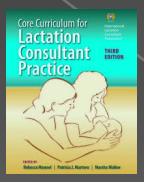
New Understanding of Infant suckling

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

Lactation Management Training Program
2019

Resources



'Core Curriculum'
ILCA
3rd Edition (2013)

- Geddes DT, Kent JC, Mitoulas LR, Hartmann PE. **Tongue movements and intro-oral vacuum in breastfeeding infants.** *Early Human Development*, **2008**, 84, 471-477

- The University of Western Australia, Medela **The science of infant suckling.** CD, edited by Medela AG **2008**.



Suckling versus Sucking

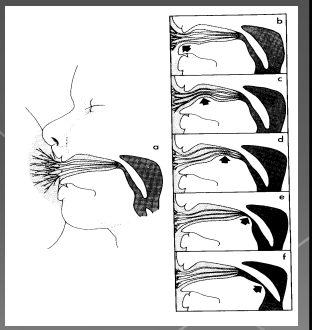
- Often used interchangeably: infant mouth movements with or without the ingestion of food
- Distinction by some authors:
  - Historically: the baby sucked and the mother suckled
  - Suckling: first pattern, sucking: after 6-9 months
  - Suckling: at the breast, sucking: bottle-feeding
  - Sucking: on bottle or breast (nutritive), or on a pacifier, finger (non-nutritive)

Determinants of Milk Removal

- Milk flow (controlled by Milk Ejection Reflex – MER)
  - Milk intake related to number of milk ejections
  - Begins between average 56 seconds and average 2.2 minutes after the start of suckling
- Additional mechanisms:
  - Negative pressure within the oral cavity
  - Positive pressure of the tongue against the teat
  - Increased intraductal pressure
- Effective suckling: coordination sucking, swallowing, breathing

Theories on milk removal

- Vacuum (Waller,1936)
- Compression by infant's jaw and peristaltic action of the tongue (Cooper1840, 1958 [BoF], Woolridge1986)
- This theory presupposes the existence of lactiferous sinuses
- Lactiferous sinuses do not exist → maybe changes also in suckling?



Imaging used previously

- Fluoroscopy (X-Ray) *[1958, 1959]*
  - Mother and infant unable to feed in a 'normal position'
  - No identification of milk flow
  - *"The mechanisms of BF is probably similar to bottle-feeding."*
- Ultrasound imaging *[Woolridge, 1986]*
  - Large transducers (interference with position)
  - Limited image resolution
  - No identification of milk flow
  - 6 infants (2 to 6 days old)

New research published in 2008

Early Human Development (2008) 84, 471–477

available at www.sciencedirect.com

ScienceDirect

www.elsevier.com/locate/earlhumdev

ELSEVIER

Tongue movement and intra-oral vacuum in breastfeeding infants

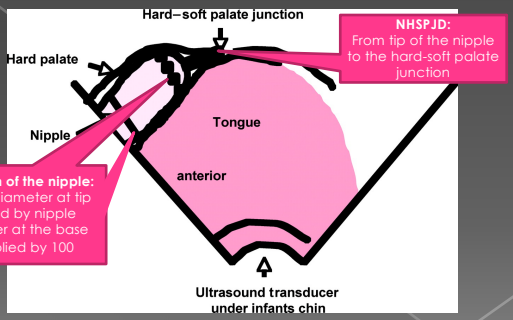
Donna T. Geddes [a,*], Jacqueline C. Kent [a], Leon R. Mitoulas [b], Peter E. Hartmann [a]

[a] The University of Western Australia, Biochemistry and Molecular Biology, School of Biomedical, Biomolecular and Chemical Sciences, Faculty of Life and Physical Sciences, Australia
[b] Medical Research Coordinator, Medela AG, Medical Technology, Lättichstrasse 4b, 6341 Baar, Switzerland

Material and method

- 20 exclusively breastfed infants (3-24 weeks old), with good weight gain.
- Submental ultrasound scans of infant's oral cavity during a whole breastfeed, videotaped. *Long-handled transducer.*
- Simultaneous measurement of intra-oral vacuum via a milk-filled supply-line (SNS) connected to a pressure transducer.
- Analysis of movements of the tongue in relation with milk flow and vacuum.

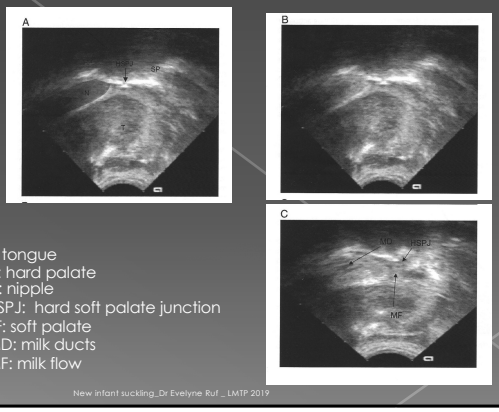
Measurements done by US



Geddes, D. T. et al. Pediatrics 2008;122:e188-e194

FIGURE 1 Schematic diagram of the submental sagittal view of infant oral cavity with the tongue up in apposition with the palate

Submental US images during breastfeeding



T: tongue
H: hard palate
N: nipple
HSPJ: hard soft palate junction
SF: soft palate
MD: milk ducts
MF: milk flow

Intra-oral pressure measurements done

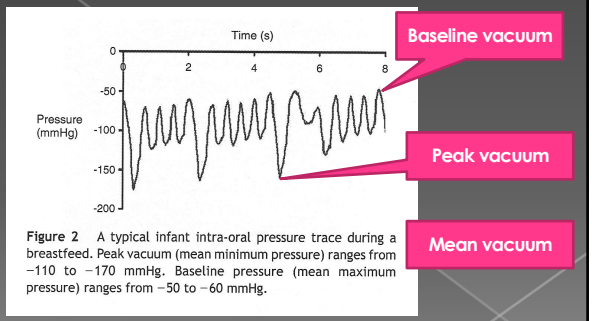


Figure 2 A typical infant intra-oral pressure trace during a breastfeed. Peak vacuum (mean minimum pressure) ranges from −110 to −170 mmHg. Baseline pressure (mean maximum pressure) ranges from −50 to −60 mmHg.

Changes in tongue position and vacuum in one suck cycle

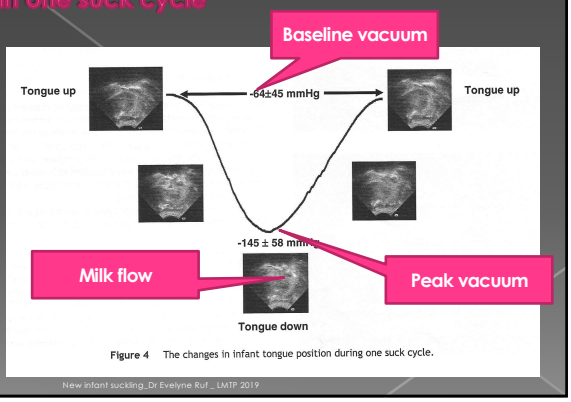


Figure 4 The changes in infant tongue position during one suck cycle.

Main points of the new concept

- Nipple does not reach the hard-soft palate junction (distance varies from 1.3 to 6.9 mm).
- Tongue does not indent into the nipple to "pinch-off' the ducts.
- Anterior tongue remains flat – there is no 'wave-like' or 'peristaltic' motion.
- Nipple expands as the tongue moves downwards.
- Milk is drawn from the nipple by a vacuum generated by the tongue:
  - Peak vacuum (when tongue down): -110 to -170 mmHg
  - Baseline vacuum (when tongue up): -50 to -60 mmHg

The four main changes

1. Milk flows when the tongue is down (peak vacuum) → **Vacuum plays a key role in milk removal:** when the tongue is down and vacuum is at its maximum, milk flows from the ducts.
2. The tongue does not move in a 'peristaltic motion' → Milk is not stripped from the ducts.
3. No 'wave-like' motion → the nipple does not get rolled or pinched: **it maintains its basic shape throughout the feed**.
4. The nipple should be at least 6mm far from the hard-soft palate junction → **milk to flow.**

Clinical relevance

INSUFFICIENT VACUUM

- Cleft palate (hard, soft or submucosal)
- Preterm infants
- 37-weekers or even full term with weak suction
- Large nipples

N-B: vacuum created anteriorly (lips) and posteriorly (tongue)

EXCESSIVE VACUUM

- Persistent nipple pain (despite good latch)

EXCESSIVE TONGUE PRESSURE

- Poor latch
- Ankyloglossia

Main clinical implications

- Effective milk expression (to protect milk supply and strengthen infant)
- Feeding method matching the infant's ability to create vacuum (e.g. special need feeder, SNS…)
- Flexibility in attachment ('do not fix if not broken!') Golden way: self- attachment
- Nipple shield useful for some cases (temporarily)
- Frenotomy does make a difference in some situations

Examples with ankyloglossia

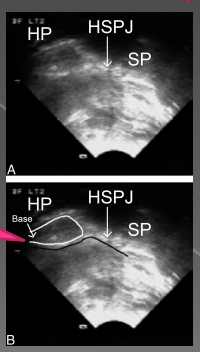


FIGURE 2, Ultrasound image of the oral cavity of a breastfeeding infant with ankyloglossia prefrenulotomy

Compression of the BASE of the nipple: Due to upward movement of **distal** portion of the tongue

Geddes, D. T. et al. Pediatrics 2008;122:e188-e194

PEDIATRICS

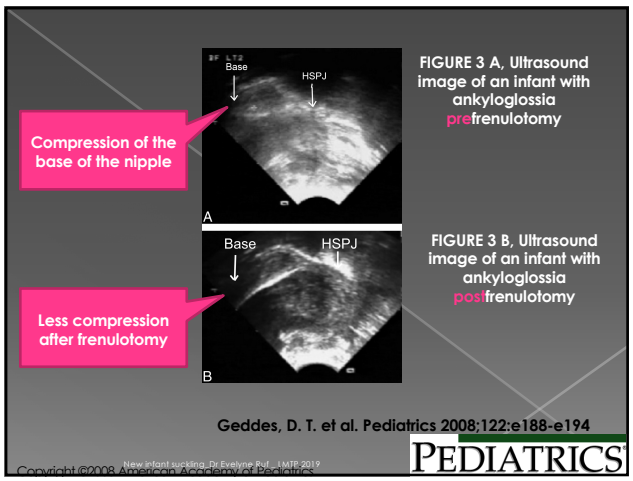


FIGURE 3 A, Ultrasound image of an infant with ankyloglossia prefrenulotomy

FIGURE 3 B, Ultrasound image of an infant with ankyloglossia postfrenulotomy

Geddes, D. T. et al. Pediatrics 2008;122:e188-e194

PEDIATRICS

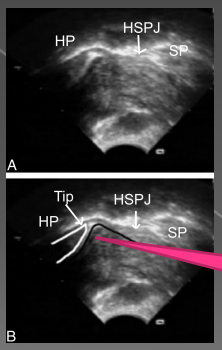


FIGURE 4, Ultrasound image of the oral cavity of a breastfeeding infant with ankyloglossia prefrenulotomy

Geddes, D. T. et al. Pediatrics 2008;122:e188-e194

PEDIATRICS

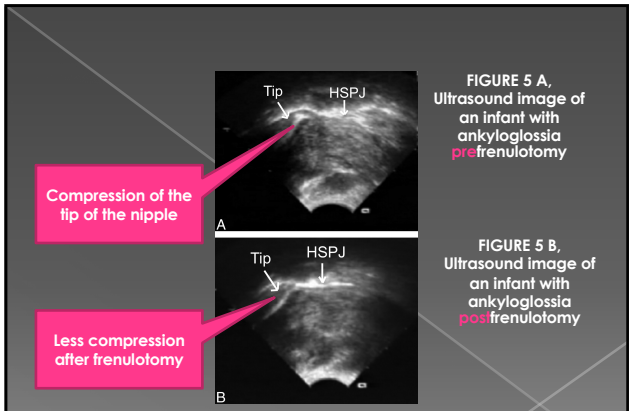


FIGURE 5 A, Ultrasound image of an infant with ankyloglossia prefrenulotomy

FIGURE 5 B, Ultrasound image of an infant with ankyloglossia postfrenulotomy

Geddes, D. T. et al. Pediatrics 2008;122:e188-e194

PEDIATRICS

Factors that Affect Suckling

- Anomalies of the face, mouth or pharynx
  - Cleft lip/palate
  - Macroglossia
  - Micrognathia (recessed jaw)
  - Ankyloglossia (tongue-tie)
  - High palatal arch (bubble palate)
- Dysfunction of CNS or peripheral NS
  - Prematurity
  - Down syndrome or other genetic syndromes
  - Asphyxia

Factors that Affect Suckling (cont.)

- Intracranial hemorrhage
- CNS infection
- Miscellaneous factors
  - Early use of artificial nipples
  - Hyperbilirubinemia/kernicterus
  - Pain

Conclusion…

- Advanced ultrasound technology → vizualization of the breastfeeding infant and lactating breast
- Stripping theory → intraoral vacuum theory
- Many factors play a role (neurological maturity, anatomy of breast/infant mouth, state of alertness)