

Real-time 3D ultrasound imaging of infant tongue movements during breast-feeding

Summary of Burton P, Deng J, MacDonald D, Fewtrell MS. Real-time 3D ultrasound imaging of infant tongue movements during breast-feeding. *Early Hum Dev.* 2013; 89(9): 635-41. doi:10.1016/j.earlhumdev.2013.04.009.

Key study take-aways

- Opposing theories in literature have led to an incomplete understanding of the physiology of breast-feeding, which is crucial for the minimization of potential breast-feeding issues.
- This pilot study confirmed that 3D ultrasound imaging is a suitable technique for viewing infant tongue movements during breast-feeding.
- This is the first study to show that peristalsis can be observed in the majority of breast-feeding infants, if the probe is positioned on the mid-sagittal[†] plane of the infant's tongue.
- This progressive study has contributed to the further understanding of the mechanics of breast-feeding, and these data should be considered in future study designs investigating the relative importance of vacuum and peristalsis in milk extraction.

Background and study rationale

Over the years, the mechanics involved in infant milk extraction from the breast has been at the heart of much controversy, with theories either pointing to vacuum being solely responsible (see image 1)^{1,2} or compression of the areola and surrounding tissue (see image 2), occurring in conjunction with peristaltic tongue movements³ (see image 3).

As 2D ultrasound imaging is not a reliable technique for confirmation of breast-feeding physiology, this pilot study was conducted to confirm whether 3D ultrasound scanning can be used to non-invasively observe infant tongue movements (study objective 1) and whether peristalsis is evident during breast-feeding (study objective 2).

Methods

The study was carried out at the Great Ormond Street Hospital, London, UK or the UCL Institute of Child Health, London, UK and was approved by the National Research Ethics Committee, London, UK.

Infant inclusion criteria: healthy babies (born >37 weeks' gestation), aged 2 weeks to 4 months, birth weight >2.5 kg

Each infant, from the enrolled 15 mother-infant pair, was studied using 3D ultrasound (either via the X-plane or Live-3D approach) and data was collated via a 7MHz transducer probe, placed sub-mentally* during each feed.

[†]A vertical plane through the midline of the body; divides the body into right and left halves

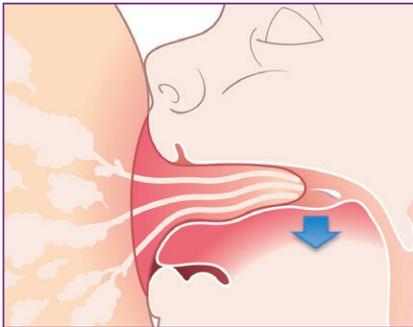
*Located in, affecting, or performed on the area under the chin (courtesy of /medical).

Results

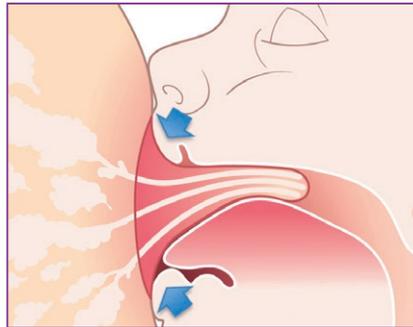
No breast-feeding infants showed any signs of anxiety during scanning, and mothers were happy with the techniques used.

The first study objective was successful in that 72% of X-plane and 56% of Live-3D datasets provided **adequate coverage (>75%) of the infant's tongue**, with the Live-3D approach proving to be superior to identification of the truly mid-sagittal plane.

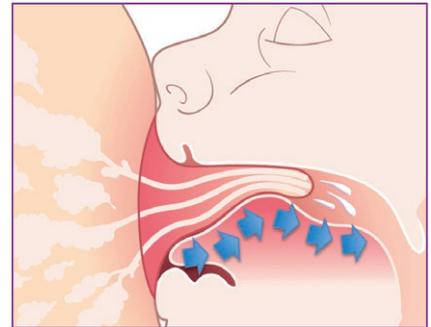
The second study objective was met as **peristaltic tongue movement was observed** in 13 of 15 infants (87%), when viewing was through the mid-sagittal plane of the tongue.



1. Vacuum



2. Compression



3. Peristaltic tongue movements

Conclusions

3D ultrasound scanning can be used to view an infant's tongue movements during breast-feeding. Probe positioning on (and not just along) the mid-sagittal plane is crucial to the observation of peristaltic movement during breast-feeding, as with even a small shift off this plane, less peristaltic movement is seen. These findings bring us closer to understanding the physiology of breast-feeding and should be considered in future studies investigating the relative importance of vacuum and peristalsis in milk extraction.

References

1. Smith WL, Erenberg A, Nowak AJ. Imaging evaluation of the human nipple during breast-feeding. *Am J Dis Child* 1988;142:76–8.
2. Waller H. The force exerted by the baby. William Heinemann Ltd: Clinical studies in lactation; 1936.
3. Woolridge MW. The anatomy of infant sucking. *Midwifery* 1986;2(4):164–71.