



Feeding skill milestones of preterm infants born with extremely low birth weight (ELBW)

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ABSTRACT

Aim: To compare the feeding development of preterm infants with that of full-term infants. **Participants:** Nineteen preterm infants with extremely low birth weight, and 11 healthy full-term infants.

Methods: Intensive follow-up study. Feeding situations were analyzed by NOMAS (Neonatal Oral Motor Assessment Scale) and by an oral motor patterns checklist based on video recorded sessions.

Results: Most of the preterm infants showed a disorganized sucking pattern and most of the full-term infants a normal sucking pattern, as long as suckling was present. However, the early suckling pattern did not predict the schedule of later feeding development. Preterm infants seemed to learn the various feeding skills at the same corrected ages as full-term infants, with the exception of munching, which they learned earlier than the full-term infants. However, the age range for gaining these skills was wider for the preterm infants. Preterm infants also seemed to have feeding problems more often than full-term infants when qualitative features of feeding were considered. Feeding was prolonged and messy, and the preterm infants were sensitive to different qualities of food.

Conclusion: Feeding development of preterm and full-term infants is similar except for suckling, when only oral motor skills are concerned. When the qualitative characteristics of feeding are taken into account, the preterm infants suffer from feeding problems that create a risk for early interaction and communication.

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1. Introduction

Preterm infants born with extremely low birth weight (ELBW) often stay in neonatal intensive care for several weeks after birth. The care includes medical procedures, such as suctioning and tube feeding and even intubation, which may have a negative impact on oral sensory and oral-motor functioning of the infant (Arvedson, Clark, Lazarus, Schooling, & Frymark, 2010; Pridham, Steward, Thoyre, Brown, & Brown, 2007). The transition from tube feeding to oral feeding is often difficult and takes time (Amaizu, Shulman, Schanler, & Lau, 2008). Pridham et al. (2007) found feeding skills among preterm infants varied widely during the first year of life with regard to sucking and eating of semisolids and solid food. Delays in feeding development are common, as are difficulties in transitioning to new textures and tastes. Prolonged use of endo-tracheal tube and naso-gastric or oro-gastric tubes for gavage feeding may cause sensory problems that affect the feeding development of the preterm infant for a substantial period of time (Pridham et al., 2007).

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Successful oral-motor development can also be complicated by disorganization, low muscle tone, irritable state and neurological immaturity (Morris & Klein, 1987). Preterm infants are more commonly bottle- than breast-fed (Nykqvist, 2008), which can also be a stress factor and affect feeding.

It has been found that the sucking performance of preterm infants differs from that of full-term infants (Gewolb, Bosma, Reynolds, & Vice, 2003; Gewolb, Bosma, Taciak, & Vice, 2001; Lau, Alagugurusamy, Schanler, Smith, & Shulman, 2000; Lau, Smith, & Schanler, 2003; Nykqvist, 2008). The most important difference is seen in the coordination of swallowing and respiration. It is especially typical for preterm infants to present apneic swallow runs and to swallow at an improper moment of respiration. Swallowing during inhalation may cause aspiration, which is quite common in these children (Lau et al., 2003). The average rate of milk transfer (ml/min), average bolus sizes and suction amplitudes are smaller in preterm than in full-term infants (Lau et al., 2003). The length of the sucking-runs and swallow/sucking-runs has also been found to be shorter in preterm infants with bronchopulmonary dysplasia (BPD), a severe breathing problem occurring in preterm infants (Pridham et al., 2007). Accordingly, BPD as well as small birth weight for gestational age (SGA) are both risk factors for deviant feeding development (Da Costa et al., 2010a, 2010b). These infants need more time to develop a mature sucking pattern, and it is only after term age that the sucking of these infants resembles that of preterm infants without BPD or SGA.

Following birth, the first oral motor action of an infant is suckling, which means reflexive sucking (Rogers & Arvedson, 2005). Suckling is followed by volitional sucking, eating of semisolids, solids and drinking. A great deal of development and growth takes place in an infant during this process. Neurological maturation, anatomical changes, sensation and sensory feedback – proprioception, touch, pressure, temperature and taste – all are important factors in feeding development (Stevenson & Allaire, 1996; Wolf & Glass, 1992).

Infants first suck all food entering the mouth, whether liquid or not. At the age of six months, the child combines the phasic bite movements of the jaw with up-down movements of the tongue. This is called munching, which is the basis of the diagonal rotatory movement appearing later (Morris & Klein, 1987). When playing with fingers and toys in the mouth the infant gets the first experiences of biting. Before controlled biting appears, a phasic bite-and-release pattern appears reflexively. Next, the infant is able to hold a bite of food between the gums or teeth in a stabilized, closed position. At approximately the age of one year he/she is able to take a bite from, for example, a banana in a controlled manner, and later from harder foods. The tongue starts to produce lateral movements and large rolling movements in combination with the diagonal rotatory movement of the jaw. Circular rotatory movement appears when the child is able to move a piece of food with the tongue from one side of the mouth to the other without pausing in the midline (Delaney & Arvedson, 2008; Morris & Klein, 1987).

Even though the process of sucking development in preterm and full-term infants is already well documented (Lau & Smith, 2011; Thoyre, Shaker, & Pridham, 2005), the later stages of feeding development and especially that of preterm infants is not well known (Carruth & Skinner, 2002; Delaney & Arvedson, 2008).

In the present study, we wanted to examine the developmental sequences of the feeding skills of preterm infants and to find out how they differ from that of the full-term infants and if motor or qualitative feeding problems are those that cause more concern during the first year of their lives.

2. Material and methods

2.1. Study population

The study group was composed of 20 preterm infants (Table 1), born with a birth weight less than 1000 g, except for one girl with a birth weight of 1020 g. The mean birth weight was 880 g (range 670–1020 g) and the mean gestational age 27 weeks (range 23–30 weeks). All possible consecutive preterm births with no known congenital or chromosomal anomalies from October 2003 to April 2005 were included, if approved by the parents and if the family was geographically accessible. After excluding one child because of a diagnosed chromosomal anomaly, there were 19 extremely-low-birth-weight infants, 7 girls and 12 boys. Most of the preterm infants had suffered from respiratory problems; 17 had had respiratory distress syndrome (RDS) and four of them also had bronchopulmonary dysplasia. Three of the infants had suffered from birth asphyxia. Six of the preterm infants had periventricular leucomalacia (PVL). Thirteen had had intraventricular hemorrhage (IVH), although it was of significant degree in only two of them, one having 3rd and one 4th grade IVH. The naso-gastric tube was used for feeding up to 37 weeks corrected age (median) in all preterm infants (Table 1).

Eleven healthy full-term infants (7 girls and 4 boys) whose parents volunteered for the study constituted the control group. All children were born at Oulu University Hospital in Northern Finland during the period between August and November 2003 and the families all lived in the Oulu region.

2.2. Assessment

We used NOMAS (Neonatal Oral Motor Assessment Scale) to assess the sucking pattern (Palmer, Crawley, & Blanco, 1993) (Appendix A). NOMAS categorizes the sucking pattern into normal, disorganized and dysfunctional. Disorganization means that the sucking pattern is uncoordinated, while dysfunction means abnormal movement patterns of the jaw and the tongue (Palmer & Heyman, 1993). The motor movement patterns of the jaw and the tongue in eating semisolids and solids was assessed using a checklist adapted from the Paediatric Oral Skills Package (Brindley, Cave, Crane, Lees, & Moffat, 2001)

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