Cause and Prevention of OSA

- Principles involved in OSA
- Hypothesis
- Prevention

Principles involved in airway collapse

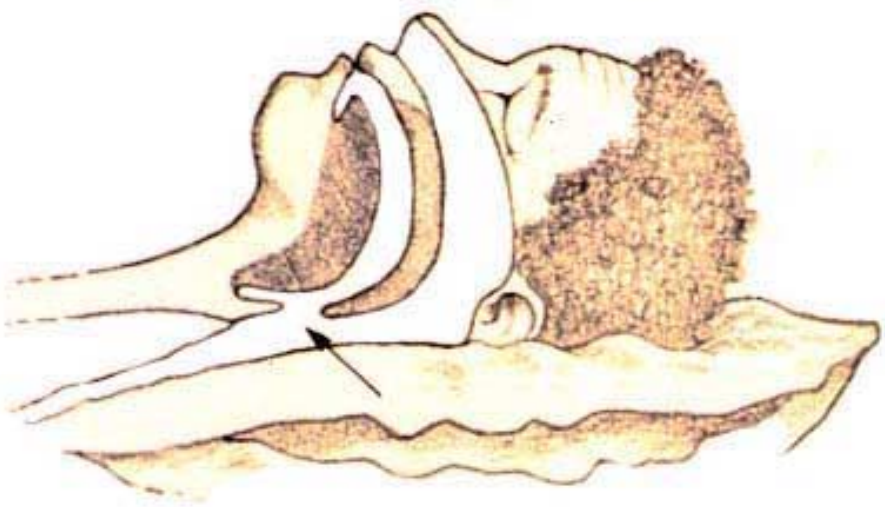
- Vacuum
- Gravity
- Venturi principle
- Bernoulli principle

Vacuum

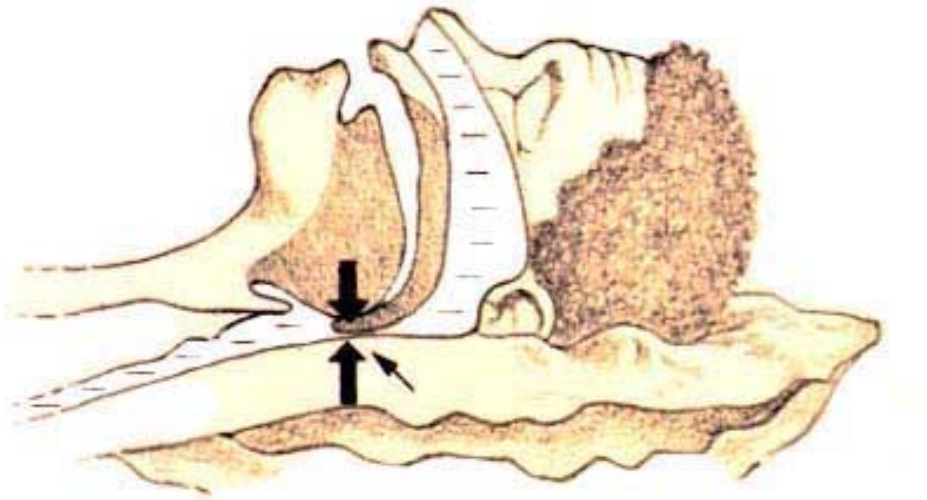
A vacuum can create an inward collapse of the oral cavity, throat and airway.

D3

Gravity



Jaw and tongue are forward while awake.



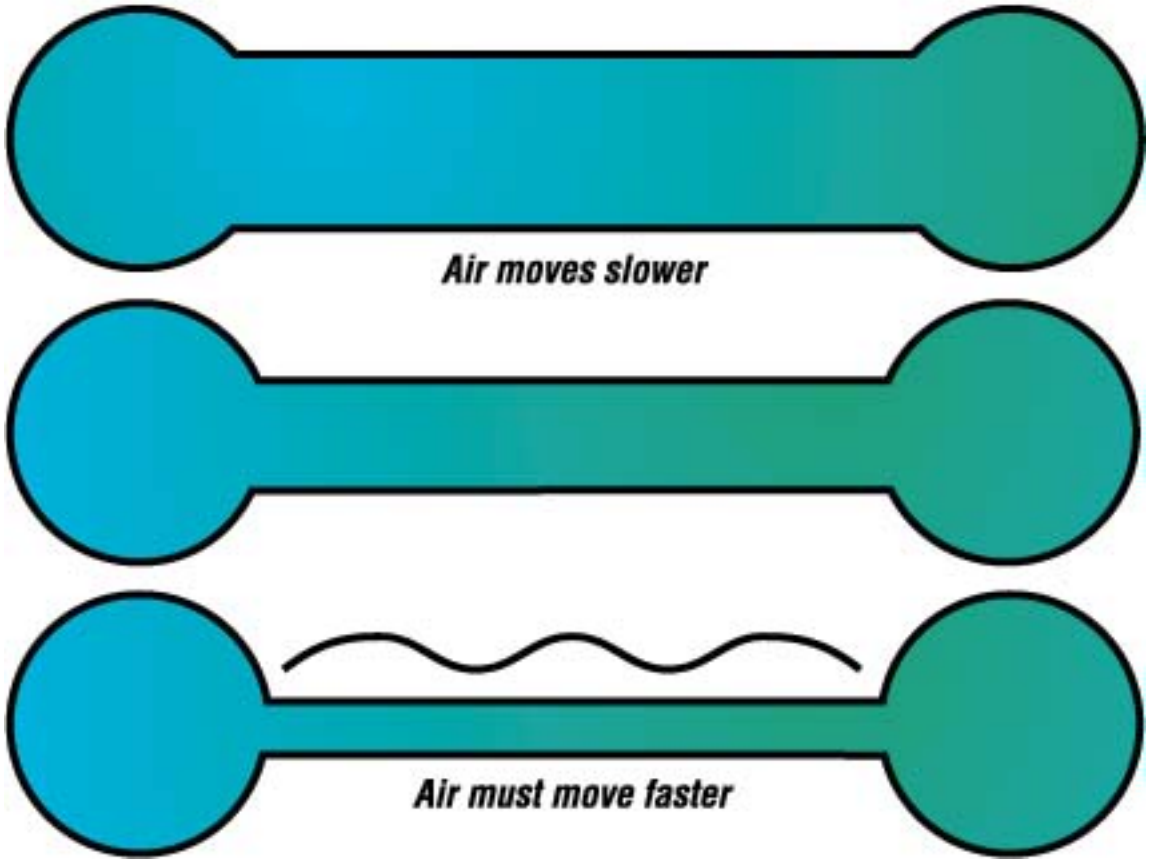
While asleep, muscles relax and gravity can drop the tongue back and block off the airway.

D4

Venturi Principle

Air must pass through a small tube faster than through a large tube, if the volume of air and time to pass through are equal.

VENTURI PRINCIPLE



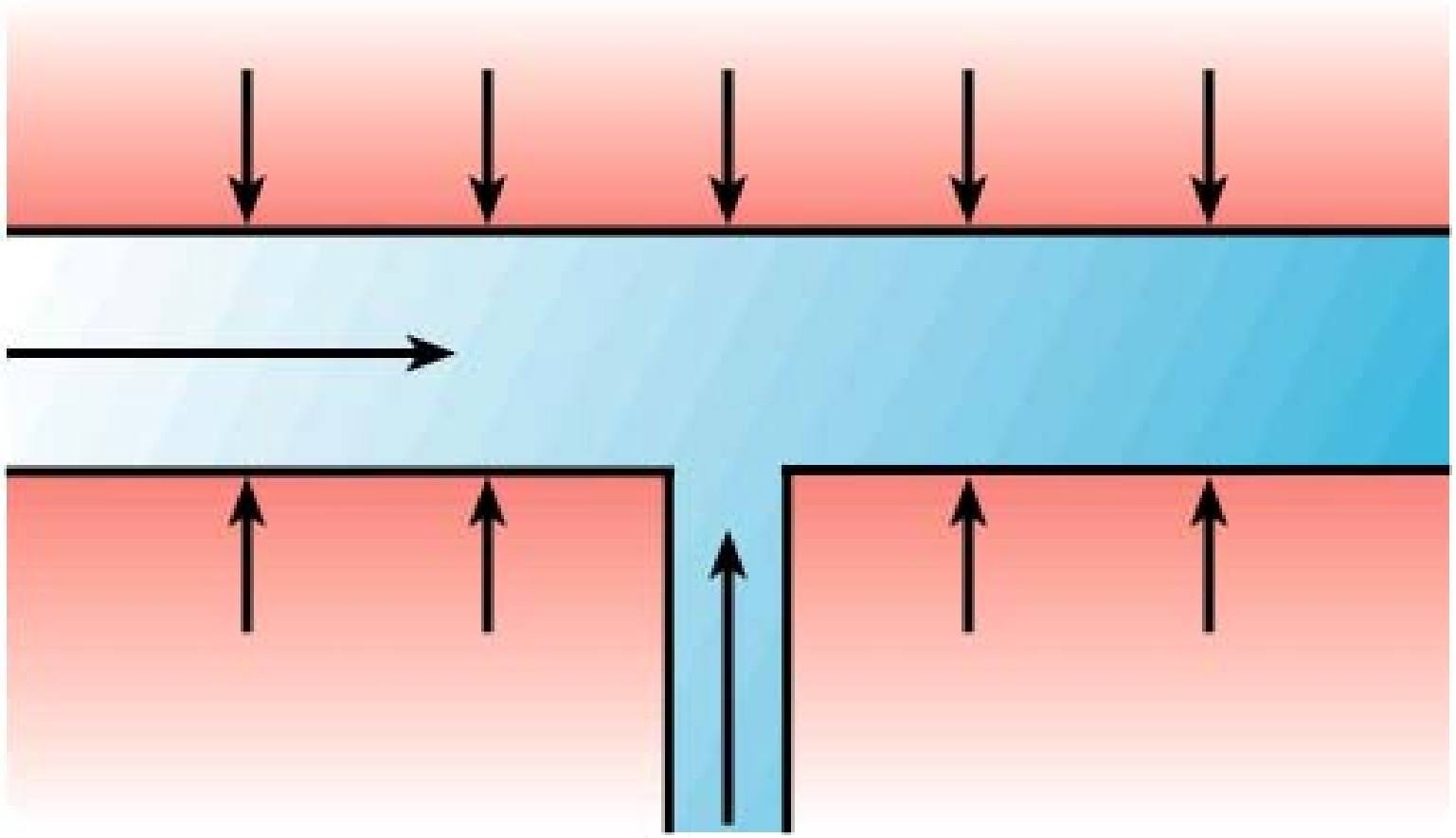
D6

Bernoulli Principle

- Causes an inward collapsing of a soft tube.
- Principle used in atomizers & carburetors.
- Could cause an elongation of any stretchable material inside the tube.

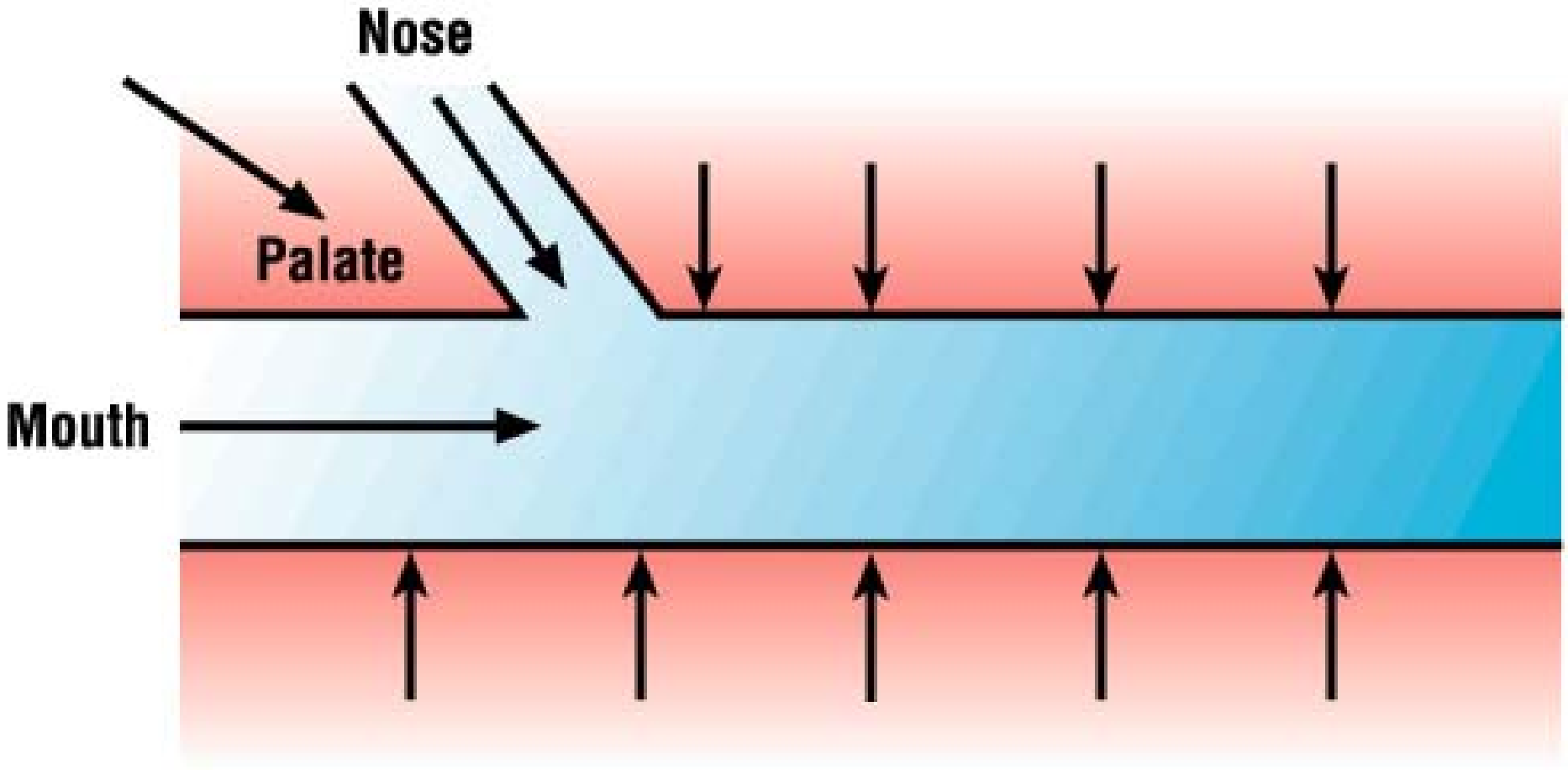
D8 Atomizer uses Bernoulli principle

Bernoulli Principle

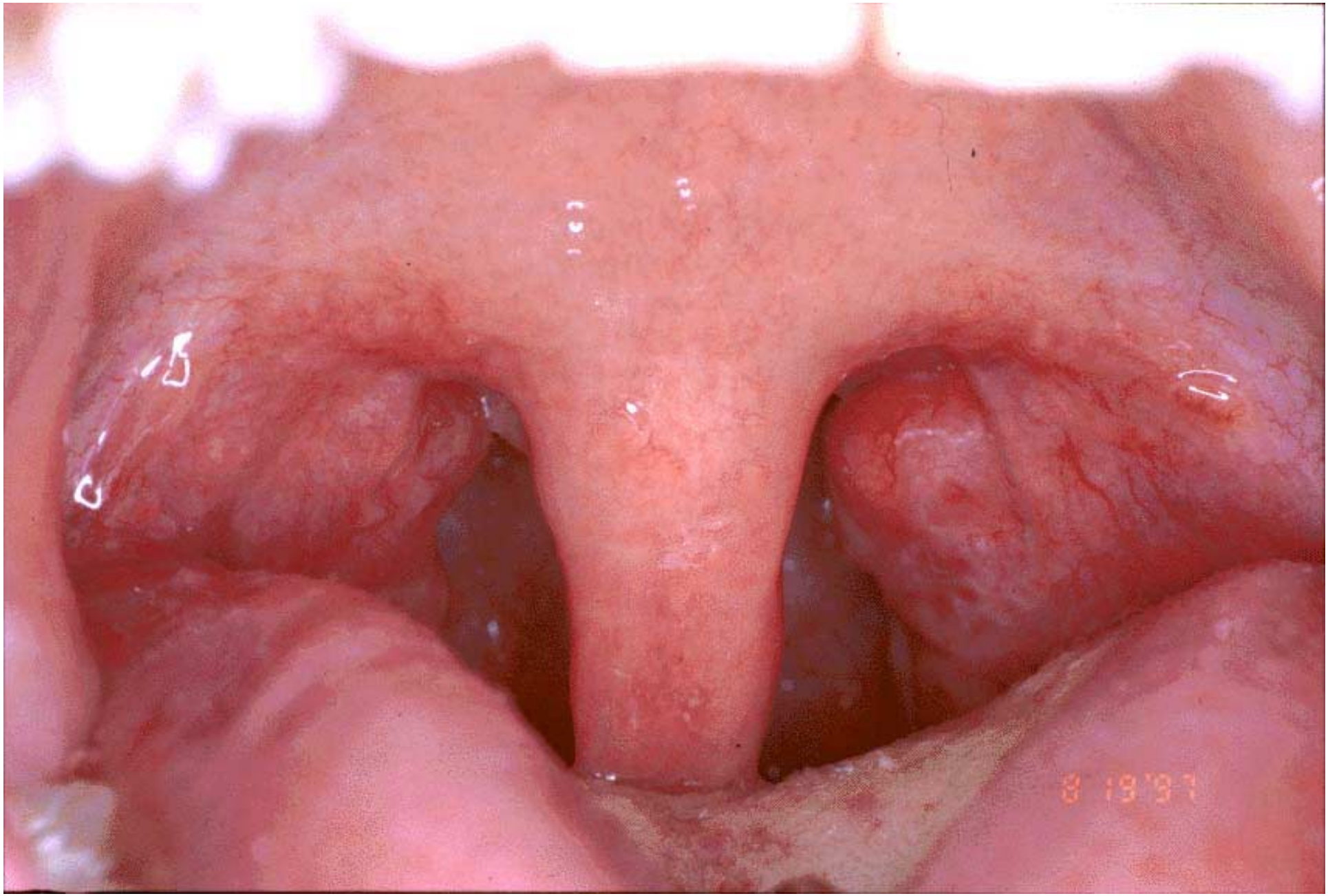


D9

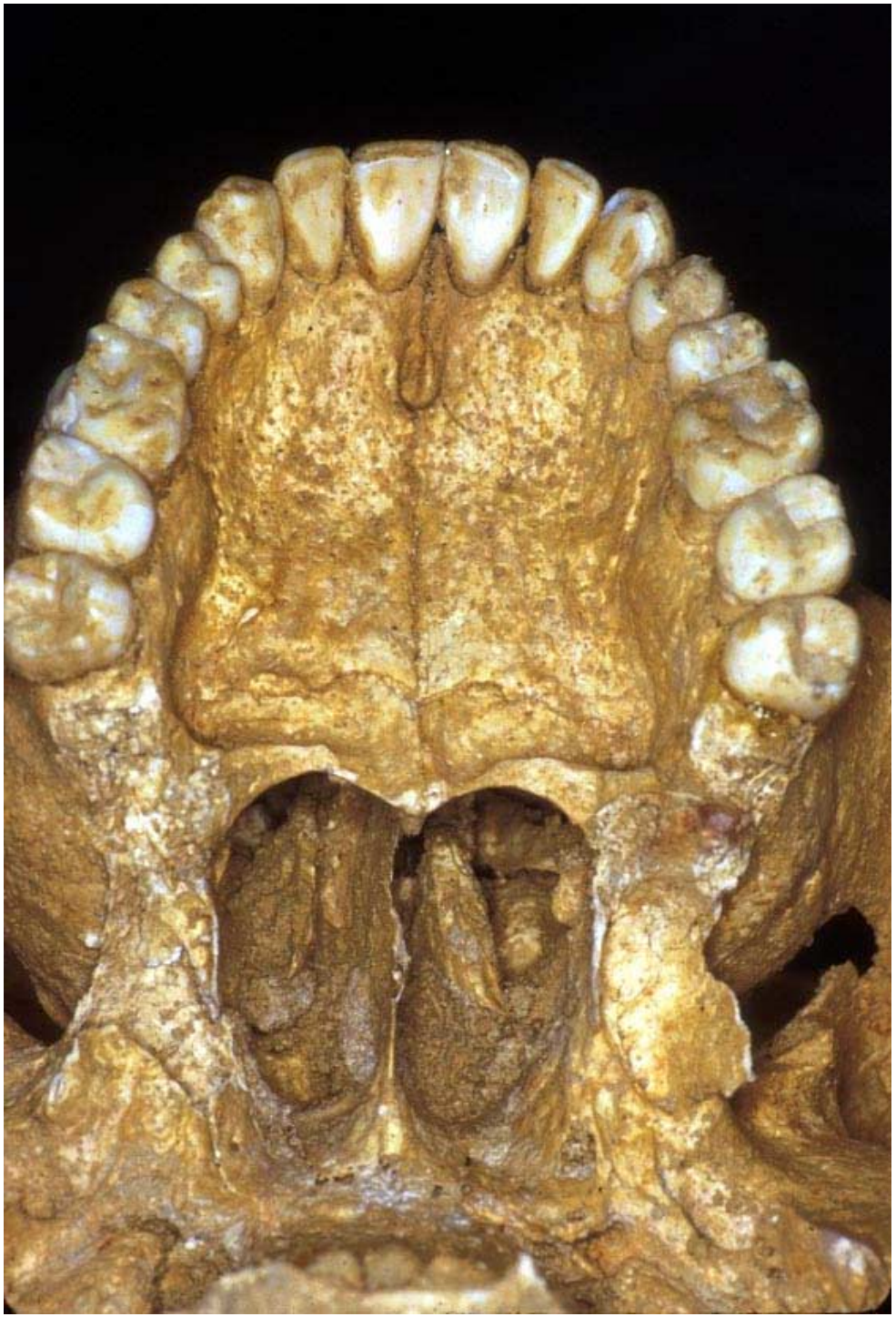
Bernoulli Principle



D10

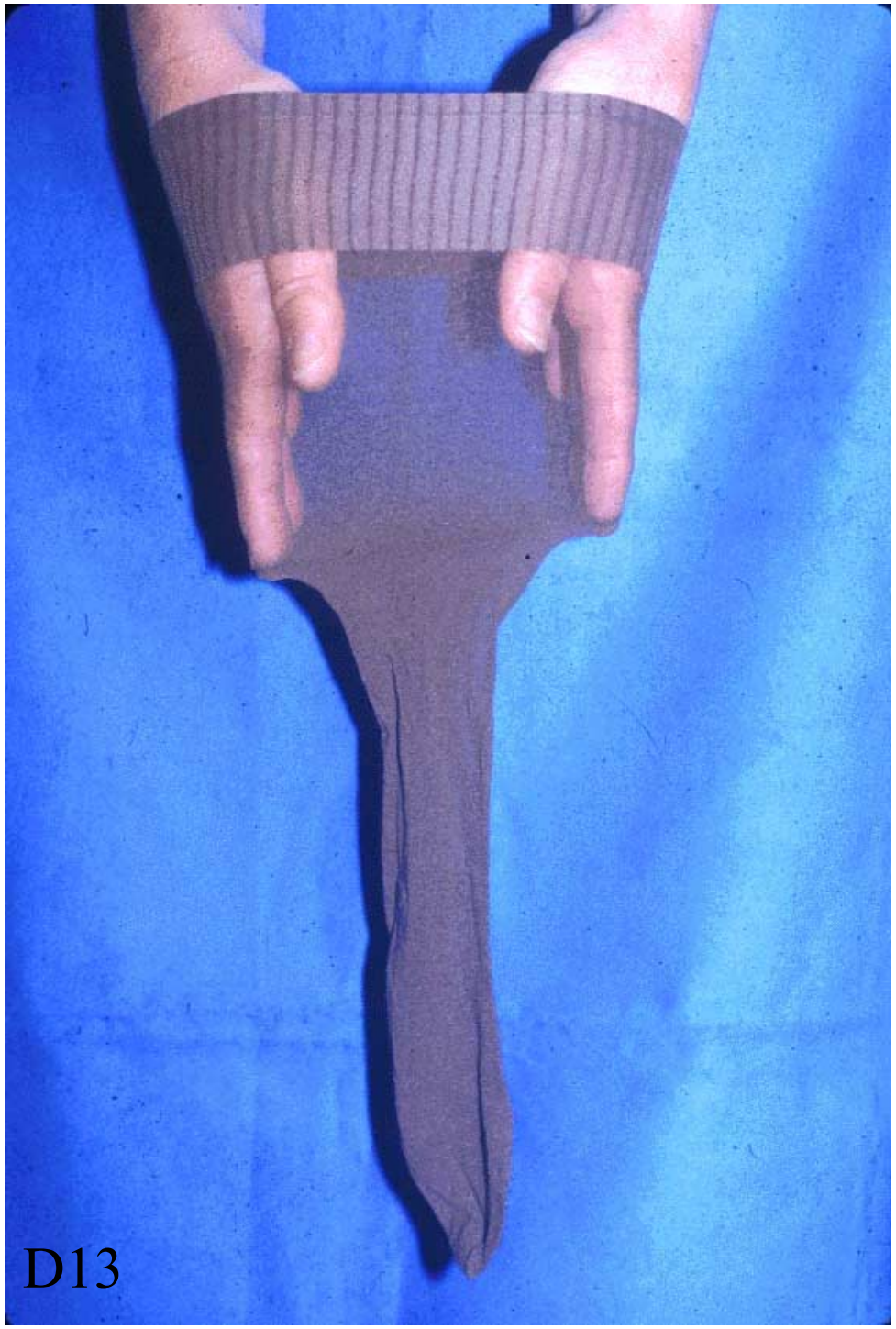


Elongated palate and uvula of a 14 year old with compromised airway D11



Prehistoric skull with wide palate and large posterior nasal aperture. There is also good width between the pterygoid plates. This allows for a wide beginning of the airway.

D12

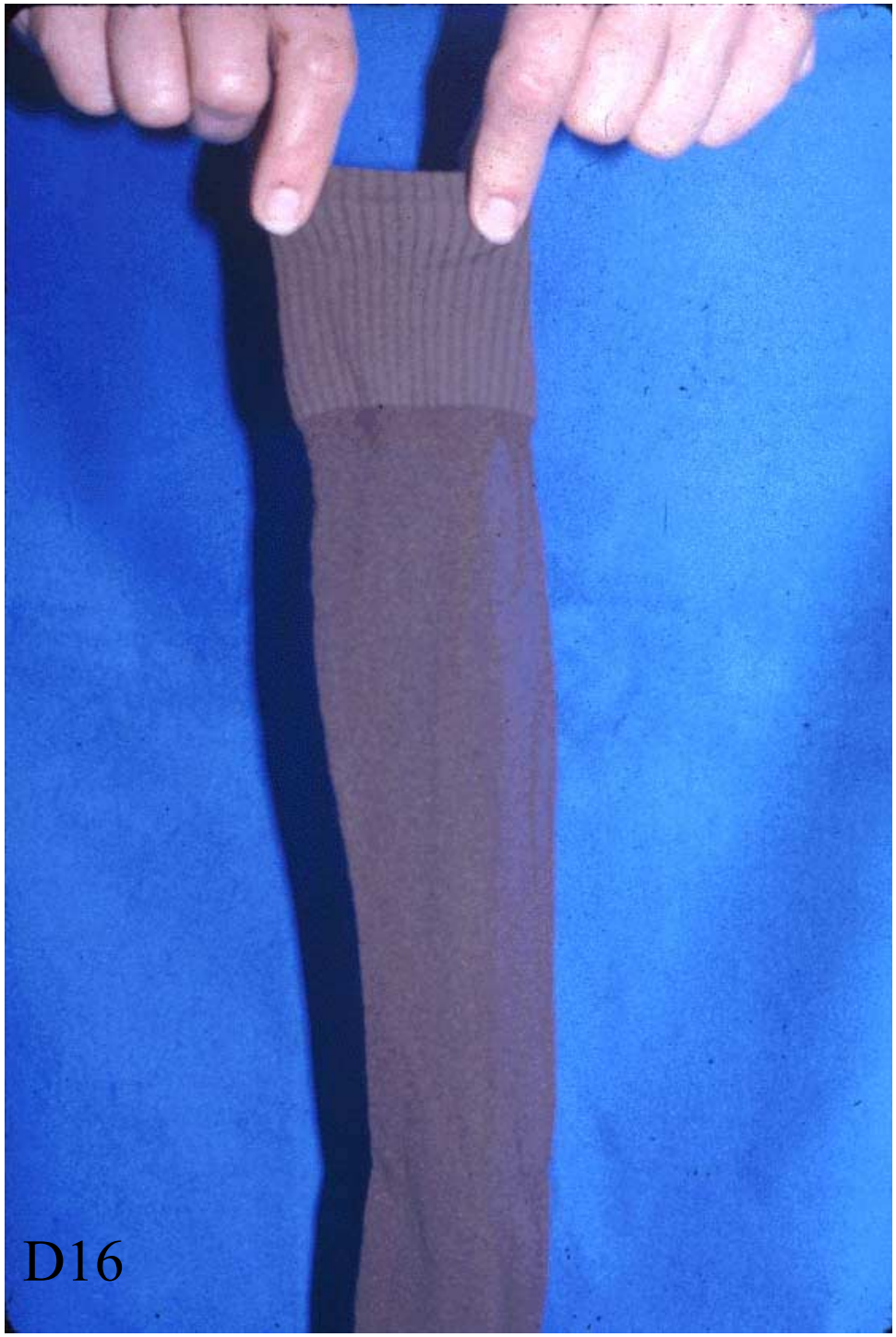


The wider the beginning of the airway, the less risk for collapse of the airway.

Skull from the 1940s demonstrating a high palate and narrow maxillary arch. Note small nasal aperture and less width between the pterygoid plates. This results in a narrow beginning of the airway - which creates a greater risk of airway collapse.

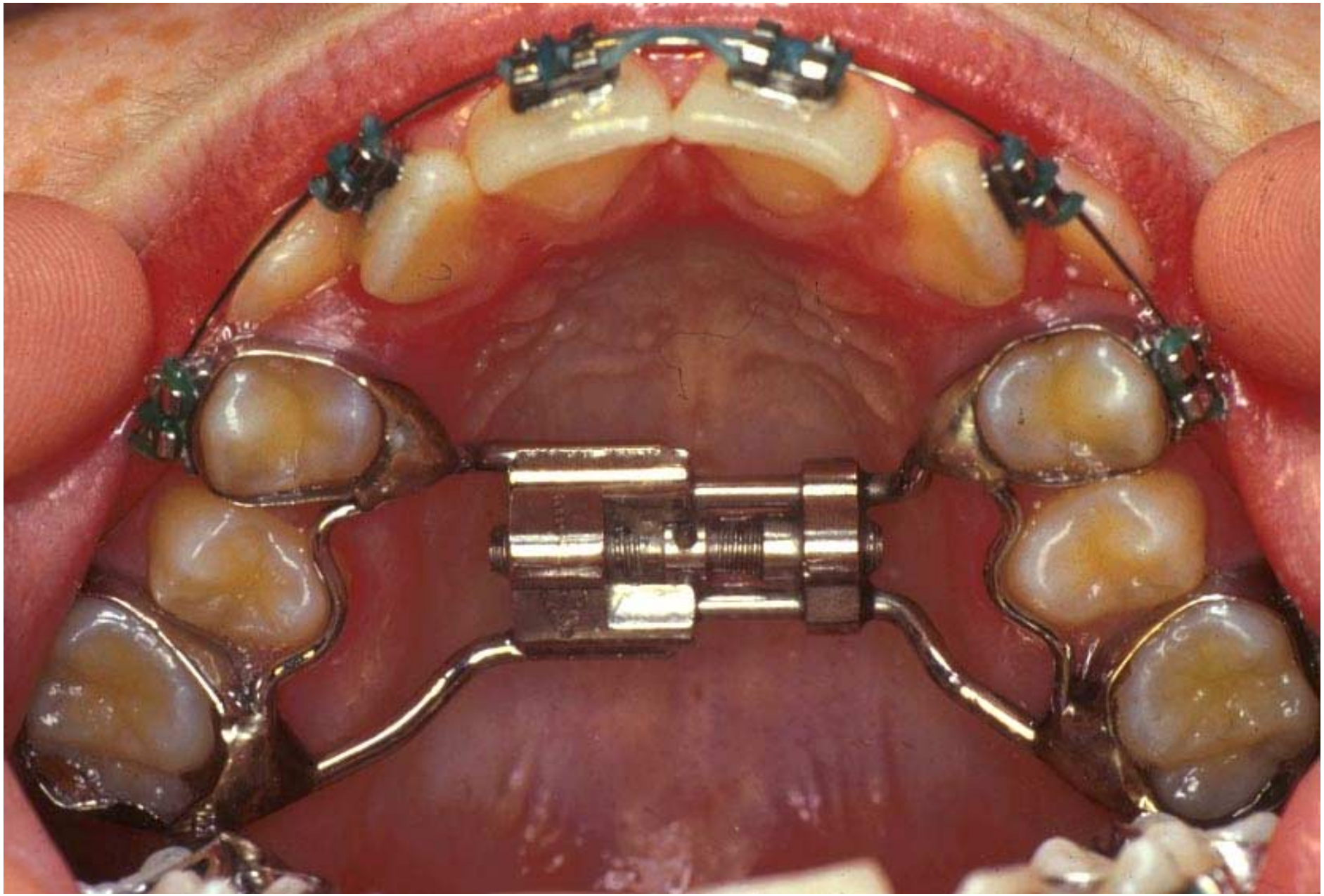
D14

D15 Close up of previous slide demonstrating narrow opening



The narrower the beginning of the airway, the greater the risk for collapse.

For example, a narrow skinny straw collapses a lot easier than a wide straw when drinking a milk shake.



D17 Rapid palatal expansion also expands the pterygoid plates

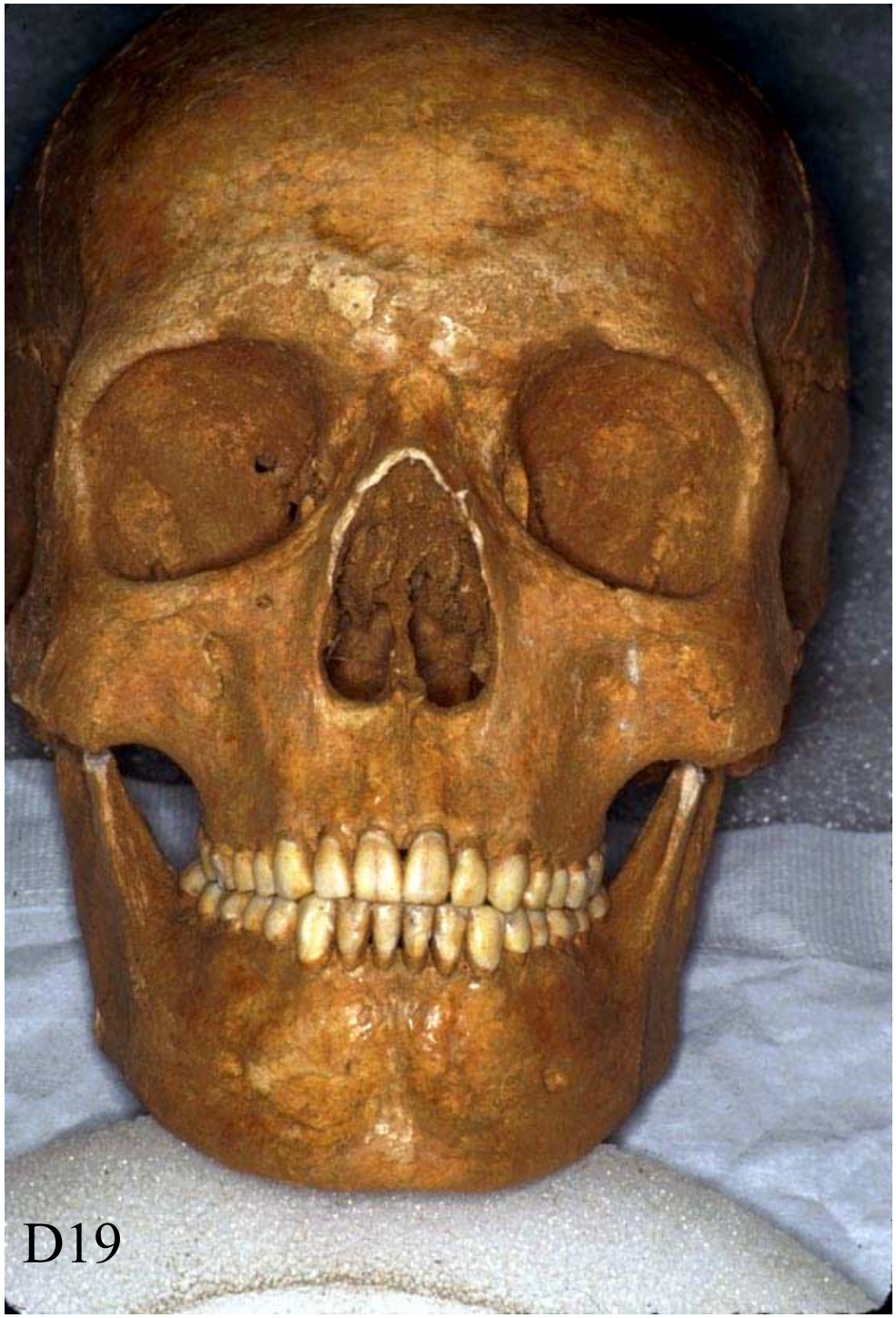
Hypothesis:
Prehistoric man did not have OSA

In prehistoric skulls you rarely find:

- High palates
- Narrow arches
- Overjets
- Non pathologic malocclusions

You do find, however:

- Large posterior nasal apertures or choanae



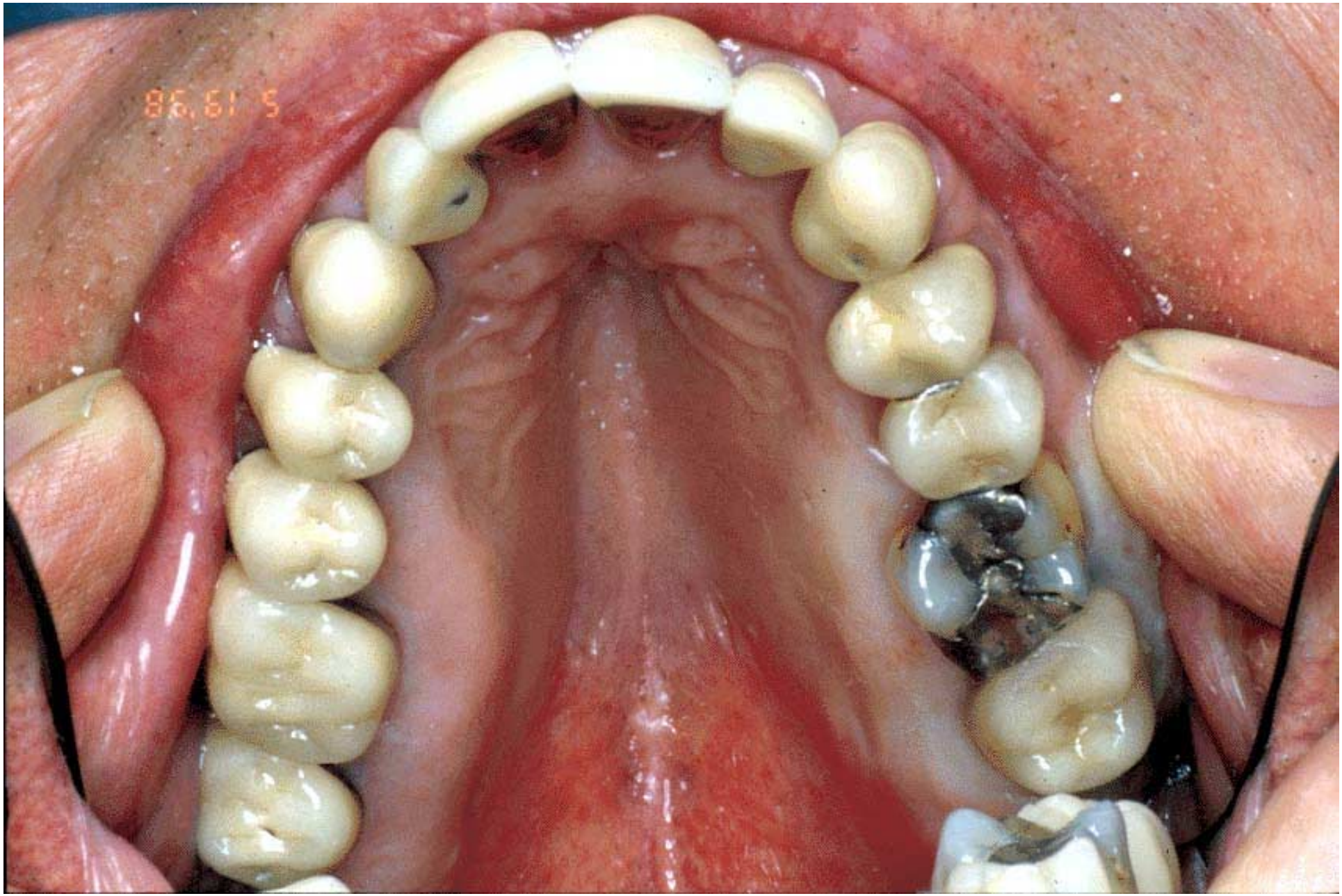
Prehistoric skull has good facial form, beautiful dental occlusion and no dental decay. There were no options except to breastfeed during that era.

D20 Classic prehistoric skull with wide palate and arch

Prehistoric skull with wide palate and large posterior nasal aperture.

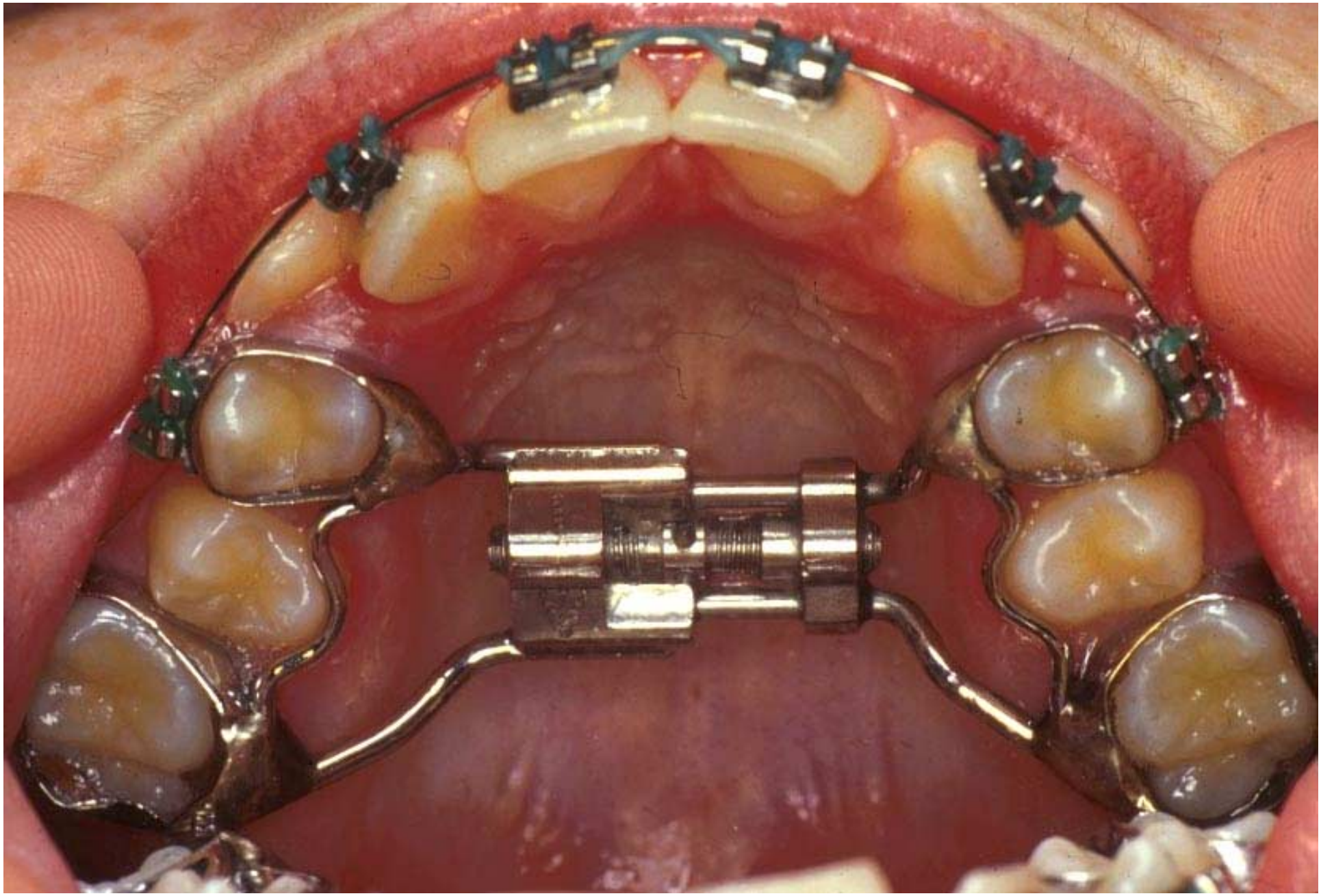
D21

D22 Classic wide prehistoric mandibular arch - has good tongue space.



D23 Modern high palate and narrow arch

D24 Modern (1940) high palate / small posterior aperture



D25 Rapid palatal expansion - a fairly common orthodontic procedure

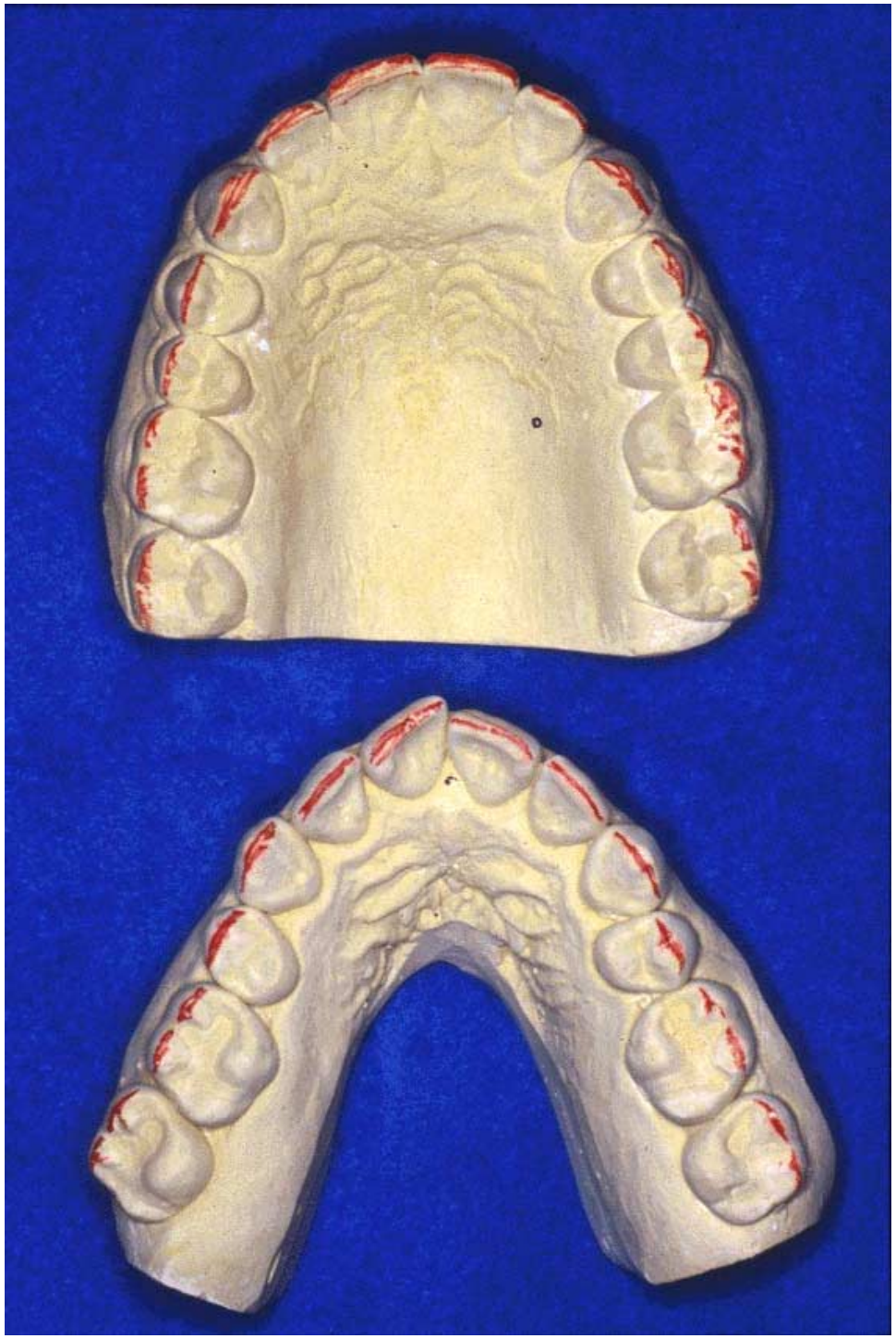
Hypothesis

Breastfeeding reduces the risk of Obstructive Sleep Apnea

Brian Palmer, D.D.S, 2001

Breastfeed babies have a better chance of having a good natural palate and arch width like this prehistoric skull.

D27



Ideal wide palate and nice “U” shaped arch of an adult that was breastfed.

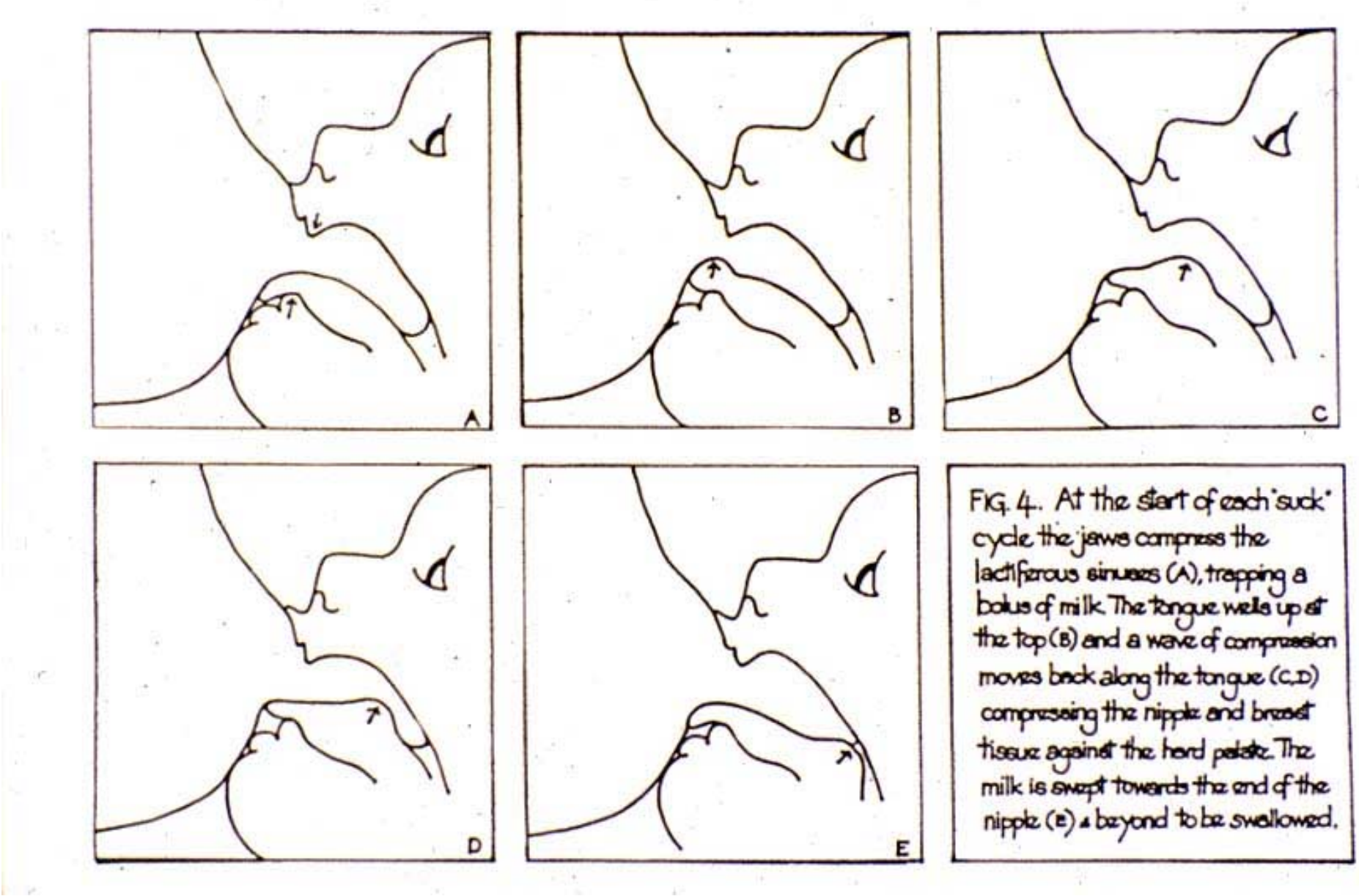
Narrow “V’ shaped maxillary arch and high palate of an adult that was bottle fed and was a thumb sucker.

D28

Labbok / Hendershot article:

- Principle finding - the longer the duration of breastfeeding, the lower the incidence of malocclusion.
- Bottle feeding leads to a habit of forward tongue thrusting and a weakened development of the orbicularis muscles.
- There is a significant decrease in tongue thrusting with an increased duration of breastfeeding .

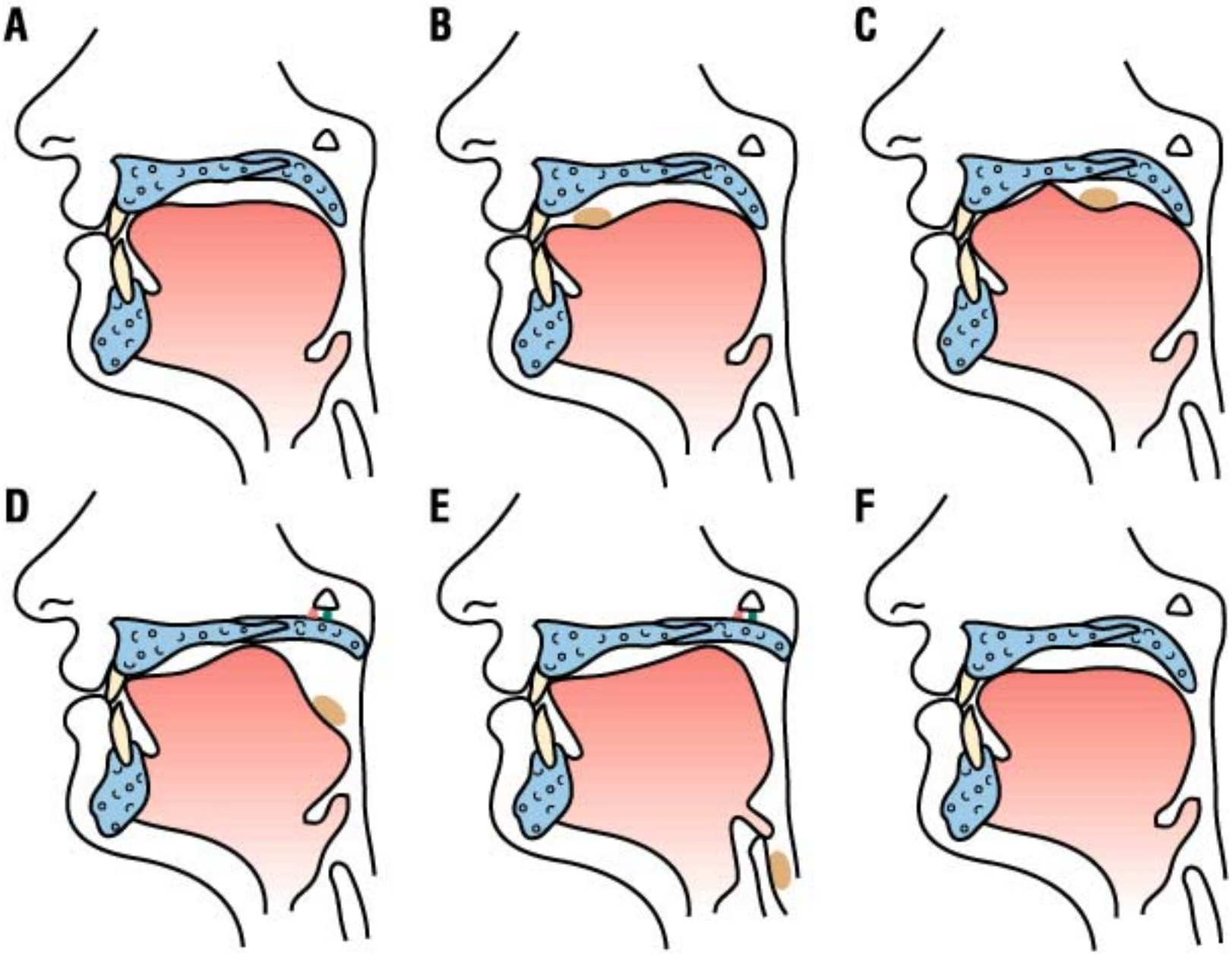
Labbok M et al. Does breast-feeding protect against malocclusion? Am J Prev Med, 1987;3(4):227-32



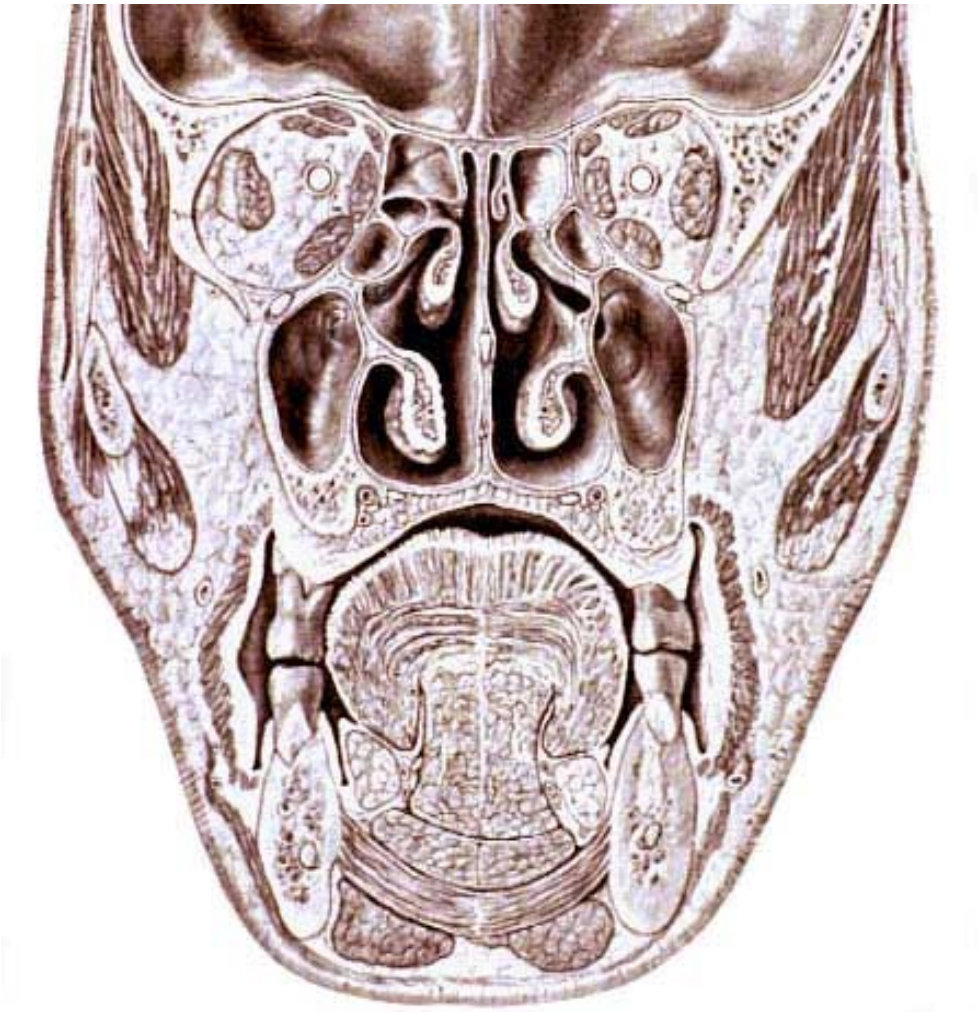
During breastfeeding, the proper tongue action is developed

D30

Adult Swallow



D31

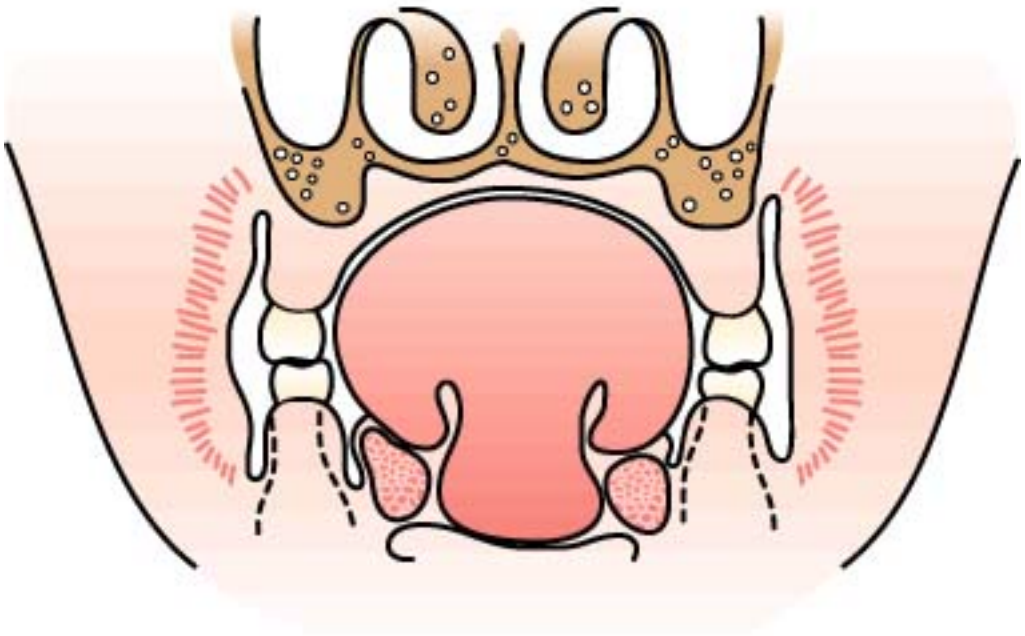


Tongue / teeth / cheeks are at rest in a “neutral” position. There are no abnormal forces within the mouth. This allows for the proper alignment of the teeth and dental arches.

This also allows for normal face development. Will discuss in another presentation on “long face syndrome”.

D32

Tongue at Rest



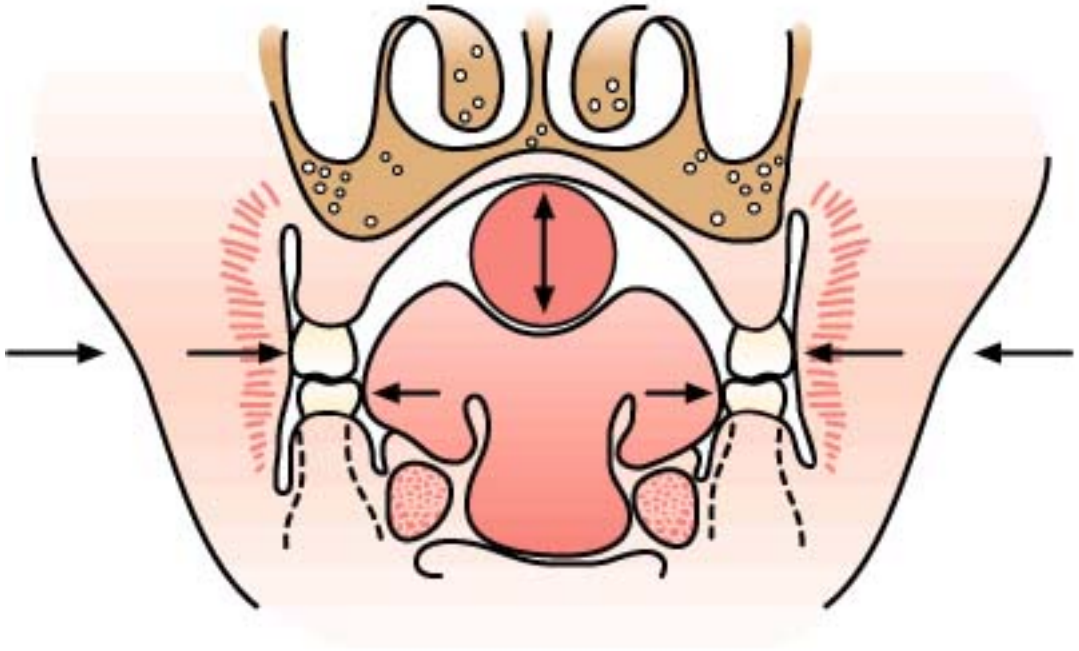
While at rest, the tongue does not exert abnormal forces on any of the structures within the oral cavity. The teeth remain in a stable position because they are in a “neutral zone” between the tongue and cheeks.

D33

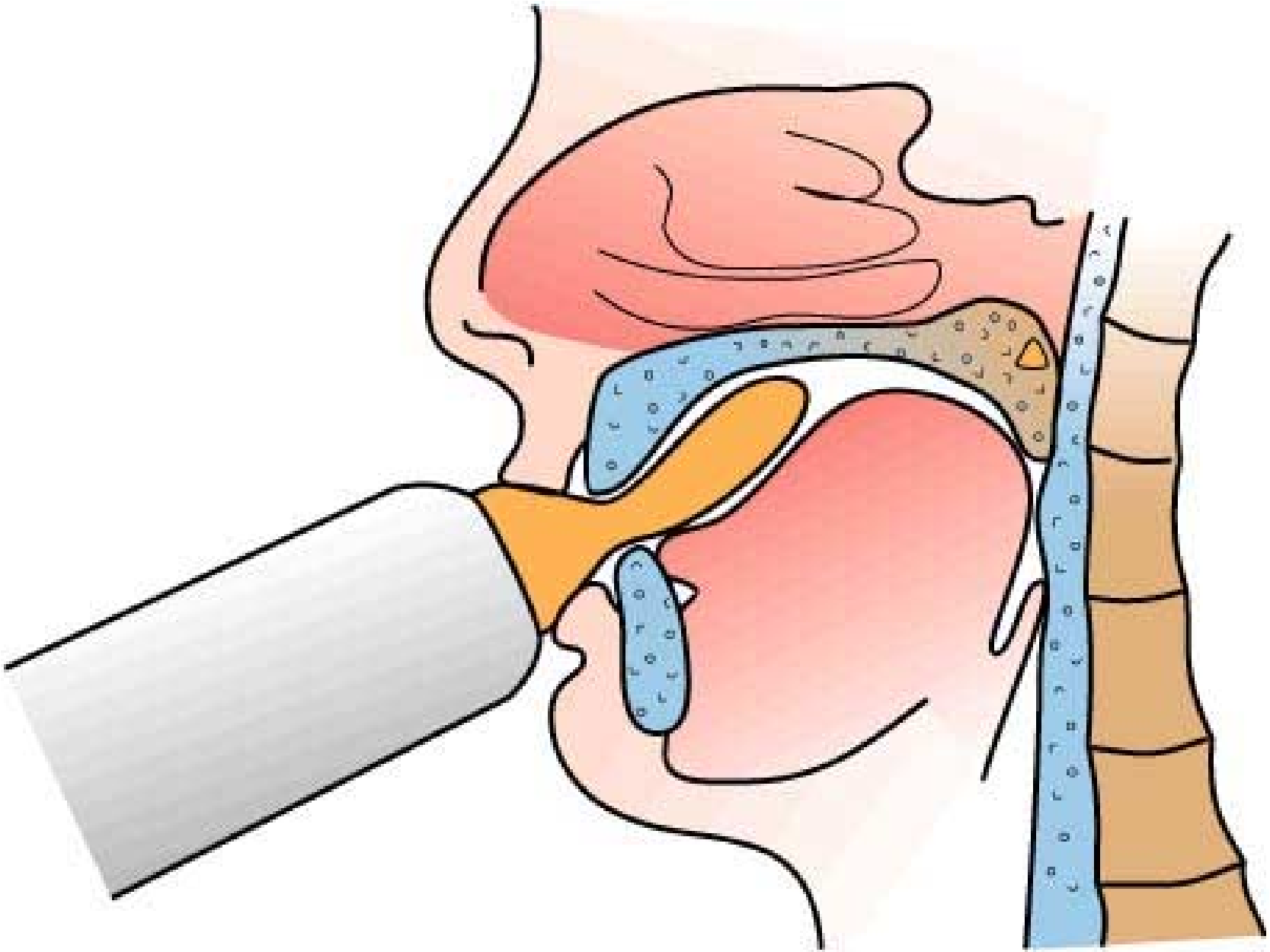
Tongue Position While Breastfeeding

During breastfeeding, the breast (breast/nipple) adapts to the shape of the mouth. The peristaltic motion of the tongue during breastfeeding, presses the breast up against the palate.

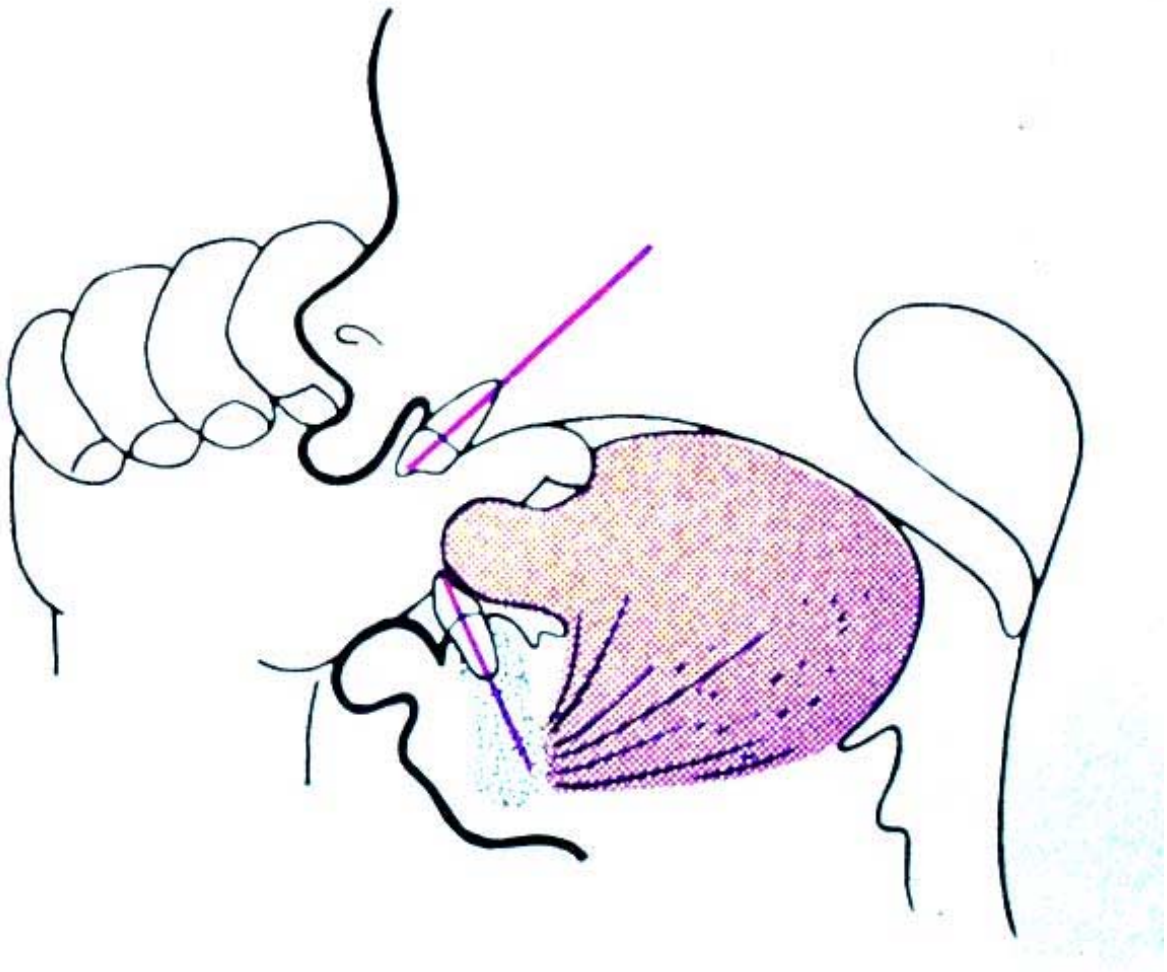
Pacifier / Bottle Nipple



The mouth has to adjust to any object in the mouth other than the breast. The unnatural forces that can develop can impact the position of the teeth and shape of the palate. Muscle forces always win out over bone. - e.g.- teeth will be moved.

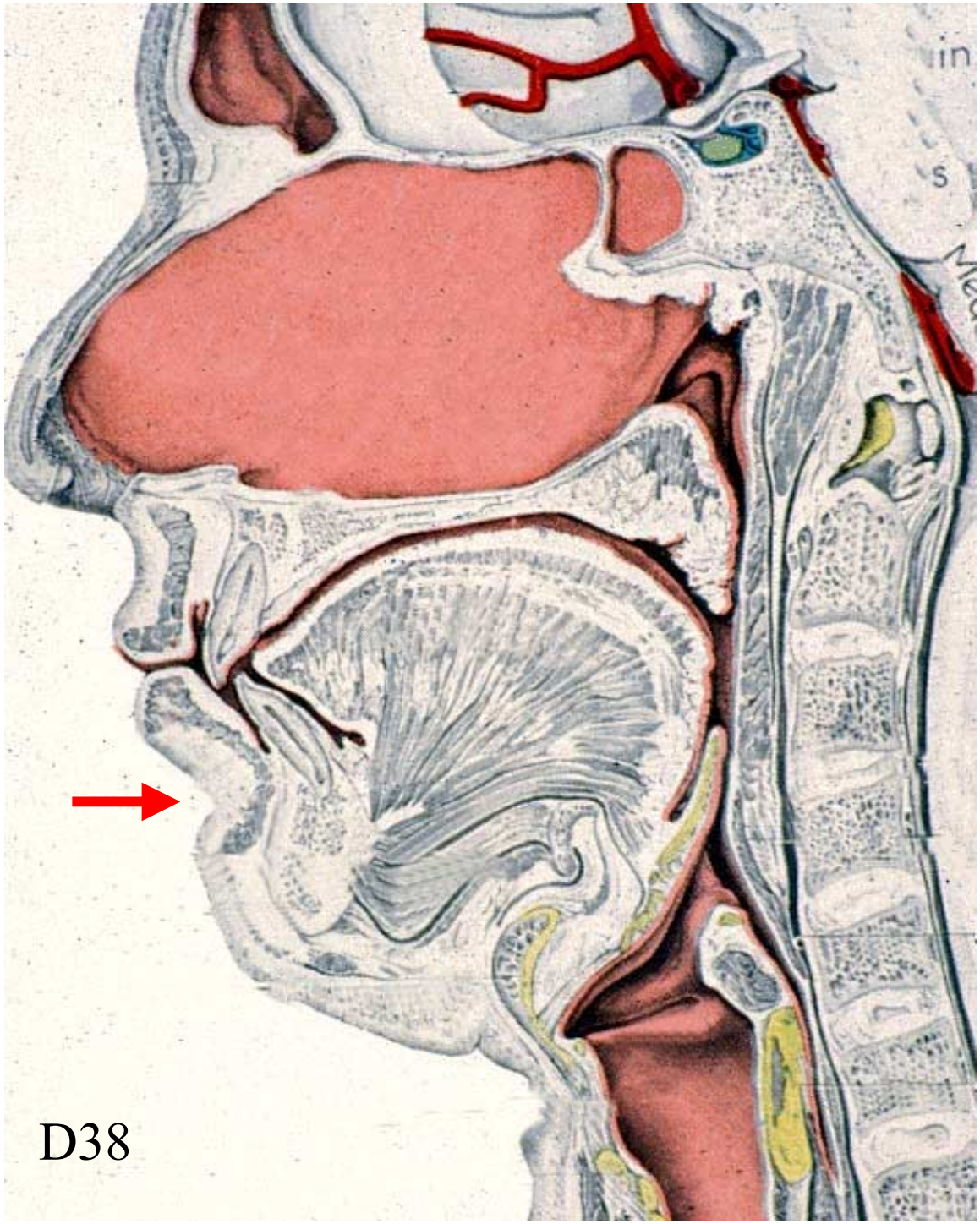


Bottles can impact the shape of the mouth and the action of the tongue D36



Excessive thumb sucking can also impact oral shape and muscular action of the tongue.

D37



D38

A retruded mandible can drive tongue back into throat and can block off airway. A retruded tongue can also elevate the soft palate which in turn can block off the airway and eustachian tubes.

Cadaver dissection demonstrating airway, tongue position, soft palate, eustachian tubes, epiglottis and turbinates.

Reasons for the collapse of the Oral Cavity and Airway Space

- Improper feeding - artificial bottles and nipples
- Noxious habits - pacifiers, excessive digit sucking, lip sucking, blanket sucking, etc.
- Grossly enlarged tonsils, adenoids.
- Macroglossia and ankyloglossia
- Facial-skeletal growth abnormalities
- CNS dysfunctions affecting facial muscles
- Drugs - sugar might be considered in this category

Prevention is better than treatment!

Early diagnosis and treatment
is the best prevention of
obstructive sleep apnea (OSA)

Basic Principle

Overall health

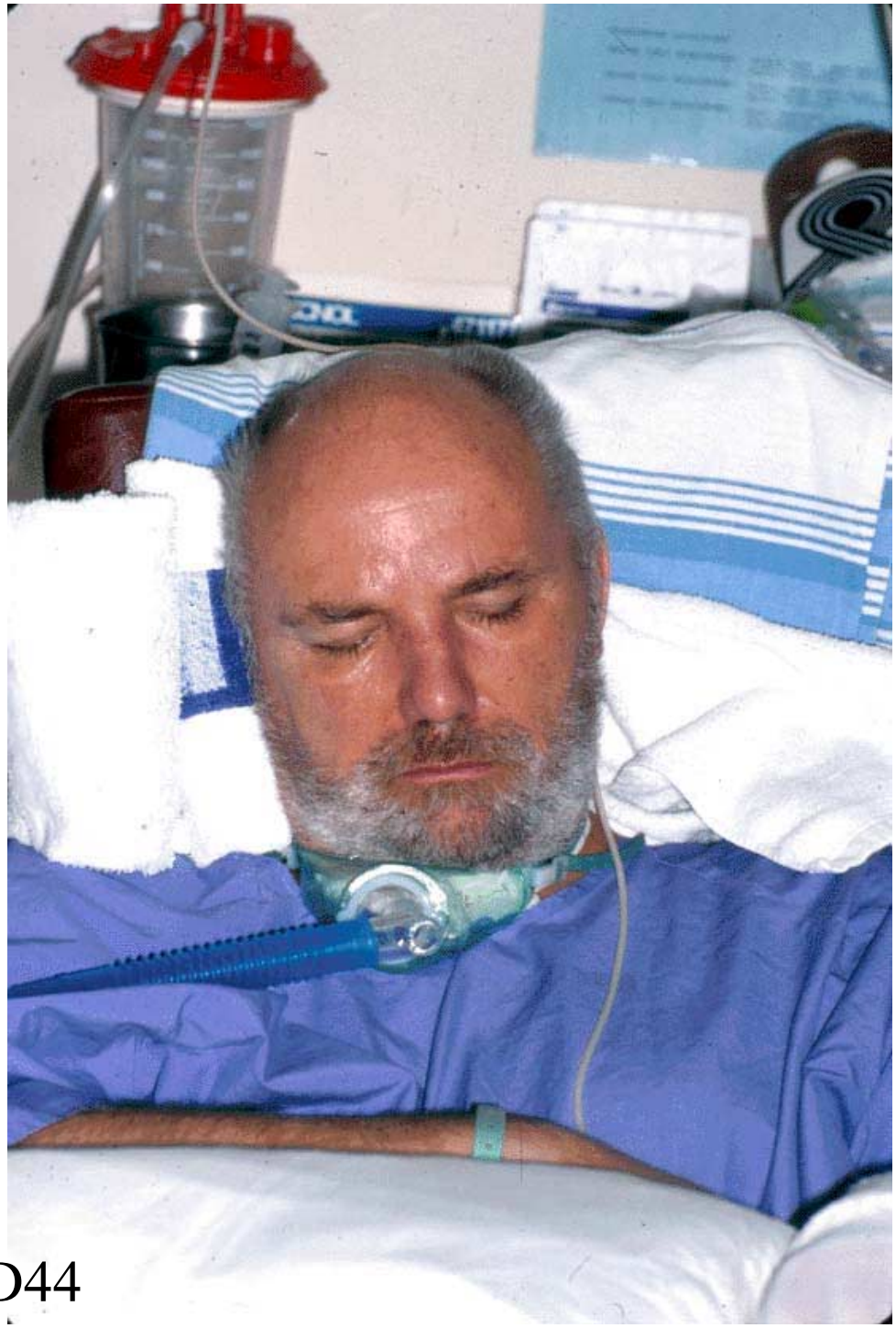
is directly related to the

EASE OF BREATHING

Cost of OSA on health care dollars

Conclusion: OSA patients are heavy users of health care resources 10 years prior to their diagnosis.

Ronald J. et al. Obstructive sleep apnea patients use more health care resources ten years prior to diagnosis. Sleep Research Online, 1998; 1(1):71-74. www.sro.org



My brother had a stroke in 1995. One of the main contributing factors was his untreated obstructive sleep apnea. He needed a tracheotomy. He no longer has the tracheotomy, but he is in a long term care facility and will never get out.

This one case of untreated OSA has cost thousands of dollars to the health care industry.

Don’t let this happen to you!

D44

Craniofacial Development

- Largest increase occurs within the first 4 years of life.

- Is 90% complete by 12 years of age.

Shepard, J. et al. Evaluation of the Upper Airway in Patients with OSA. *Sleep* 1991, 14(4):361-71. (Research done at Mayo)

AAPD Vision Statement - 1996

- “89% of youth, ages 12 - 17 years, have some occlusal disharmony.”

- “16% of youth have a severe handicapping malocclusion that requires mandatory treatment.”

Pediatr Dent, Spec Edition: Ref Manual 1995-96, 17(6).

Incidence of malocclusions in infants

Malocclusion was found in 35% of 3-year-old children

- anterior open bites in 27%
- unilateral cross bites in 8%

Paunio P et al. The Finnish competence study: The effects of living conditions on sucking habits in 3-year-old Finnish children and the association between these habits and dental occlusion. Acta Odontol Scand 1993; 51(1):23-29.

Impact of infant sucking habits

- Digit and dummy sucking resulted in increased tendency to tongue thrust.
- Tongue thrust related to: open bites, overjet, and Class II malocclusion.
- Sucking habits influence the etiology of malocclusion

Melsen B, et al., Sucking habits and their influence on swallowing pattern and prevalence of malocclusion; European J of Orthodont, 1979, 1(4):271-280.

Stanford Morphometric Model

$$P + (Mx - Mn) = 3 \times OJ + 3x (BMI - 25) \times (NC/BMI)$$

P = palatal height

Mx = maxillary intermolar distance

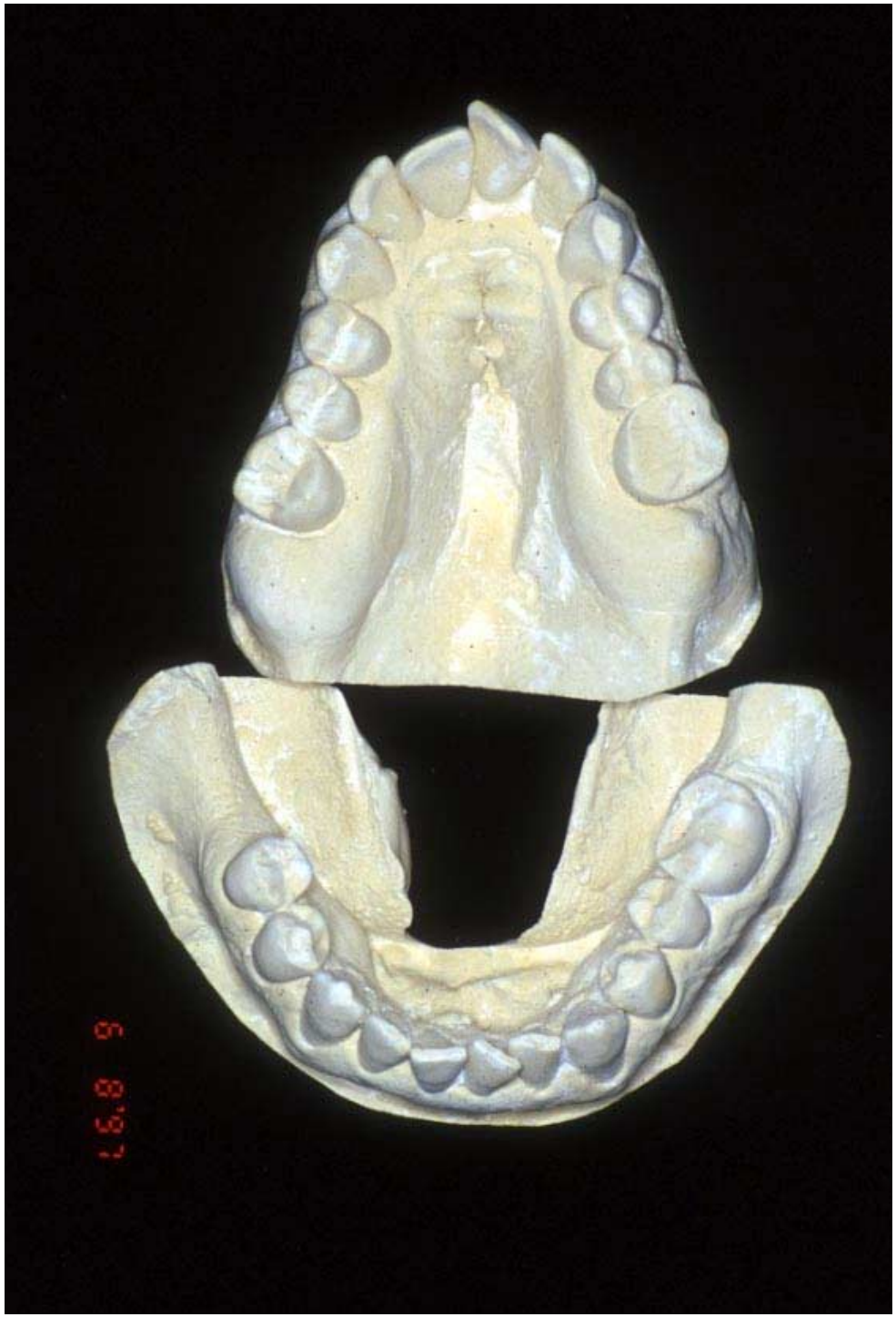
Mn = mandibular intermolar distance

OJ = overjet

NC = neck circumference

BMI = body mass index

"Model has clinical utility and predictive values for patients with suspected obstructive sleep apnea"

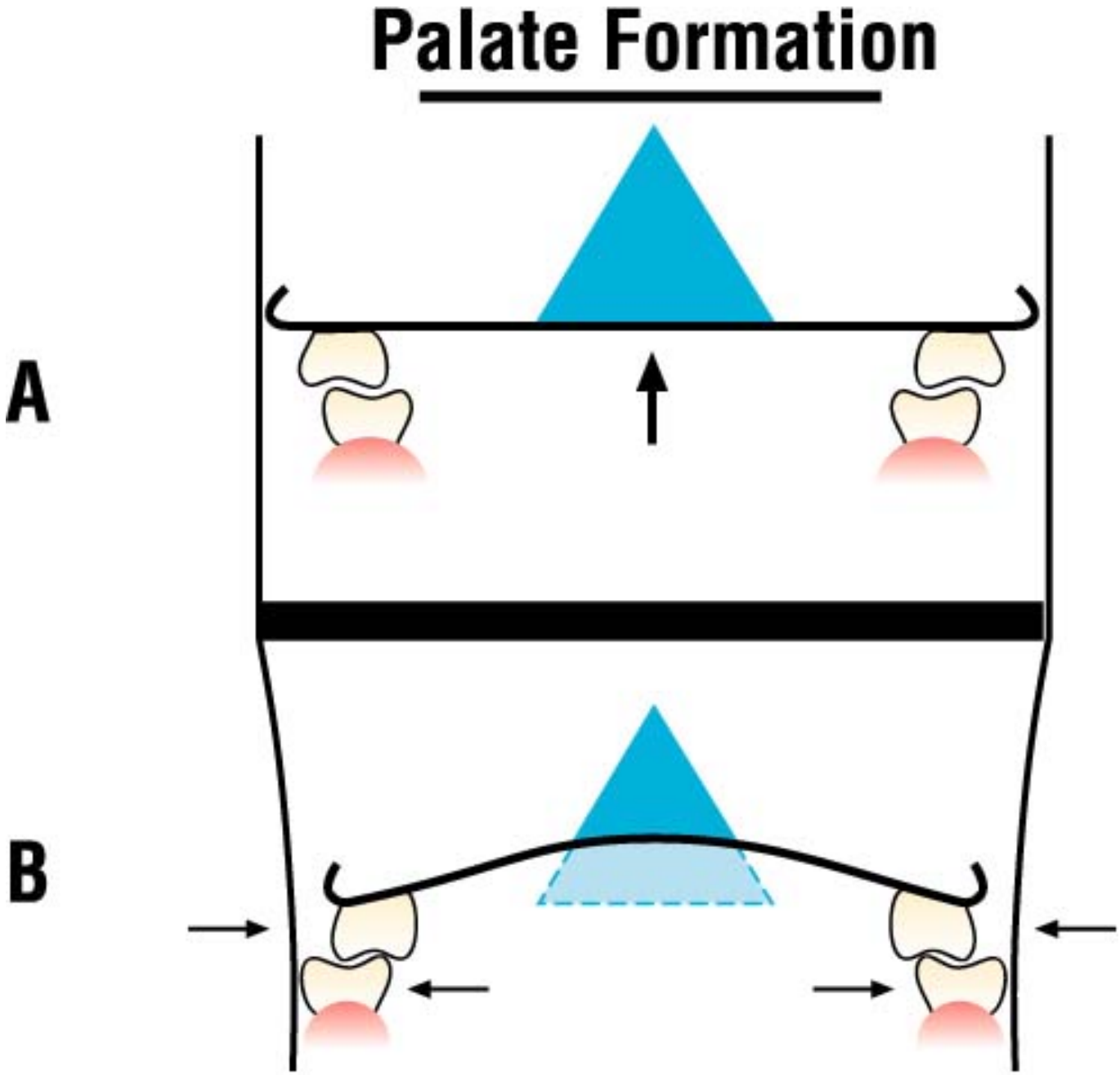


Models demonstrating a high palate and narrow upper dental arch

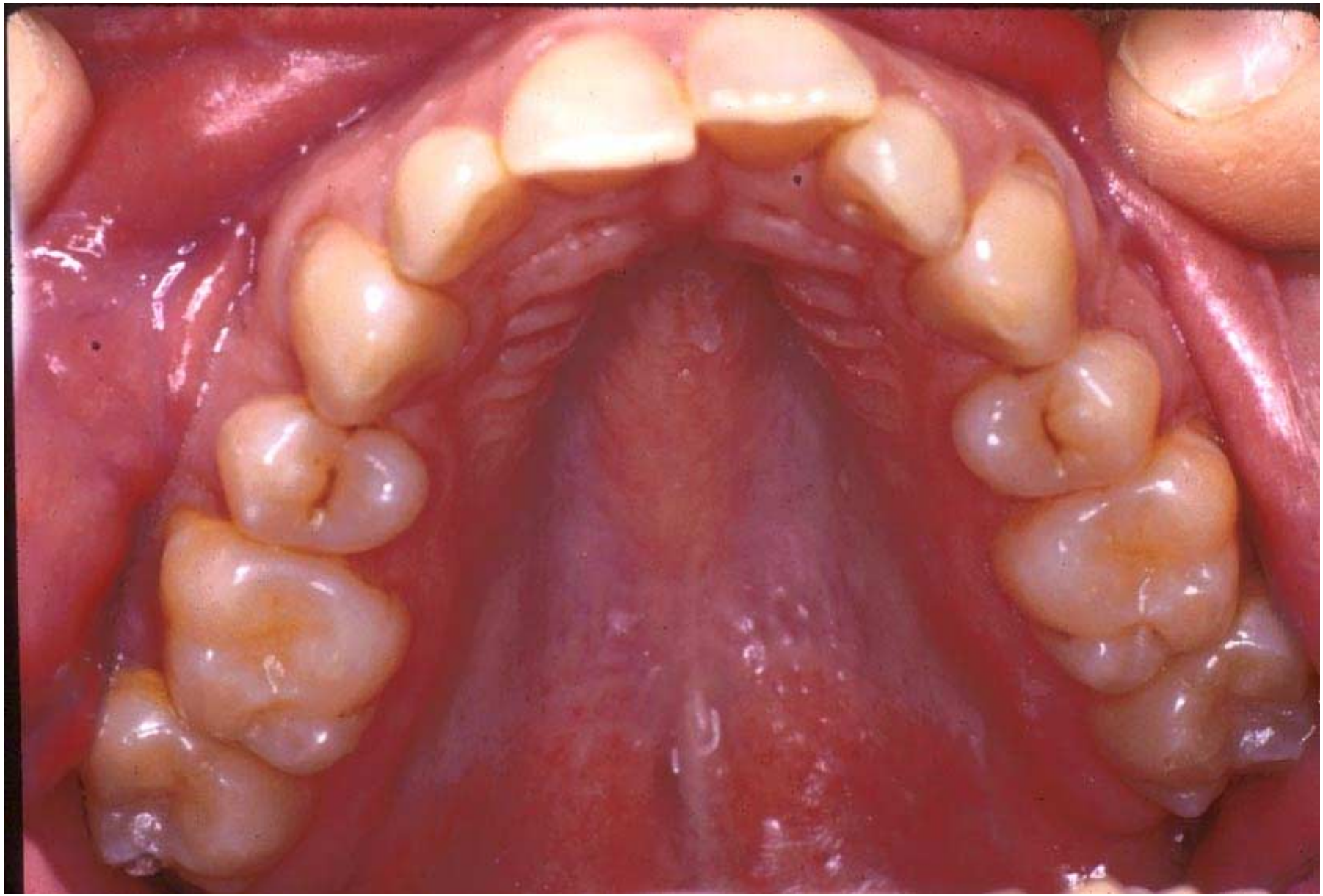
D50

Skull demonstrates how a high palate and narrow arch results in a small posterior nasal aperture.

D51

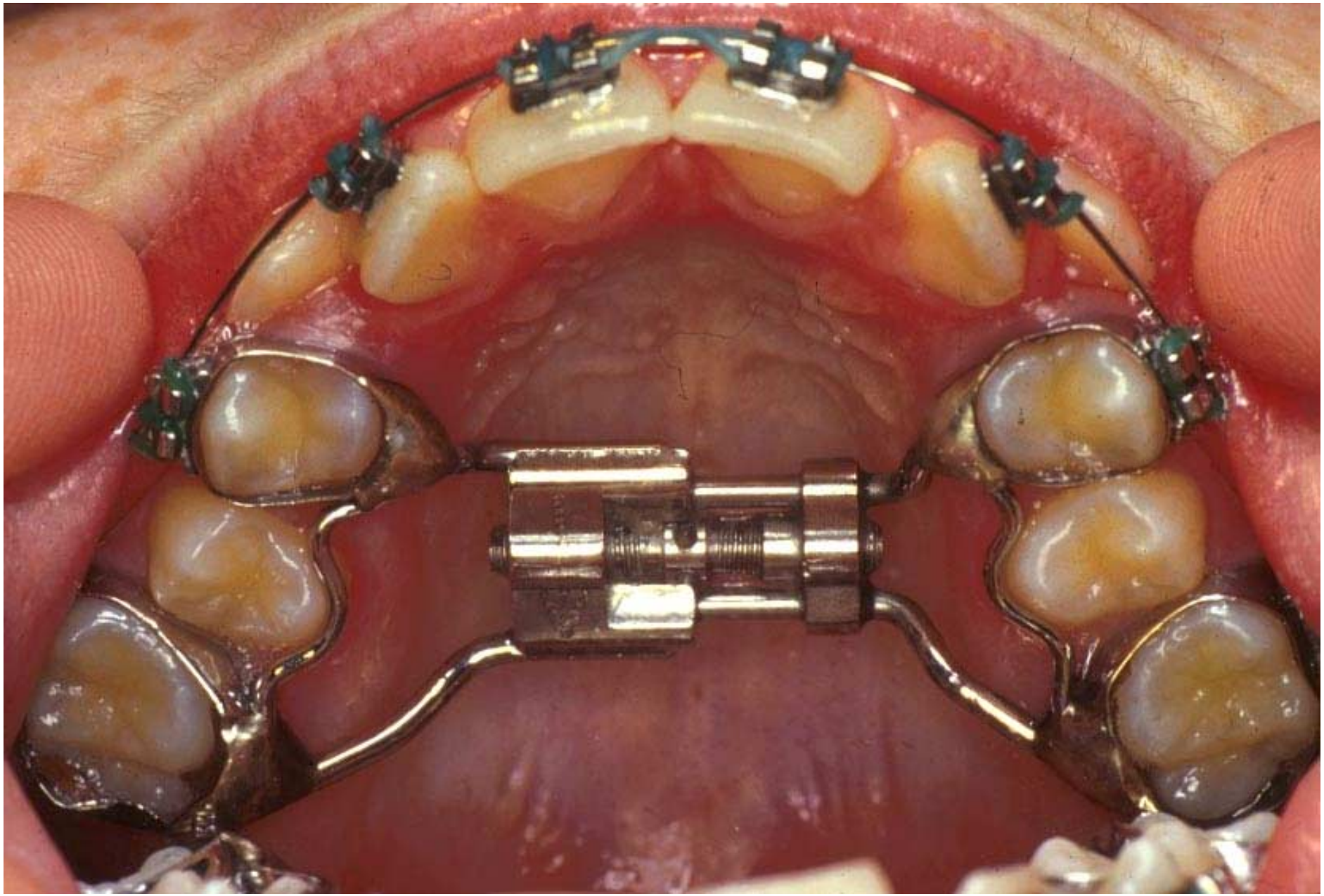


D52 Understand the significance of a high palate and what causes it



Do not take out bicuspids for orthodontic reasons unless absolutely necessary - get 2nd opinions

D53

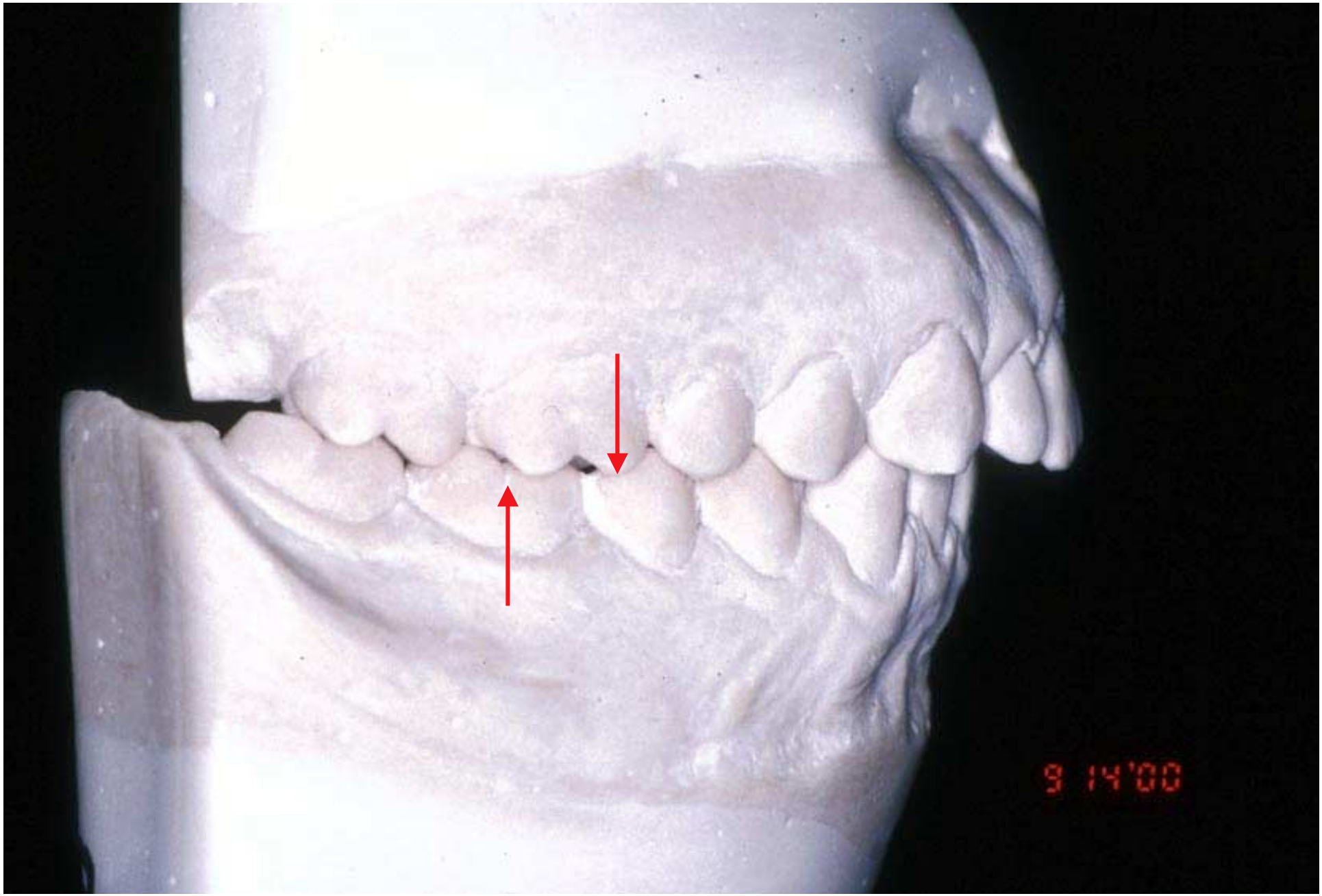


D54

Palatal expansion BEFORE mid line suture fuses

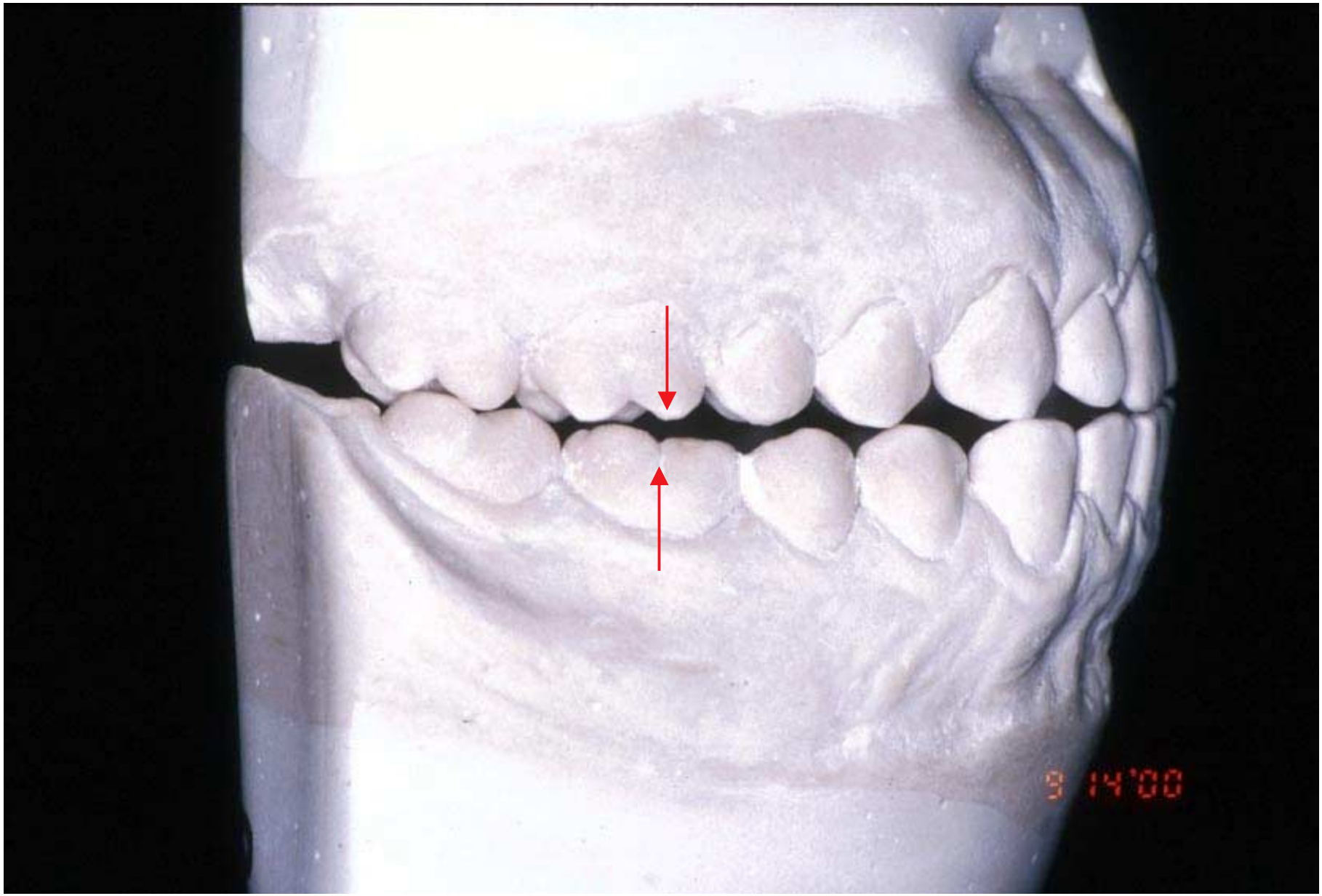
By using rapid palatal expansion you not only get a widening of the palate, but you can also get an enlargement of the nasal cavity and a widening of the pterygoid plates - with resultant enlargement of the posterior nasal aperture as seen on this skull.

D55

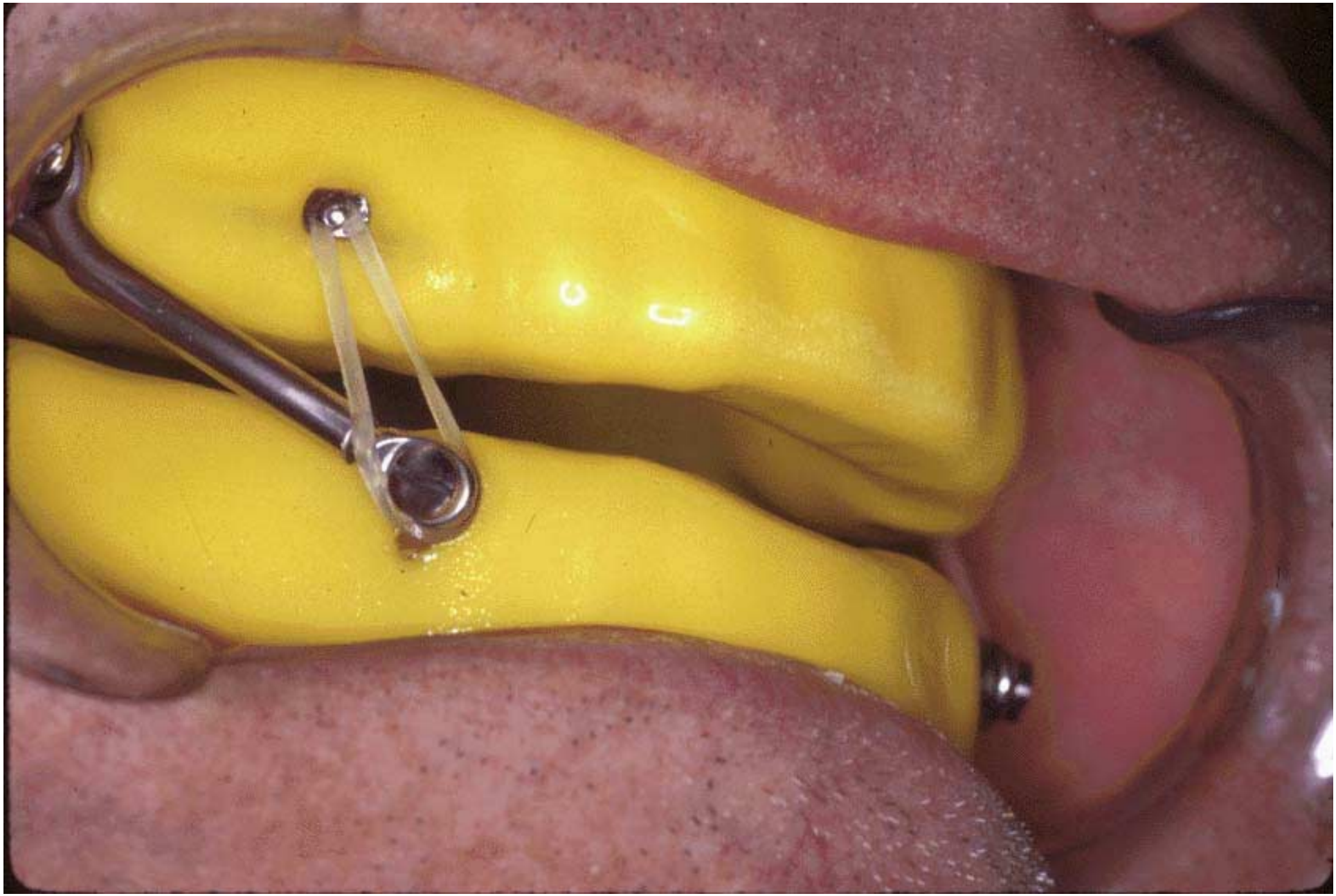


D56

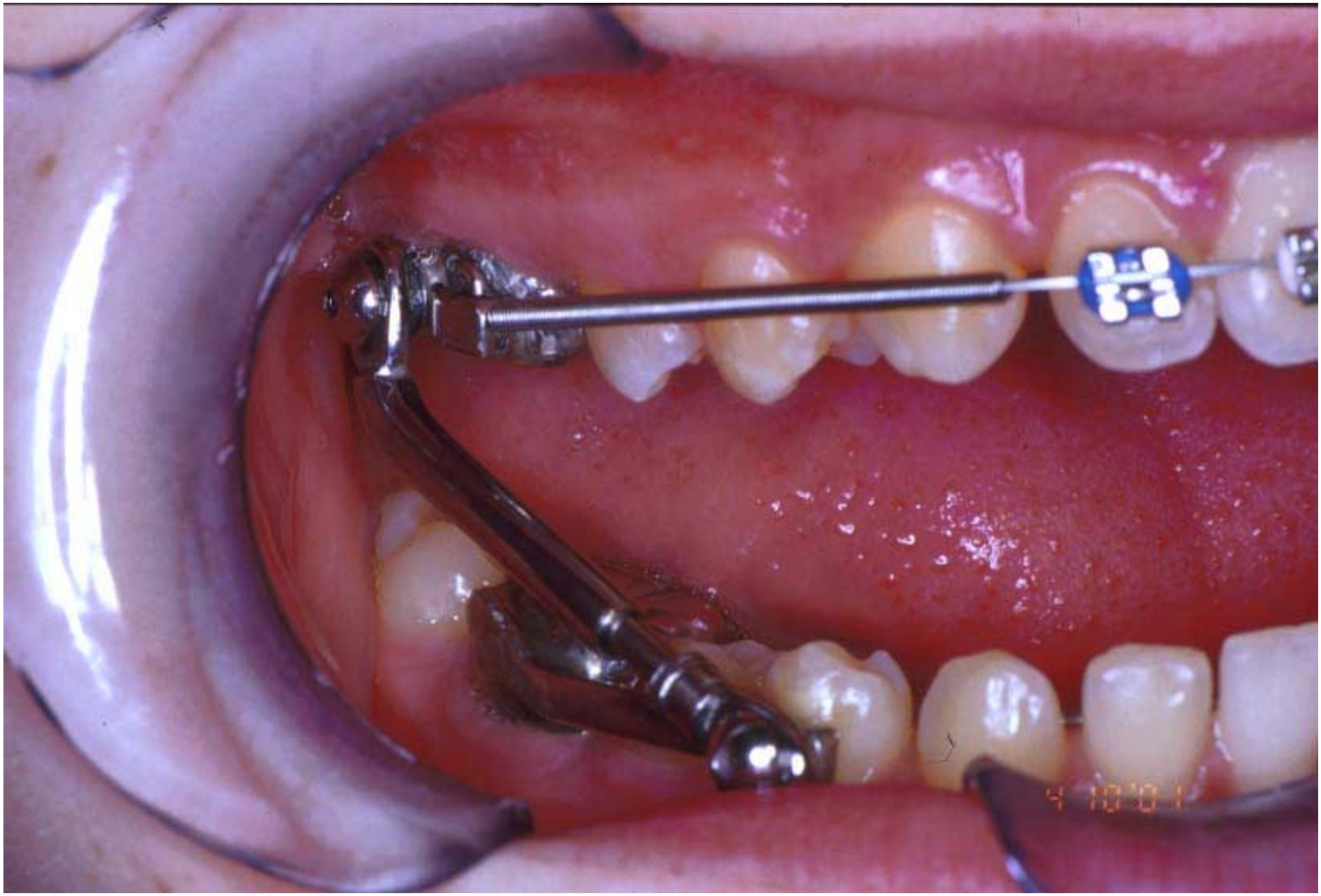
Class II - retrognathic malocclusion



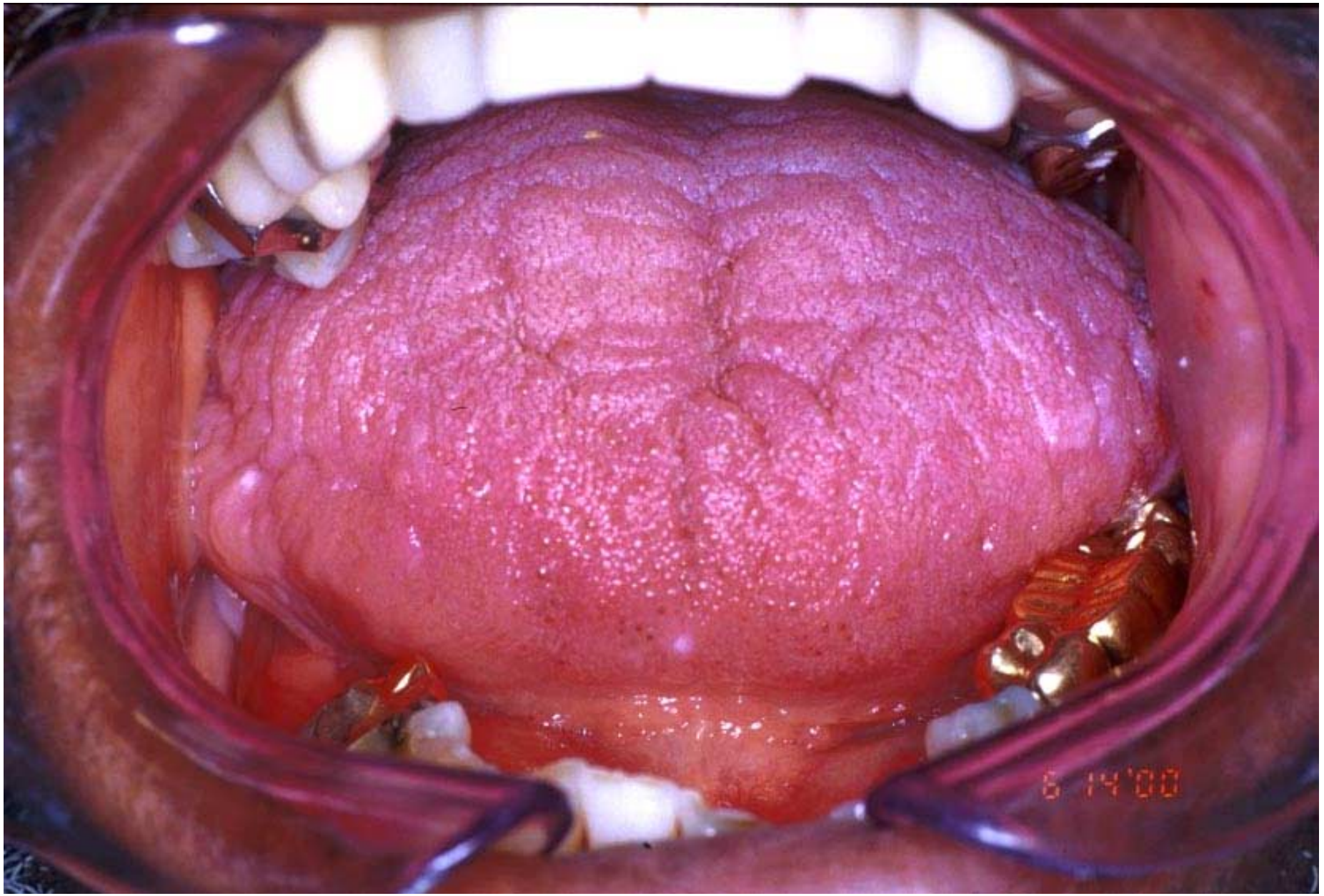
D57 Previous models positioned in a Class I occlusion



D58 Herbst appliance in the mouth



D59 Permanent Herbst appliance - age 11 1/2 years



Macroglossia in patient with severe OSA

D60

Tongue activity and OSA

"Apnea patients exhibited greater genioglossal activity and tensor palatini EMG activity than did controls during wakefulness."

Mezzanotte W et al. Influence of sleep onset on upper-airway muscle activity in apnea patients versus normal controls. Amer J Respir Crit Care Med, 1996 Vol 153:1880-87.

Upper open bites caused by lower tongue thrust

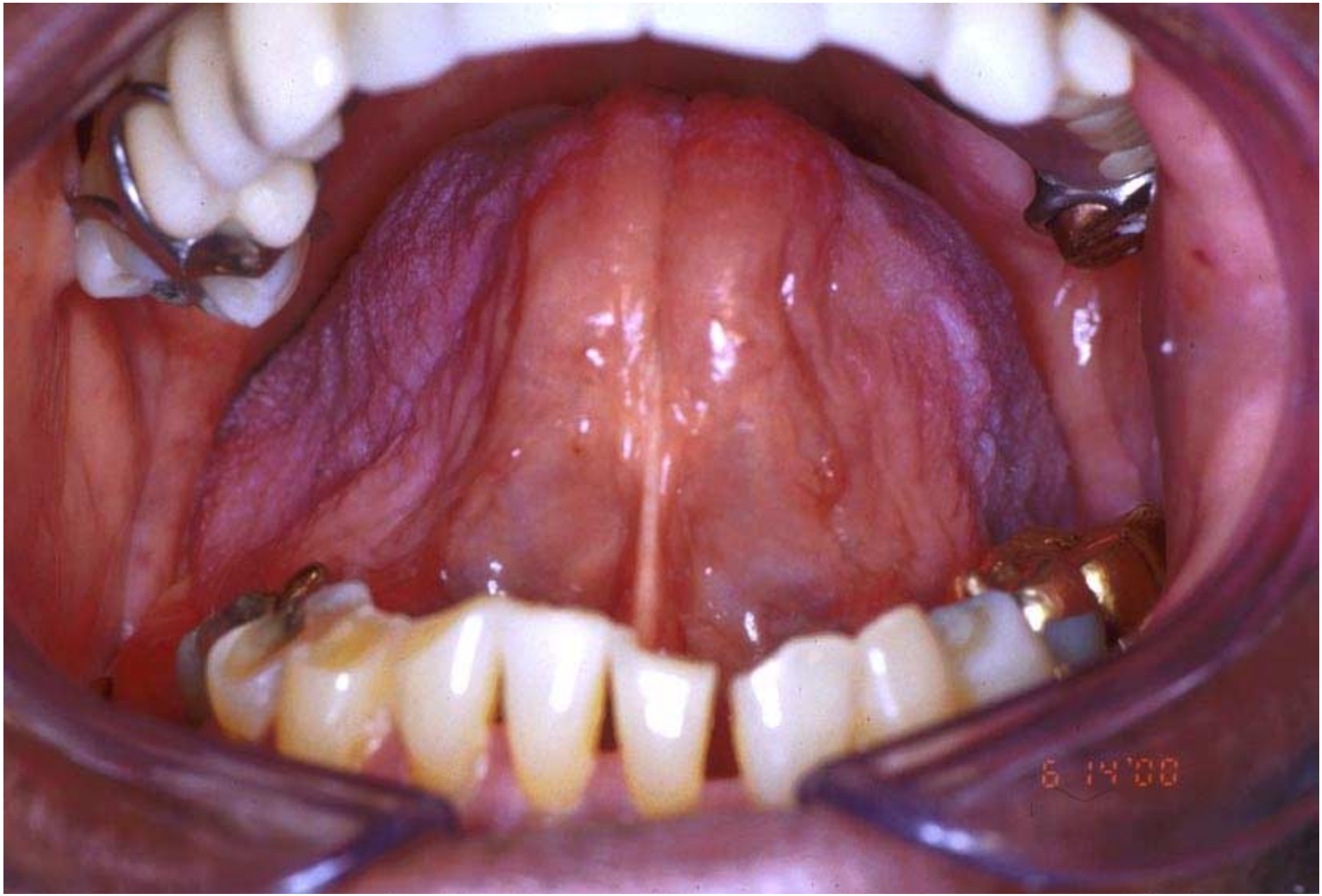
D62

Genetics and OSA

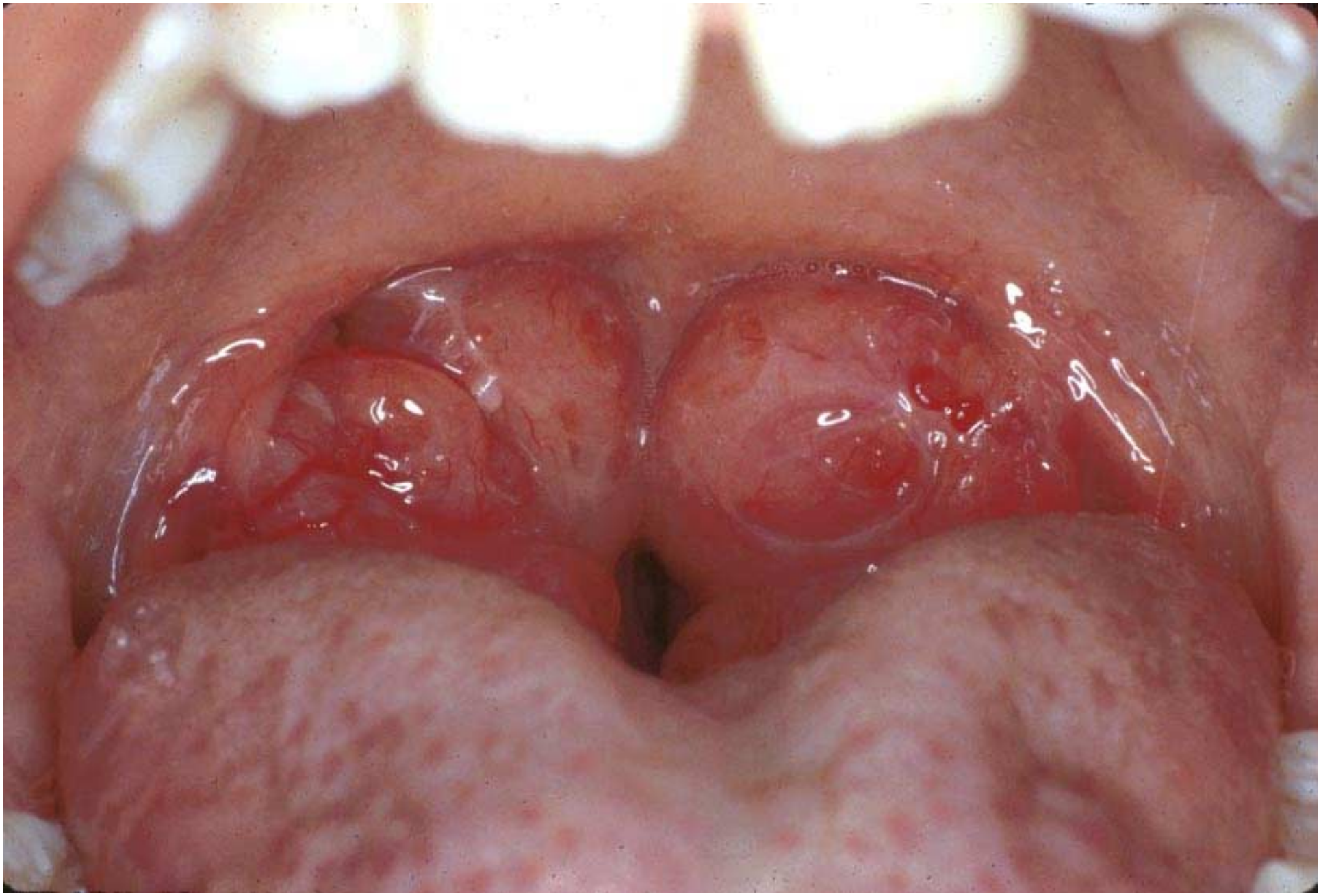
OSA may be the result of inherited factors such as:

- abnormal tongue motor activity

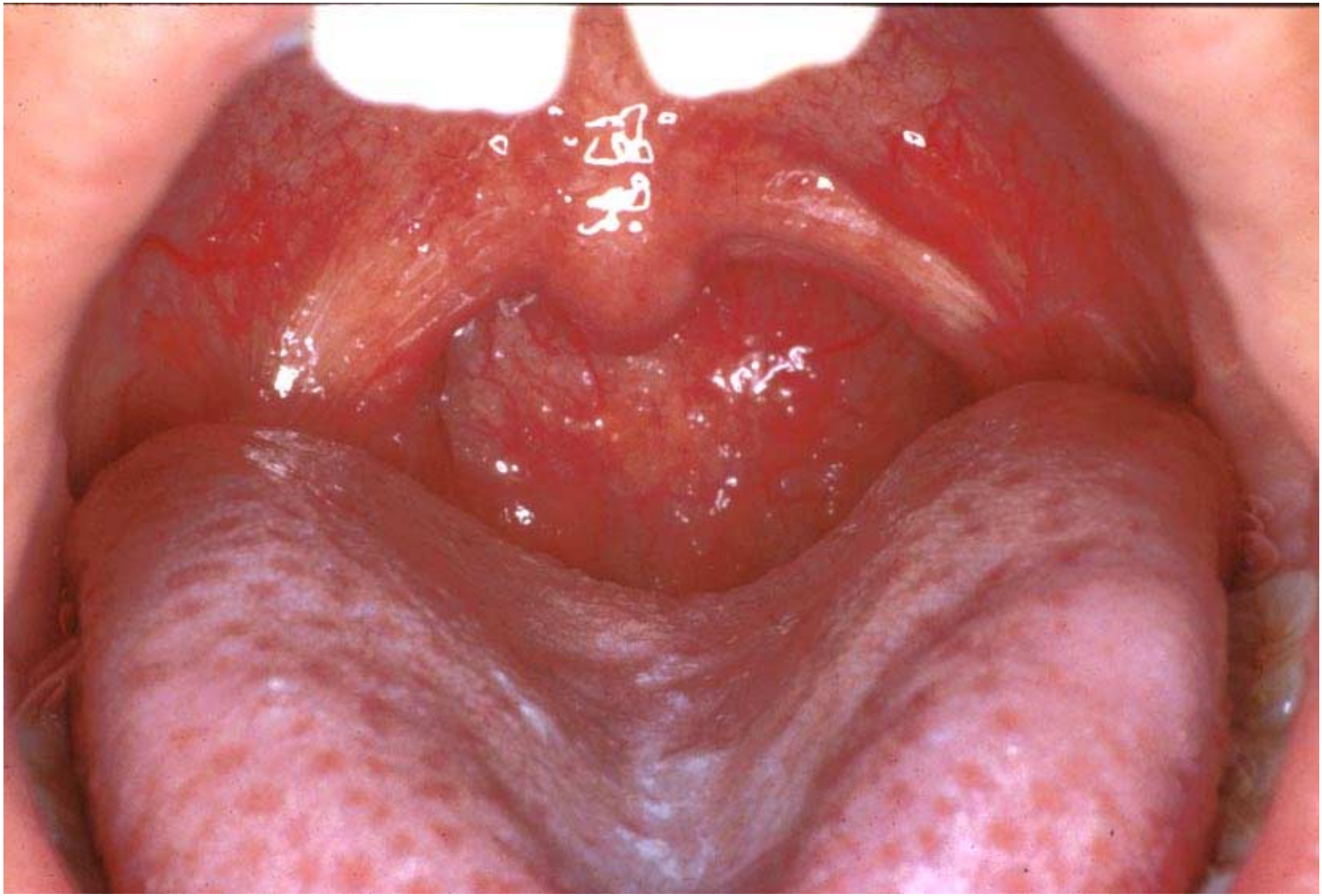
Kushida C. et al. Genetics and craniofacial dysmorphism in family studies of obstructive sleep apnea, June 1996, APSS Conference, Wash, DC.



D64 **Inherited ankyloglossia is a contributing factor to tongue thrusting**



D65 Twelve year old with massive tonsils



D66

Same patient with tonsils removed

"Modern,

non-breastfeeding nurturing,

is having a negative impact

on our health and

evolutionary destiny."

Brian Palmer, D.D.S., 1998

There is no one ideal treatment for OSA. A tracheotomy is the only 100% cure for the condition. Nearly all current treatments have unwanted side effects. The best and cheapest form of treatment is prevention.

Breastfeeding is the best way to prevent OSA.
Breastfeeding is the best and cheapest form of health care!

Brian Palmer, D.D.S., 2001

For Better Health !

Brian Palmer, D.D.S.

Kansas City, Missouri, USA