Otitis media

An anatomical perspective

Presentation prepared by:

Brian Palmer, D.D.S.

Kansas City, Missouri, USA

December, 2001.

"Knowledge is most meaningful when shared with others."

WARNING

Some of the pictures in this presentation are of dissections which are quite graphic. The pictures may not be suitable for all to view.

Factors Predisposing Bottle-fed Infants to Otitis Media

- Lack of IgA immunity from human breastmilk.
- Bottles propped - infant on back - regurgitates into Eustachian tubes (ETs).

Ruth Lawrence, 1980, "Breast-feeding, a guide for the medical profession."

I add the following factors:

- Confinement of the space in the area of the ETs due to the displacement of soft palate during bottle feeding.
- Altered ability of the tensor palatini to fire properly.

Auditory tube position changes with age

Lumen of tube in child is more horizontal and wider

The pharyngeal opening is:

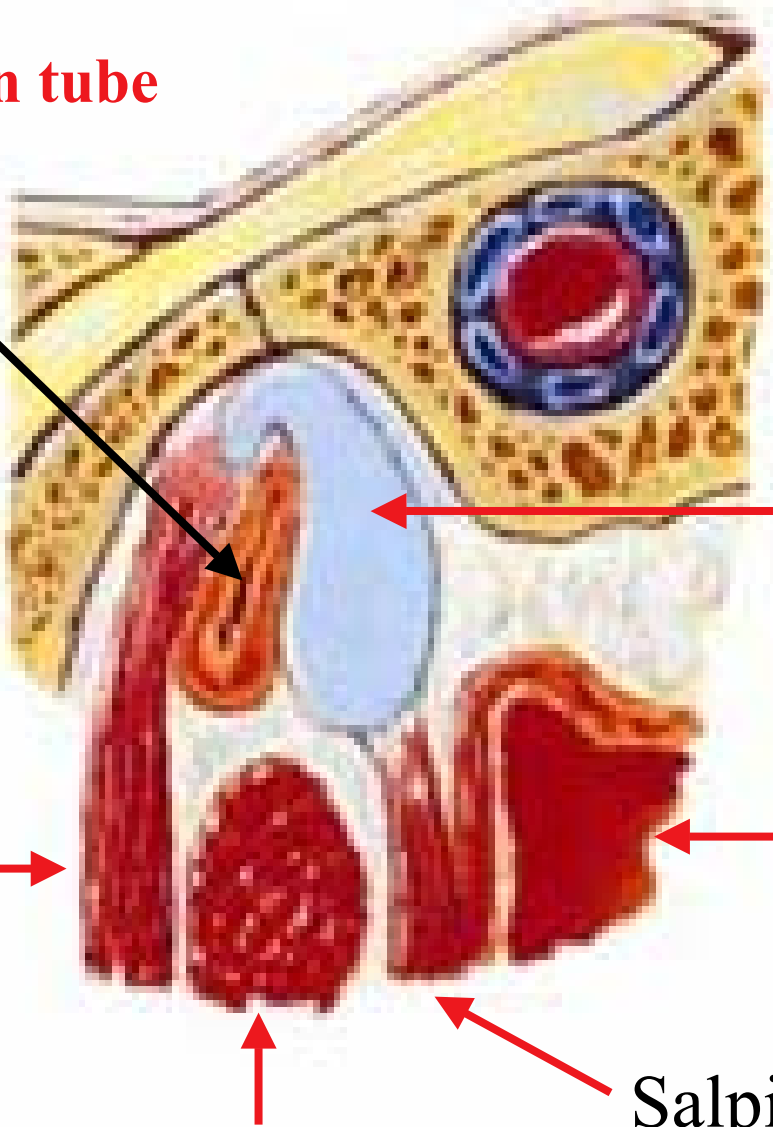
- Below the level of the hard palate in the fetus.
- Is level with the palate at birth.
- Is 3 to 4 mm. above it at the fourth year.
- Is 10 mm. Above it as an adult

Cunningham's Textbook of Anatomy, 10th Ed., 1964, p814.

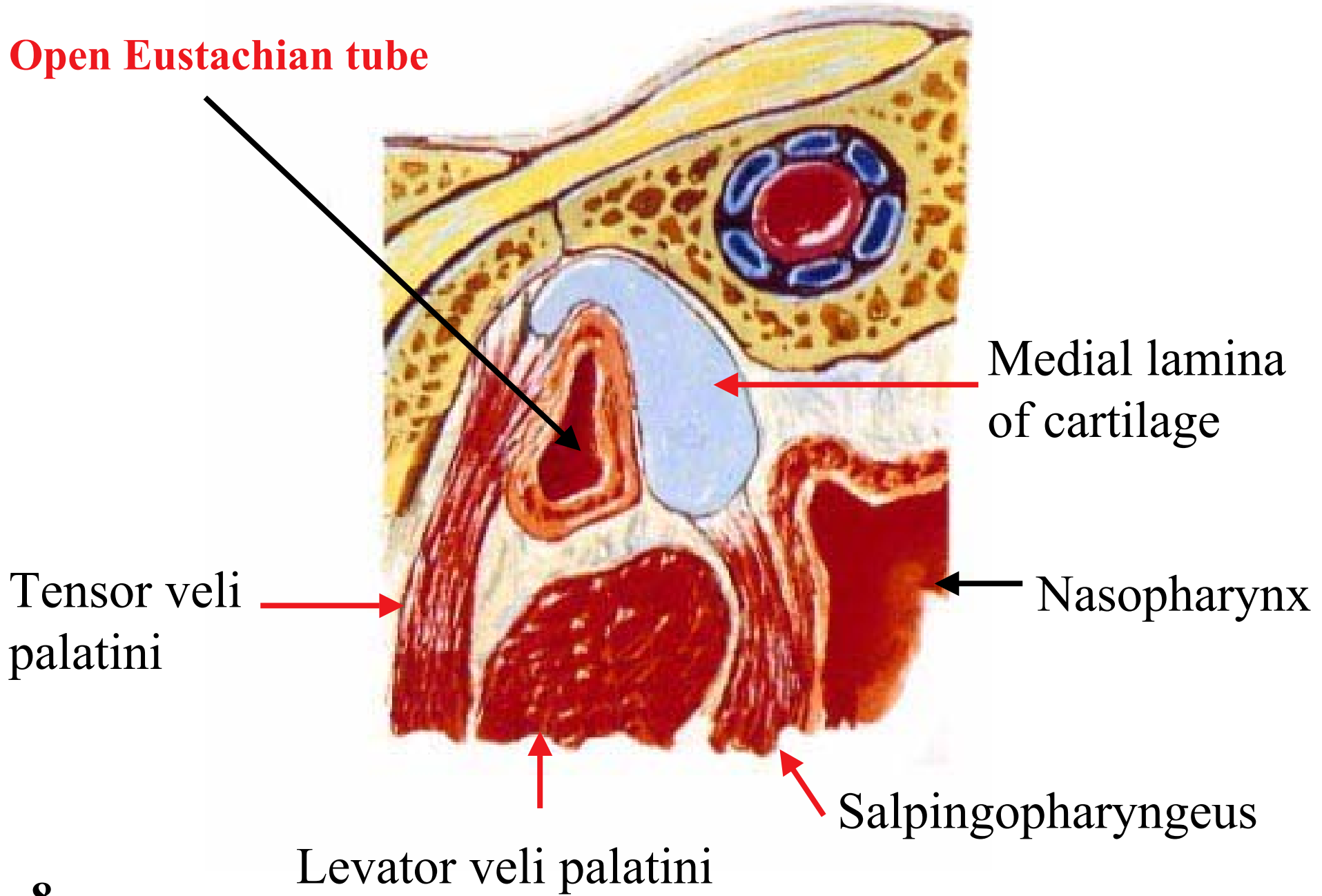
Muscles involved with the opening and closing of the Eustachian tube / Auditory canal

- Lumen **opens** chiefly when attachment of tensor veli palatini muscle pulls wall of tube laterally during swallow.

- Auditory tube **closes** by elastic recoil of cartilage, tissue turgidity and tension of salpingopharyngeus muscle.

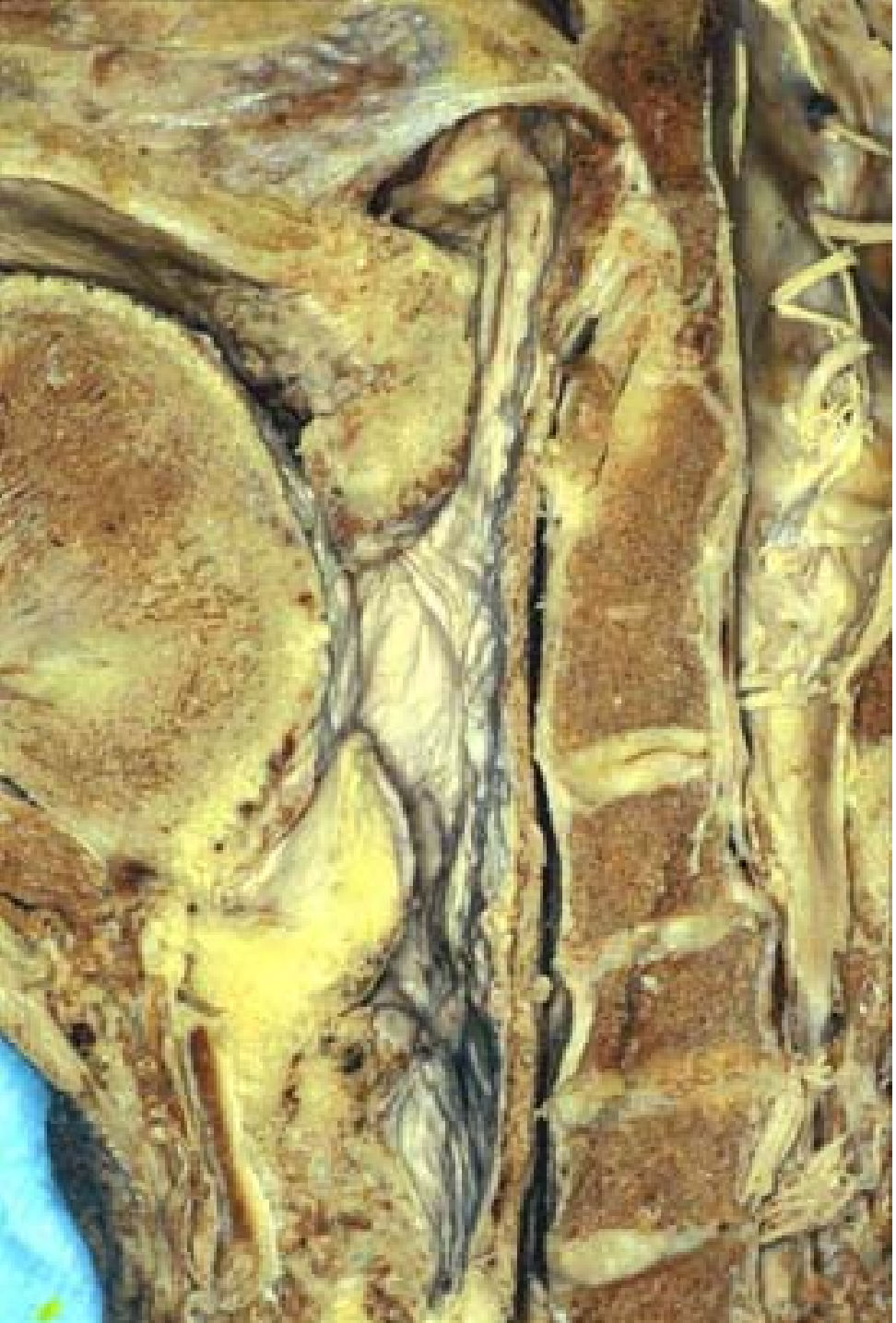


Musculature around the Eustachian tube

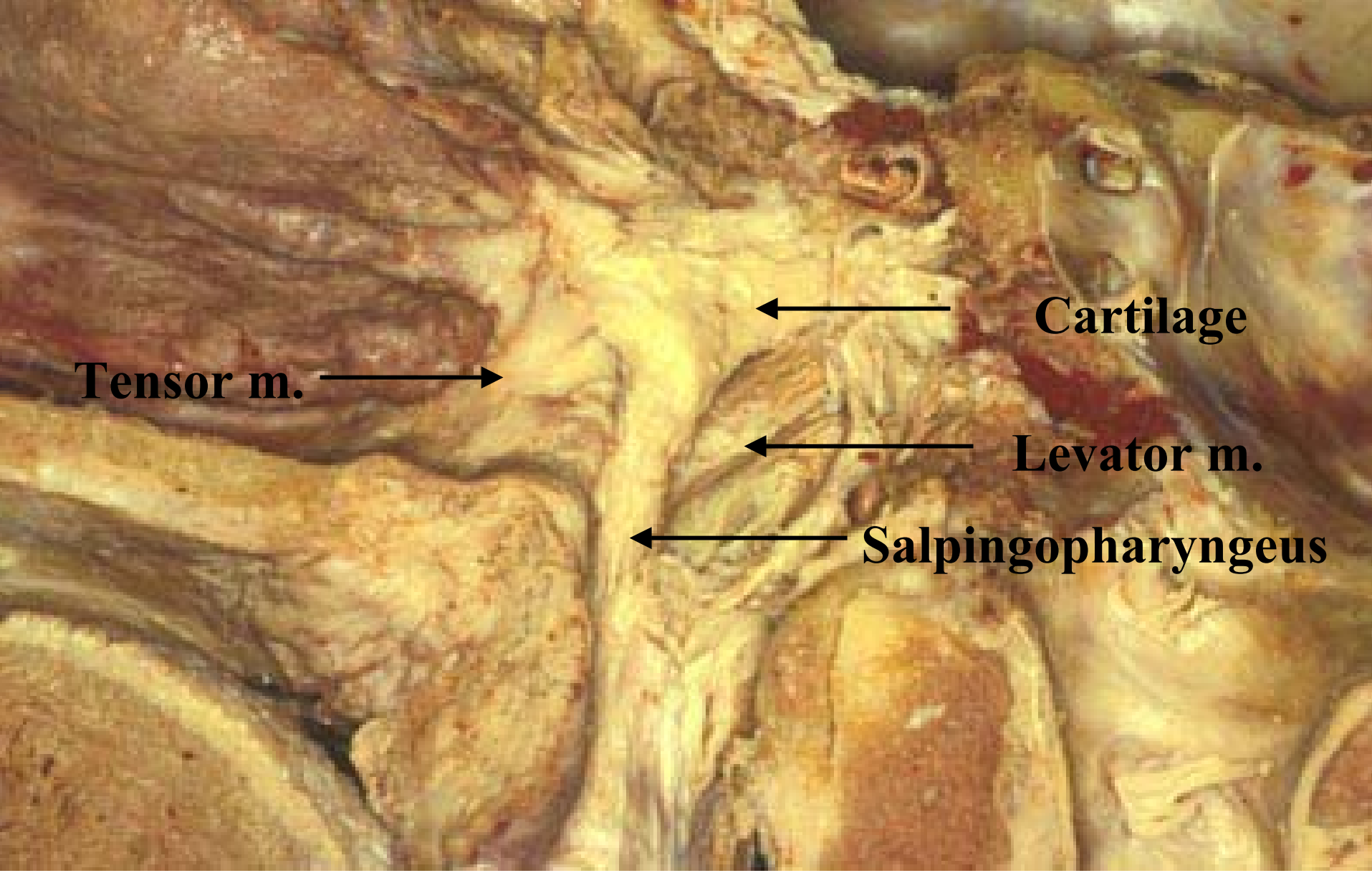

Open Eustachian tube
Medial lamina of cartilage
Tensor veli palatini
Nasopharynx
Levator veli palatini
Salpingopharyngeus

Eustachian tube in adult

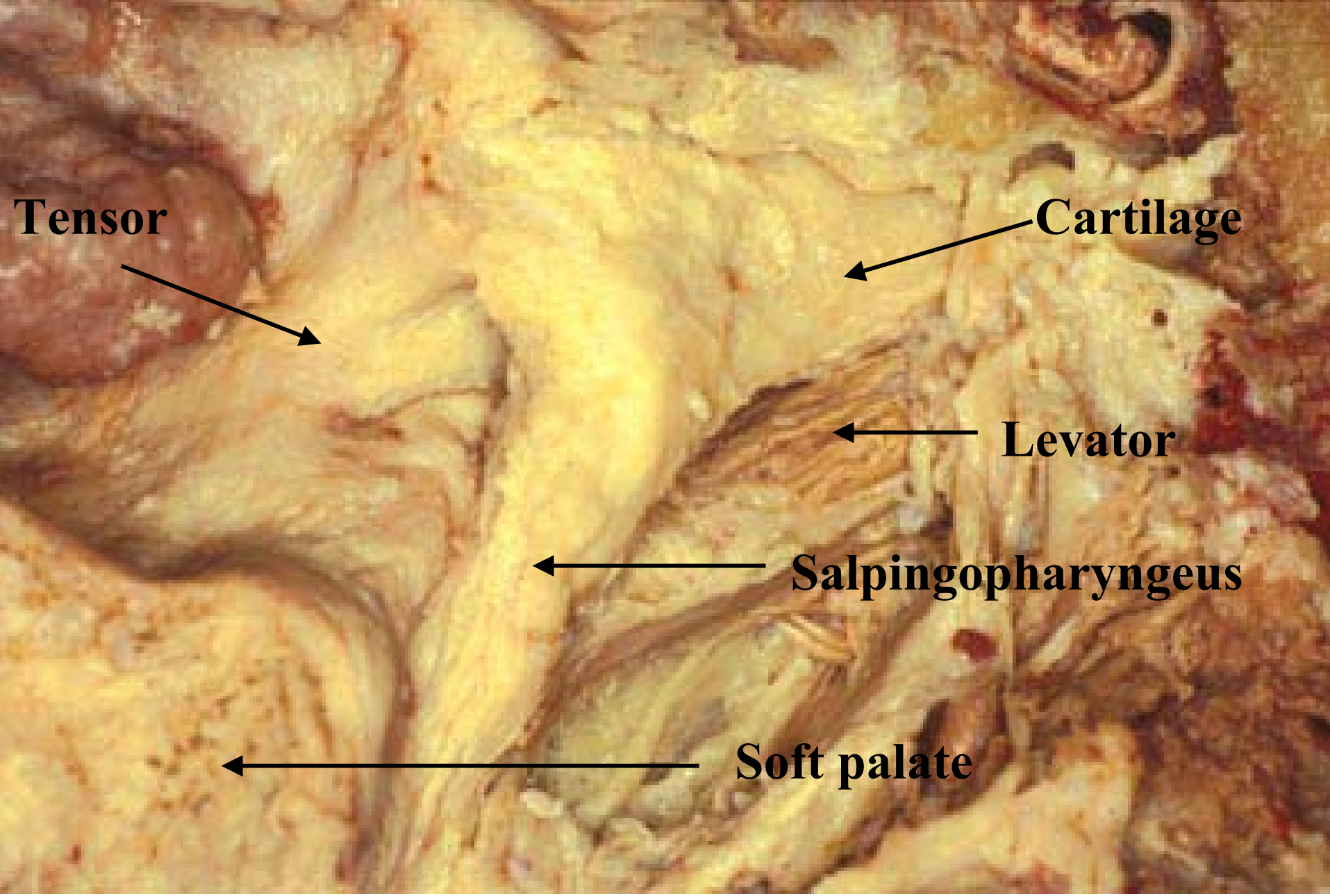
Adult dissection showing high position of the Eustachian tube.



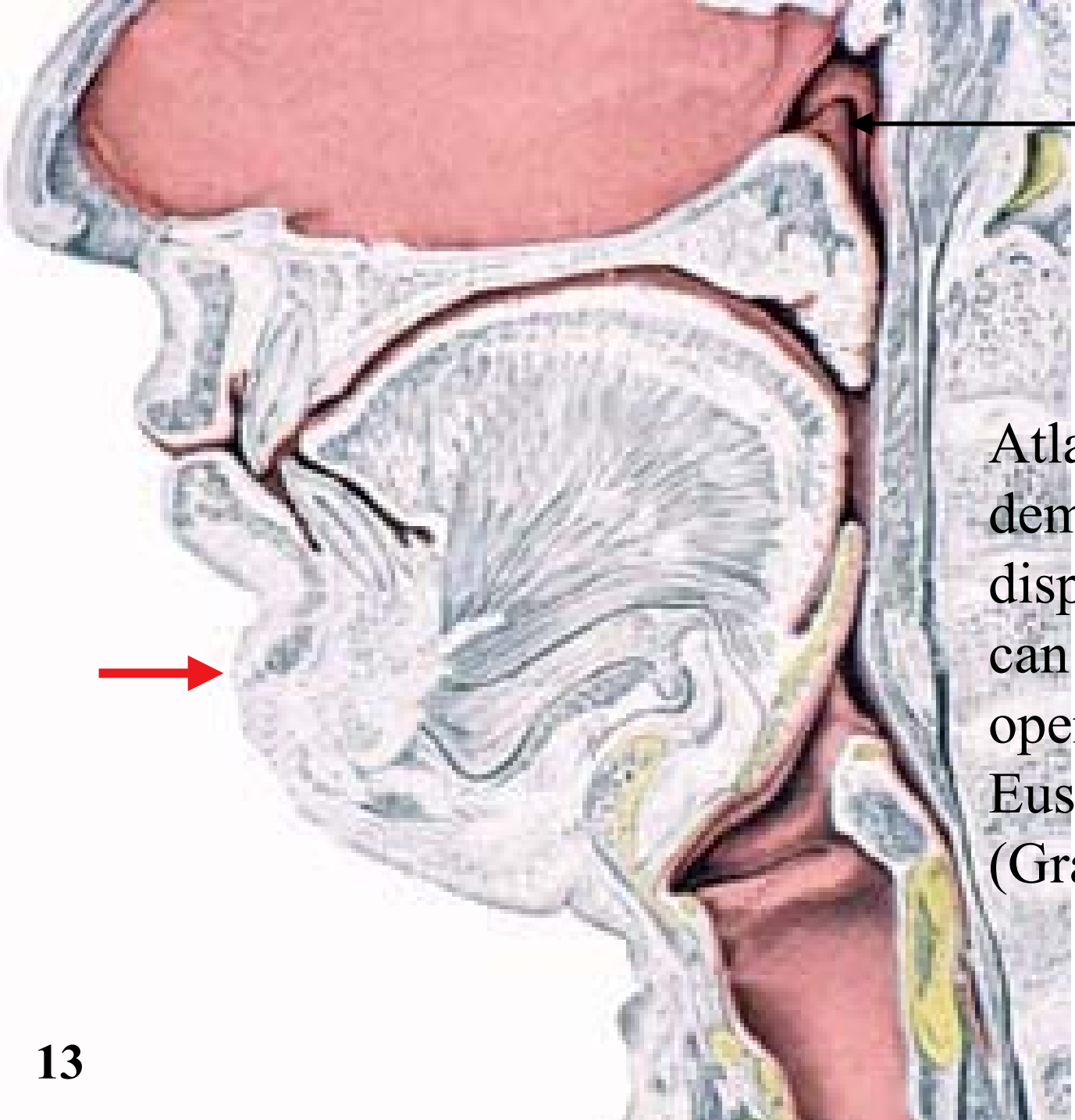
Note how soft palate could push up into the Eustachian tube and plug it if the mouth was closed.



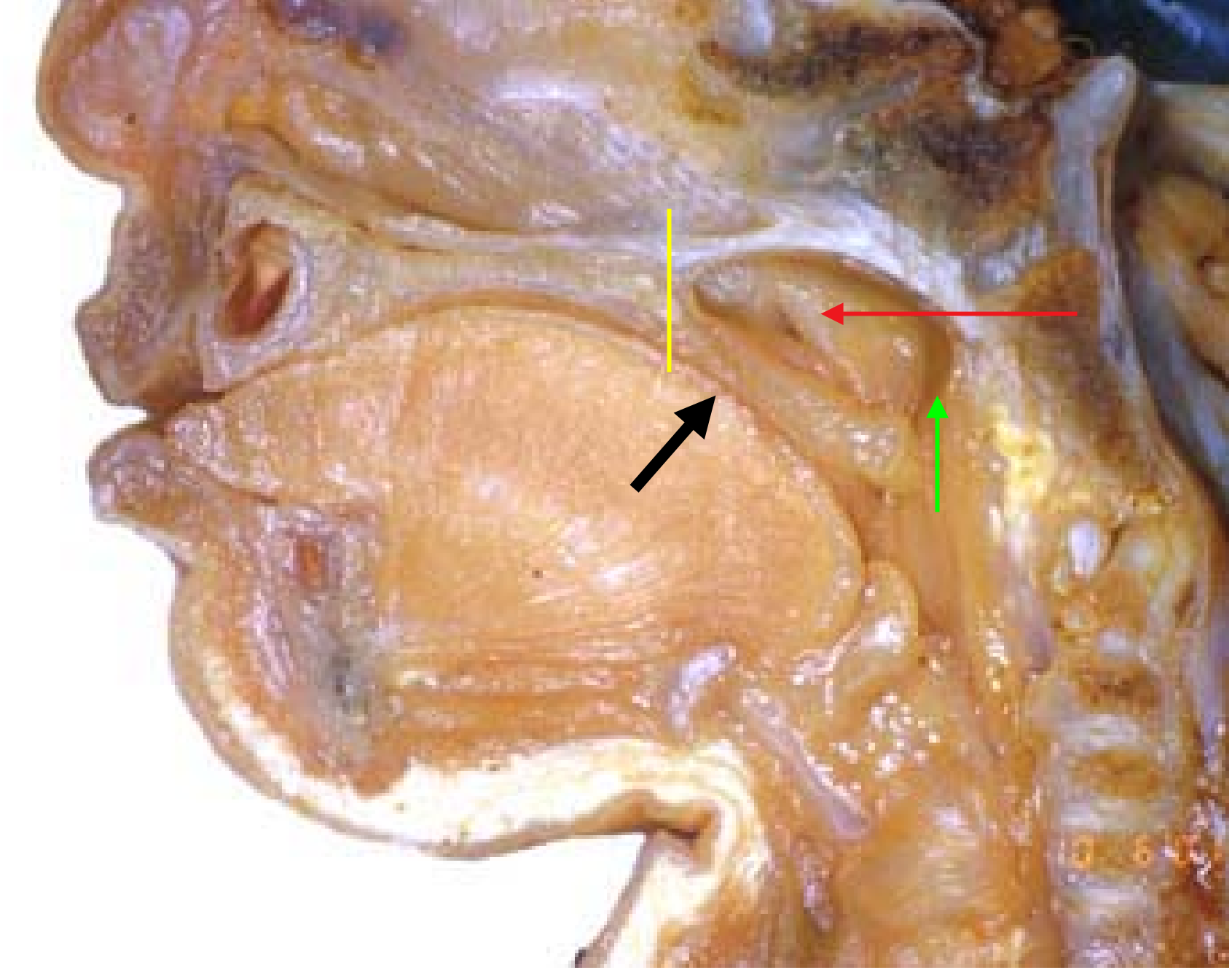
Close up view of Eustachian tube.



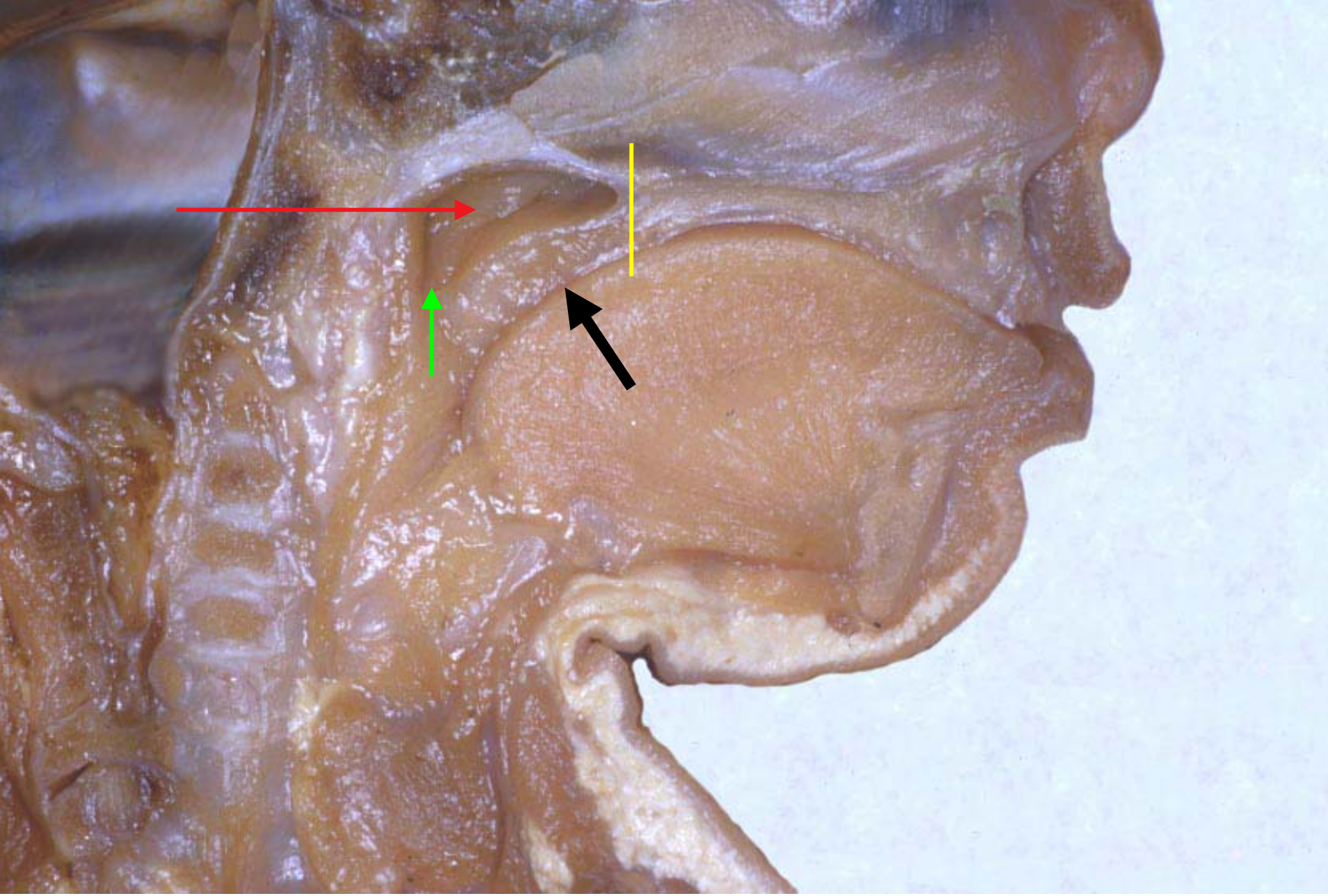
12 Closer view of Eustachian tube.



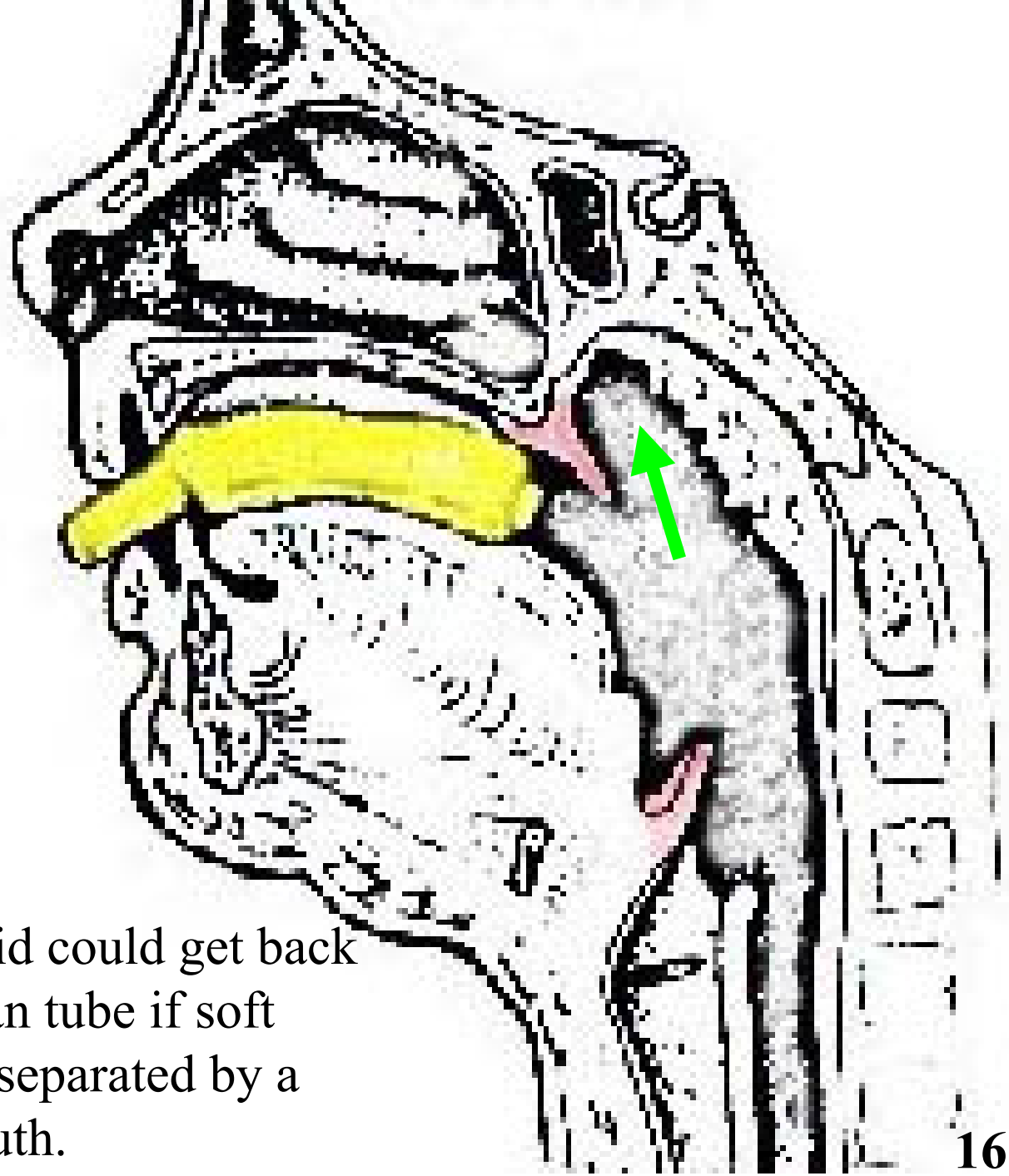
Atlas picture demonstrates how displaced soft palate can obstruct the opening of the Eustachian tube. (Grant's Atlas)



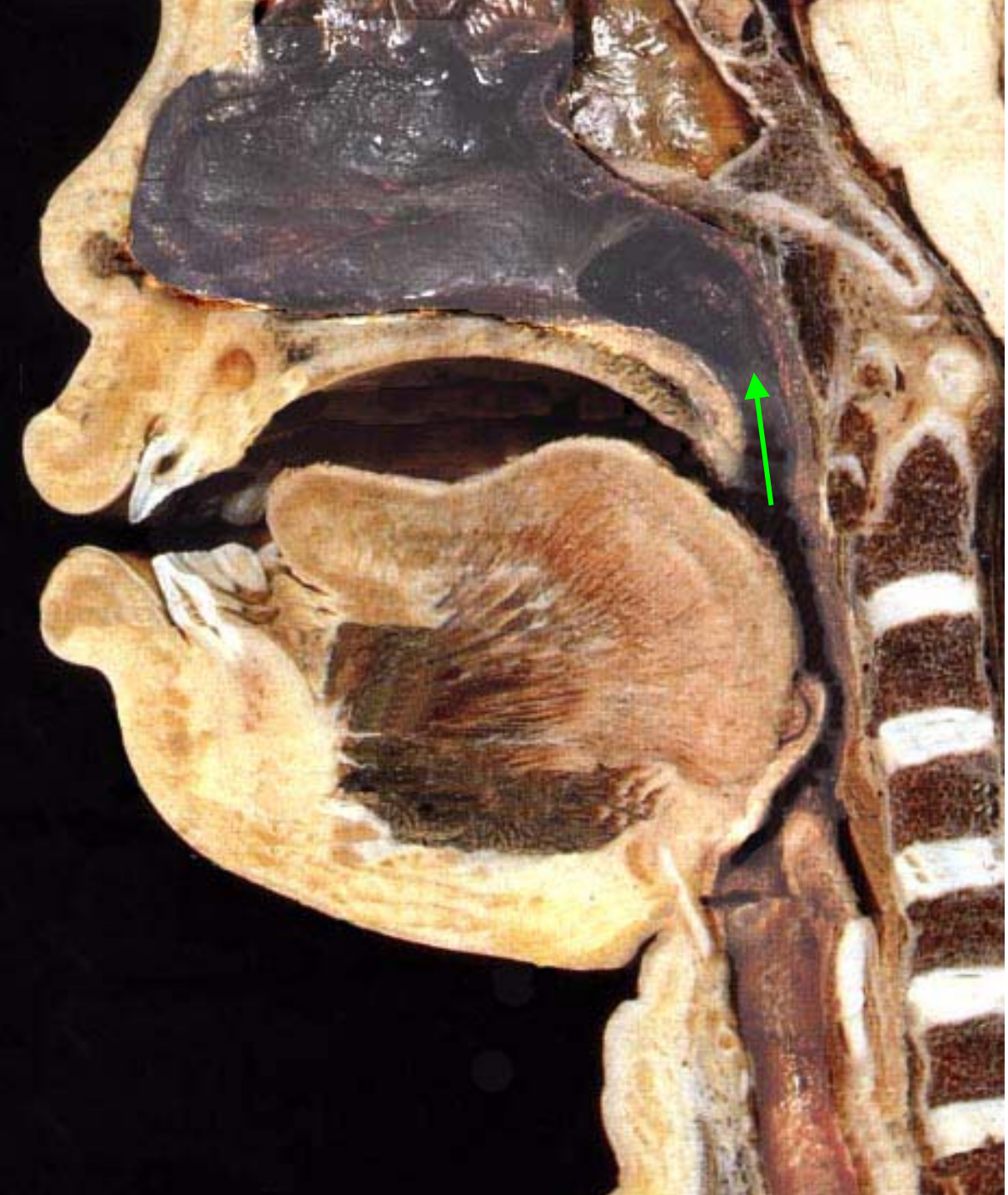
14 Position of the Eustachian tube in the fetus.



15 Position of the Eustachian tube in the fetus.



An example of how liquid could get back up into area of Eustachian tube if soft palate and epiglottis are separated by a foreign object in the mouth.



Atlas picture of adult demonstrates how a tongue that is driven back by some force can extend distance between soft palate and epiglottis and allow fluids to flow around soft palate and contaminate area around Eustachian tubes.. (Rohen/Yokocki)

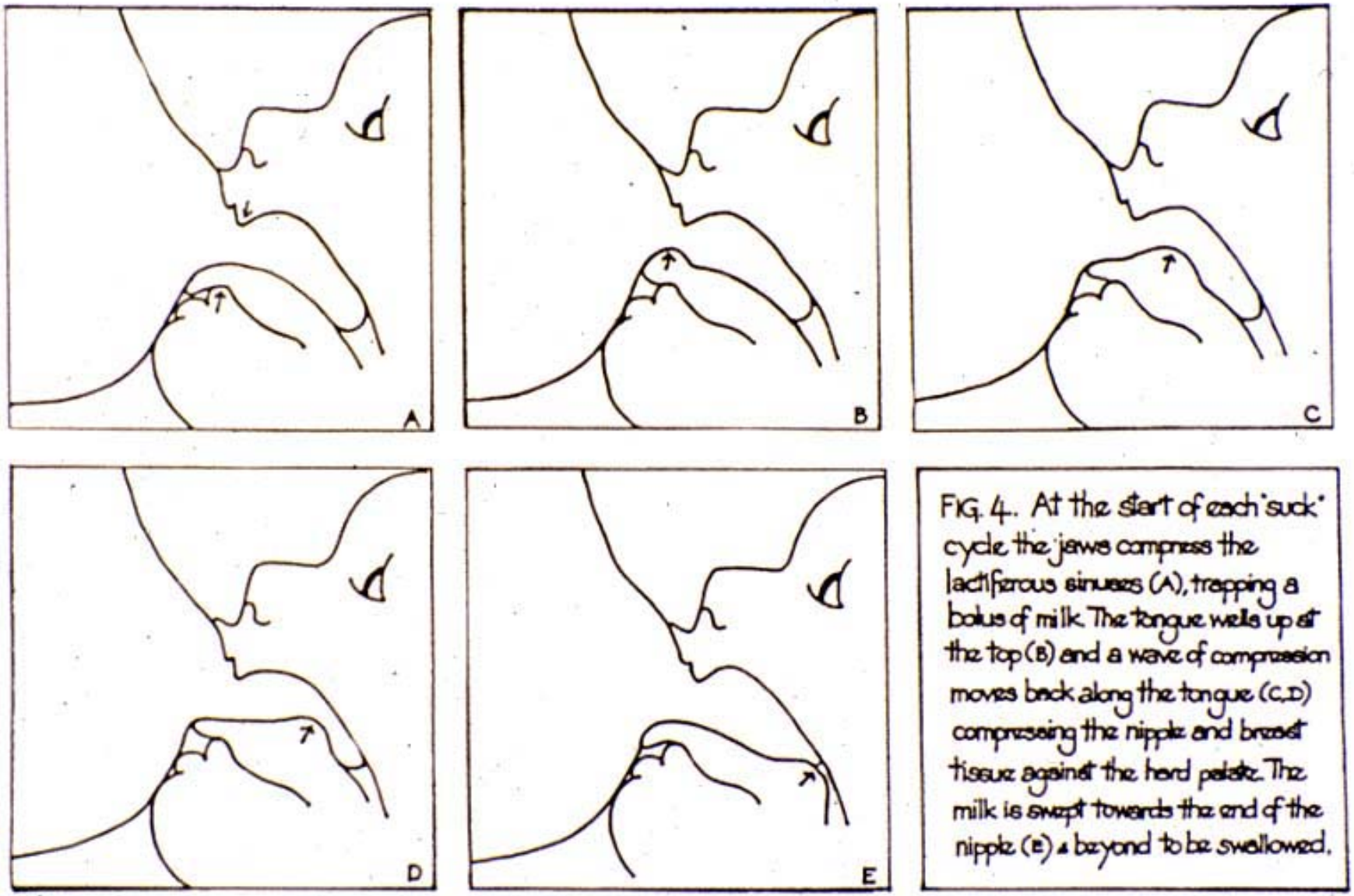
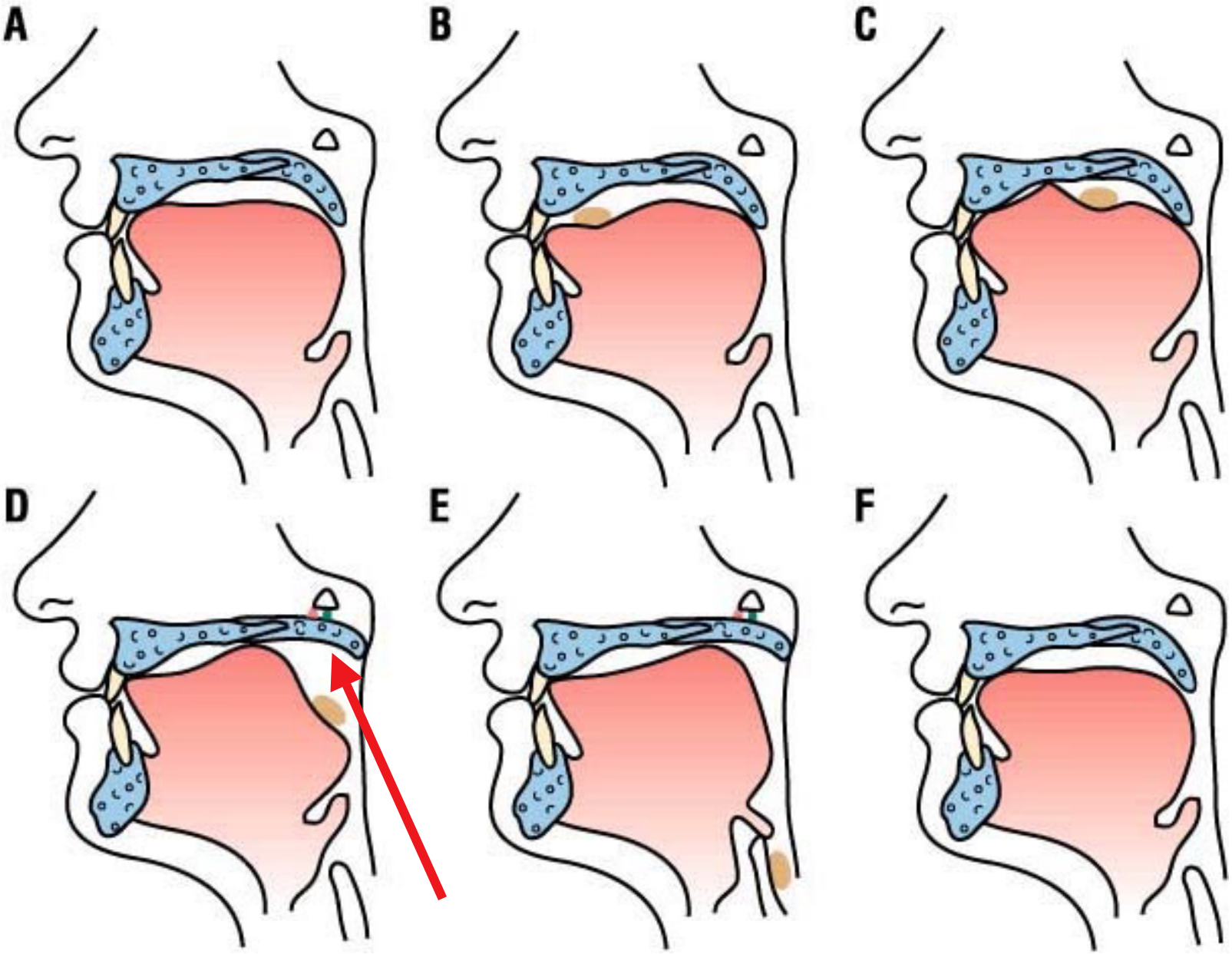


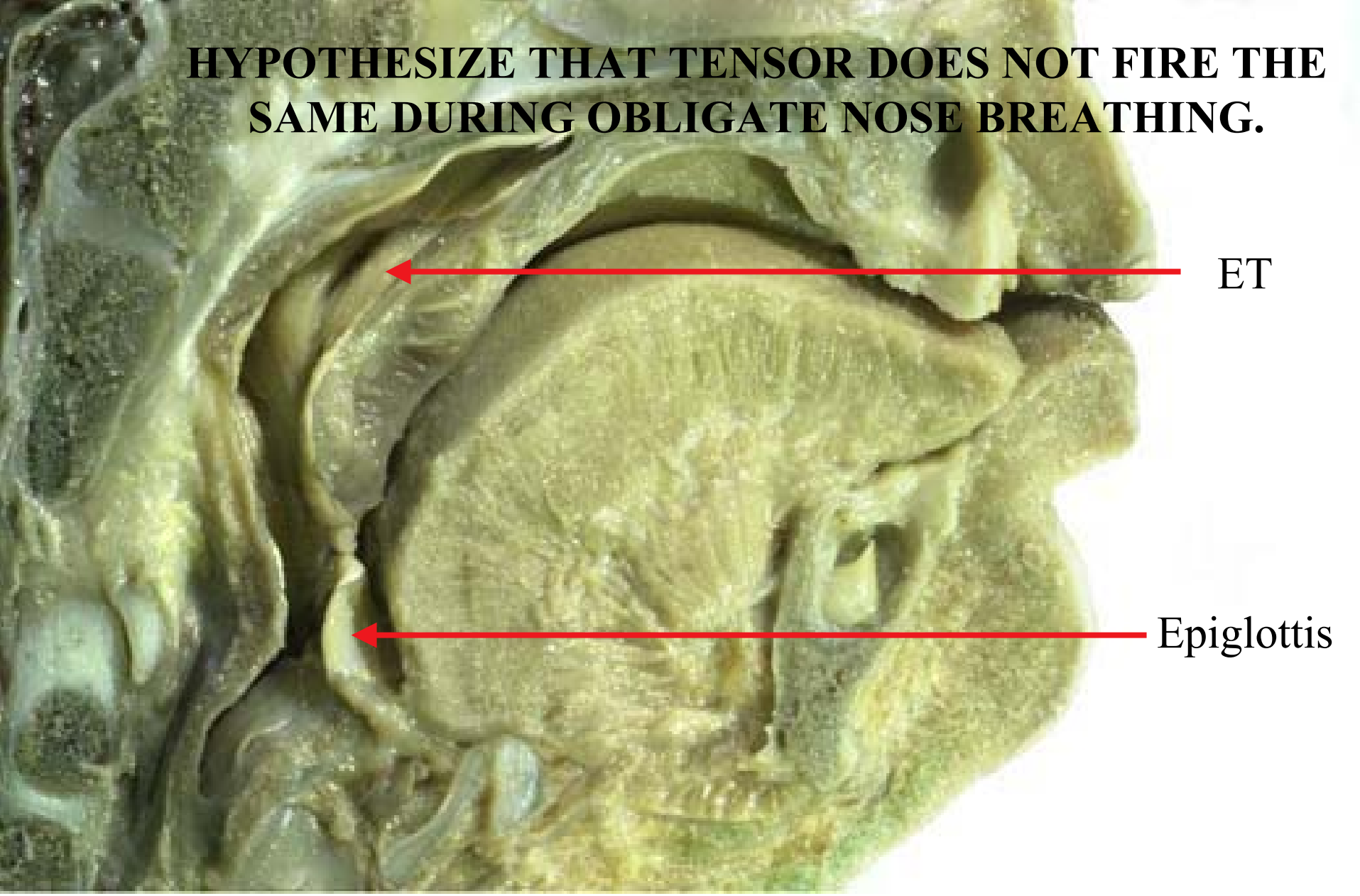
FIG. 4. At the start of each 'suck' cycle the jaws compress the lactiferous sinuses (A), trapping a bolus of milk. The tongue wells up at the top (B) and a wave of compression moves back along the tongue (C,D) compressing the nipple and breast tissue against the hard palate. The milk is swept towards the end of the nipple (E) & beyond to be swallowed.

During breastfeeding, proper tongue action is developed. The breast is drawn into the mouth back to the junction of the hard and soft palate.

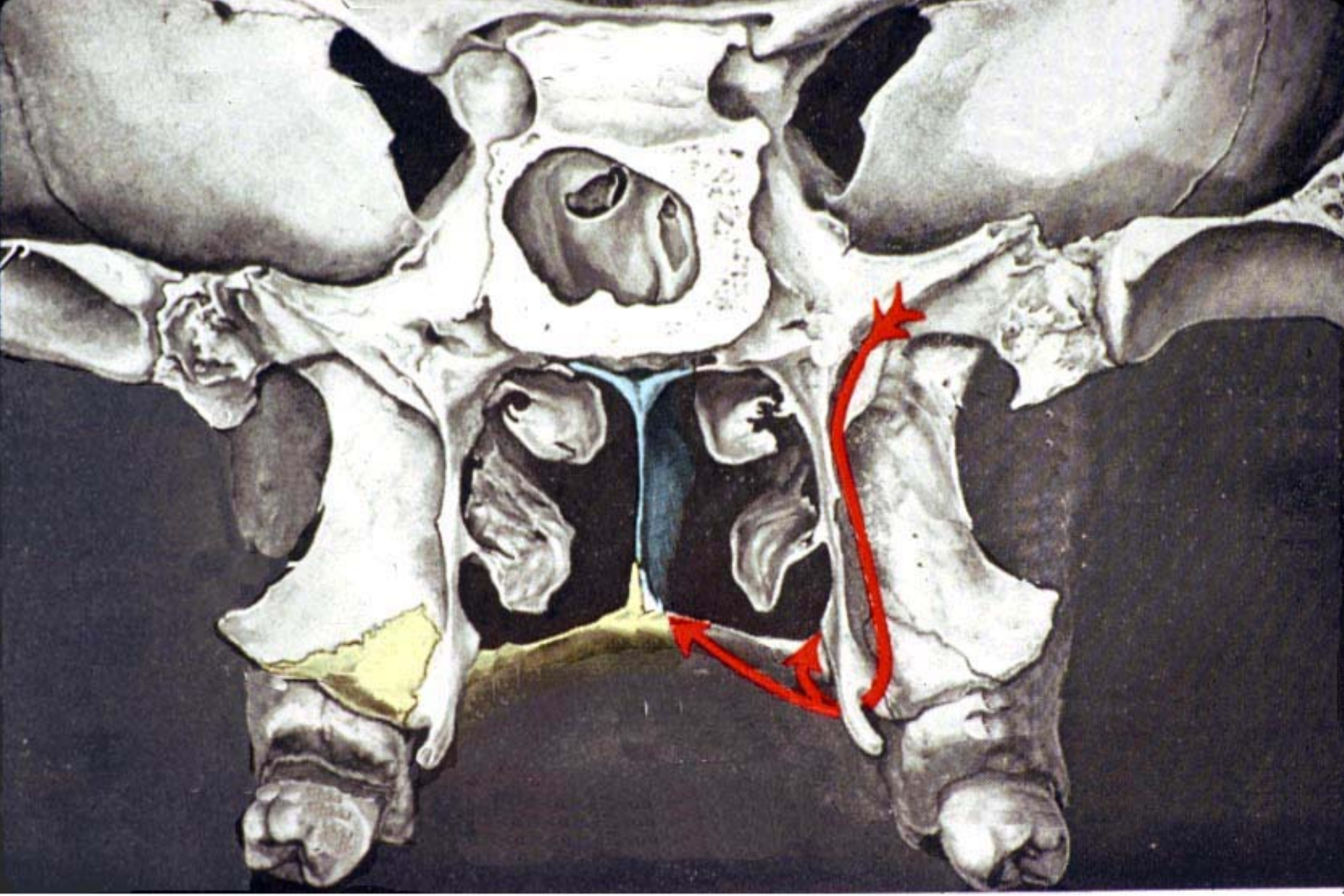
Adult Swallow



HYPOTHESIZE THAT TENSOR DOES NOT FIRE THE SAME DURING OBLIGATE NOSE BREATHING.



20 Resting position of the epiglottis plus position of Eustachian tube

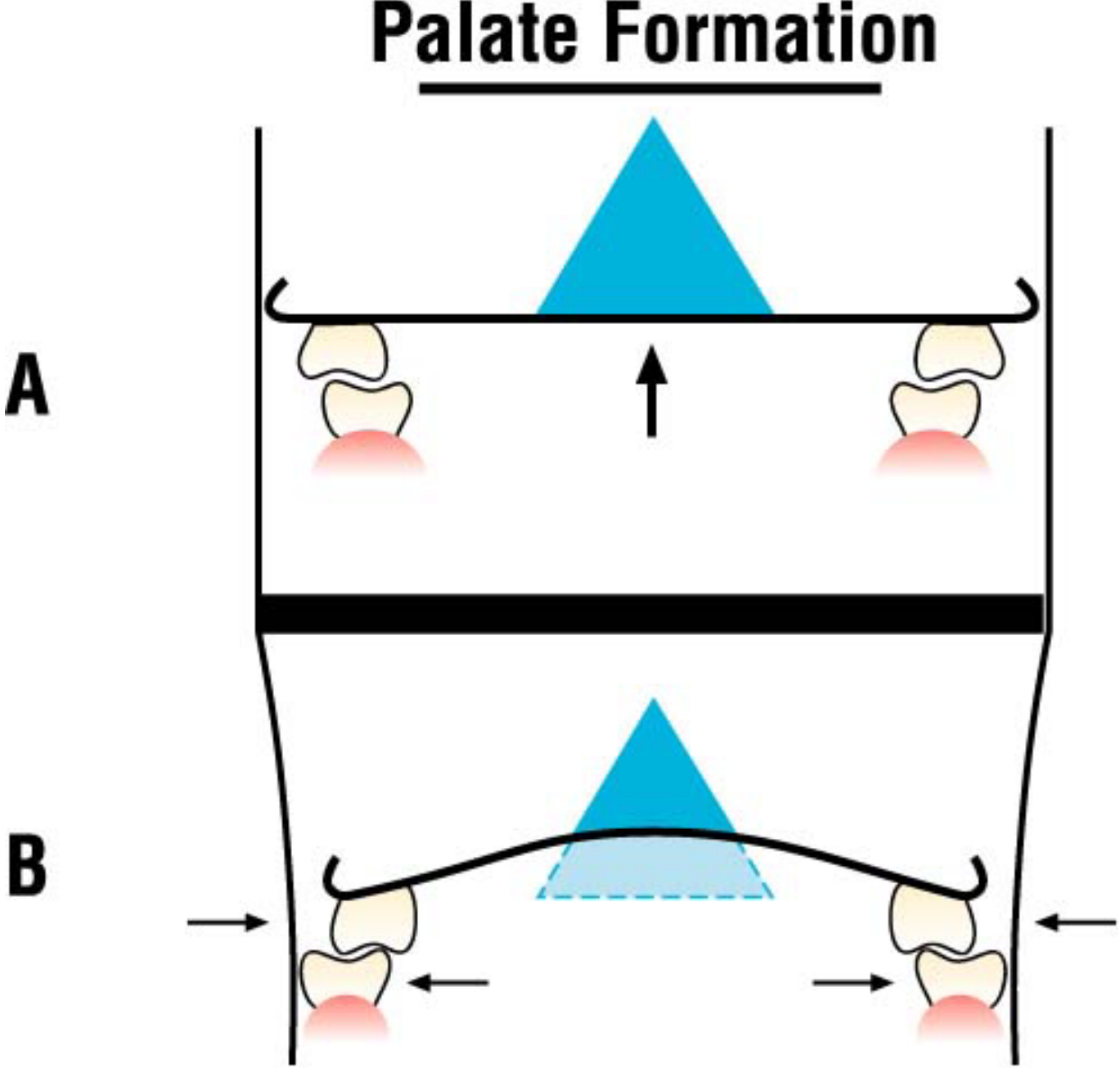


21 Path of Tensor palatini m. around Pterygoid hamulus. Tensor arises from the canoe-shaped scaphoid fossa. (Grant's Atlas)

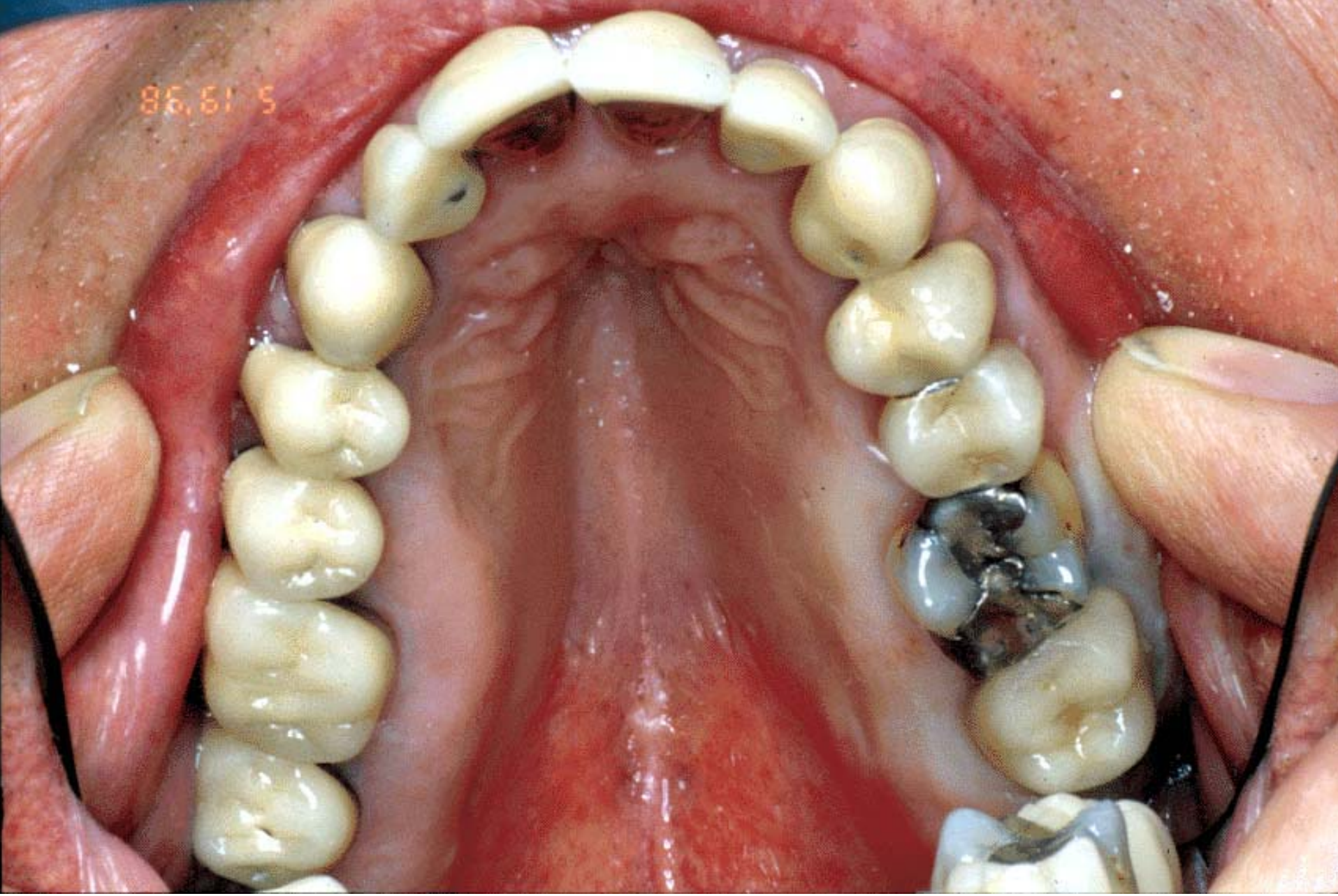
Prehistoric skull showing a large posterior nasal aperture bordered by pterygoid plates

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

Pterygoid hamulus

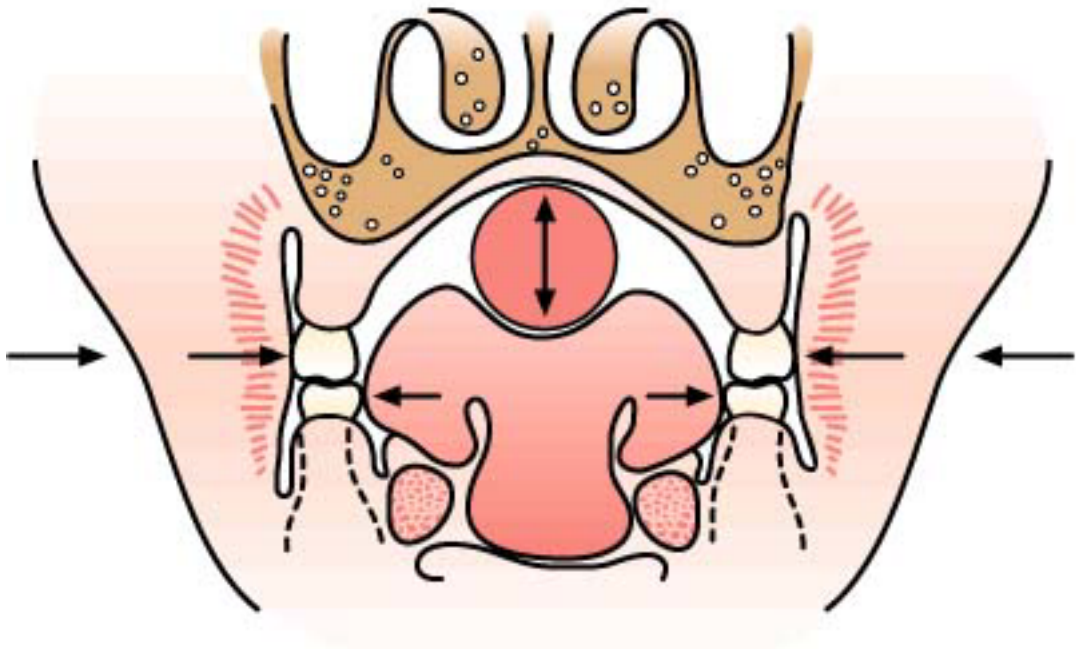


24 Illustrates how a high palate impacts arch width and nasal space.

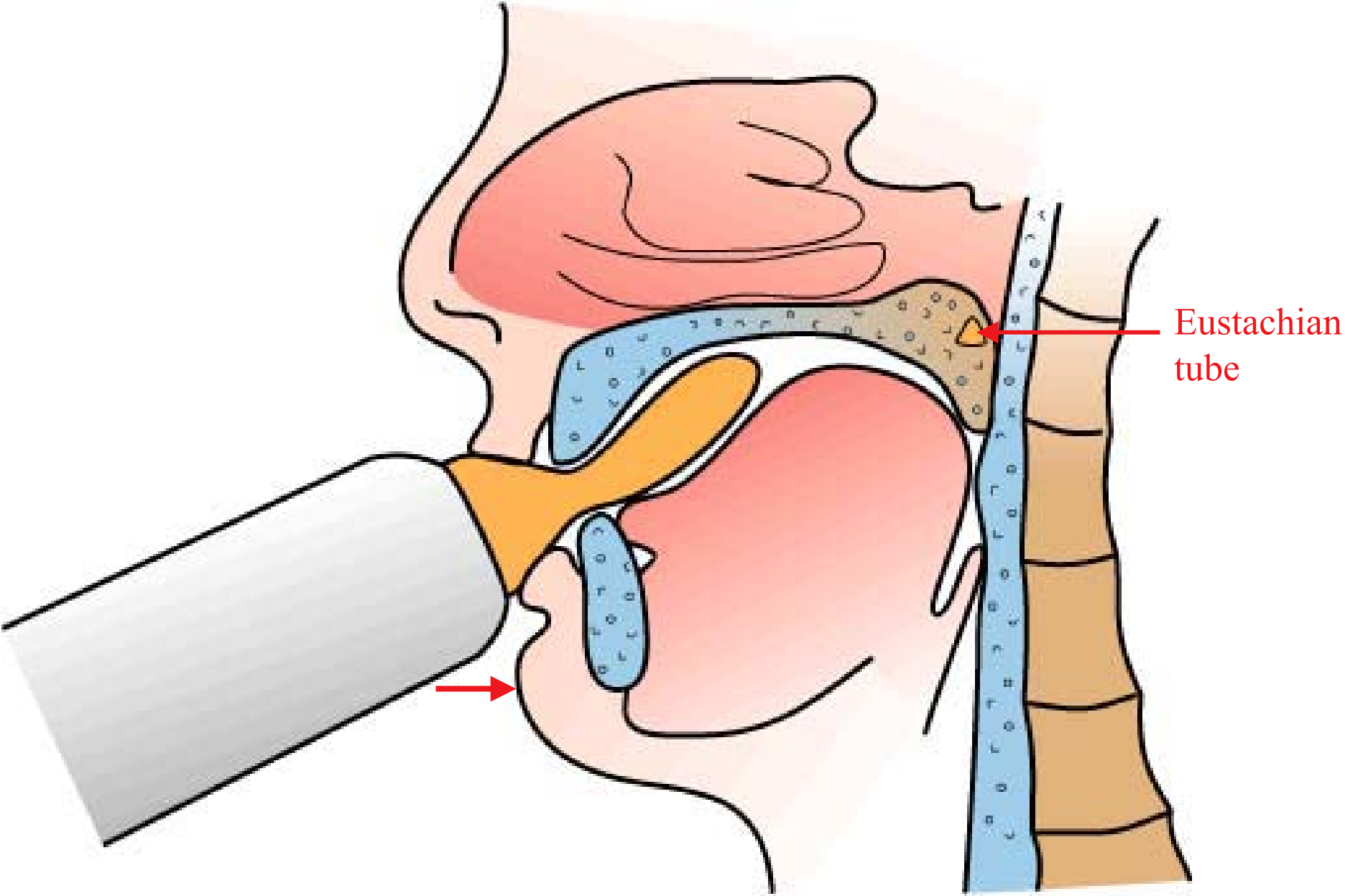


25 An example of a high palate and narrow arch.

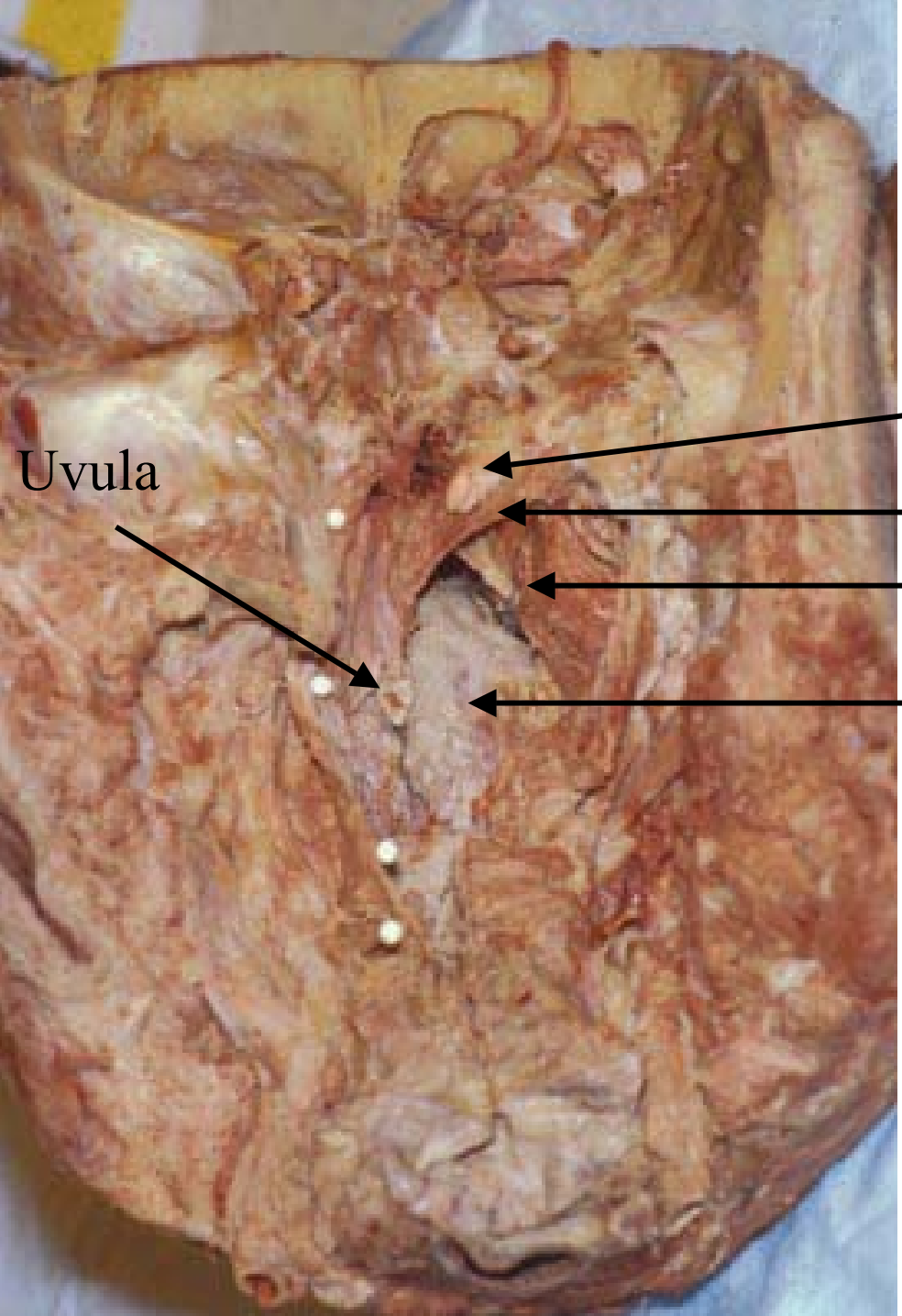
Pacifier / Bottle Nipple



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.



Bottle-feeding forces tongue back. This elevates tongue at back, which in turn can block off Eustachian tubes.



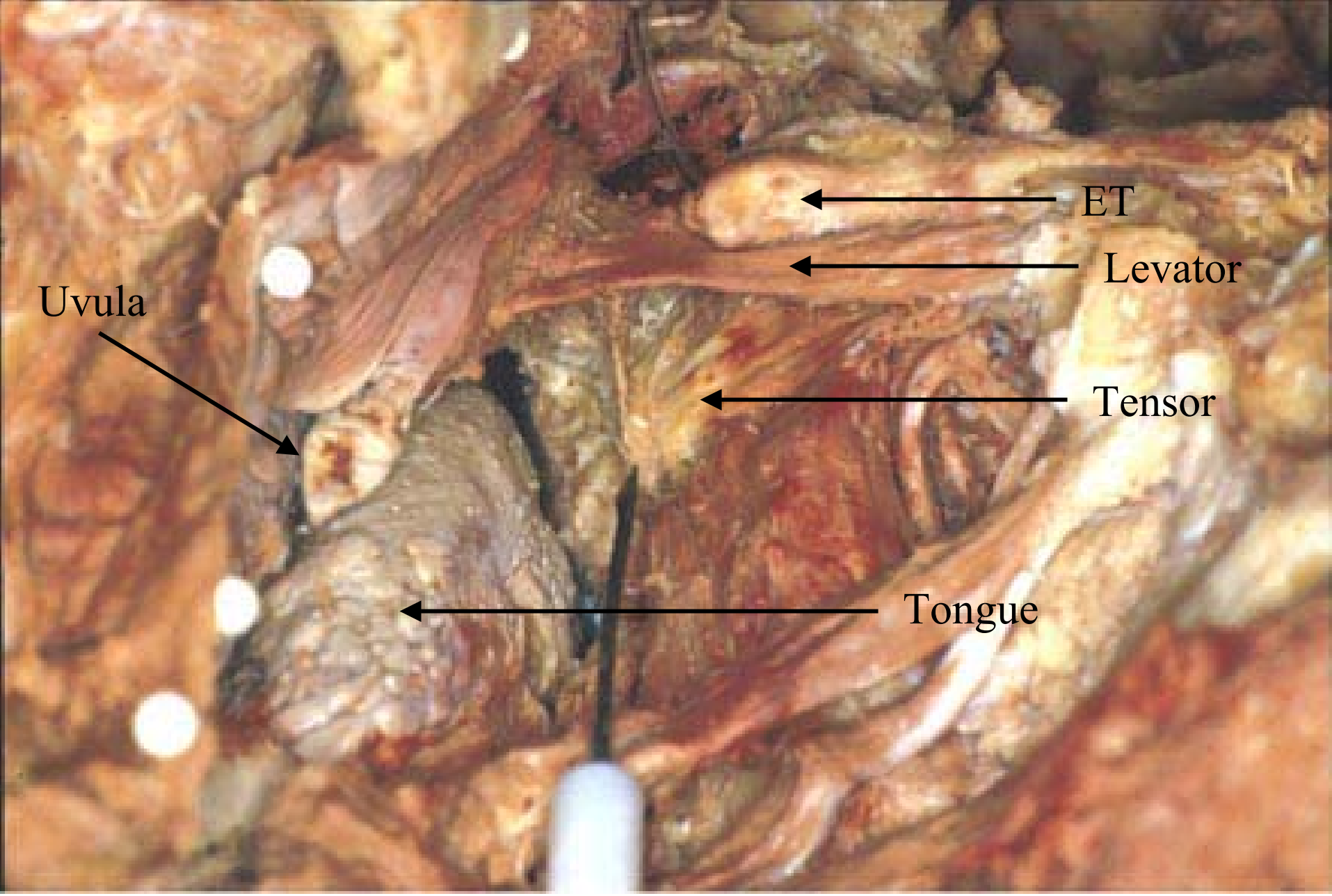
Dissection of adult head from behind.

Eustachian tube

Levator palatini m.

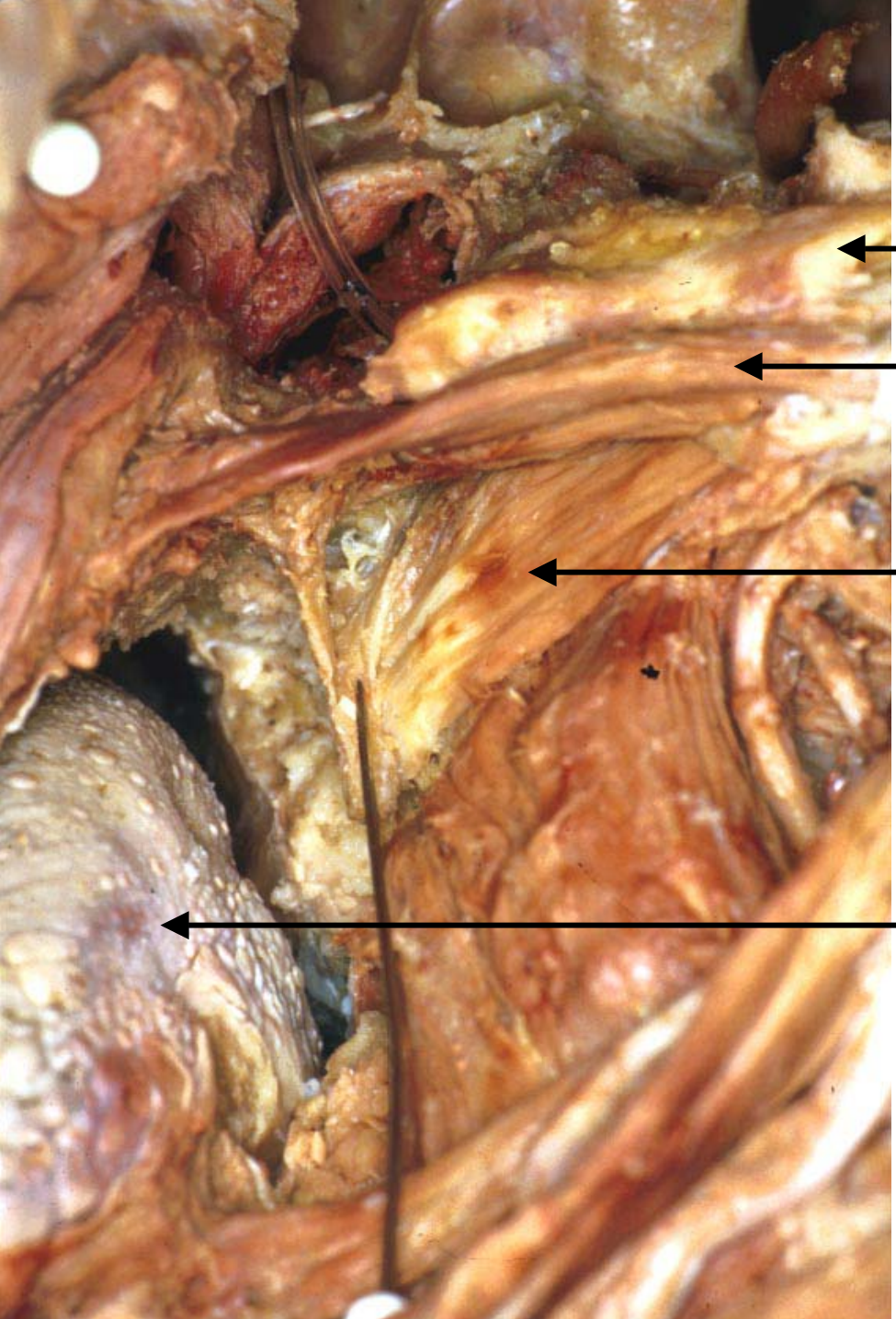
Tensor palatini m.

Tongue

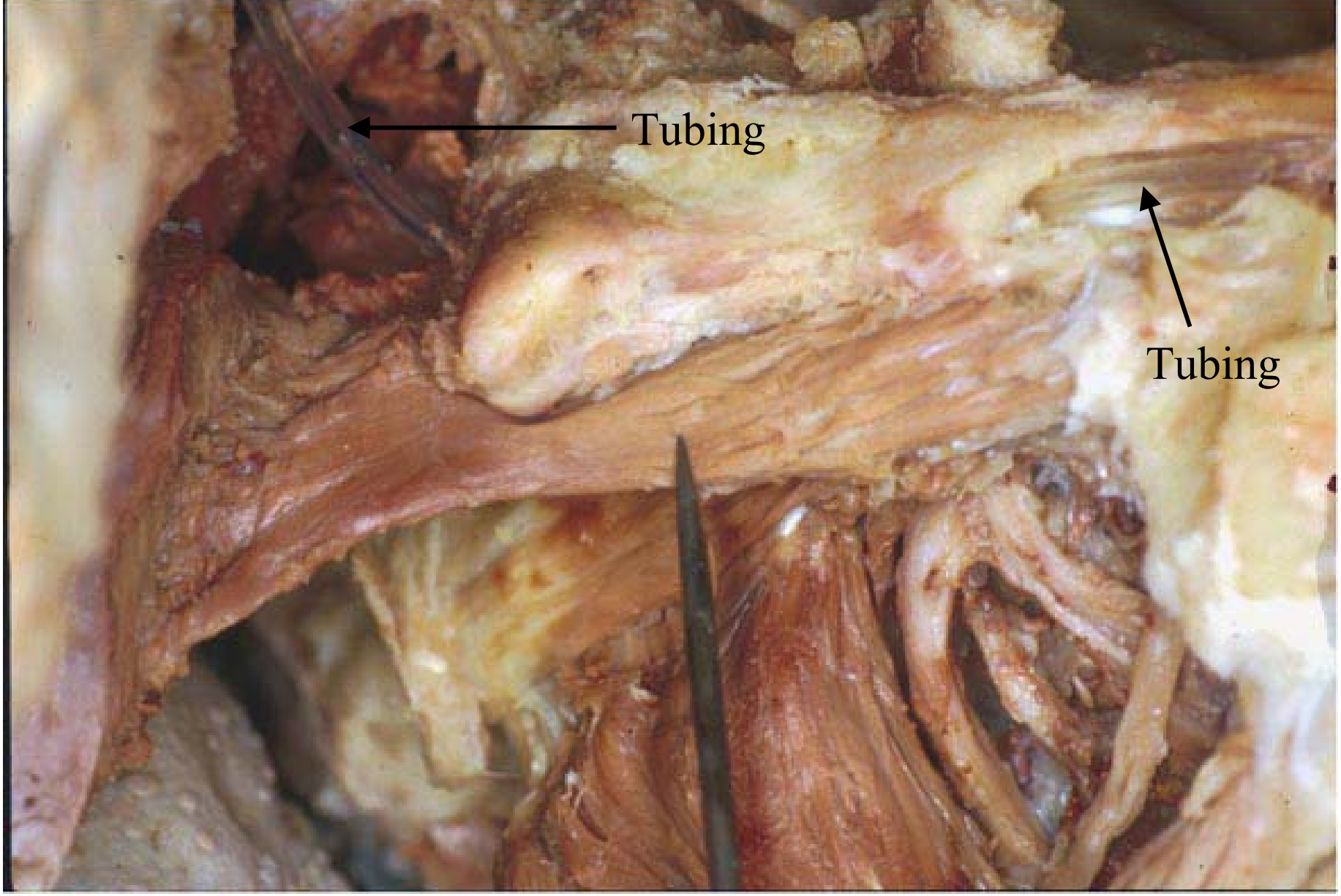


Zooming in on Tensor palatini, Levator palatini, and ET.
Pointer is on Pterygoid hamulus

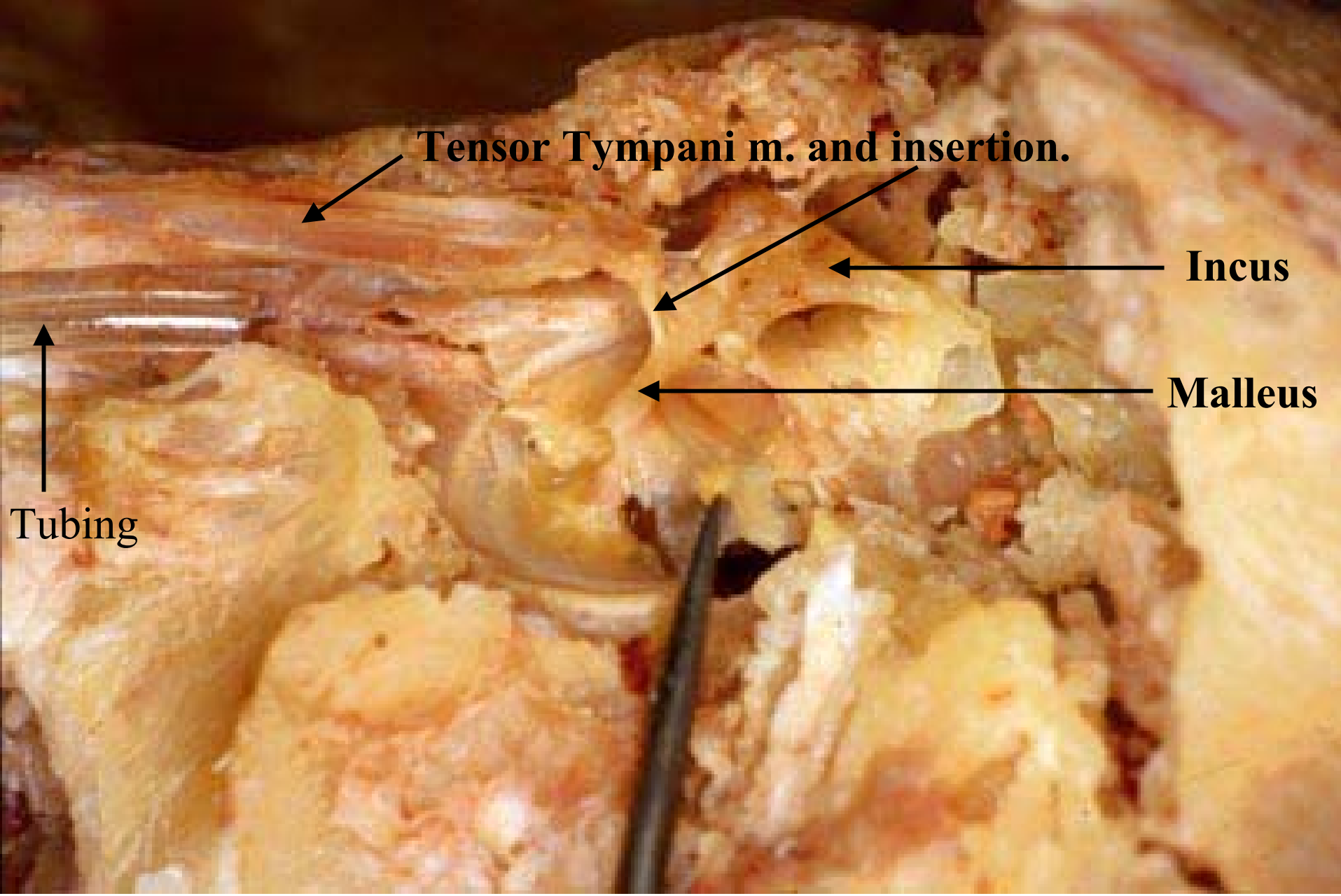
Dissection from behind



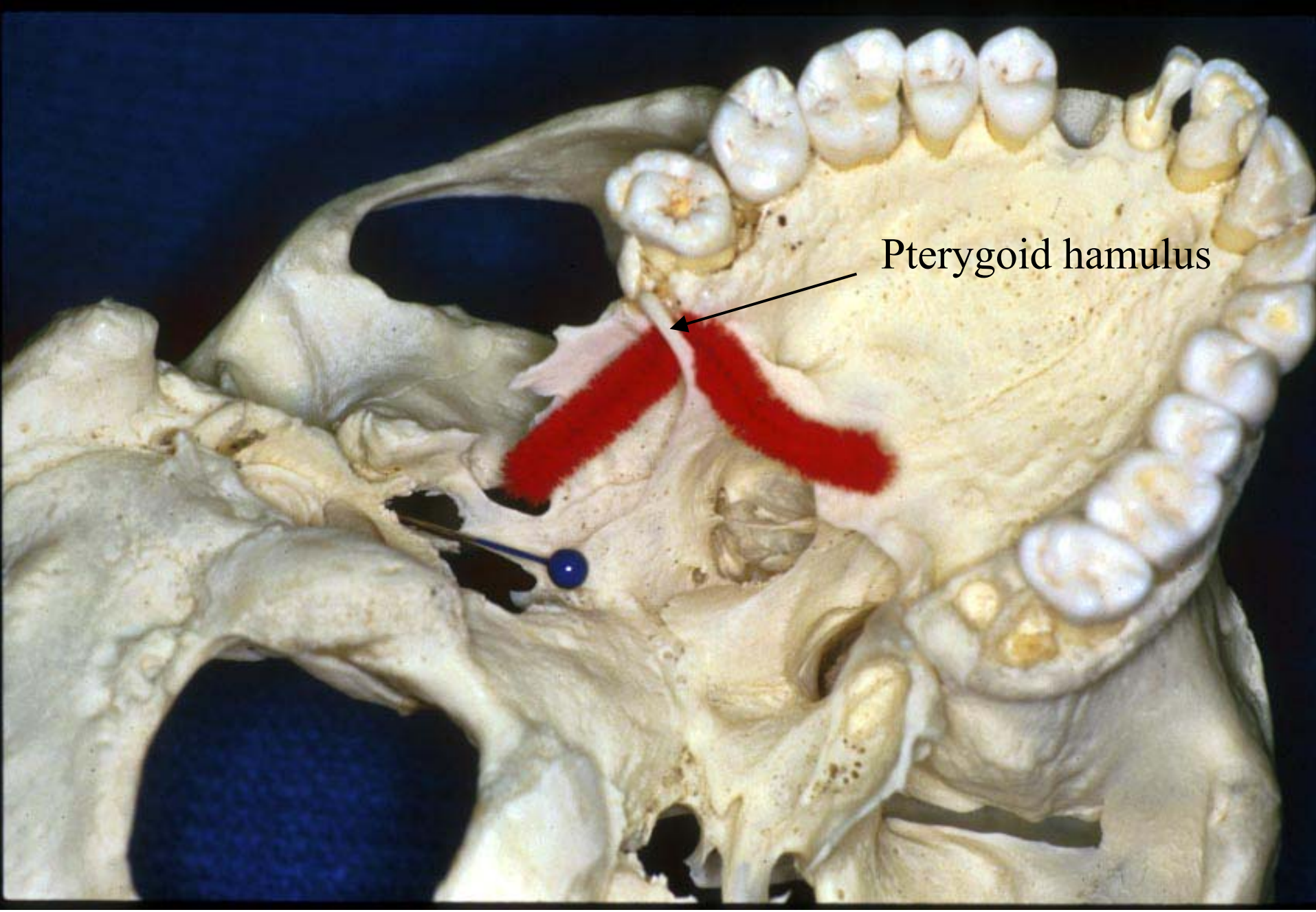
Close up of path of Tensor palatini m.
around the Pterygoid hamulus.



Pointer on Levator palatini, ET is on top, and Tensor palatini below.
Plastic tubing can be seen passing through Eustachian tube.



33 Tubing entering middle ear cavity. Pointer on Tympanic membrane.

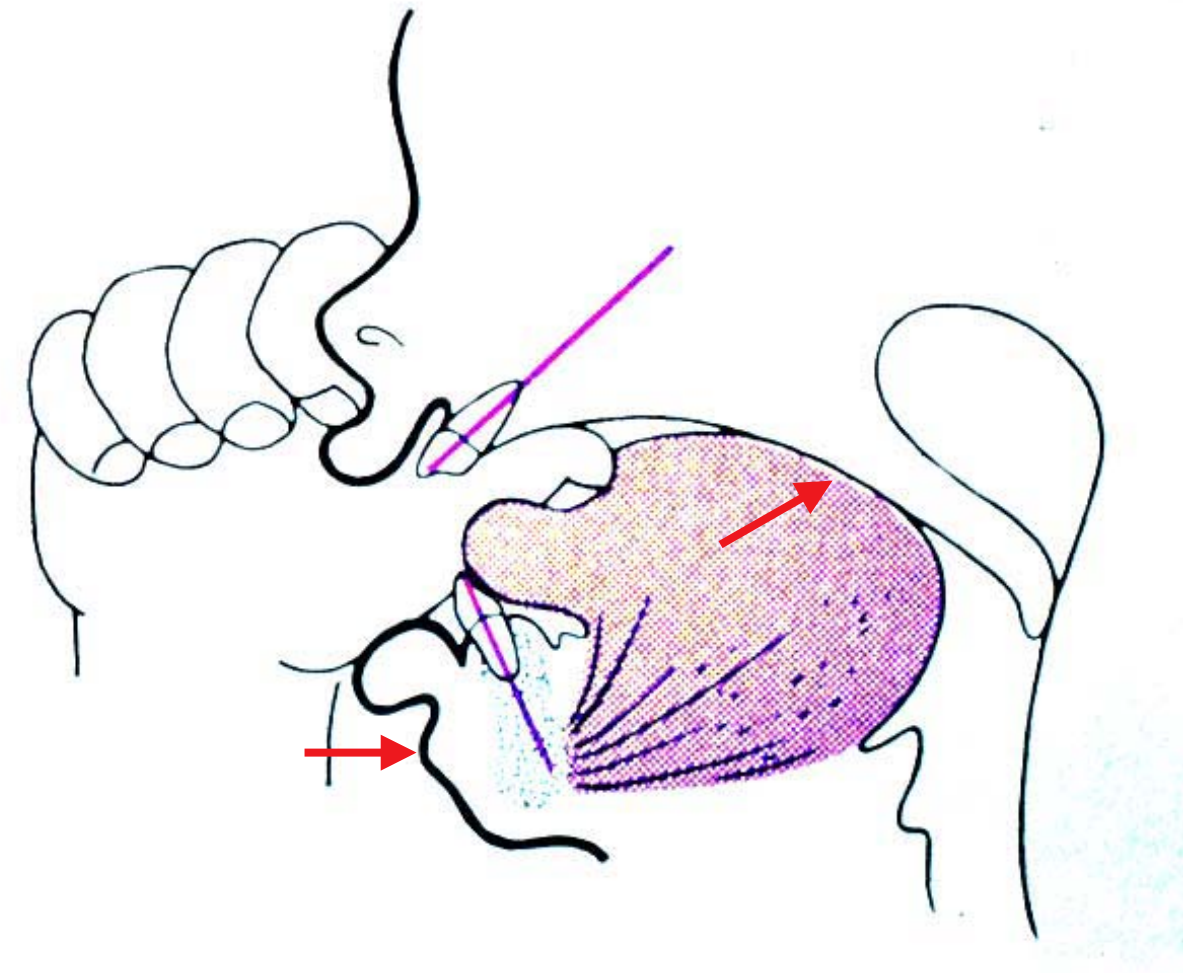


34 Path of Tensor palatini m. around the Pterygoid hamulus.

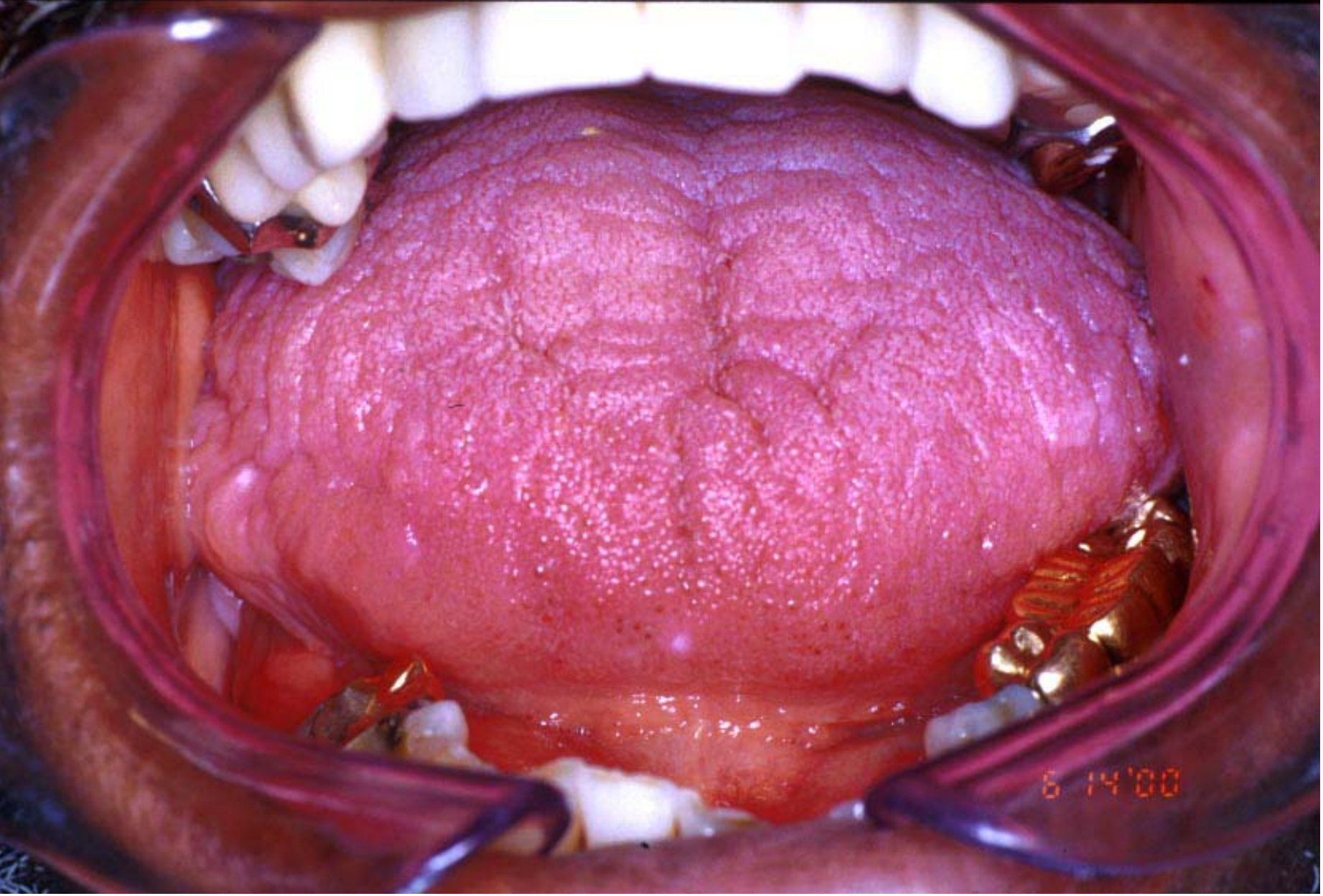
Impact of infant sucking habits

- 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

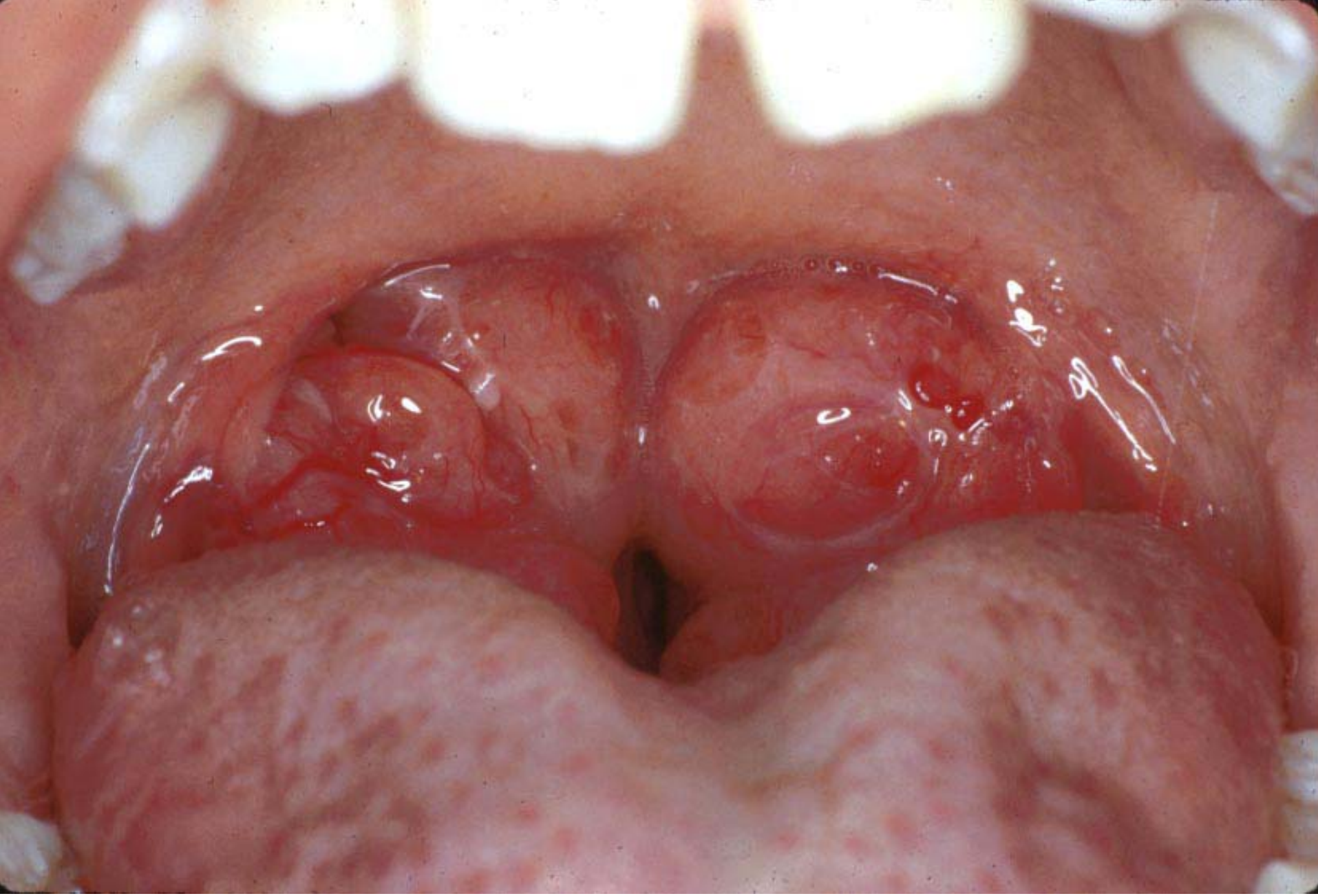
Melsen B, et al., Sucking habits and their influence on swallowing pattern and prevalence of malocclusion; European J of Orthodont, 1979, 1(4):271-280.



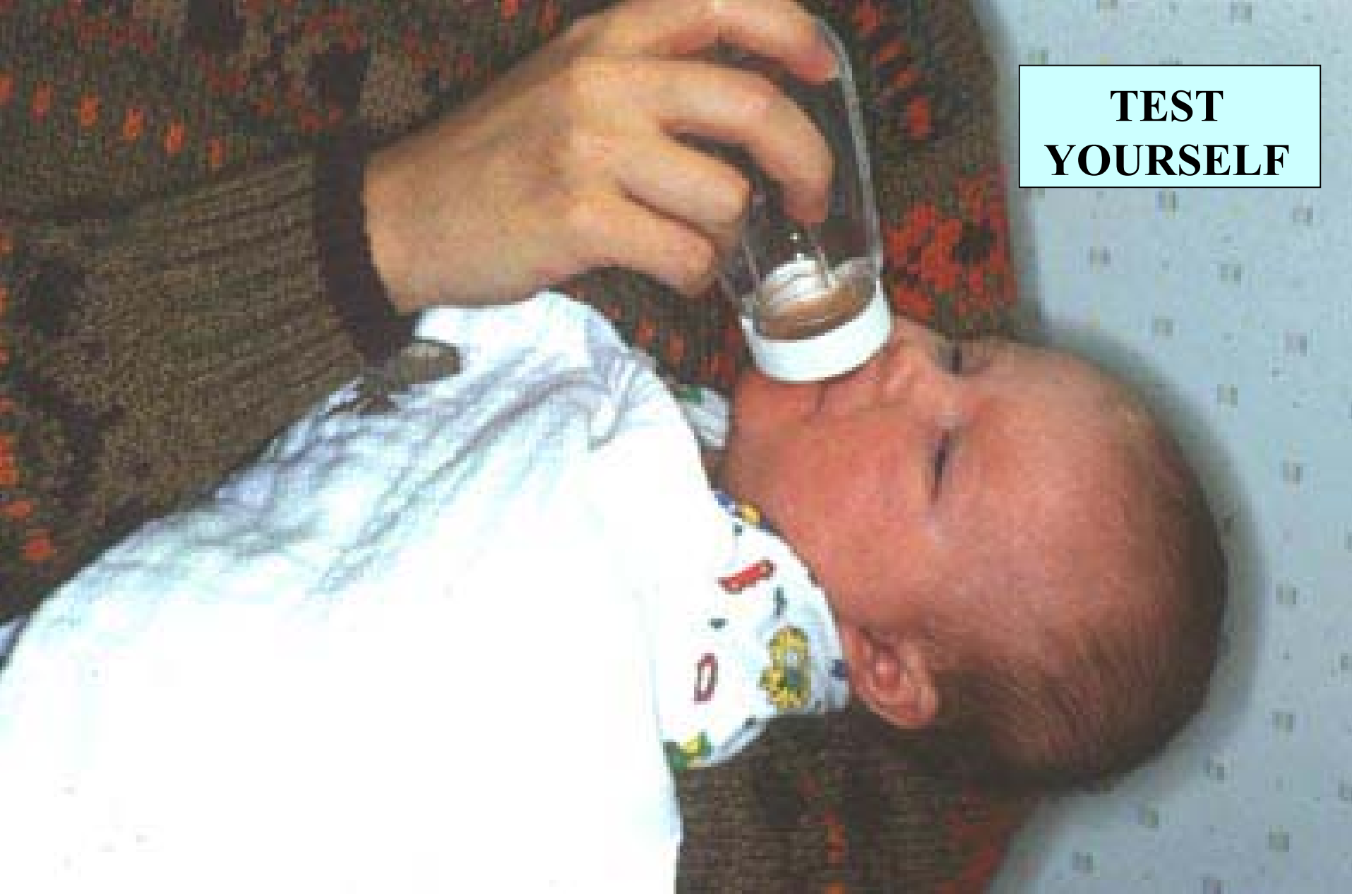
Excessive digit sucking can also drive jaw and tongue back - and block off eustachian tubes.



A large tongue can block off Eustachian tubes by elevating soft palate.



38 Massive tonsils can obstruct the Eustachian tubes.



39 **NEVER** bottle-feed an infant on it's back like this!

For Better Health!

Brian Palmer, D.D.S.

Kansas City, Missouri,USA

December, 2001.