ACTA PÆDIATRICA
NURTURING THE CHILD

Acta Pædiatrica ISSN 0803–5253

SHORT COMMUNICATION

Sucking characteristics of successfully breastfeeding infants with ankyloglossia: a case series

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Received
26 June 2009; revised 11 September 2009; accepted 5 October 2009.

DOI:10.1111/j.1651-2227.2009.01577.x

Partial ankyloglossia is a congenital oral anomaly characterized by restricted movement of the tongue resulting from a lingual frenulum that is either short, inelastic, or is attached distally, too near or onto the gingival ridge (1). The prevalence of ankyloglossia is not well documented because of the lack of a standard definition or a reliable clinical method of classification (2). Studies of neonates, infants and adolescents quote the incidence of ankyloglossia to be between 0.1% and 10.7% (2,3). Recently, a resurgence of breastfeeding difficulties in infants with ankyloglossia has been reported, with a frequency ranging from 25% to 44% (3,4). Feeding difficulties associated with ankyloglossia include painful nipples (4–6), poor latch (6), reduced milk supply, neonatal dehydration (7) and decreased duration of breastfeeding (4). Controversy exists regarding the management and treatment of ankyloglossia (8), although studies show that in infants with feeding problems, frenotomy improves maternal nipple pain (5,6,9,10), latch scores (6,10), tongue action, milk transfer and milk supply (10). Fortunately, the majority of infants with ankyloglossia are able to breastfeed successfully. The controversy surrounding ankyloglossia most likely stems from the lack of knowledge of the effect the condition has on feeding, and in particular breastfeeding.

Five fully breastfed infants with ankyloglossia presented for a research study designed to assess the sucking characteristics of normal breastfed infants. The study was approved by the Human Ethics Committee of The University of Western Australia.

Sub-mental ultrasound scans of the infant oral cavity were made during a breastfeed to image tongue motion (Fig. 1A,B). Intra-oral vacuums were measured simultaneously via a supply line filled with sterile water connected to a pressure transducer (11). The test-weigh method was used to measure milk intakes for the monitored feed and **three** mothers measured every feed for a 24-h period (12).

All infants recorded normal growth and the **three** mothers who measured every feed for a 24-h period recorded normal levels (range 478 to 1356 g per 24 h) (12). The data are shown in Table 1 **(Infants 3–5)**.

Infants 1, 2 and 3 displayed no compression of the nipple; however, weak vacuums were recorded for Infant **1** (Fig. 2A,B; Table 1). Infants 2 and 4 recorded strong maximum vacuums. Infant 4 had strong minimum vacuum and displayed compression of the base of the nipple on ultrasound (Fig. 2C,D). Infant 5 had very weak maximum vacuum and compression of the tip of the nipple (Fig. 2E,F).

Mean maximum vacuums quoted in the literature range from −145 (11) to −197 mmHg (13) for breastfeeding infants. Mean minimum vacuum has been measured at −64 mmHg in one study of breastfeeding infants (11). The importance of the level of vacuum has become apparent with a recent study demonstrating an association between strong infant sucking vacuums and nipple pain (14). Conversely, similar to pumping vacuums (15), low sucking vacuums have been associated with reduced efficiency and effectiveness of feeding(16). Although these infants with ankyloglossia had intra-oral vacuums outside the normal range, they were able to obtain enough milk to grow satisfactorily and none of the mothers experienced nipple pain during feeding. It is possible that the vacuum exerted by the infant is influenced by both the restriction of tongue movement or nipple/breast shape. Further research is required to investigate this.

Ultrasound imaging during breastfeeding showed that two of the infants compressed the nipple. One infant compressed the base of the nipple and the other compressed the tip of the nipple. Previous ultrasound imaging of infants

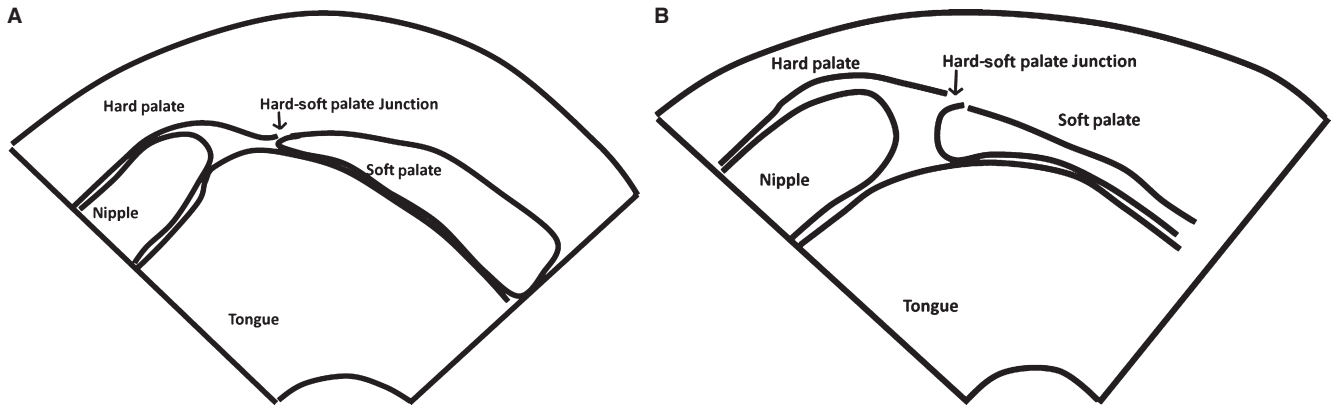

Figure 1 Line diagrams of infant intra-oral structures imaged by ultrasound during normal breastfeeding. (A) The tongue is up in apposition with the soft palate. The tongue compresses the nipple evenly. (B) As the tongue is lowered inferiorly, the nipple expands in diameter and moves closer to the hard-soft palate junction. Note there is no distortion of the nipple.

Table 1 Sucking characteristics of successful breastfeeding infants with ankyloglossia

Case	Infant age (days)	24-h Milk intake (g)	Maximum vacuum (mmHg)	Minimum vacuum (mmHg)	Milk intake (g)	Ultrasound observations
1	52	–	−113	−25	64	Normal
2	49	–	−250	−58	36	Normal
3	55	1210	−155	−61	98	Normal
4	21	505	−205	−170	50	Compression of nipple base
5	26	1092	−113	−3	90	Compression of nipple tip

–, not measured.
Normal mean vacuum: maximum −145 to −197 mmHg (11,13), minimum −64 mmHg (11).

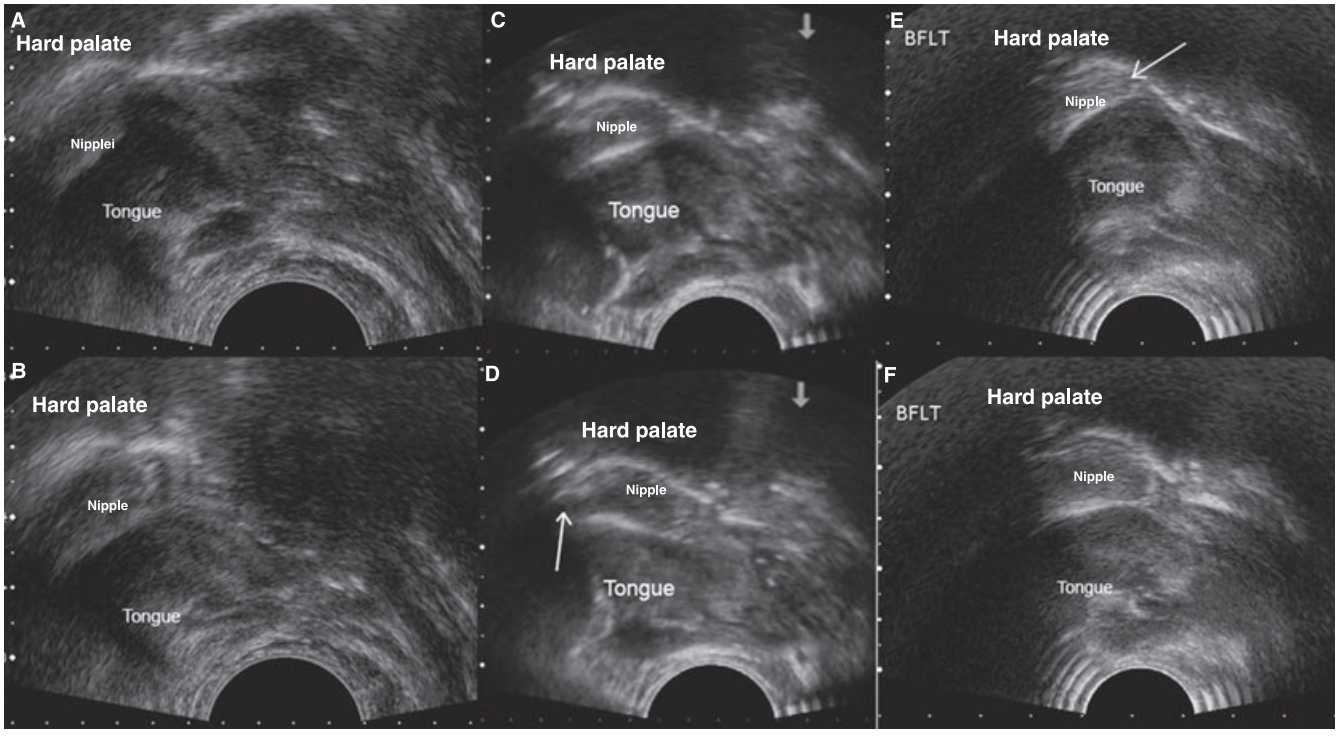

Figure 2 Ultrasound images of normal sucking and infants with ankyloglossia. (A) Normal sucking – tongue up. (B) Normal sucking – tongue down (C) Ankyloglossia Infant 1 – tongue up, no nipple distortion. (D) Ankyloglossia Infant 1 – tongue down, compression of the nipple base (arrowed). (E) Ankyloglossia Infant 2 – tongue up, compression of nipple tip (arrowed). (F) Ankyloglossia Infant 2 – tongue down, no nipple distortion.

with ankyloglossia that were experiencing feeding difficulties has also demonstrated compression of the nipple both at the base and the tip during breastfeeding (10). It is currently unknown whether compression of the nipple contributes to maternal pain, which could lead to a reduction in oxytocin release and thus a corresponding decrease in the amount of milk sucked by the infant. Conversely, abnormal compression of the nipple may result in an ineffective suck by mechanically compressing the milk ducts in the nipple, obstructing the milk flow and thus reducing milk intake.

In the cases presented here, maternal pain, milk intake, or milk production were not affected by either vacuum or compression of the nipple. Furthermore, the force and volume of the milk ejected from the breast as well as the extent of restriction of the infant tongue may influence the vacuum level required by the infant to effectively remove milk. Thus, these results suggest that some mothers may have particular breast/nipple or milk ejection characteristics that contribute to successful breastfeeding of infants with ankyloglossia.

Further studies are required to compare both infant and maternal characteristics for infants with ankyloglossia that are able to breastfeed successfully and those that cannot.

FUNDING

This study was done by a research grant provided by Medela AG.

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