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The Use of Nonnutritive Sucking to Facilitate Oral Feeding in a Term Infant: A Single Case Study

Celia Harding BSc (Hons), MSc, ACS, (Dist), CertMRCSLT[a,b,*], Lindsay Frank BSc (Hons), PGDip (APHC), RGN, RSCN[b], Carol Dungu BSc (Hons), RD[b], Nuala Colton BSc, RN[b]

[a]*Dept LCS, City University, Northampton Square, London, United Kingdom*
[b]*The Royal Free Hospital, London, United Kingdom*

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This individual case study presents an evaluation of and reflection on the use of nonnutritive sucking as a technique to facilitate nutritive sucking with an infant with feeding difficulties. Nonnutritive sucking is used in a variable way with mainly premature or sick infants. However, the rationale underpinning use of such an approach is not clear. The infant participant in this study, Baby H, was born at 37 weeks. This case illustrates the use of nonnutritive sucking as an approach with supported rationales for promoting transition toward oral feeding with infants who have complex needs and who are term infants. The literature focuses on using nonnutritive sucking with premature infants who have no additional difficulties such as hypoxic neonatal encephalopathy, meconium aspiration, sepsis, or severe perinatal asphyxia. The intervention carried out with Baby H demonstrates that nonnutritive sucking can contribute toward the management of an infant's feeding development. Baby H took 23 days to develop a sequential nonnutritive sucking pattern, but her ability to transfer this to nutritive sucking and safe feeding took the first 17 months of this infant's life. This study is unique in that it explored the issues involved with a term infant who had complex needs that impacted on feeding development. It is important because many practitioners use nonnutritive sucking with infants who have complex needs.

NONNUTRITIVE SUCKING (NNS) has been identified as having many benefits for premature infants. These include assisting neurodevelopmental organization, supporting neurobehavioral maturation, and optimizing ventilation in preterm babies who require nasal noninvasive ventilatory support as well as reducing pain (Boyle et al., 2006; Fucile, Gisel, & Lau, 2002; Fucile, Gisel, & Lau, 2005; Pinelli & Symington, 2005). In addition, NNS may allow critical aspects of oral–motor and feeding development to progress through stimulation and reduce the length of time spent on nasogastric (NG) tube feeding (Boiron, Da Nobrega, Roux, Nenrot, & Saliba, 2007; Fucile et al., 2002, 2005; Harding, 2009; Harding, Law, & Pring, 2006; Pickler & Reyna, 2004; Pinelli & Symington, 2005; Rocha et al., 2006).

Background

Infants use two types of sucking: nutritive sucking (NS) and NNS. NS is the process of obtaining nutrition with a rate of one suck per second and is constant over the course of feeding. It involves intake of fluid due to the alternation of expression and suction. Suction is the negative intraoral pressure that occurs when the tongue and jaw become lower

* Corresponding author: Celia Harding BSc (Hons), MSc, ACS, (Dist), CertMRCSLT.
E-mail address: C.Harding@city.ac.uk (C. Harding).

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and the soft palate closes the nasopharynx (Lau, Sheena, Shulman, & Schanler, 1997; Meyer-Palmer, 1993). In contrast, NNS occurs at two sucks per second in the absence of nutrient flow and may be used to satisfy an infant's basic sucking urge or as a state regulatory mechanism (Lau et al., 1997). The two forms also differ in their influence on respiratory rate. Thoyre, Shaker, and Pridham (2005) describe the increases in transcutaneous oxygen levels that occur during NNS. It is suggested that there is a higher respiratory rate during NS pauses (Pinelli & Symington, 2005; Thoyre et al., 2005). Key behavioral and environmental factors also influence the feeding process. The rooting reflex is recognized as an important adaptive reflex relevant to the search for food. When healthy full-term infants are aroused and hungry, they respond to touch in the lip and cheek region by turning toward the stimulus, mouth open. Mouth opening can be stimulated by stroking the side of an infant's mouth to elicit a rooting reflex (Lau et al., 1997; Thoyre et al., 2005). Environmental factors important for feeding development are satiation (the presence of milk in the stomach inhibits NS) and fluid viscosity (Kelly, Huckabee, Jones, & Frampton, 2007).

Sucking in particular is vital in the early development of the infant whether it involves breast- or bottle-feeding. It is essential for the means of receiving nutrition, of providing stability in distress, and of exploring the environment (Thoyre et al., 2005). Successful and effective feeding is an energetic activity that is described as being complex, requiring the coordination of a suck–swallow–breathe cycle (Kelly et al., 2007; Thoyre et al., 2005). Research studies show that a stable swallow rhythm appears to be established earlier than a suck rhythm (Gewolb, Vice, Schweitzer-Kenney, Taciak, & Bosma, 2001). In the high-risk neonatal population, the suck–swallow–breathe sequence is rarely well coordinated before 34 weeks. Babies with complex birth histories are highly likely to be at risk of feeding difficulties and also to have specific difficulties establishing the suck–swallow–breathe cycle so important for feeding (Hawden, Beauregard, Slattery, & Kennedy, 2000).

Although a range of papers have described NNS as a beneficial approach, few have provided a detailed program as to how to facilitate NNS and even fewer have linked the intervention to a clear rationale. Fucile et al. (2002, 2005) have described a vigorous program based on "Beckman's principles" (Beckman, 1998). Oral stimulation lasted 15 minutes where the first 12 minutes involved stroking the lips, teeth, gums, and tongue. The last 3 minutes involved sucking on a pacifier. This was carried out between 15 and 30minutes before a tube feed. Interestingly, Beckman's principles are described as an oral–motor approach but one that has not been peer reviewed extensively in the literature. It is often used with older children with congenital speech disorders and not neonates. This therefore makes the rationale for using such an approach with infants in this study questionable. Oral–Motor approaches for intervention to enhance oral–motor skills are judged in the literature as having variable effectiveness (Clarke, 2003); therefore, the outcomes of the Fucile et al. (2002, 2005) study need to be considered with caution.

Rocha et al. (2006) carried out the same program as recommended by Fucile et al. (2002, 2005). Given that the same procedure was implemented, it is interesting to note that different results are achieved; Fucile et al (2002) achieved oral feeding earlier in the intervention group taking up to 11 days, with the control group taking up to 18 days; this was significant ($p > .05$). There was no difference in length of hospital stay between the two groups. Rocha et al. (2006) found that the intervention group took up to 38 days to achieve oral feeding as opposed to the control group, which took up to 42 days. There was a significant difference between the two groups ($p > .01$). Neither of these studies involved parents carrying out the intervention.

The effects of NNS on NS and general feeding behavior for bottle-fed infants have been investigated by Pickler & Reyna, (2004). Qualitative differences between NNS and NS were identified using a gauge to record the wave patterns of each type of suck. NNS wave patterns were pointed at the peak and base in recordings with no clear rhythmic definitions. NS suck wave patterns were rounded at both the base and peak with clear and rhythmic definitions. This study identified that the time to onset and duration of the first NNS burst was positively correlated with time to onset for the first NS burst ($r = .79$, $p < 0.01$). NNS was reported as having no significant impact on breathing during feeding or any other characteristics associated with feeding. The use of NNS did help a positive behavioral state to develop. Boiron et al. (2007) evaluated NNS in relation to oral stimulation and oral support with bottle-feeding performance of infants aged between 29 and 24 weeks' gestation. Oral support in conjunction with an NNS program enhanced the transition to oral feeding. Although the oral stimulation program is described, there is no stated rationale underpinning the procedure. Researchers, not parents and medical staff, carried out the program with the infants.

Harding et al. (2006) completed a pilot project that focused on nurses and speech and language therapists supporting the parents to do the nonnutritive program 10 minutes prior to onset of tube feeding. Fourteen infants in a matched-pair design participated with seven parents electing to use NNS as a strategy with their infants and seven parents continuing to receive the usual care of the neonatal unit. Nursing staff and therapists carried out the nonnutritive intervention when the parents were not available. The use of NNS during tube feeding was a recognized approach used by the nurses and therapists in this neonatal unit. Assessment involved observing infant tongue and jaw movement using the Neonatal Oral Motor Schedule (NOMAS; Meyer-Palmer, 1993). The NOMAS is an assessment tool used by practitioners who work with infants to differentiate between disorganized and dysfunctional sucking patterns. Disorganized sucking is frequently demonstrated by premature infants when they begin to feed. This