up!

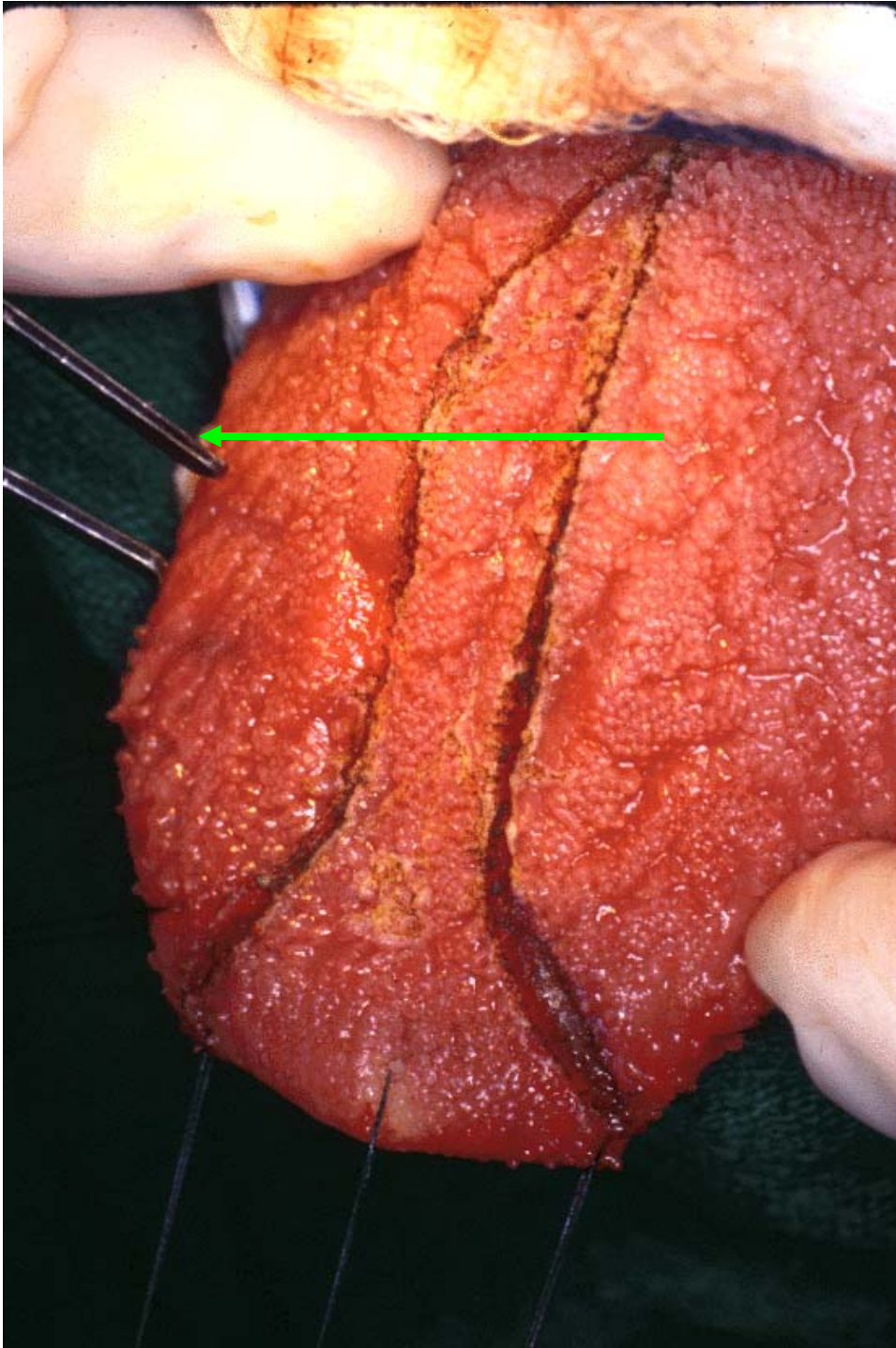


(4 slides)



Preparing for tongue
reduction surgery.

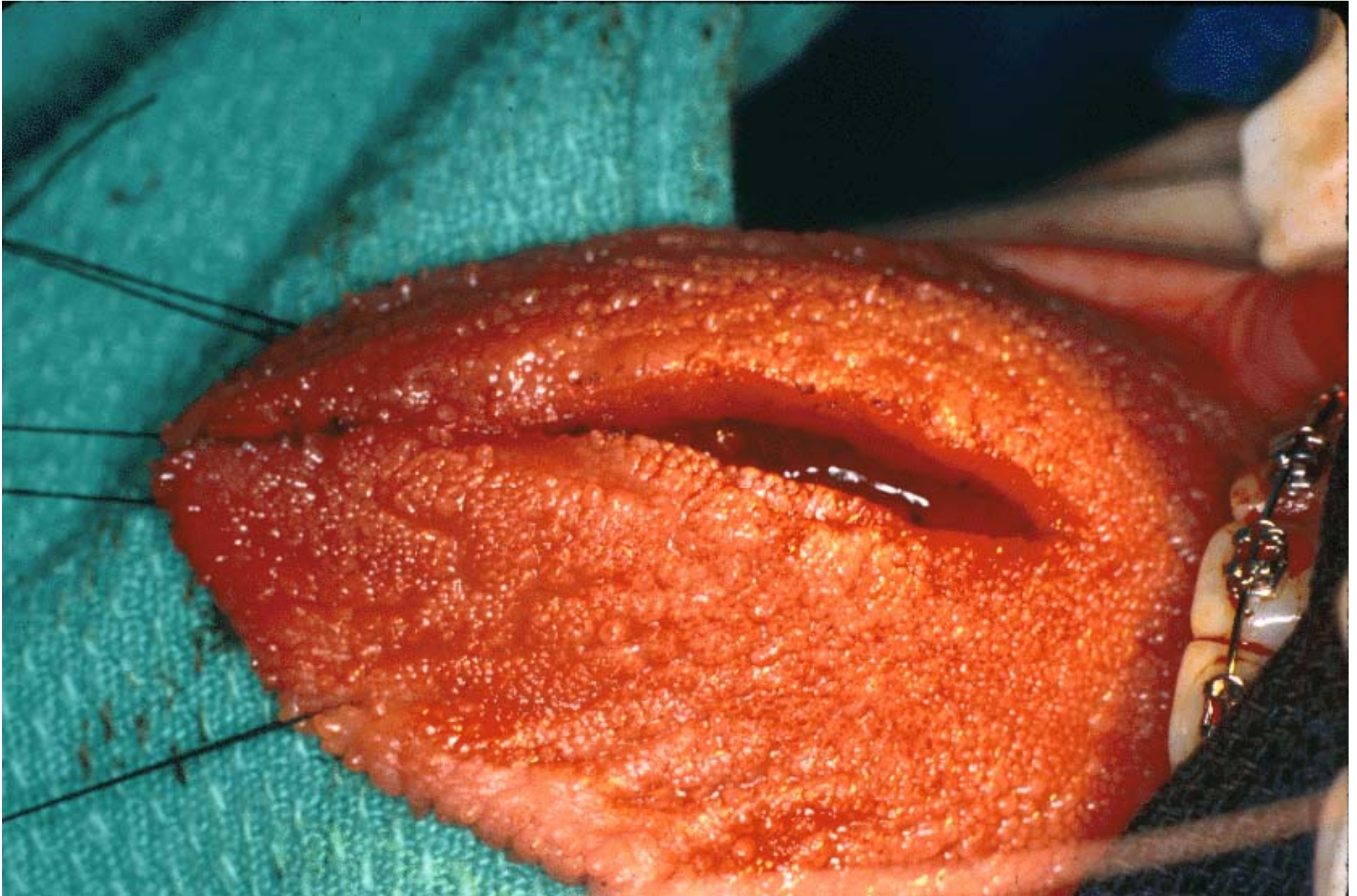
This procedure was actually
done for orthodontic reasons.



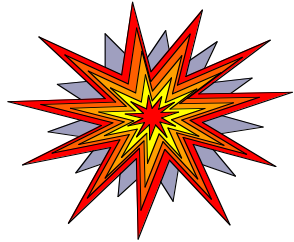
Laser being used to
outline area of
tongue to be
removed.



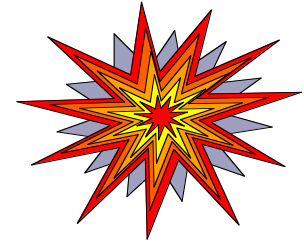
Mid section of
tongue removed.



Tongue being sutured.



Oropharyngeal exercises



In conclusion, in patients with moderate OSAS, oropharyngeal exercises improved objective measurements of OSAS severity and subjective measurements of snoring, daytime sleepiness, and sleep quality. **Our results suggest that this set of oropharyngeal exercises is a promising alternative for the treatment of moderate OSAS.**

Kátia C. Guimaraes, Luciano F. Drager, Pedro R. Genta, Bianca F. Marcondes and Geraldo Lorenzi-Filho - *Effects of Oropharyngeal Exercises on Patients with Moderate Obstructive Sleep Apnea Syndrome*. American Journal of Respiratory and Critical Care Medicine Vol 179. pp. 962-966, (2009).

Kátia Guimaraes article from Brazil available online:

Link: <http://ajrccm.atsjournals.org/cgi/content/abstract/179/10/962>

Effects of Oropharyngeal Exercises on Patients with Moderate Obstructive Sleep Apnea Syndrome

Kátia C. Guimarães¹, Luciano F. Drager¹, Pedro R. Genta¹, Bianca F. Marcondes¹, and Geraldo Lorenzi-Filho¹

¹Sleep Laboratory, Pulmonary Division, Heart Institute (InCor), University of São Paulo Medical School, São Paulo, Brazil

Rationale: Upper airway muscle function plays a major role in maintenance of the upper airway patency and contributes to the genesis of obstructive sleep apnea syndrome (OSAS). Preliminary results suggested that oropharyngeal exercises derived from speech therapy may be an effective treatment option for patients with moderate OSAS.

Objectives: To determine the impact of oropharyngeal exercises in patients with moderate OSAS.

Methods: Thirty-one patients with moderate OSAS were randomized to 3 months of daily (~30 min) sham therapy (n = 15, control) or a set of oropharyngeal exercises (n = 16), consisting of exercises involving the tongue, soft palate, and lateral pharyngeal wall.

Measurements and Main Results: Anthropometric measurements, snoring frequency (range 0–4), intensity (1–3), Epworth daytime sleepiness (0–24) and Pittsburgh sleep quality (0–21) questionnaires, and full polysomnography were performed at baseline and at study conclusion. Body mass index and abdominal circumference of the entire group were $30.3 \pm 3.4 \text{ kg/m}^2$ and $101.4 \pm 9.0 \text{ cm}$, respectively, and did not change significantly over the study period. No significant change occurred in the control group in all variables. In contrast, patients randomized to oropharyngeal exercises had a significant decrease ($P < 0.05$) in neck

AT A GLANCE COMMENTARY

Scientific Knowledge on the Subject

Continuous positive airway pressure is the treatment of choice for obstructive sleep apnea syndrome (OSAS) but is not suitable for a large proportion of patients. Alternative treatments for OSAS have shown variable results.

What This Study Adds to the Field

This randomized controlled trial showed that oropharyngeal exercises developed for the treatment of OSAS significantly reduced OSAS severity and symptoms. This novel modality of OSAS treatment represents a promising approach for moderate OSAS.

for patients with severe OSAS, in whom the apnea-hypopnea index (AHI) is greater than 30 events/hour. However, for

Guimaraes Kátia, Drager LF, Genta PR, Marcondes BF, Lorenzi-Filho G. Effects of oropharyngeal exercises on patients with moderate obstructive sleep apnea syndrome. Am J Respir Crit Care Med. 2009 May 15;179(10):962-6.

Didgeridoo article:

Didgeridoo playing as alternative treatment for obstructive sleep apnoea syndrome: randomised controlled trial

Milo A Puhon, Alex Suarez, Christian Lo Cascio, Alfred Zahn, Markus Heitz, Otto Braendli

Abstract

Objective To assess the effects of didgeridoo playing on daytime sleepiness and other outcomes related to sleep by reducing collapsibility of the upper airways in patients with moderate obstructive sleep apnoea syndrome and snoring.

Design Randomised controlled trial.

Setting Private practice of a didgeridoo instructor and a single centre for sleep medicine.

Participants 25 patients aged > 18 years with an apnoea-hypopnoea index between 15 and 30 and who complained about snoring.

Interventions Didgeridoo lessons and daily practice at home with standardised instruments for four months. Participants in the control group remained on the waiting list for lessons.

Main outcome measure Daytime sleepiness (Epworth scale from 0 (no daytime sleepiness) to 24), sleep quality (Pittsburgh quality of sleep index from 0 (excellent sleep quality) to 21), partner rating of sleep disturbance (visual analogue scale from 0 (not disturbed) to 10), apnoea-hypopnoea index, and health related quality of life (SF-36).

Results Participants in the didgeridoo group practised an average of 5.9 days a week (SD 0.86) for 25.3 minutes (SD 3.4). Compared with the control group in the didgeridoo group daytime sleepiness (difference -3.0, 95% confidence interval -5.7 to -0.3, $P=0.03$) and apnoea-hypopnoea index (difference -6.2, -12.3 to -0.1, $P=0.05$) improved significantly and partners reported less sleep disturbance (difference -2.8, -4.7 to -0.9, $P<0.01$). There was no effect on the quality of sleep (difference -0.7, -2.1 to 0.6, $P=0.27$). The combined analysis of sleep related outcomes showed a moderate to large effect of didgeridoo playing (difference between summary z scores -0.78 SD units, -1.27 to -0.28, $P<0.01$). Changes in health related quality of life did not differ between groups.

Conclusion Regular didgeridoo playing is an effective treatment alternative well accepted by patients with moderate obstructive sleep apnoea syndrome.

Trial registration ISRCTN: 31571714.

Introduction

Snoring and obstructive sleep apnoea syndrome are two highly prevalent sleep disorders caused by collapse of the upper airways.¹⁻³ The most effective intervention for these disorders is continuous positive airway pressure therapy, which reduces daytime sleepiness⁴ and the risk of cardiovascular morbidity and mortality in the most severely affected patients (apnoea-hypopnoea index (measured as episodes per hour) > 30).⁵ For

moderately affected patients (apnoea-hypopnoea index 15-30) who complain about snoring and daytime sleepiness, however, continuous positive airway pressure therapy may not be suitable and other effective interventions are needed.^{1,6,7}

AS, a didgeridoo instructor, reported that he and some of his students experienced reduced daytime sleepiness and snoring after practising with this instrument for several months. In one person, the apnoea-hypopnoea index decreased from 17 to 2. This might be due to training of the muscles of the upper airways, which control airway dilation and wall stiffening.^{8,9,10} We tested the hypothesis that training of the upper airways by didgeridoo playing reduces daytime sleepiness in patients with moderately affected patients.

Methods

Participants and methods

We included German speaking participants aged > 18 years with self reported snoring and an apnoea-hypopnoea index of 15-30 (determined by a specialist in sleep medicine within the past year). Exclusion criteria were current continuous positive airway pressure therapy, use of central nervous acting drugs (such as benzodiazepines), current or planned intervention for weight reduction, consumption of ≥ 14 alcoholic drinks a week or ≥ 2 a day, and obesity (body mass index ≥ 30 kg/m²).

We recruited patients at our study centre (Zuercher Hoehe-klinik Wald, Wald, Switzerland) and one private practice in Zurich. Physicians at the study centre assessed all potential participants for eligibility. Those willing to participate provided written informed consent. After study enrolment, all patients completed a baseline assessment.

We randomised enrolled patients into an intervention group with didgeridoo training or a control group. We used STATA software (STATA 8.2, College Station, Tx) to generate the randomisation list (ralloc command) with stratification for disease severity (apnoea-hypopnoea index 15-21 or 22-30 and Epworth score < 12 or ≥ 12). The randomisation list was concealed from the recruiting physicians and the didgeridoo instructor in an administrative office otherwise not involved in the study. We used a central telephone service, which the didgeridoo instructor used to obtain group allocation.

Intervention and control

Participants in the intervention group started their didgeridoo training after the instructor received group allocation. The instructor (AS) gave the first individual lesson immediately after randomisation. In the first lesson, participants learnt the lip technique to produce and hold the keynote for 20-30 seconds. In the second lesson (week 2) the instructor explained the concept and

CONCLUSION: Regular didgeridoo playing is an effective treatment alternative well accepted by patients with moderate obstructive sleep apnoea syndrome.



Milo A Puhon, Alex Suarez, et al. Didgeridoo playing as alternative treatment for obstructive sleep apnoea syndrome: randomised controlled trial. **BMJ.** 2006 Feb 4;332(7536):266-70.

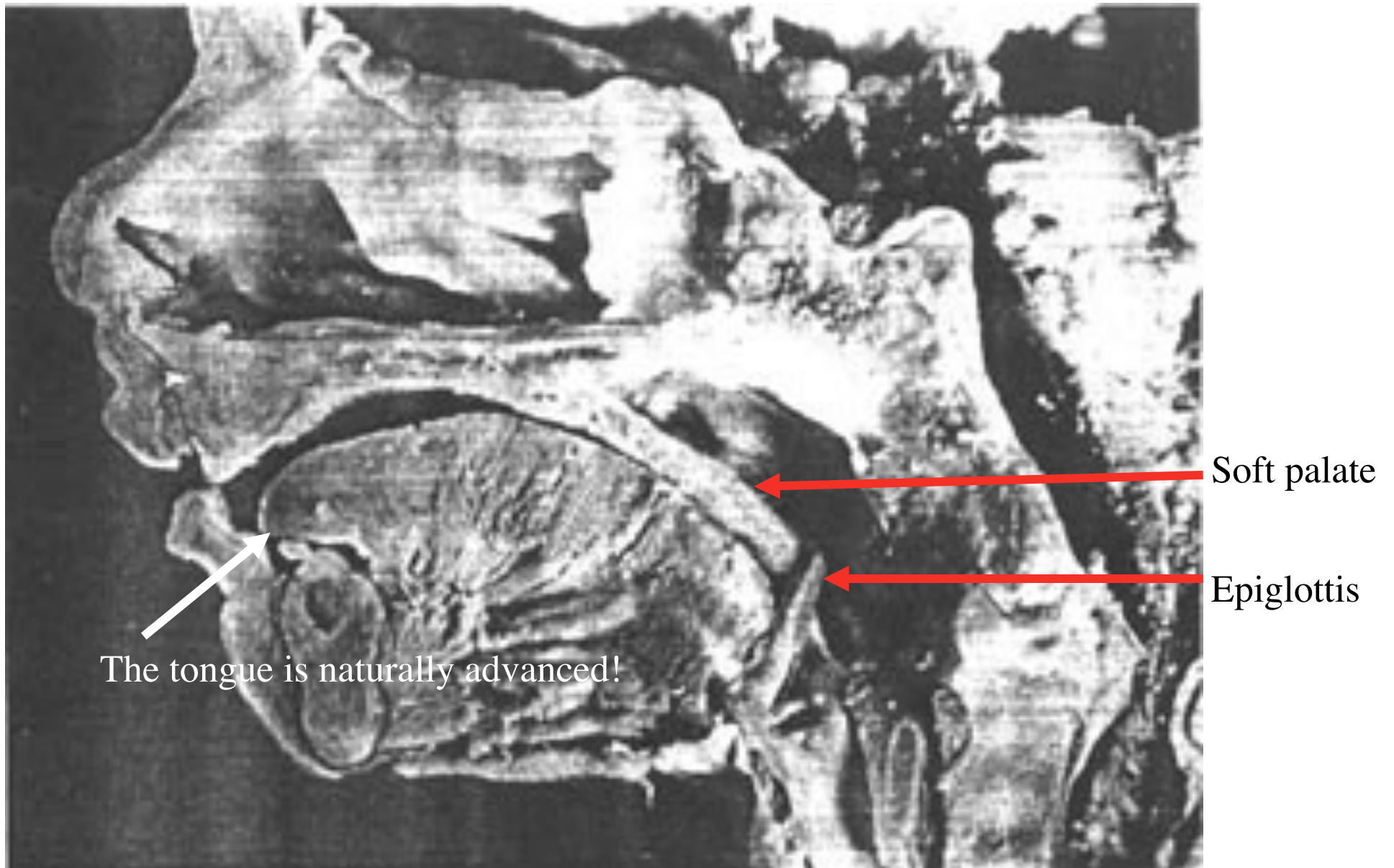


Australian
Didgeridoo player

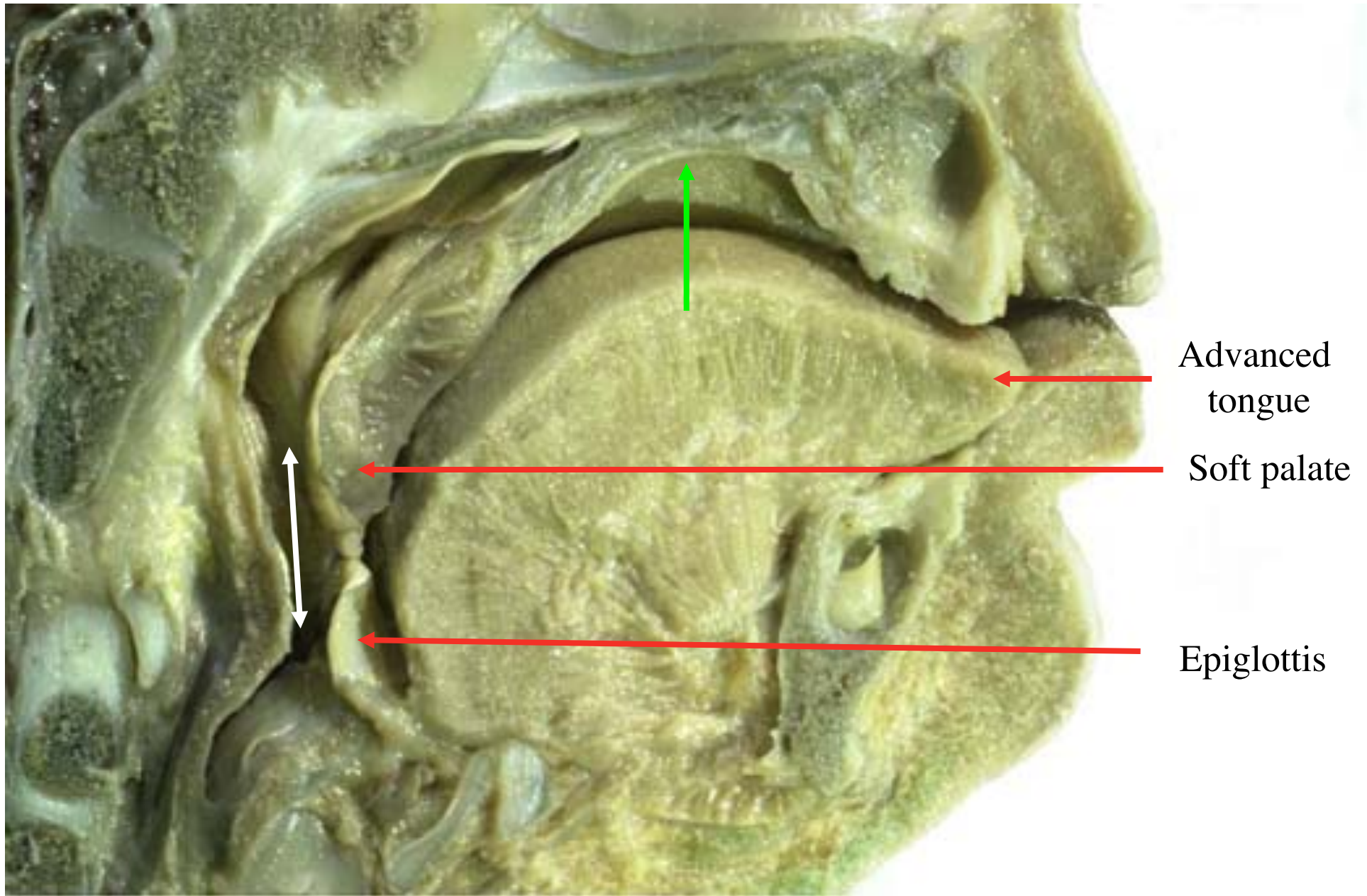
Prediction:

Tongue /oropharyngeal exercises will be significant treatment options in the future!

The difference between the
throats of newborns, adults
and other mammals.

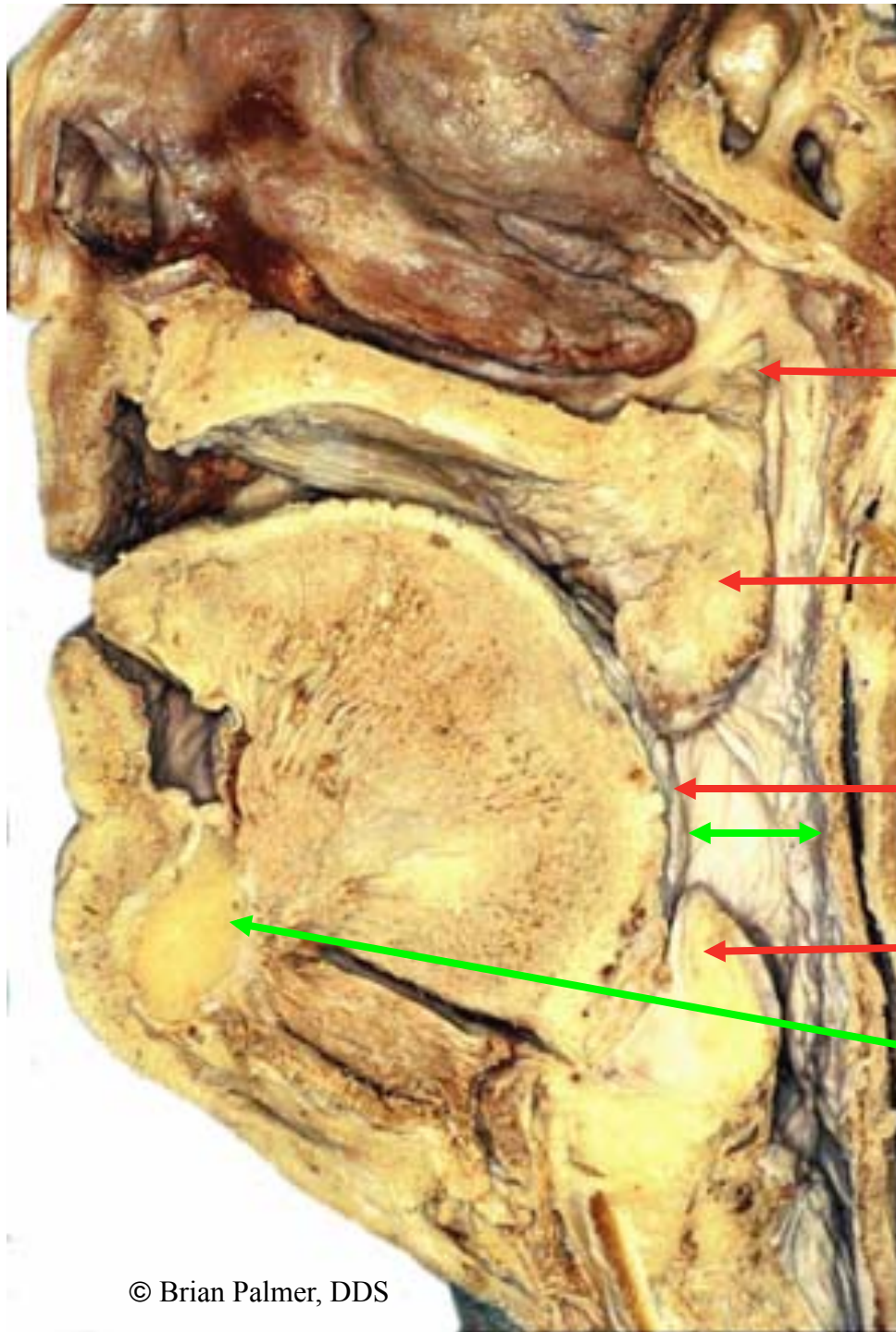


“The epiglottis is in direct contact with the soft palate.
The tongue is located entirely within the oral cavity.” (Crelin)
Not the anterior wall of the throat!



Cadaver dissection showing close relationship between the epiglottis and soft palate.

Anatomy of the throat of an adult cadaver.



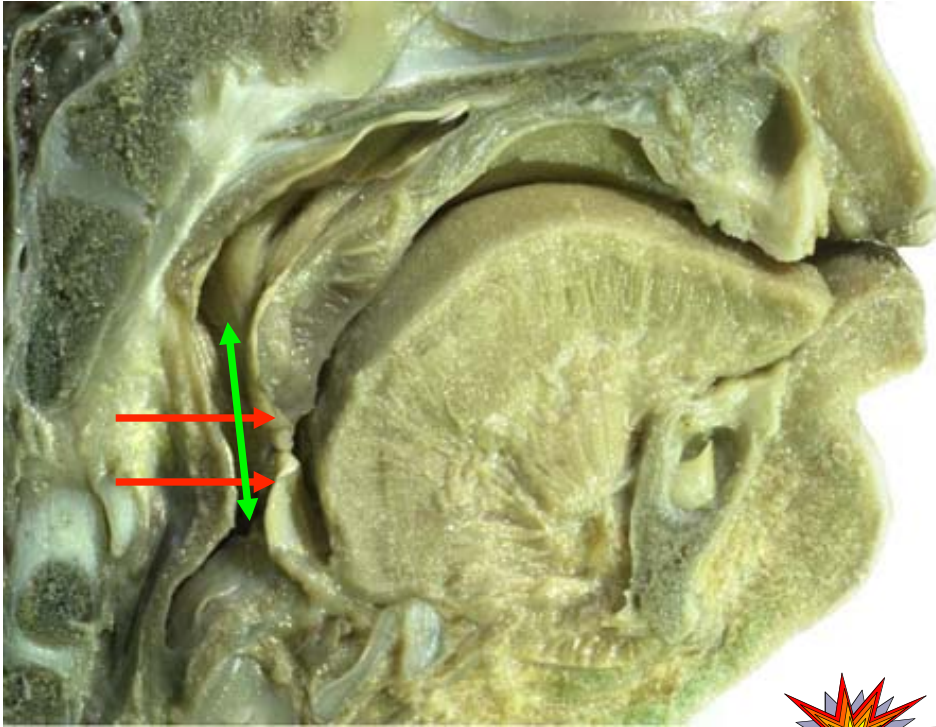
Eustachian tube

Soft palate

Posterior (back) 1/3 of tongue is the
anterior (front) wall of oropharynx
(throat)!

Epiglottis

Tongue attached to mandible.

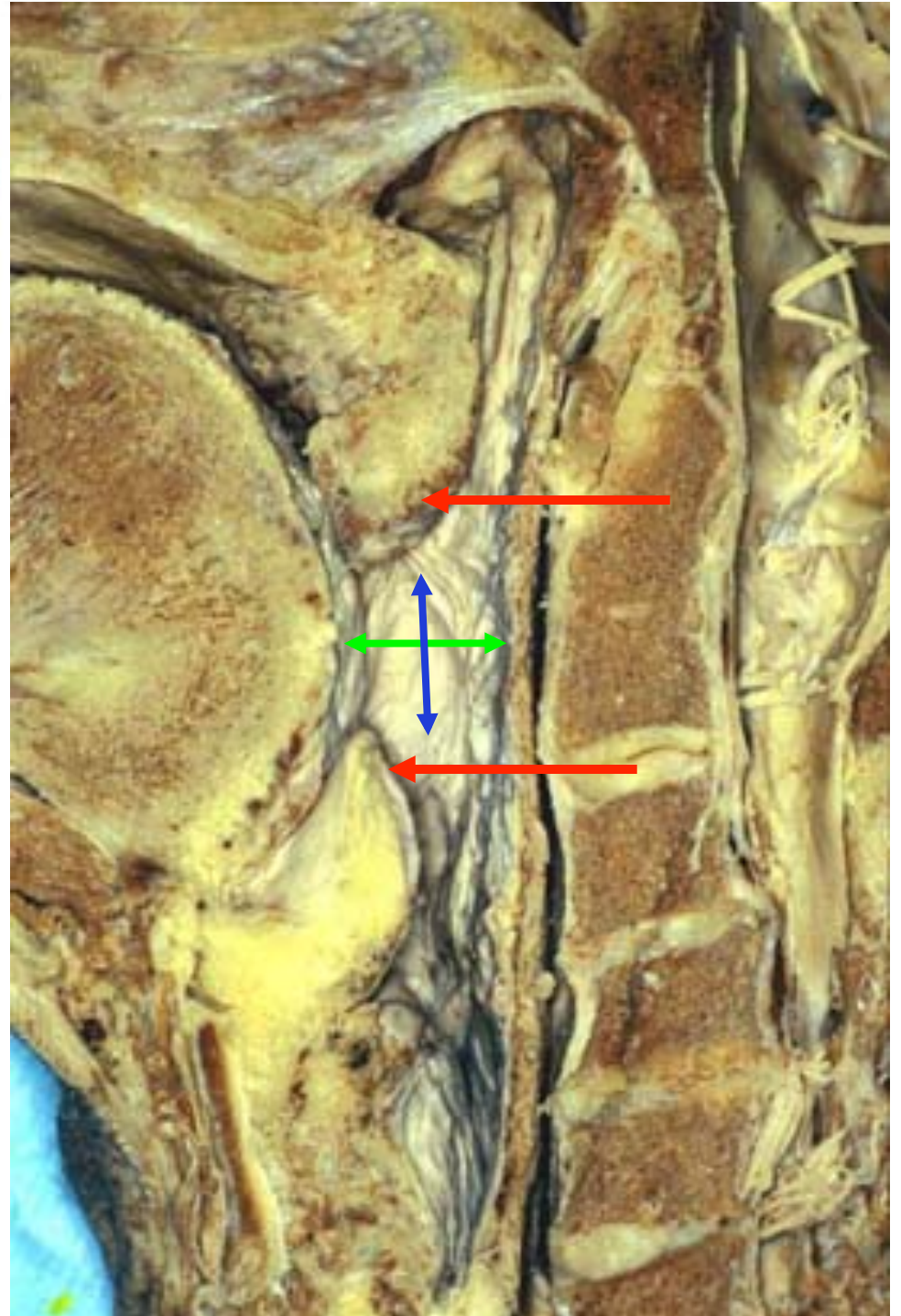


KEY COMPARISON

between the oropharynx of
a newborn and an adult.

CANNOT compare OSA
research between humans
and other mammals!

© Brian Palmer, DDS



The descent of the epiglottis

“Maturational descent of the epiglottis, was found to occur between the 4th and 6th months of age, and was verified by cineradiography.”

“This period, interestingly coincides with the peak incidence of SIDS, which similarly occurs at 3 to 5 months of age.”

Sasaki CT, Crelin E,S et al. Postnatal Descent of the Epiglottis in Man,
March 1977, Arch Otolaryngol, Vol. 103, 169-171.

Why does the epiglottis descend?

The descent of the epiglottis “allows man to produce a greater variety of sounds than all the other air-breathing forms on earth.”

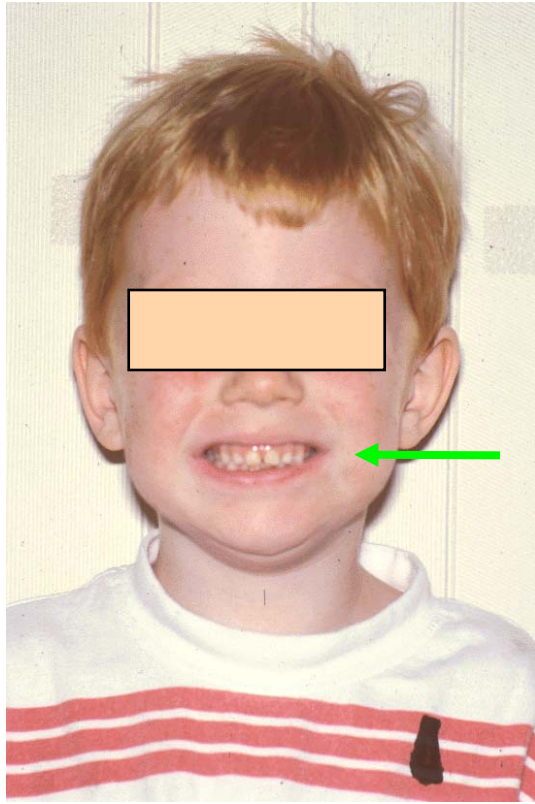
In other words, it allow humans to speak!

Edmund Crelin. Development of the Upper Respiratory System.
Clinical Symposia 1976; 28(3) - page 28.

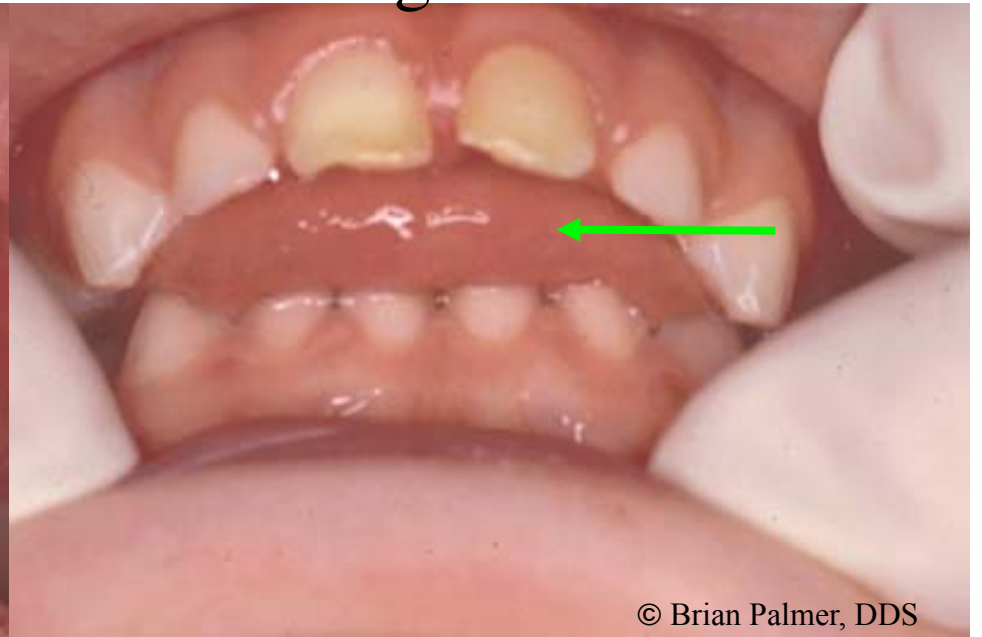
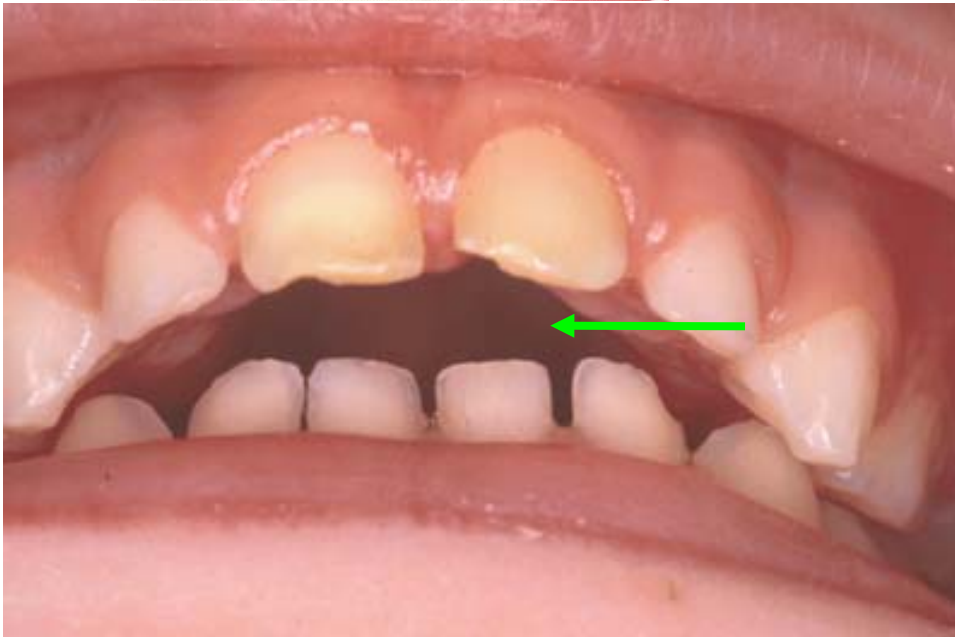
Impact of infant habits on occlusion
and height of palate.

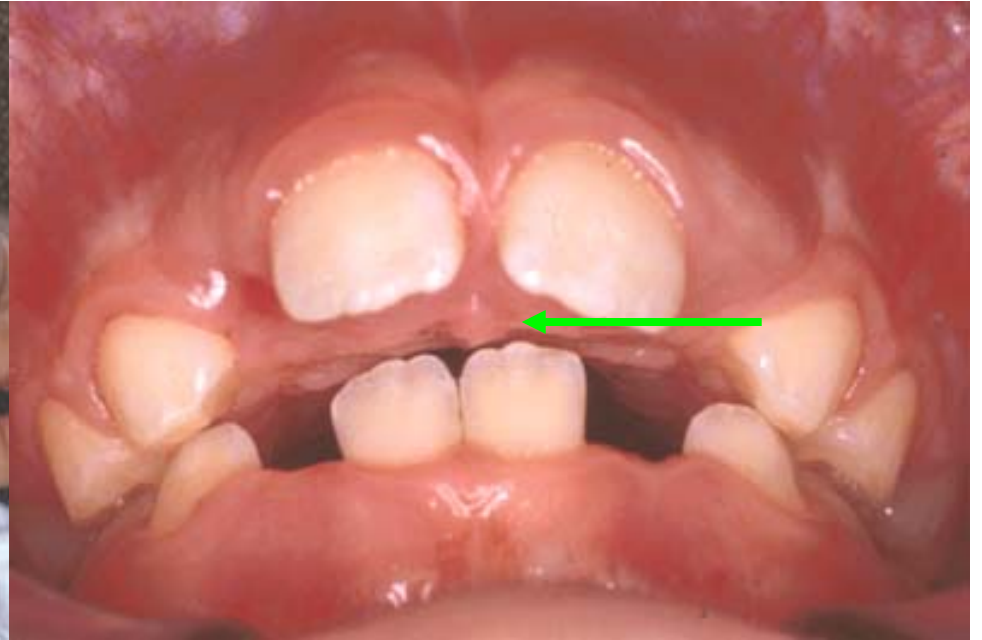
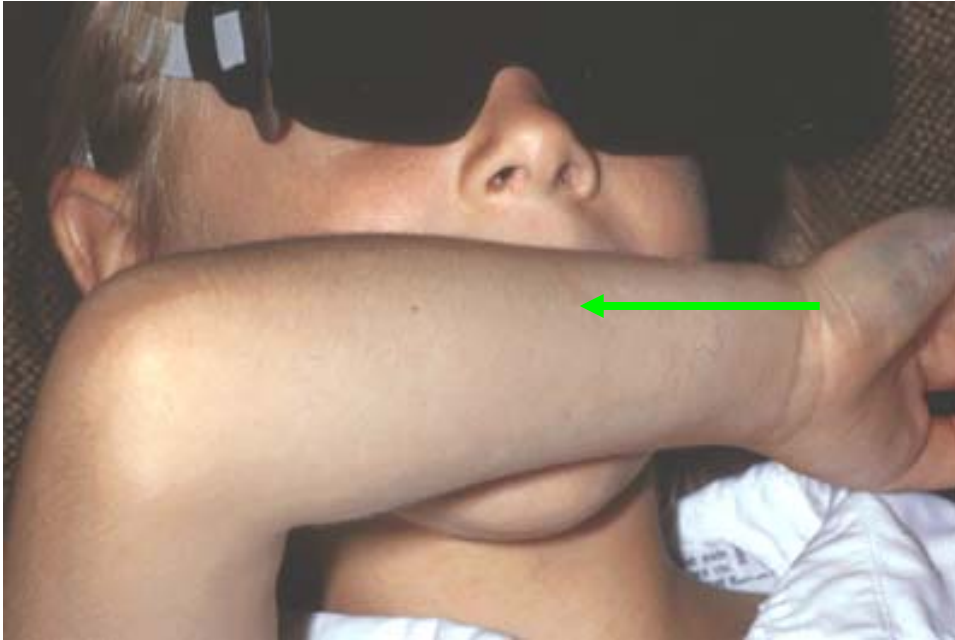
Excessive sucking is what causes the damage.

$$\begin{aligned} &\textbf{Excessiveness} = \\ &\text{Intensity} + \text{Frequency} \\ &+ \text{Duration} + \text{Direction} \end{aligned}$$

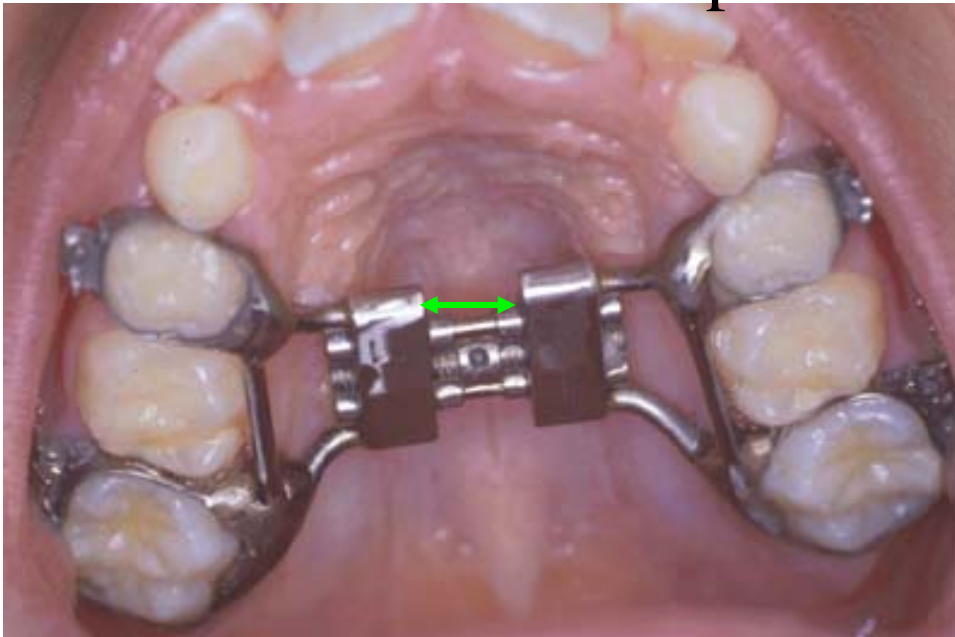


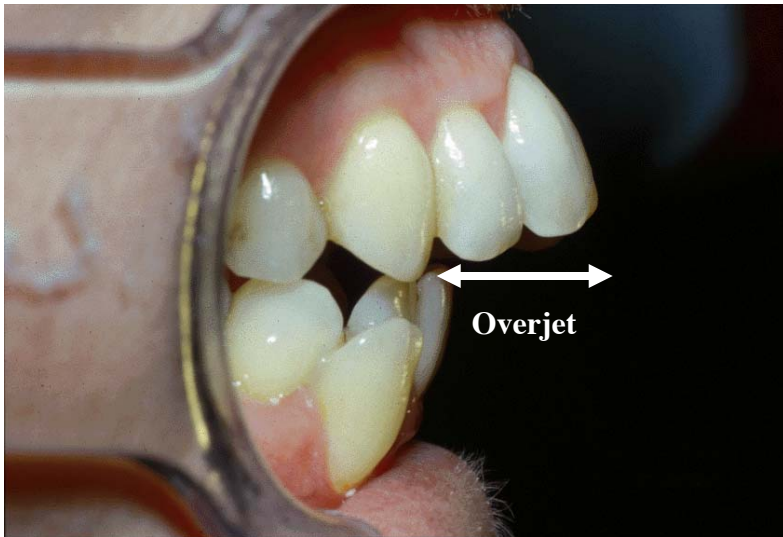
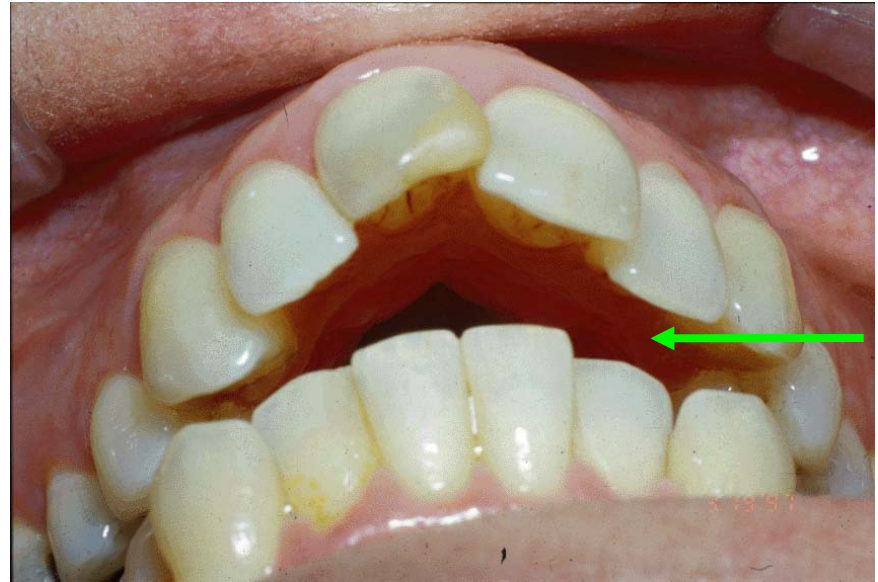
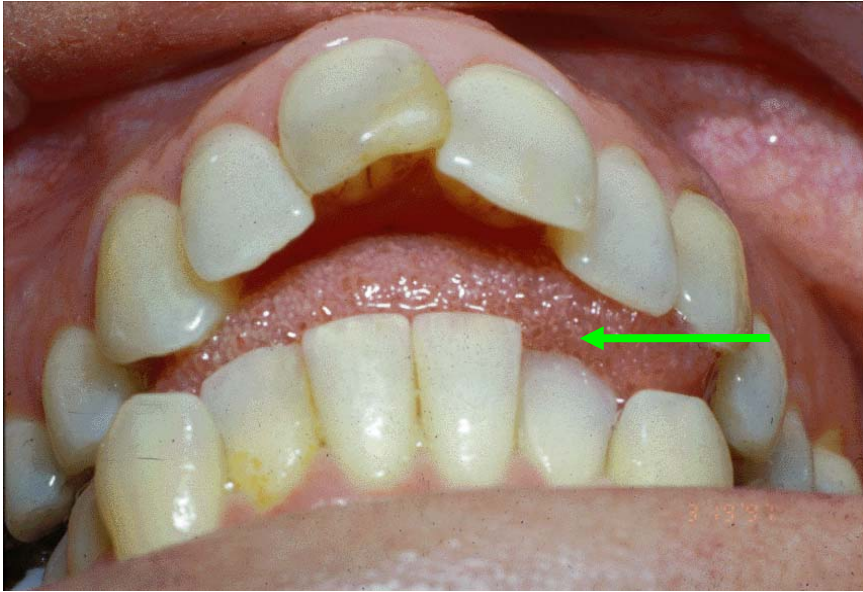
Lip sucking caused open bite
and tongue thrust.



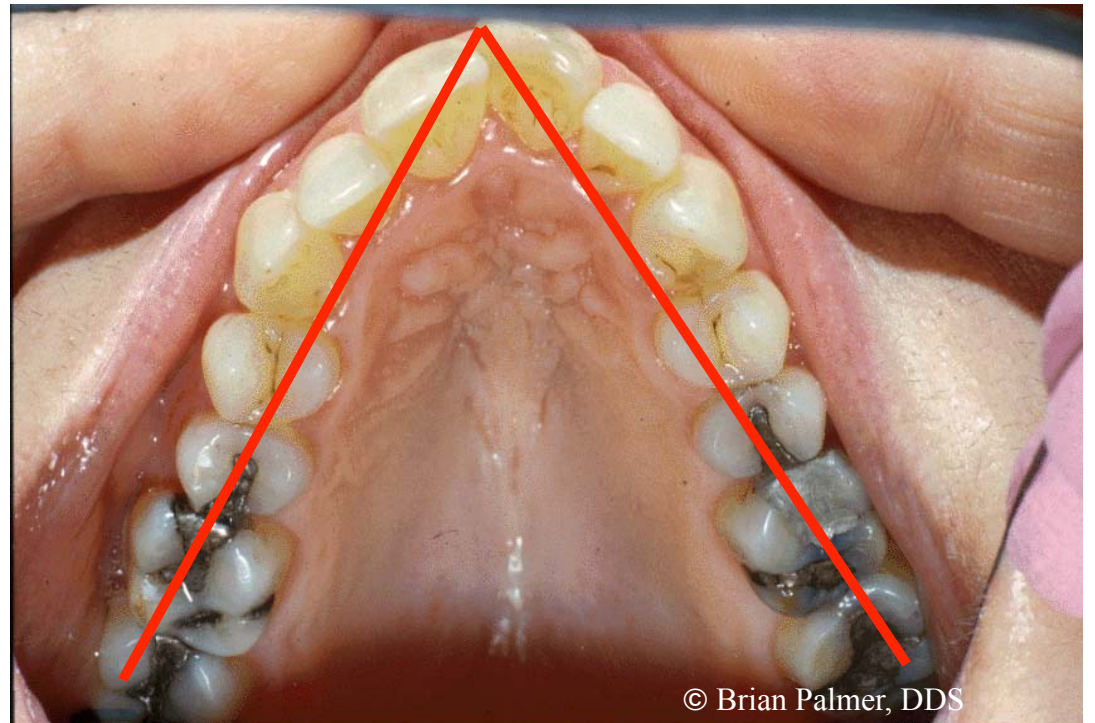


Arm sucking caused malocclusion and need for expansion and orthodontics.





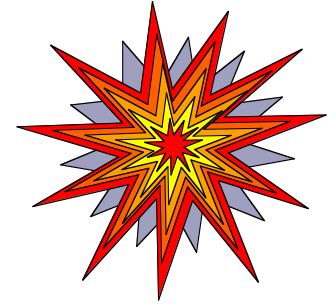
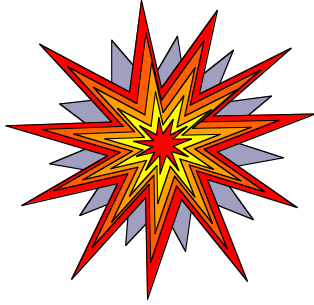
Consequences!



© Brian Palmer, DDS



Dogs that sucked their paws!



Facial Form / Facial Beauty



Breastfed infant.

Impact on facial form.

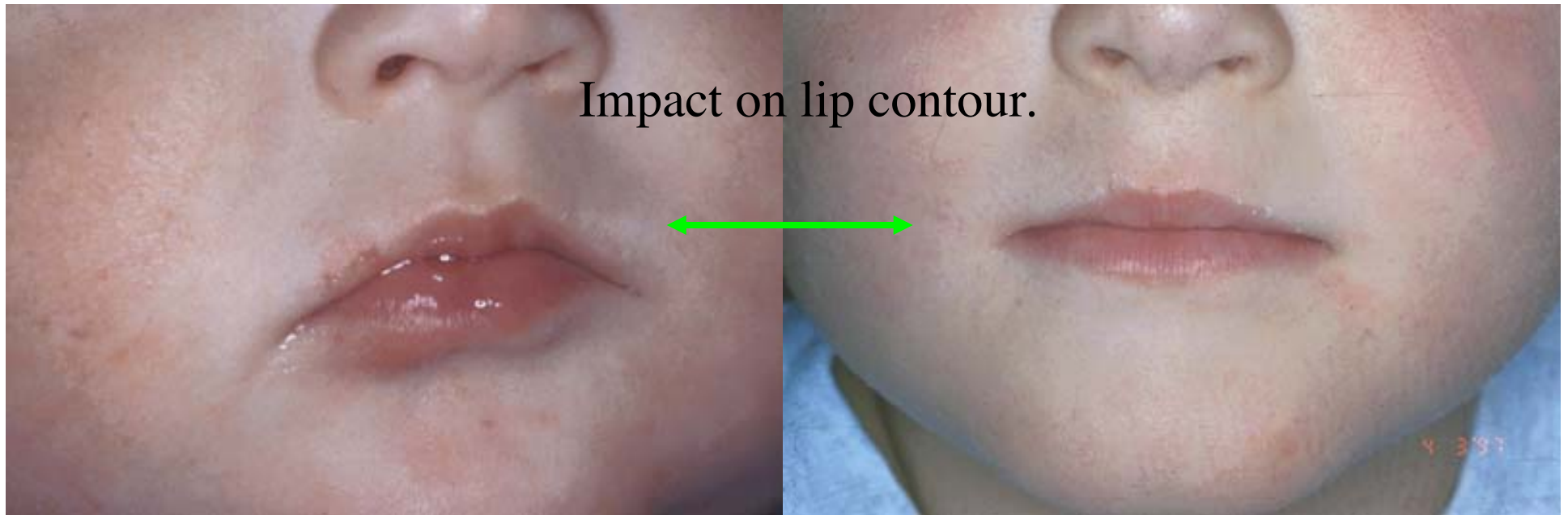


Excessive thumb sucker.



Breastfed or not!

© Brian Palmer, DDS



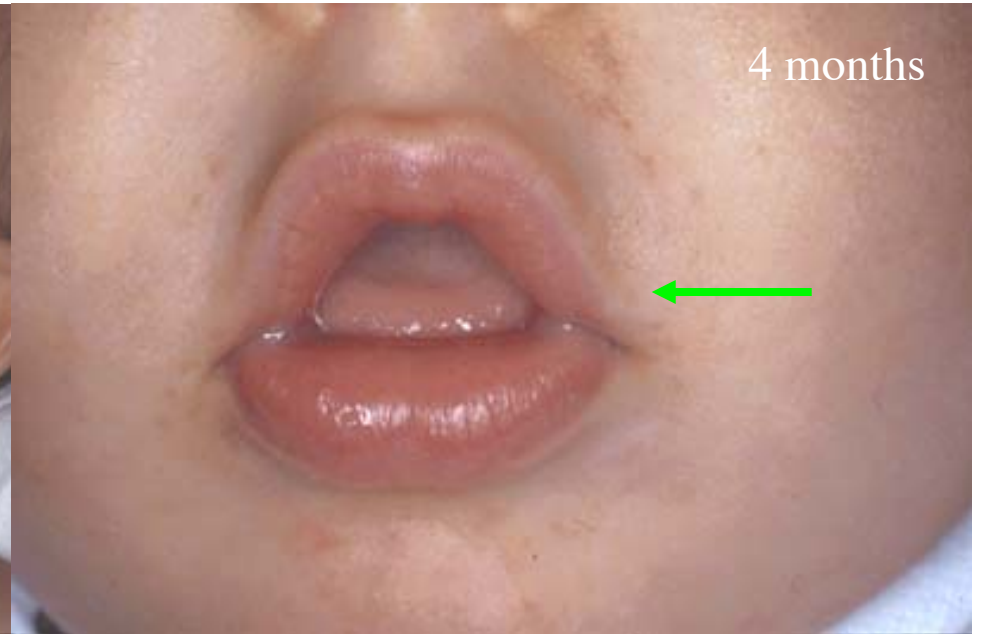
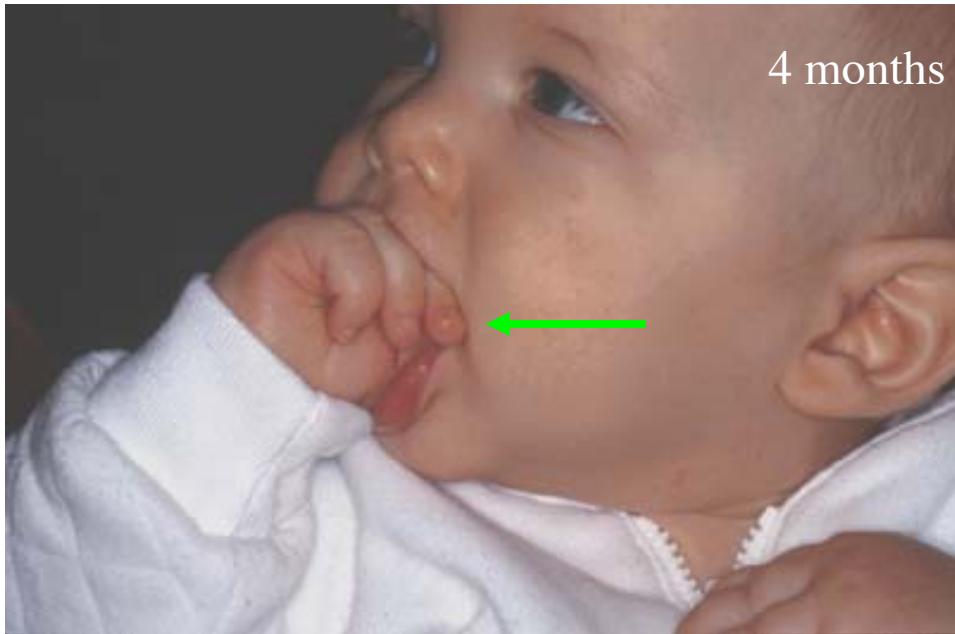
4 months old.

Breastfed and was not a thumb sucker. 4 1/2 years old.

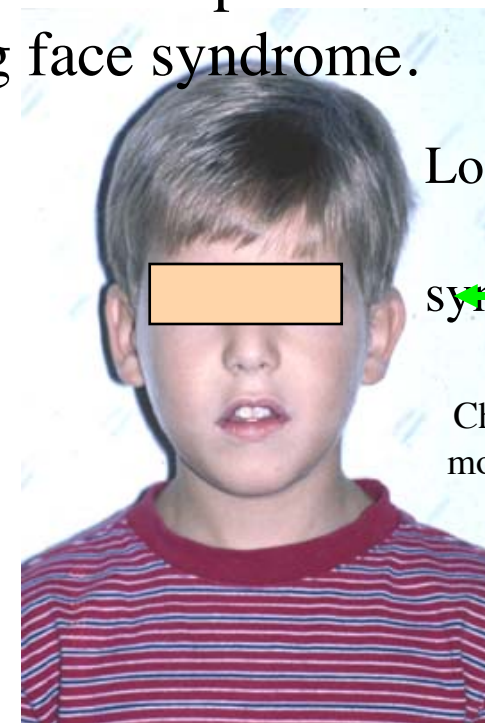
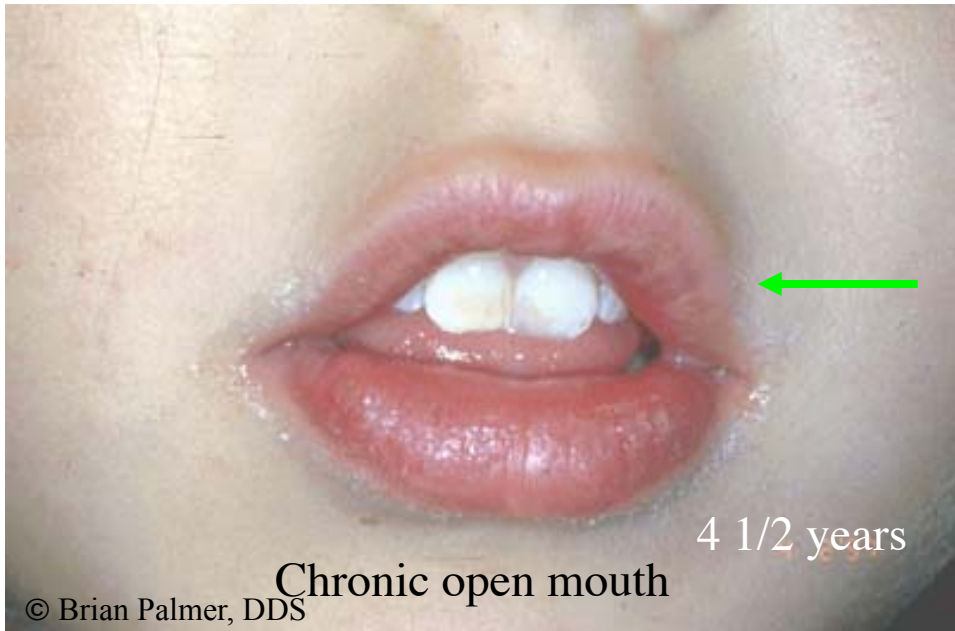
4 months old.

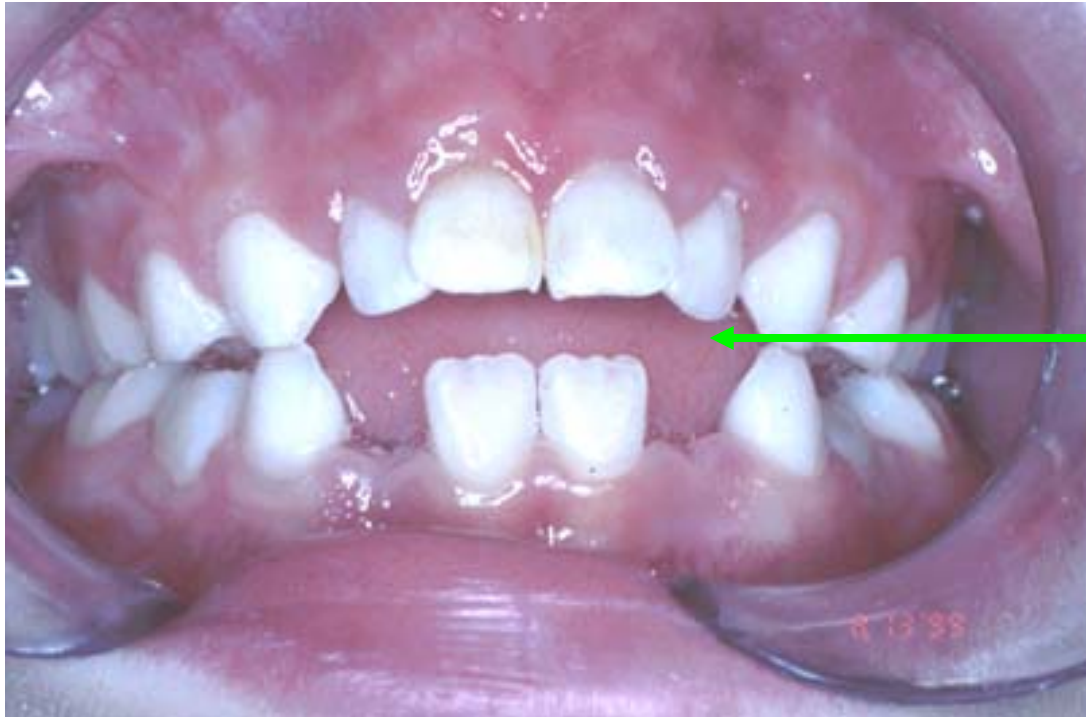
Was an **excessive** a thumb sucker. 4 1/2 years old.





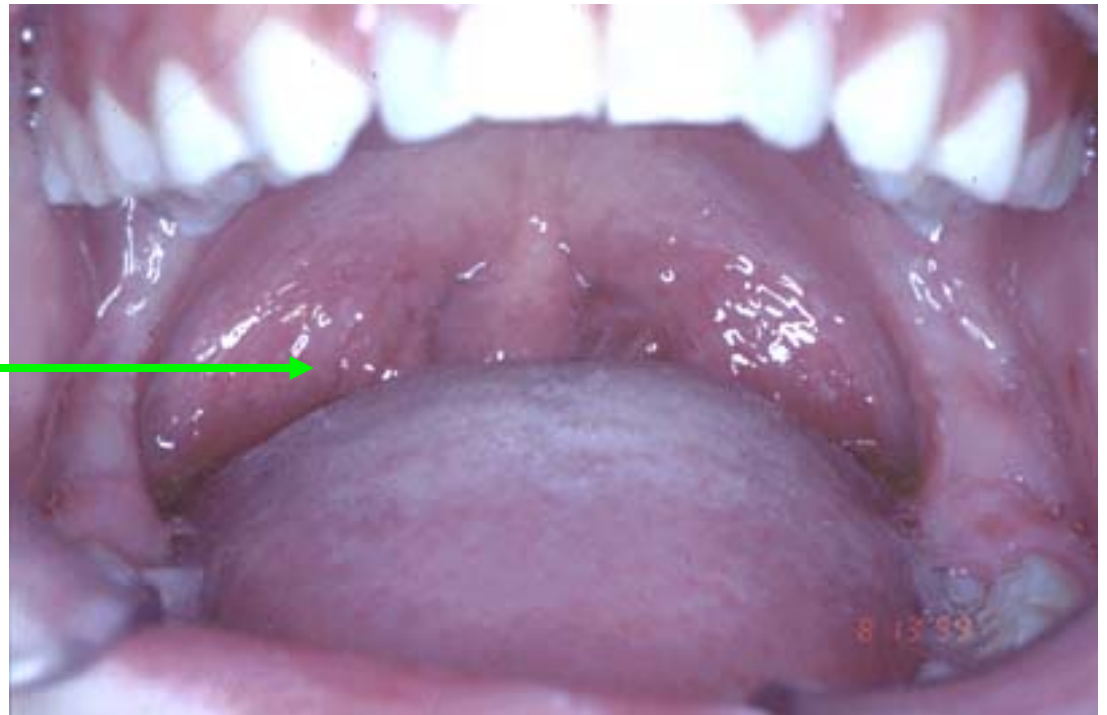
Early excessive thumb sucking caused open bite malocclusion and resultant long face syndrome.



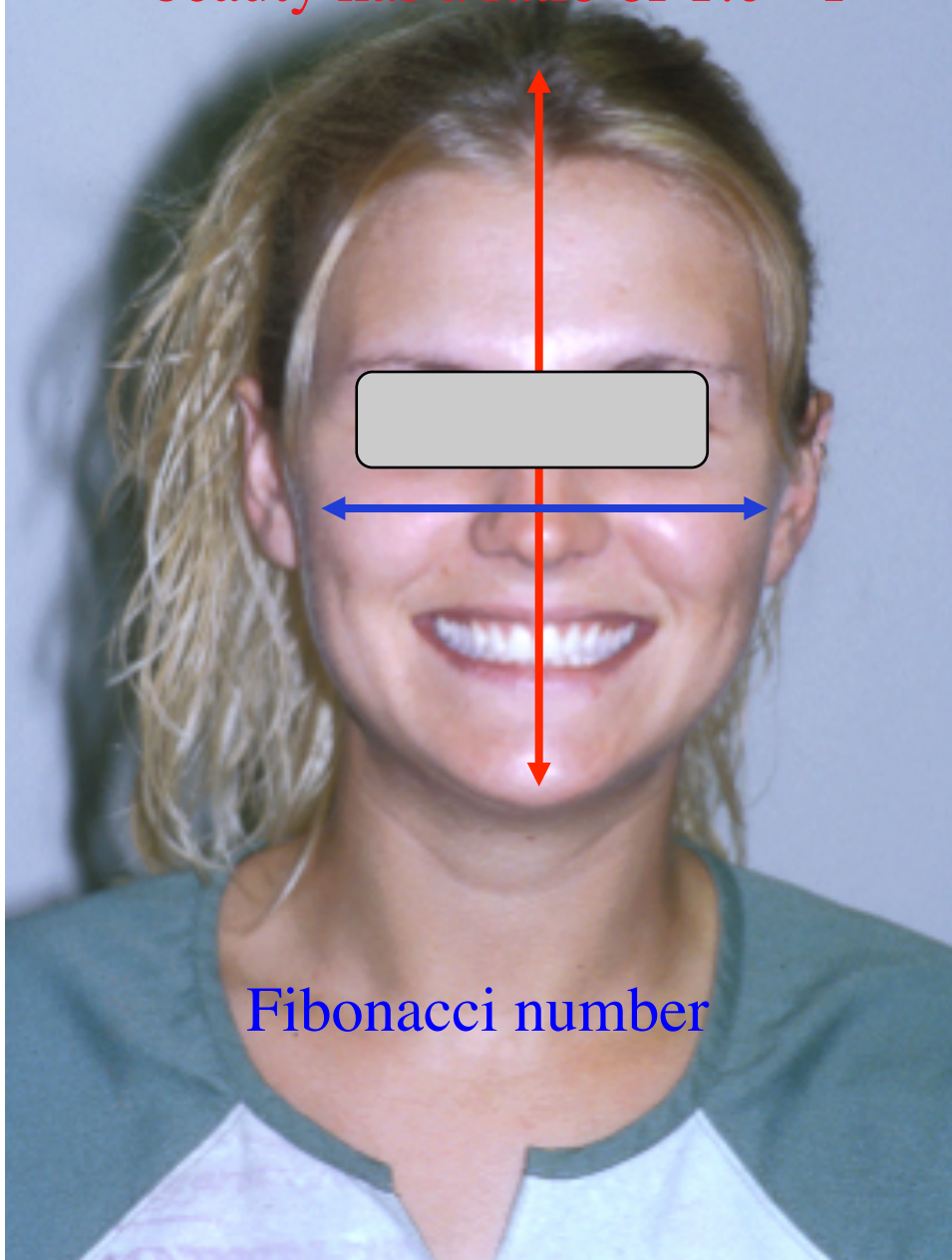


Open bite on same 7-year-old. Note forward position of tongue.

Compromised oropharynx (throat) of same 7-year-old.

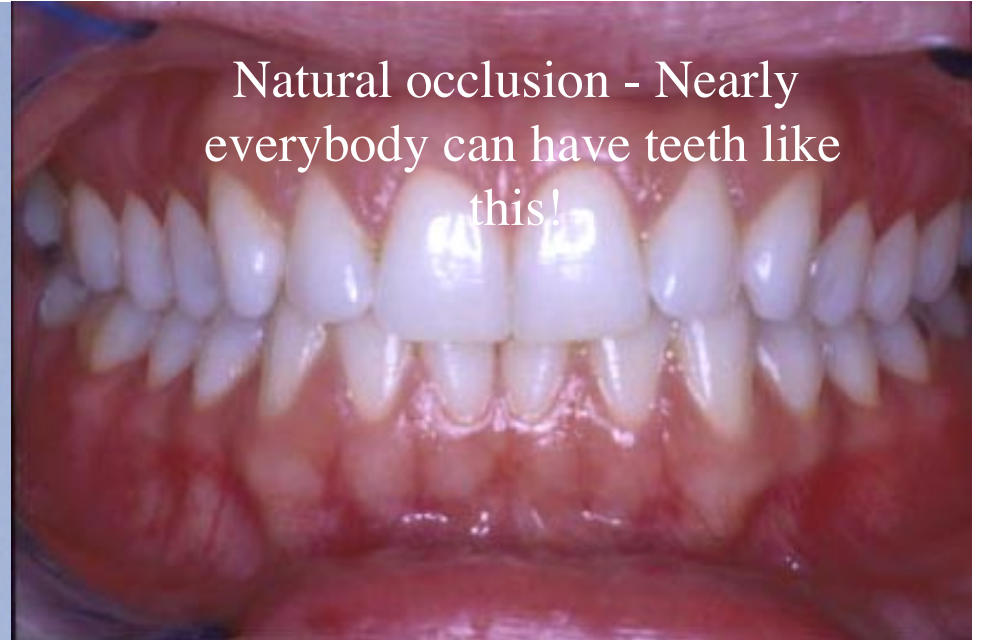


Natural, more attractive facial
beauty has a ratio of 1.6 - 1



Fibonacci number

Natural occlusion - Nearly
everybody can have teeth like
this!



Facial beauty and importance

Natural - spacious -
healthy nasopharynx!



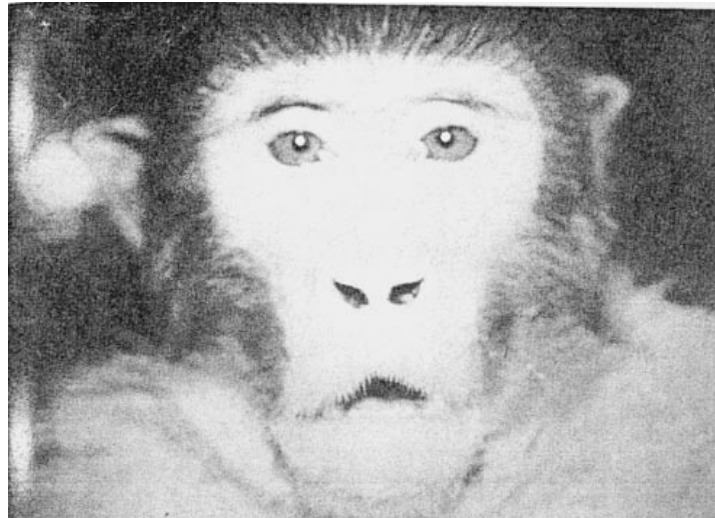
Eustachian tube

Long Face Syndrome



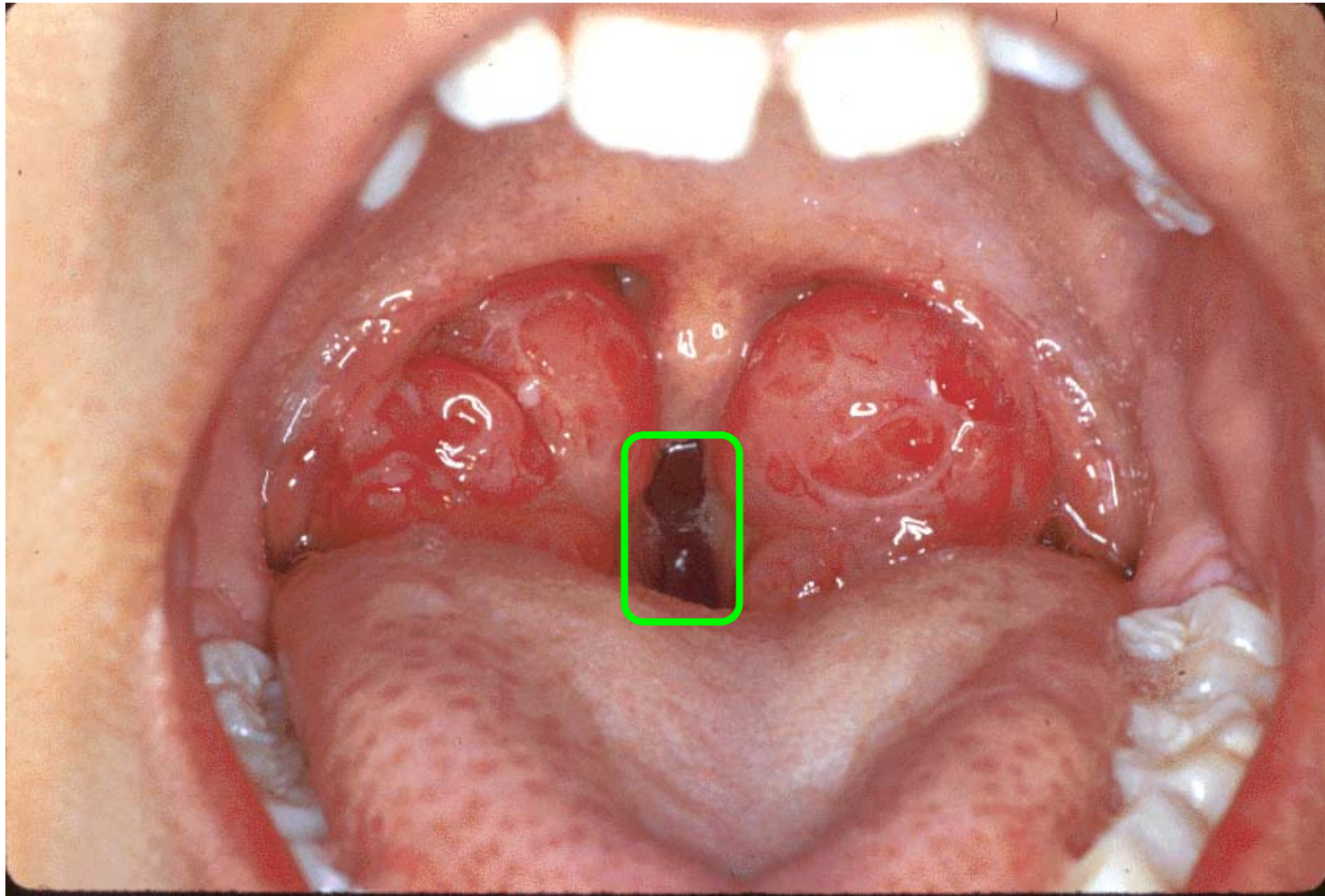
Test yourself. Hold your nose and see what happens.

Rhesus monkey research



George M. Meredith, MD, *Airway and Dentofacial Development*, Am J Rhinol. 2(1), Winter 1988, 33-41. American Journal of Rhinology.

Dr. Meredith is an Assistant Clinical Professor of Otolaryngology,
Eastern Virginia Medical School, Norfolk, VA.

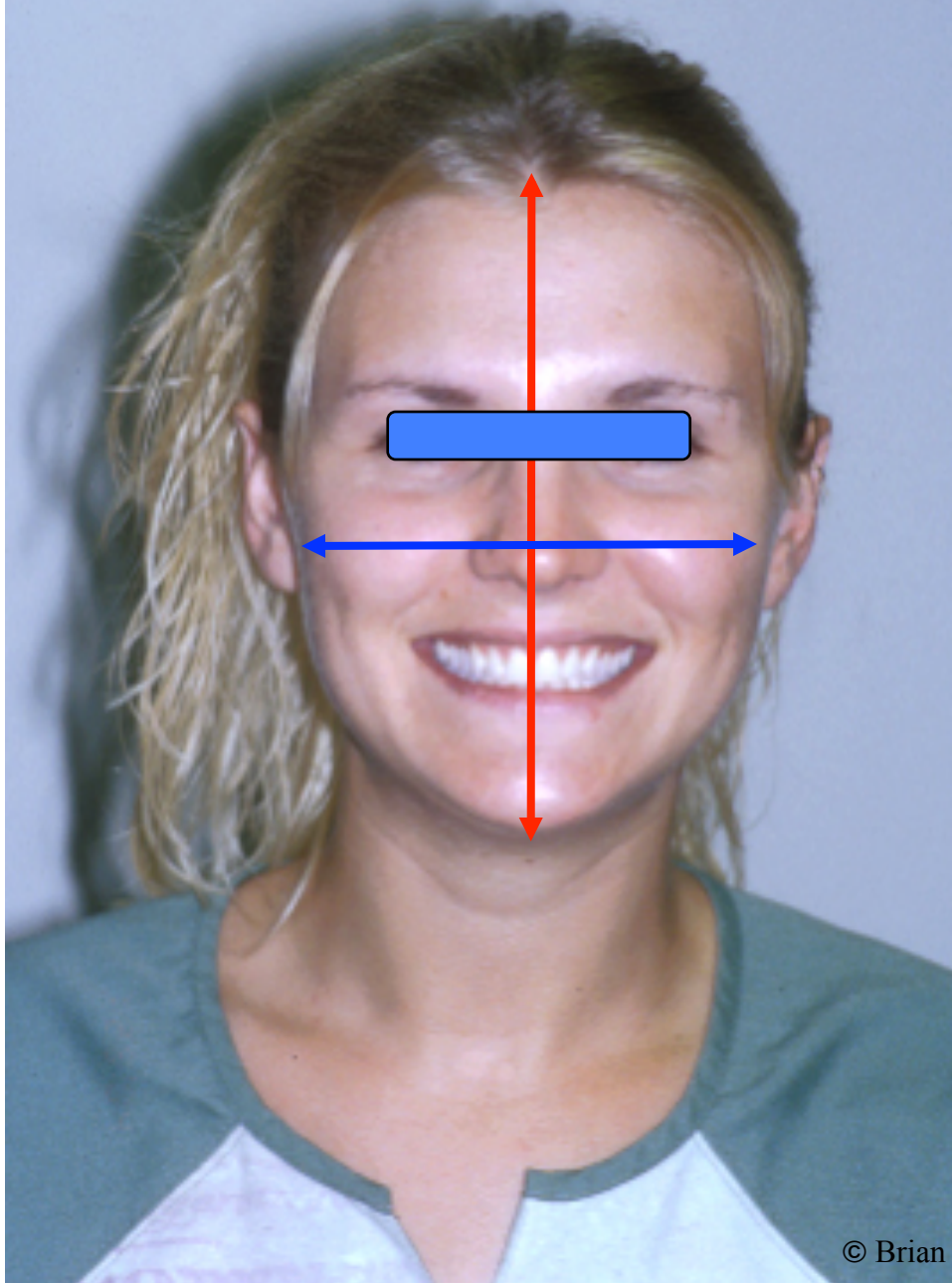


Massive tonsils

Due mainly to not receiving mother's
immunological properties of her breastmilk.

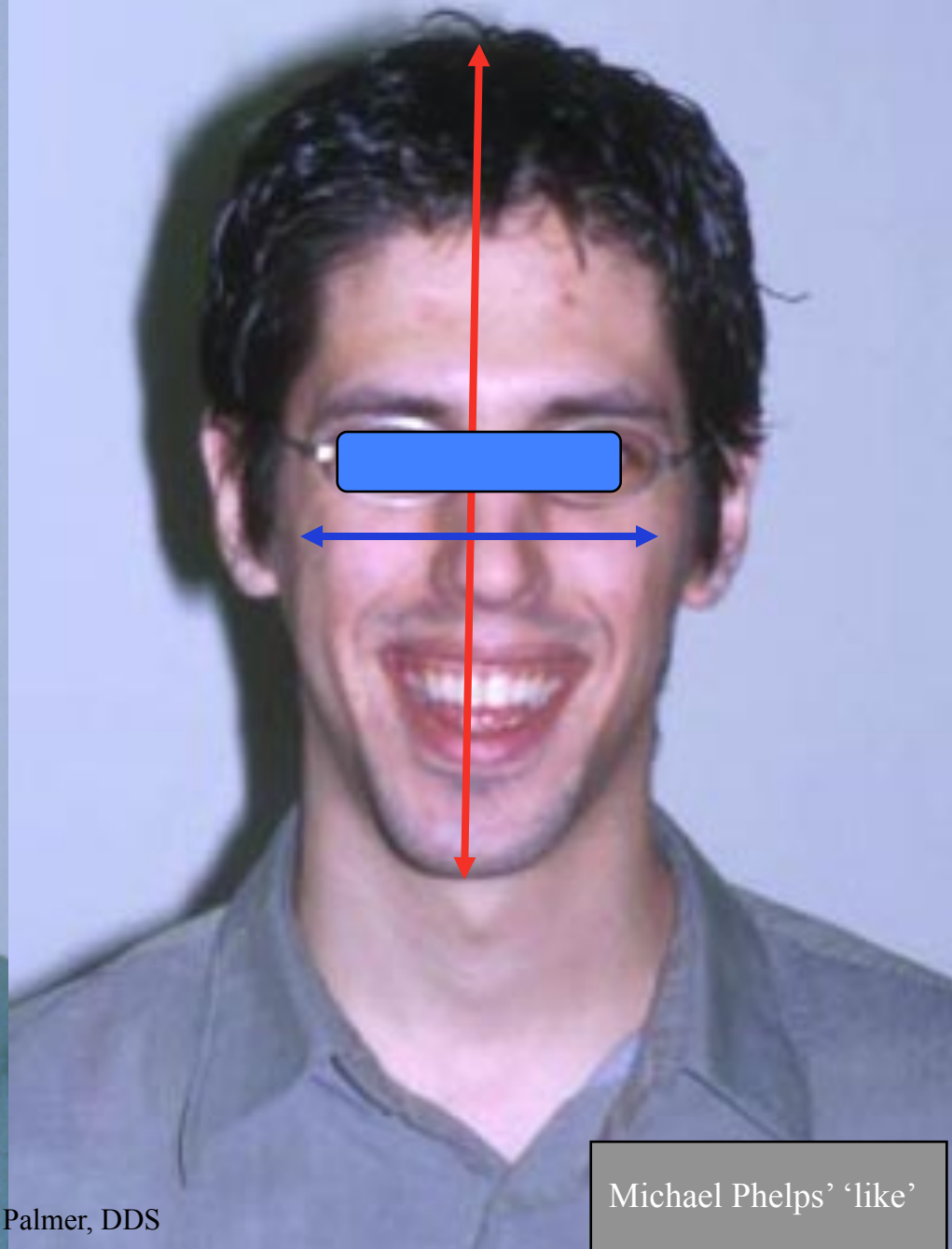
Getting around a lot of sick kids - ie. Day Care

Natural Proportions - Breastfed

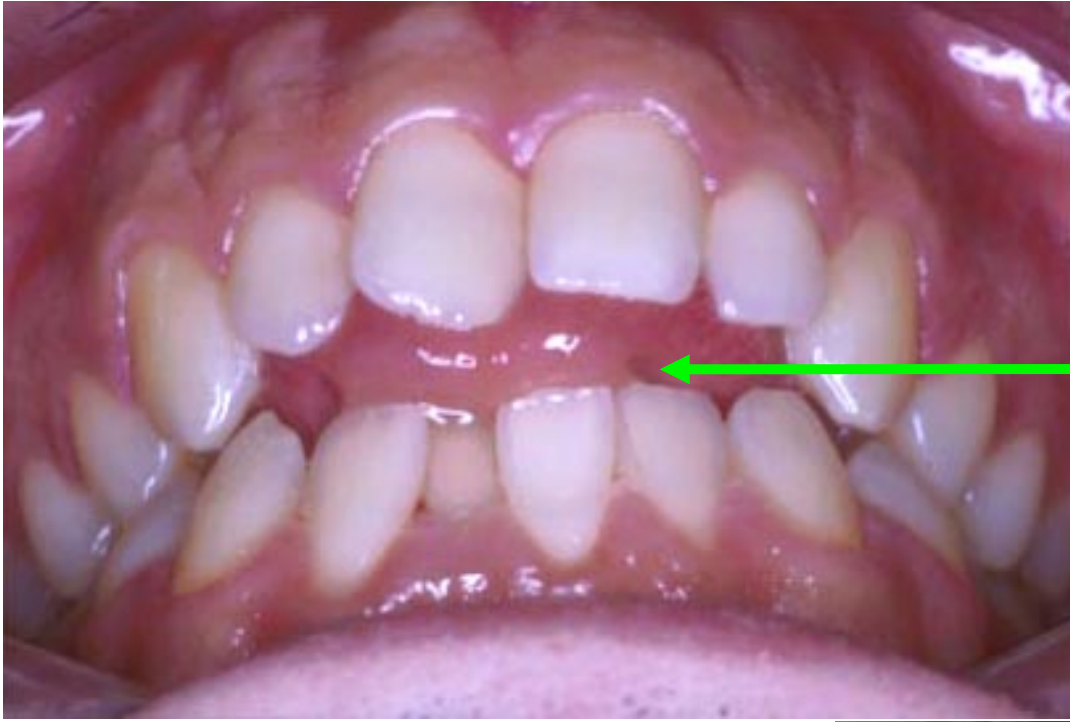


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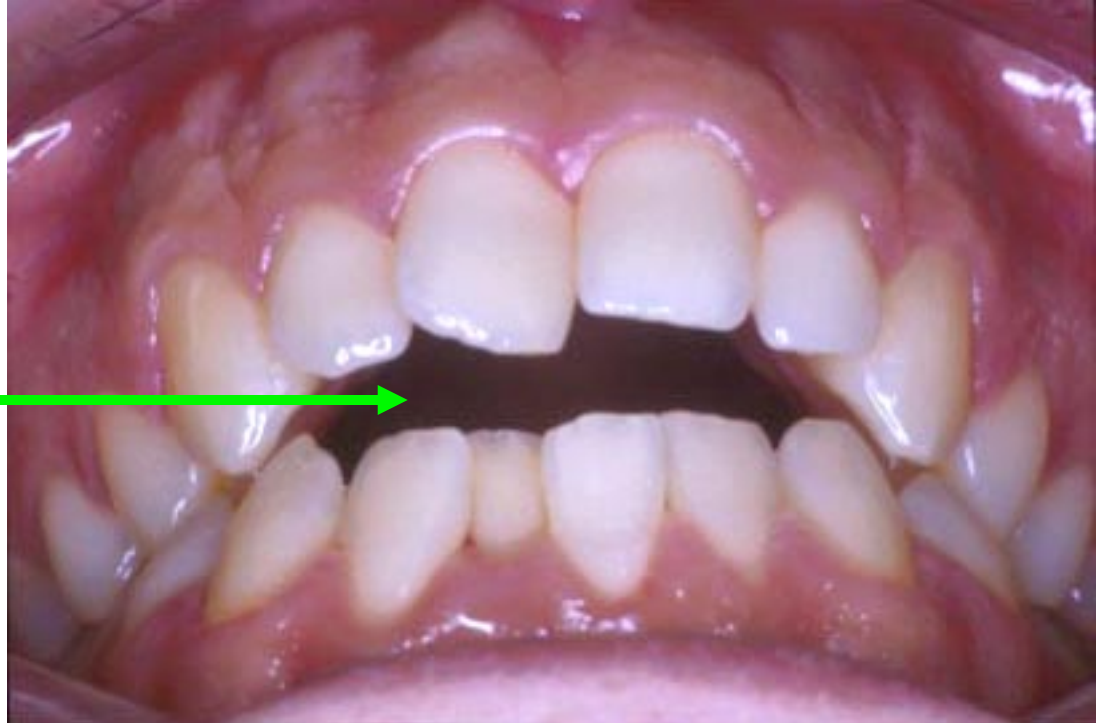
Long Face - Bottle-fed



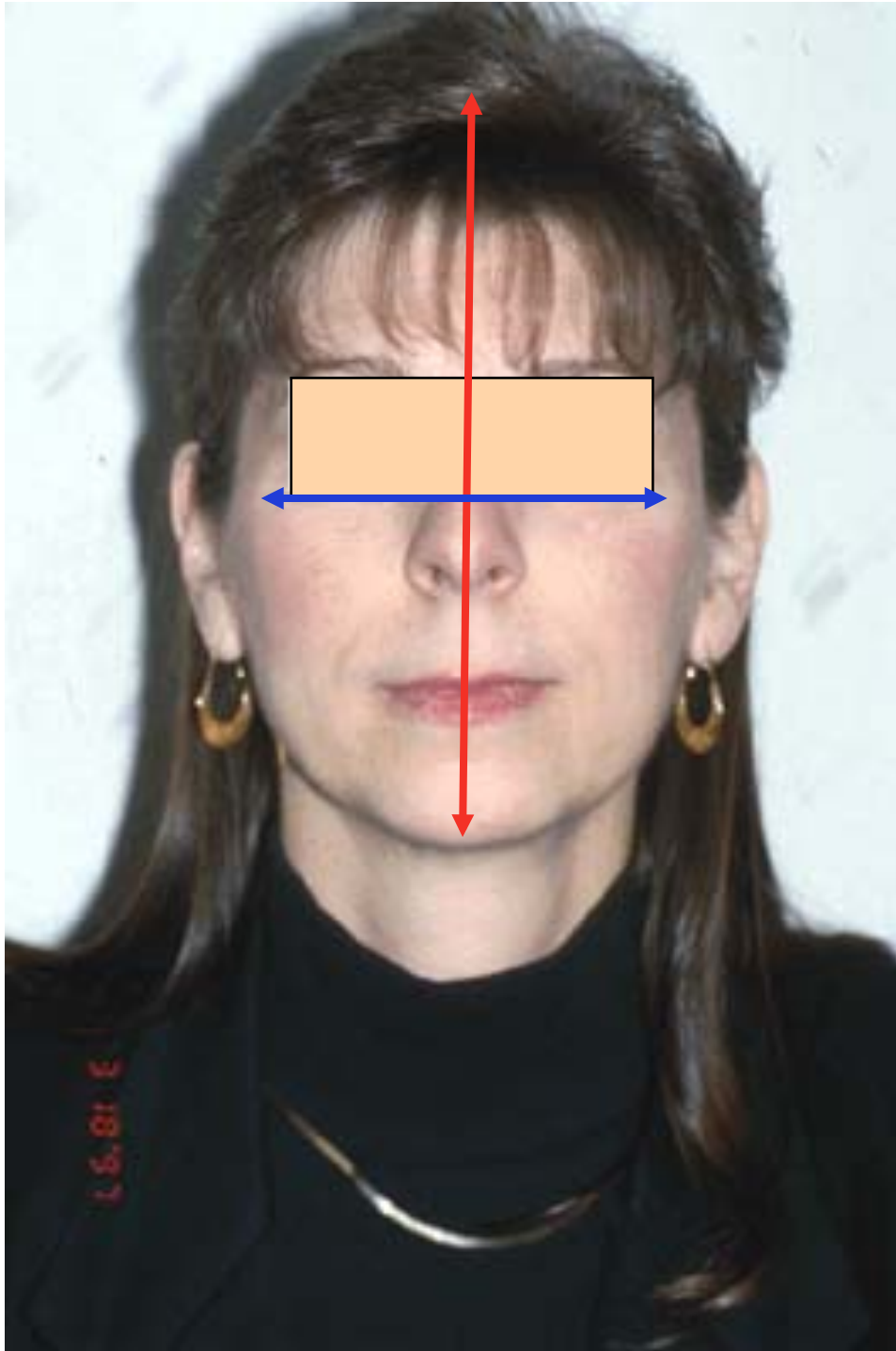
Michael Phelps' 'like'



Close up of his tongue thrust.

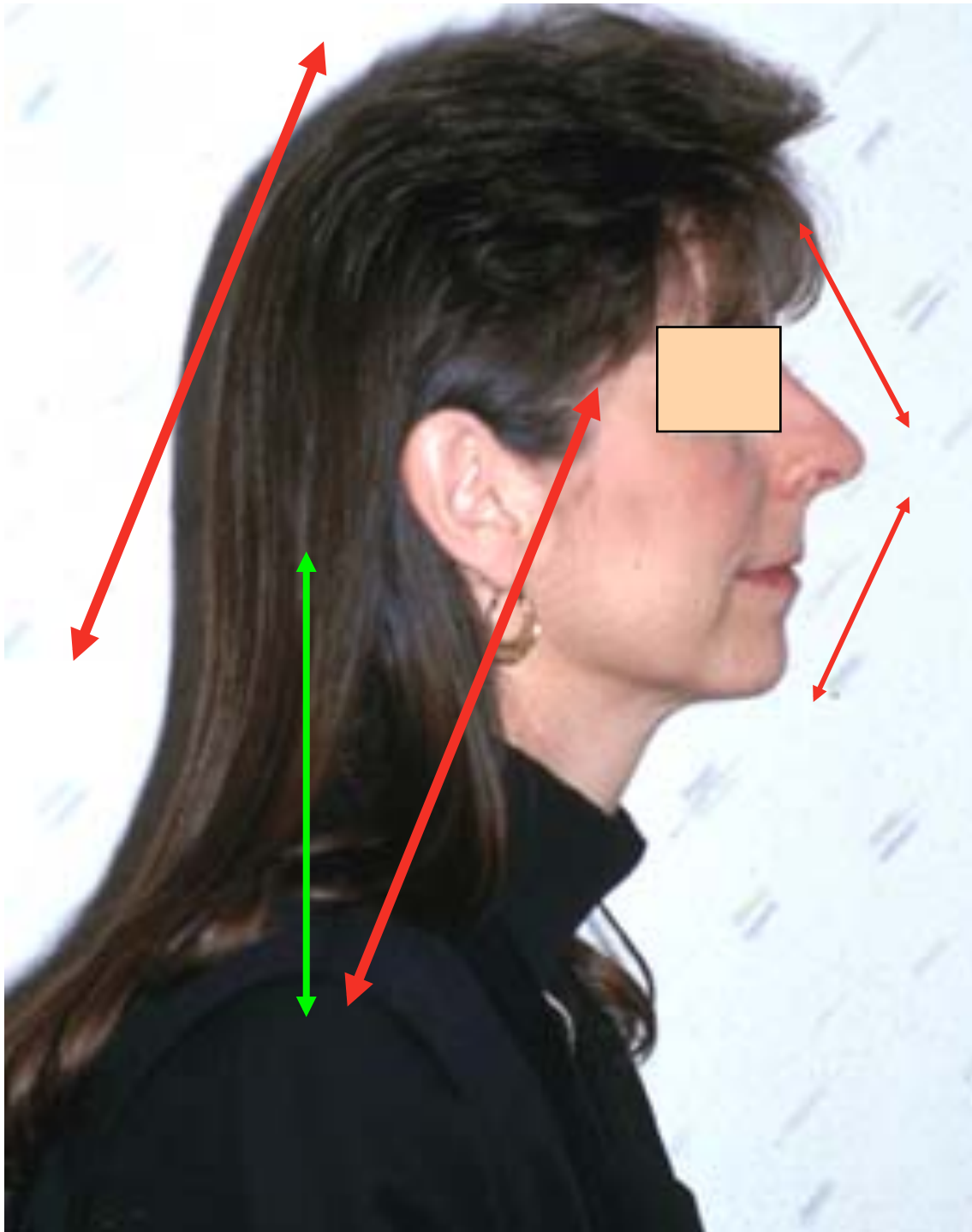


Close-up of his open bite.



Classical characteristics
of Long Face Syndrome.

Adult with long face and
significant OSA.



Typical forward angulation
of head of a person with
Long Face Syndrome.

Forward angulation of the
head makes it easier to
breathe - ie - like in CPR.

Many times has pointed
prominence of nose.



Any questions?

Thank you!

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