

## INFANT OROFACIAL ANATOMY

Evelyne Ruf, MD, IBCLC  
Lactation Clinic  
Family Health Promotion Center, Sharjah

### Objectives

- Locate, name and describe the **different components** of the infant oral and facial anatomy involved in breastfeeding: lips, cheeks, jaws, tongue, palate, nose, epiglottis, larynx, pharynx
- Identify the **reference**, as well as **common variations or abnormalities**
- Describe their **potential impact** on breastfeeding

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### PLAN

- **Introduction**
- Resources
- Overview
- Reference & anomalies/challenges for:
  - Lips, cheeks, jaws, tongue, palates, nose, epiglottis/larynx, pharynx
- Conclusion

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### Importance for the Lactation Consultant

- Oral and Facial Anatomy
  - Basis for understanding:
    - Aspect of the different structures involved
    - Their function in infant feeding
    - Reference\* for analyzing and correcting breastfeeding problems

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### 'Reference'

- Most common example, greatest representation of a population
- Less judgmental than 'norm'
- Necessary to distinguish between normal variations and abnormalities (both of them might cause breastfeeding problems)

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### Aim of oral anatomy: suckling

- Suckling is a dynamic process: constant adaptation to a changing anatomy
- Far more than simply obtaining food: principal interaction with the environment
- Suckling vs. sucking (often used interchangeably)
- Common to all mammals



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Intro from Smillie C, 'Mother-Baby Dance'

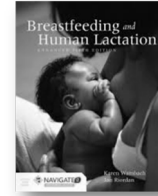
**PLAN**

- Introduction
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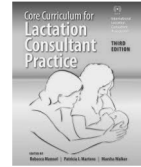
**Resources**



'Supporting Sucking Skills'  
Catherine Watson Genna,  
2<sup>nd</sup> Ed. (2013)

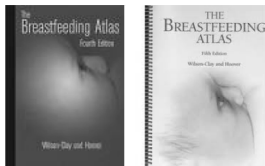


'BF and Human Lactation'  
Jan Riordan & K. Wambach  
5<sup>th</sup> Edition (2016)



'Core Curriculum'  
ILCA  
3rd Edition (2013)

**Resources (end)**



'The Breastfeeding Atlas'  
Wilson-Clay & Hoover,  
4<sup>th</sup> Edition (2008), 5<sup>th</sup> Edition (2013)  
and CD from 2<sup>nd</sup> edition



'BF, An illustrated Guide to  
Diagnosis and Rx'  
Denise Both & Kerri Frischknecht  
2008

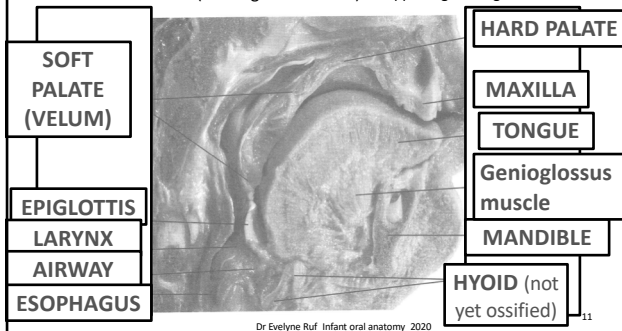
✓ Cases from Sharjah Ex-MCH  
Lactation Clinic

**PLAN**

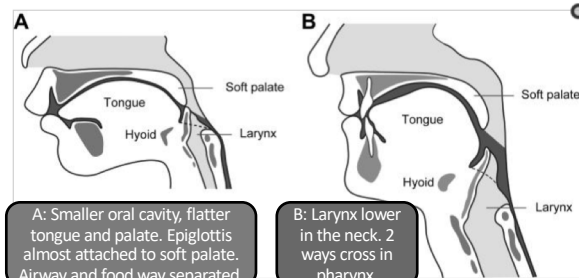
- Introduction
- Resources
- **Overview**
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**Anatomical Components**

7-month fetus (midsagittal section) 'Supporting Sucking Skills'



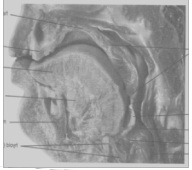
**Oral Anatomy of Infant and Adult**



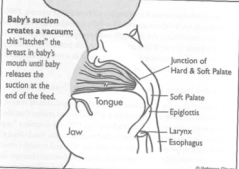
Matsuo (2008) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2597750/figure/F2/>

### Main Characteristics

- Newborn mouth (vertically short): particularly well designed for sucking
  - When closed: tongue (large in relation to the size) touching gums and roof of the palate
  - When feeding: tongue and breast fill almost all space



'Supporting Sucking Skills'



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### PLAN

- Introduction
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## LIPS

### Reference

Variations and Abnormalities

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### Lips: Reference



- Soft and flexible
- Partially everted: oral mucosa slightly externally
- Tiny swellings on the inner surface (eminences of the pars villosa)
- Well adapted for airtight closure around the breast
- Lower lip: flanged outward
- Upper lip: neutral position

'The Breastfeeding Atlas' Dr Evelyne Ruf\_Infant oral anatomy\_2020 16

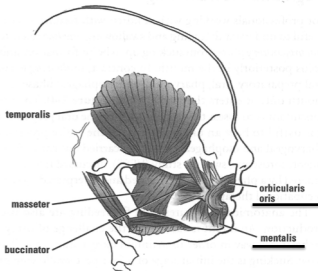
### Lips: Reference (cont.)



- **Good lip tone:** well defined philtrum and closed mouth posture while sleeping

'The Breastfeeding Atlas' Dr Evelyne Ruf\_Infant oral anatomy\_2020 17

### Lips: Muscles and Innervation

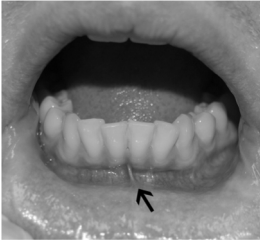


- Muscles:
  - **orbicularis oris** (closes the lips)
  - and **mentalis** (elevates center of lower lip)
- Innervation: **facial nerve (VII)**

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### Labial Frenum (plural 'Frenae'):

- Inferior



withhealth.net

- Superior (maxillary)



Dr L. Kotlow (<https://www.kiddsteeth.com/>)

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### LIPS

Reference

### Variations and Abnormalities

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### Poor Lip Tone (and Facial Tone)



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### Poor Lip Tone

- Poor lip seal → impairs amount of negative pressure
- Intermittent breaks in suction:
  - Clicking or smacking sounds
  - Milk leaking
- Needs constant re-latching:
  - Tiring, incomplete feeding
 → poor weight gain, down regulation of milk supply

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### Poor Lip (and Facial) Tone



'The Breastfeeding Atlas'

17 day-old, still under birth weight, unable to breastfeed

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### Milk Leaking

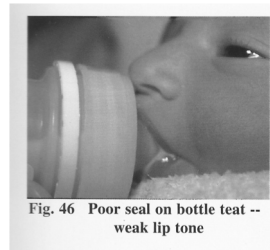


Fig. 46 Poor seal on bottle teat -- weak lip tone

'The Breastfeeding Atlas'



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### Lip Retraction (compensation for low tone)



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### Lip Retraction (compensation for low tone)



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### Hypertonic, "Purse String" Lips (due to excessive tone)



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14 day-old, not able to breastfeed

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### Sucking blister(s): sign of frictional trauma

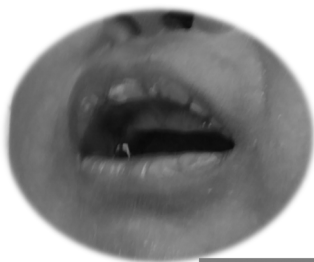


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### Suckling blisters (cont.)



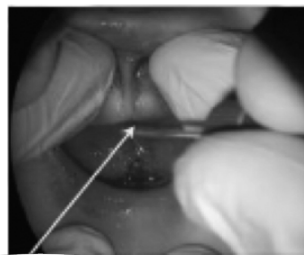
Had upper lip-tie and tongue-tie.

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21-05-2015

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### Tight labial frenum



Incisive papilla

Difficult latch

Poor gape

Sore nipples

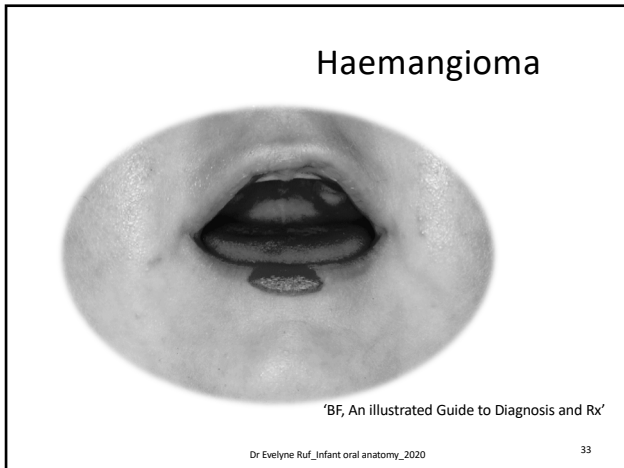
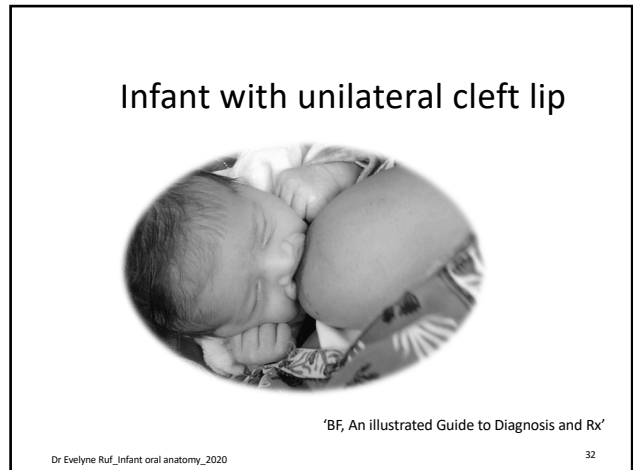
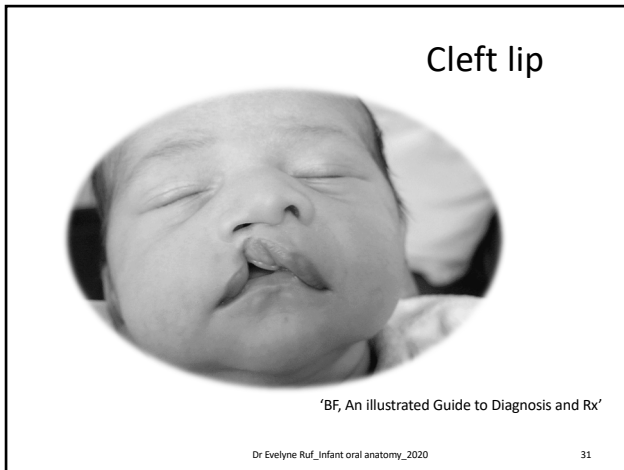
Tooth decay

Space between incisive teeth

Kotlow L. DDS

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## CHEEKS


### Reference

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### Cheeks: Reference

- Subcutaneous fat deposits
- Structural support for oral and pharyngeal function
- Thick wall: prevents collapse of cheeks while suckling
- Cheek stability influences lip seal




**Fig. 32** Assessing thickness of cheek fat pads

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### Cheeks: Reference (cont.)

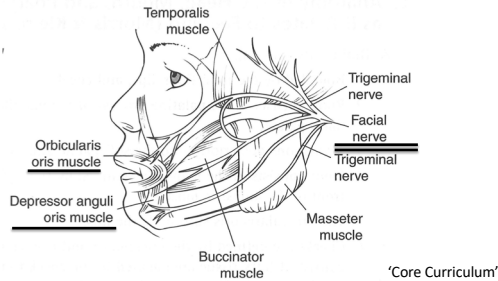
- Muscle: **buccinators**
- Compress the cheeks to maintain contact with the breast
- Innervation: facial nerve (VII)



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## Cheeks: Buccinator muscle



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## CHEEKS

Reference

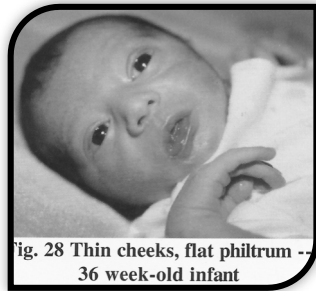
### Variations and Abnormalities

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## Thin cheeks

- Thin cheeks (lack of adequate fat deposits)
- Cheek instability
- Difficulty to create vacuum
- Collapsing of the cheeks ('dimpling')



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## Thin vs. fatty cheeks...



17 day-old, not latching



At 6-week old, after CST (cranio-sacral therapy)

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## JAWS

### Reference

Variations and abnormalities

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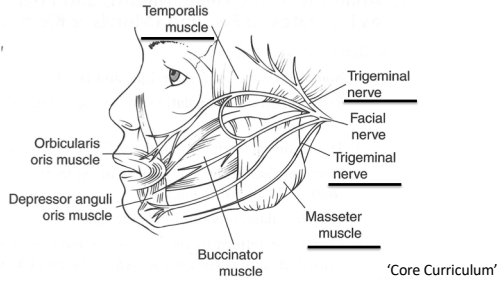
## Jaws: Reference

- Provide stability for the tongue, lips and cheeks.
- Normal lower jaw movements are rhythmic and graded (not too wide or too narrow)
  - important role in milk removal.
- Muscles: - **Masseter** : depresses and elevates the mandible (lower jaw)
  - **Temporalis**: closes mandible during suckling
- Innervation: **Trigeminal (V)**
- Mandible usually short in newborns (< 40% complete at birth); forward growth until 3 years.

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## Jaws: Muscles and Nerves



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## JAWS

Reference

### Variations and Abnormalities

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## Receding Chin (retrognathia)

- Familial
- Intrauterine positioning (breech)
- Specific chromosomal disorders (Pierre Robin Syndrome)

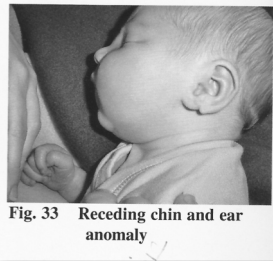


Fig. 33 Receding chin and ear anomaly

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## Reference vs. Receding chin



'The Breastfeeding Atlas'

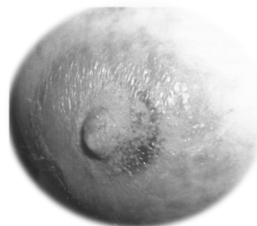
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## Consequences of Receding Chin on Breastfeeding

Poorly positioned jaw

- → sore nipples
- → poor milk transfer



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## Jaw Asymmetry

- Due to:
  - asymmetrical muscle tone,
  - injury or paralysis,
  - torticollis
  - or abnormal jaw development.
- Consequences:
  - Asymmetrical jaw movements
  - dysfunctional sucking ability



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### Jaw Asymmetry (cont.)



Fig. 34 Jaw asymmetry -- mouth closed



Fig. 35 Jaw asymmetry -- mouth open

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### Jaw Asymmetry (cont.)



<http://newborns.stanford.edu/PhotoGallery/PositionalJaw1.html>



<http://newborns.stanford.edu/PhotoGallery/PositionalJaw2.html>

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### Jaw Asymmetry (cont.)



<http://newborns.stanford.edu/PhotoGallery/PositionalJaw3.html>

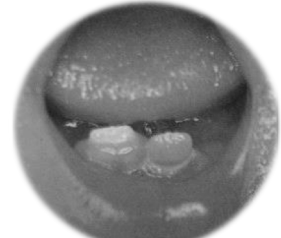
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### Natal Teeth



<http://newborns.stanford.edu/PhotoGallery/Teeth1.html>



[http://mchoralhealth.org/flvarnish/mod3\\_2\\_4.html](http://mchoralhealth.org/flvarnish/mod3_2_4.html)

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### Natal Teeth (end)



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06-07-2015

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### TONGUE

#### Reference

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### Tongue: Reference

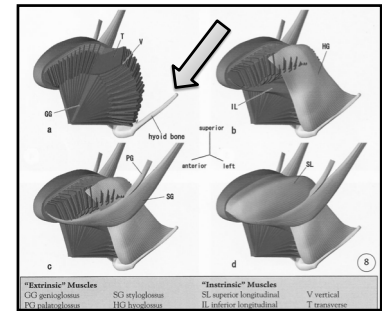
- Role in:
  - latching (draws the nipple/breast in)
  - sustaining the latch (stabilizes the breast)
  - milk removal (positive and negative pressure)
  - channeling fluid towards the pharynx (central groove)
  - preparing the bolus (in valeculae) for swallowing
- Reference : soft, thin, excellent tone, rounded tip, lies on the bottom of the mouth with a slight central groove.

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### Complex Muscular Structure (Extrinsic & Intrinsic)

- Genioglossus
- Superior longitudinal
- Inferior longitudinal
- Vertical muscles
- Transverse muscles

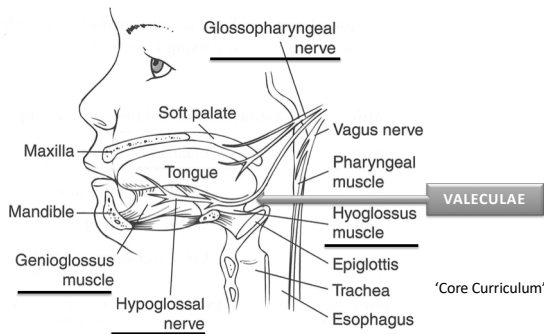


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### Tongue: Muscle and Nerves



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### Tongue: Extension



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### Tongue: Elevation



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### Tongue: Elevation (cont.)



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SHJ Ex-MCH Lact. Clinic 25-07-2013

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## Tongue: Lateralization



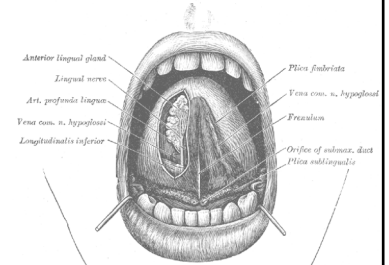
'The Breastfeeding Atlas'

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## Lingual Frenum

- Should allow free movements of the tongue



en.wikipedia.org

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## TONGUE

Reference

### Variations and Abnormalities

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## Whole Range of Disorders...

- Short tongue: restricts ability to attach to the breast
- Long tongue: held on the palate, poor coordination
- Flat tongue (low tone or severe tongue-tie)
- Humped tongue (antero-posterior direction)
- Bunched tongue (lateral direction)
- Asymmetrical (structural or from neurological cause)
- Tongue protruding (poor muscle tone)
- Enlarged tongue or macroglossia (hypothyroidism, chromosomal syndromes)
- Tongue-tie or ankyloglossia (tight lingual frenum)

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## Macroglossia



Figure 8-39 Mild macroglossia.

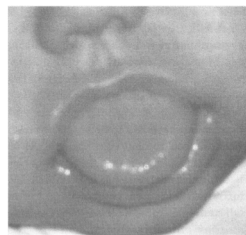


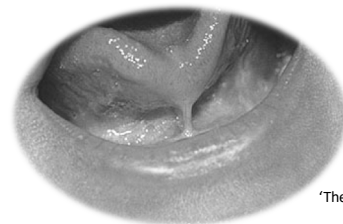
Figure 8-40 Macroglossia associated with Beckwith-Wiedemann Syndrome (BWS).

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## Tongue-tie: Whole Range of Tongue Function Disorders



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### Tongue-tie (cont)



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### Constellation of Feeding Challenges

- If the tongue cannot move properly, a whole range of consequences can occur:
  - Latching
  - Maintenance of latch
  - Milk removal
  - Swallowing
- Jaws compensate by extra pressure → nipple pain++
- Conversely, sometimes babies compensate other problems with abnormal tongue movements.

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### PALATES

#### Reference

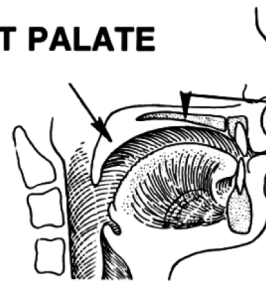
Variations and abnormalities

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### Palates: Reference

**SOFT PALATE**



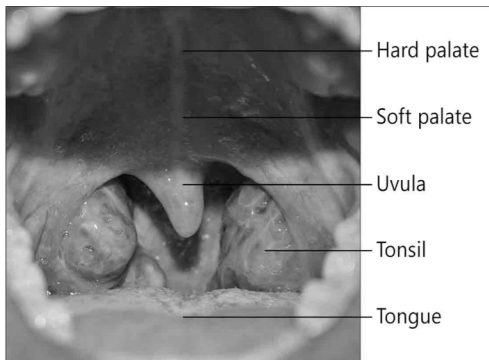
**HARD PALATE**

[https://www.wpclipart.com/medical/anatomy/mouth\\_and\\_throat/palate.png.html](https://www.wpclipart.com/medical/anatomy/mouth_and_throat/palate.png.html)

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### Palates: Reference (cont.)



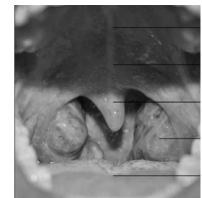
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<http://www.yourarticlelibrary.com/biology/human-beings/palate-useful-notes-on-the-palate-human-anatomy/9743>

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### Palate: Reference (cont.)

- **Hard palate:** passive role
  - Stability for the oral structures
  - Assists with positioning
- **Soft palate (with uvula):** Works with the tongue to create the posterior seal of the oral cavity



Source: see previous slide


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### Hard Palate: Reference

- Intact
- Length ≈ 1 inch (newborn)
- Smoothly contoured (moderate angle of the slope)
- Plastic (shaped by tongue movements, in utero and after birth)




<http://newborns.stanford.edu/PhotoGallery/EpsteinPearl1.html>

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### Hard Palate: Reference (cont.)



Excellent tongue elevation → reference palate

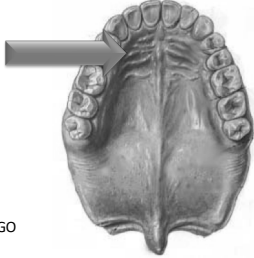
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SHU\_ ExMCH Lactation Clinic 01-09-2013

### Palatine Rugae

- Transverse folds, assisting for holding the breast



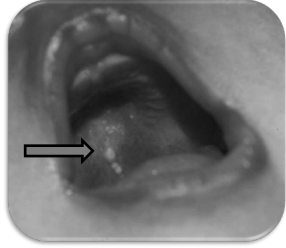
[http://rapidshare.com/files/395418935/RUGO\\_SCOPIA.pptx.html](http://rapidshare.com/files/395418935/RUGO_SCOPIA.pptx.html)

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### Epstein Pearls

- Epithelial tissue that becomes trapped during the palatal fusion.
- Very common and benign finding
- Very often misdiagnosed as thrush
- Firm papules, felt through palpation



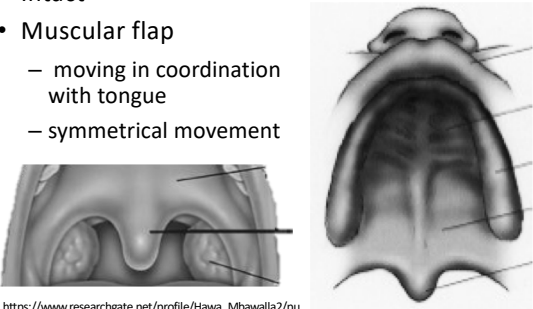
‘The Breastfeeding Atlas’

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### Soft Palate (Velum): Reference

- Intact
- Muscular flap
  - moving in coordination with tongue
  - symmetrical movement



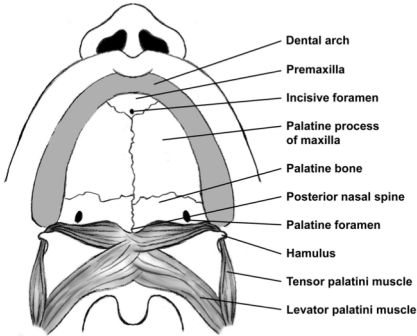
<http://prateep.info/2015/12/12/Cleft-palate-in-newborn-babies/>

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https://www.researchgate.net/profile/Hawa\_Mbawalla2/publication/310970418/figure/fig1

### Soft Palate (Velum): Reference (end)



- Dental arch
- Premaxilla
- Incisive foramen
- Palatine process of maxilla
- Palatine bone
- Posterior nasal spine
- Palatine foramen
- Hamulus
- Tensor palatini muscle
- Levator palatini muscle

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http://emedicine.medscape.com/article/837347-overview

# PALATES

Reference

## Variations and Abnormalities

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## Shapes of Hard Palate

- Short palate
- Long palate
- High palate (arched)
  - Channel palate (grooved)
  - Bubble (only anteriorly)
  - V-shaped

Plasticity: Narrow palate more often with bottle feeding

More frequent if tongue cannot apply pressure on the palate (e.g. tongue-tie, as tongue pulled down)

**! High palate can affect latch and nipple comfort**

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## Abnormal Palate Shape Reflects Abnormal Tongue Movements

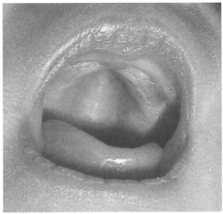


Figure 8-12 High, narrow, "V"-shaped palate in an infant with type 3 tongue-tie.













Figure 8-13 High, narrow palate in an infant with type 1 tongue-tie. Note the flat, retracted tongue.

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## Clefts of the Hard Palate

- Isolated or associated with cleft lip
- Unilateral or bilateral

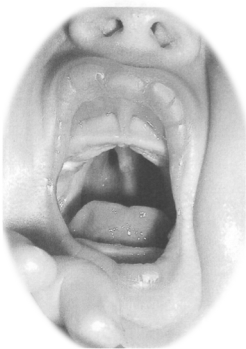
 normal lip	 normal palate	 cleft palate
 left unilateral cleft lip	 left cleft lip	 left unilateral cleft lip and palate
 bilateral cleft lip and palate	 bilateral cleft lip	 bilateral cleft lip with full palate


<http://kidshealth.org/en/parents/cleft-lip-palate.html>

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## Bilateral Cleft Palate

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<http://newborns.stanford.edu/PhotoGallery/CleftPalate1.html>

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## Bilateral Cleft Palate






Discovered in SHJ Ex-MCH Lactation Clinic (2013)

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### Complete unilateral cleft of lip and palate

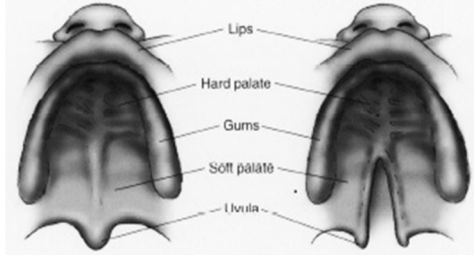


'BF, An illustrated Guide to Diagnosis and Rx'

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### Cleft of the Soft Palate (Velum)



Normal palate in infant      Partial cleft palate

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http://prateep.info/2015/12/12/Cleft-palate-in-newborn-babies/

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### Cleft of the Soft Palate (cont.)

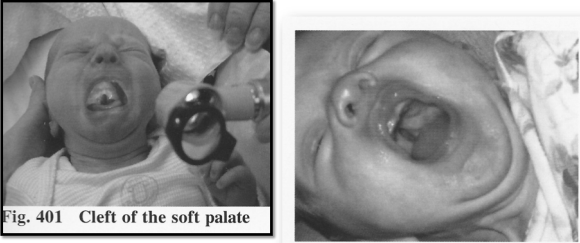


Fig. 401 Cleft of the soft palate

Fig. 402 Cleft of the soft palate

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### Cleft of the soft palate



Discovered in SHJ Ex-MCH Lactation Clinic (2013)

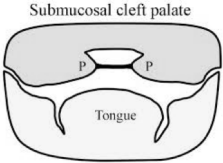
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### Submucosal Cleft Palate

When the palate appears to be structurally intact, but there are bony and/or muscular abnormalities underlying the skin's surface.

- Called 'the invisible cleft'
- Diagnosis by direct palpation only
- Uncommon in general
- Present in 36% of children with cleft lip




http://face.usc.edu/cleft-palate/

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### Submucosal Cleft Palate (cont.)

- Possible associated signs:
  - bifid uvula (cleft),
  - notching at junction of hard/soft palate,
  - bony defect in the hard palate (it looks 'dented')
  - midline translucent zone (bluish or white line): muscular diastasis



https://elementsofmorphology.nih.gov/index.cgi?tid=30b9e9da9758d9d7

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### Submucosal cleft palate (cont.) Complete or partial cleft of the uvula



<http://elements.morphology.nih.gov/index.cgi?tid=30b9e9da9758d9d7>

[missinglink.ucsf.edu](http://missinglink.ucsf.edu)

<http://newborns.stanford.edu/PhotoGallery/BifidUvula1.html>

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### Velopharyngeal Inadequacy

- Inability of the soft palate and pharyngeal muscles to close off the nasopharynx.
- Caused by a submucosal cleft of the palate or by neurological mechanisms (poor coordination)
- Consequences of velopharyngeal inadequacy:
  - Paranasal bulging
  - Nasal regurgitation (during or after feeds)
  - Poor milk transfer
  - Ear problems (glue ear), speech problems

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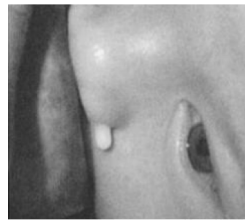
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### Signs of velopharyngeal inadequacy

Paranasal bulges and mild "gull wing" upper lip.



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Nasal regurgitation during a breastfeed.

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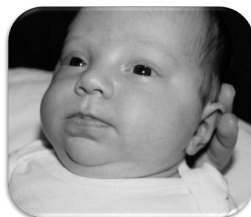
### NOSE

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### Nose: reference

- Infants are nose-breathers: they will prioritize breathing over eating
- Nostrils should be symmetrical,
- Without flaring
- Not congested (no noisy breathing).



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### Anomaly: Small nasal passages



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# EPIGLOTTIS/LARYNX

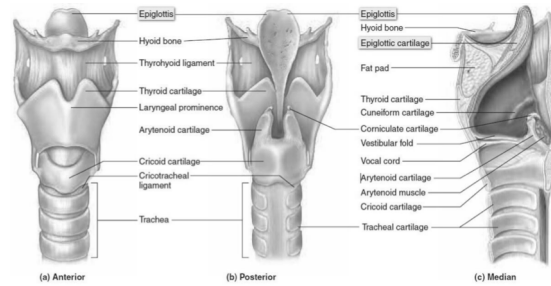
## Reference

Variations and abnormalities

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# Epiglottis & Larynx: Reference

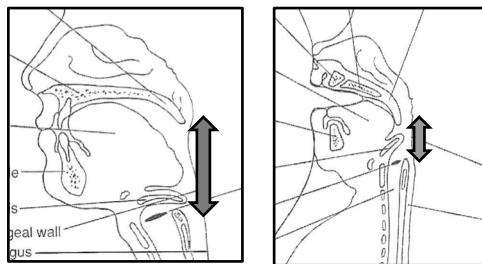


<https://healthfixer.com/epiglottis/>

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# Adult versus Infant



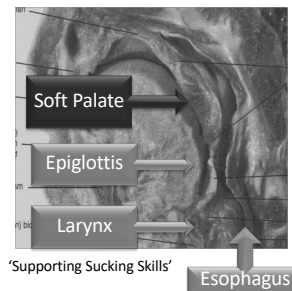
'BF and Human Lactation'

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# Newborn: Unique Airway Protection

- Epiglottis and soft palate touch at rest
- Upper airway very short
- Reduced risk of aspiration
- Reduced resistance to airflow when extending the neck



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# Epiglottis: Reference

- Infant's epiglottis: just below the soft palate.
- Role: closing off the pathway to the lungs during swallowing.
- Milk moves laterally on the outside of the epiglottis → into the esophagus.

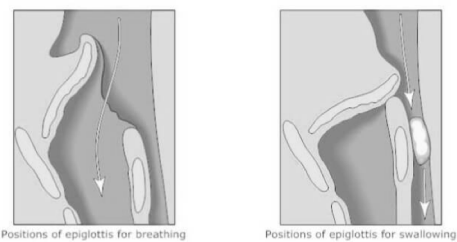


commons.wikimedia.org

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# Epiglottis: When Breathing and Swallowing



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smendraw.com

Sagittal sections of larynx showing the positions of the epiglottis for breathing and swallowing.

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### Larynx: Reference (Infant vs. Adult)

- Higher in the oral cavity
  - Occupies larger space
  - Short and funnel-shaped
  - During swallowing: larynx is high and elevated
- Depends much less on epiglottis and closure of vocal folds for airway protection

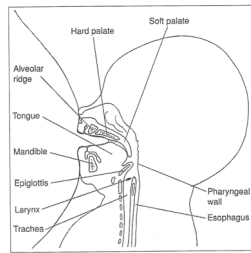


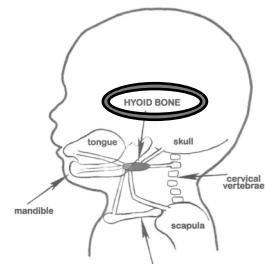
FIGURE 3-14 Midsagittal section of cranial and oral anatomy of an infant while swallowing. 'BF and Human Lactation'

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### Larynx: suspended

- Cartilage suspended by muscles and ligaments
- To the **hyoid bone**
- To the **cervical vertebrae**



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## EPIGLOTTIS/LARYNX

Reference

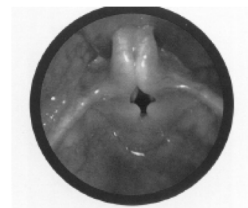
### Variations and Abnormalities

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### Abnormalities of the Airway

- **Laryngomalacia:** epiglottis small and curled on itself; most common cause of neonatal stridor
- **Tracheomalacia:** less common
- Vocal fold (Cord) paralysis
- Subglottic stenosis



Laryngomalacia <http://emedicine.medscape.com/article/1002527>

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### Malacia

- Narrowing or a collapse of the airways during part of the respiratory cycle

### Stridor

- Atypical breathing sound due to the malacia

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#### LARYNGOMALACIA

- Larynx: supra-glottic structures (epiglottis and arytenoid)
- INSPIRATORY collapse
- Most frequent
- Present in first 2 weeks, worsens up to 6 months, resolves by 1-2 years of age
- Can be mild (reassurance, prone position), moderate or severe (surgery needed)

#### TRACHEOMALACIA

- Trachea (intra-thoracic)
- EXPIRATORY collapse
- Generally benign, self resolving with age and maturation of airway structures
- If more severe, several therapeutic options

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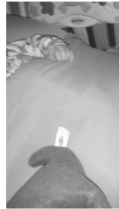
## Laryngomalacia: INSPIRATORY Stridor

INFANT AWAKE



<https://www.youtube.com/watch?v=19zQv9ooFsl&feature=youtu.be>

INFANT ASLEEP



<https://www.youtube.com/watch?v=JmJVIFeCjms&feature=youtu.be>

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## Tracheomalacia: EXPIRATORY Stridor



<https://www.youtube.com/watch?v=xMqPcFfpgk0&feature=youtu.be>

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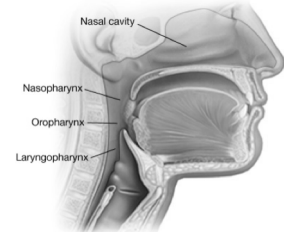
## PHARYNX

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## Pharynx: reference

- Soft muscular tube at the back of the throat
- Dual role:
  - Swallowing
  - Breathing
- Divided in:
  - **Nasopharynx**
  - **Oropharynx**
  - **Laryngopharynx**



<http://www.mayoclinic.org/parts-of-the-throat-pharynx/img-20005644>

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## INFANT OROFACIAL ANATOMY

**Thank you!**

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