

The position of the tongue during rooting reflexes elicited in newborn infants before the first suckle

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A common breast-feeding problem is when the infant "places its tongue in its palate" and has difficulties in attaching to its mother's nipple. The aim of this study was to document the position of the tongue in the mouth cavity during rooting reflexes elicited in newborn infants before the first suckle. Eleven healthy, full-term infants were videotaped 101 $\pm$ 31 min after birth during an evoked distinct rooting reflex before the first suckle. The videotaped rooting reflex was analyzed in detail concerning the degree of turning of the head, mouth opening and position of the tongue, in pictures that were "frozen" at specific intervals. "Licking movements" preceded and followed the rooting reflex in the alert infants. In 10 of the 11 infants the tongue was placed in the bottom of the mouth cavity during a distinct rooting reflex ($p = < 0.05$). It is suggested that forcing the infant to the breast might abolish the rooting reflex and disturb placement of the tongue. A healthy infant should have the opportunity of showing hunger and optimal reflexes, and attach to its mother's nipple by itself. □ *Breast-feeding, newborn infants, rooting reflex, tongue reflex*

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Previous studies have shown that the newborn infant, if placed skin-to-skin on its mother's chest immediately after birth, reveals a predictable behavioural sequence, which culminates when the infant, by itself, finds the mother's nipple and starts to suckle (1). Thus the newborn infant has a competence which we believe is not fully utilized in many breast-feeding situations. The infant is often "helped" to the breast by the nurse who grips the infant firmly over the neck and presses the infant's mouth against the nipple which is held by the other hand. By helping the infant to attach to the breast, the infant's reflexes are probably not optimally elicited and might even be disturbed.

One breast-feeding problem described by the staff on our maternity wards involves infants who "place their tongue in their palate" and thus have problems in attaching to the breast since the tongue has to be put under the nipple when the infant suckles.

Our hypothesis is that an alert, non-crying infant, during a distinct and undisturbed rooting reflex places its tongue low in its mouth to be able to attach to the nipple and suckle.

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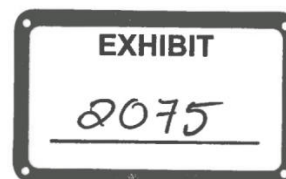
Materials and methods

Eleven mothers, four primiparae and seven multiparae, with normal pregnancies and normal deliveries partici-

pated in the study with their newborn healthy, full-term infants. The infants were born during the day and were consecutively taken into the study during the research period of two weeks in February, 1990. One couple did not want to participate in the study. The mean birth weight and gestational age of the infants were 3492 $\pm$ 406 g and 39.4 $\pm$ 1.4 weeks, respectively. Apgar score was 9 at 1 min and 10 at 5 min postpartum. The parents gave their informed consent. The study was approved by the local Ethics Committee.

When the infant had shown interest in feeding, i.e. revealed sucking movements and hand-to-mouth activity, the infant was taken into the study. The mother was asked to sit up and hold her infant in her arms and elicit rooting reflexes by touching the infant's cheek with a finger. The mother and infant were videotaped until a distinct rooting reflex was seen. The mean age of the infants at the time of the experiment was 101 $\pm$ 31 min.

The videotaped rooting reflex was analyzed in detail in pictures that were "frozen" at specific intervals. The starting point for the reflex analyzed was when the infant's face was centered. The degree of the turning of the head, the opening of the mouth and the position of the tongue in the mouth cavity were assessed according to three-graded scales (head: centered = 0, half-way turned = 1, maximally turned = 2; mouth: closed = 0, half open = 1, wide open = 2; tongue: in the bottom of the cavity = 0, in the middle = 1, high up towards the palate = 2). These assessments were made every 1 s for the first 6 s and then every 2 s up to 18 s after the start of



the reflex. The infants' "licking movements", defined as the tongue being frequently stretched out through the loosely closed lips, were also noted. To analyze the relation between head, mouth and tongue movements in each infant, line graphs were constructed.

The infants' awake states were assessed according to the Brazelton Neonatal Behaviour Assessment Scale (BNBAS); deep sleep, light sleep, drowsy, alert, considerable motor activity, crying (2).

The transcription of all the videotapes was made by the same person. To test the reliability, three randomly selected tapes were transcribed by a second researcher. The same reflex pattern was observed.

Statistical analysis was performed using the Sign test.

Results

At the time of the experiment, nine of the infants were in an alert state (BNBAS, awake state=4). Two were drowsy (BNBAS, awake state=3). The infants' awake state and age are shown in Table 1. Licking movements preceded and also followed the rooting reflex in all the infants except the two who were drowsy (see Table 1). In 10 of 11 infants, the maximal opening of the mouth occurred when the head was turned maximally to the side. In 10 of 11 infants the tongue was placed in the bottom of the mouth cavity during a rooting reflex. Thus to exhibit this behavior is more common than not to exhibit it ($p < 0.05$). An example of an infant performing a rooting reflex during which the tongue is kept low is seen in Fig. 1. In the infant in our study who lifted the tongue, the mother had problems evoking a distinct reflex. Although this infant was alert it did not show spontaneous rooting movements or hand-to-



Fig. 1. A baby with a distinct rooting reflex; the mouth is wide open (score=2), the head is turning towards the shoulder (score=0-1) and the tongue is kept low in the mouth cavity (score=0).

mouth activity during the experiment. After a few minutes the father took the infant and evoked a reflex. The reflex was weak; the head was turned less than half-way, and the mouth was not maximally opened and the tongue was lifted.

The two infants exposed to pethidine (see Table 1) performed rooting reflexes and tongue movements which did not differ from those of the other infants for the variables measured. The mothers were given pethidine 100 mg im during labor. The dose-delivery interval (DDI) is shown in Table 1.

Discussion

Our results indicate that the newborn infant, without being fed, can respond to a rooting stimulus by turning the head towards the stimulus, opening its mouth wide and keeping its tongue at the bottom of the mouth. The head-turning and the mouth-opening components of the rooting reflex are well known (3-5). The control of the tongue position makes rooting an important reflex system which enables the infant to catch the mother's nipple and attach adequately to the breast without help.

To facilitate focusing the camera on the infant's mouth, the rooting reflex was artificially evoked by the mother's finger. In a natural situation at the breast, the infant, besides sensory stimulation and the sight of the nipple, is exposed to smell and taste from the nipple and areola which might elicit a different behavior than when the reflex is artificially evoked. For instance, the maximal opening of the mouth might not necessarily occur when the head is maximally turned towards the shoulder. We also found that licking movements pre-

Table 1. Number of infants, dose-delivery interval (DDI) for injection of maternal pethidine, infant's age and awake state at experiment, and licking in relation to rooting reflex.

Infant no.	Maternal pethidine (DDI min)	Age at experiment (min)	Awake state	Licking in relation to rooting	
				Before	After
1	—	137	Drowsy	No	No
2	—	130	Alert	Yes	Yes
3	—	48	Drowsy	No	No
4	—	77	Alert	Yes	Yes
5	—	93	Alert	Yes	Yes
6	—	74	Alert	Yes	Yes
7	—	86	Alert	Yes	Yes
8	58	119	Alert	Yes	Yes
9	135	121	Alert	Yes	Yes
10	—	83	Alert	Yes	Yes
11	—	148	Alert	Yes	Yes

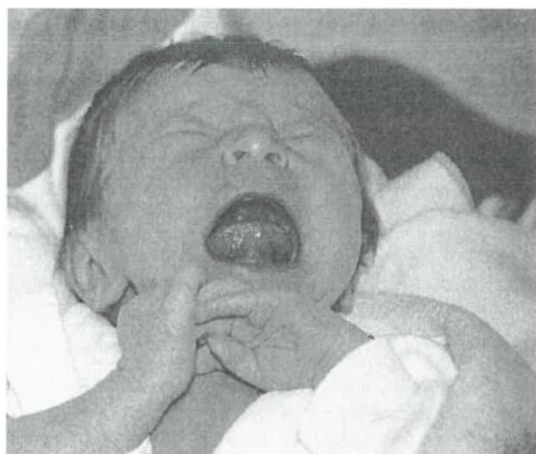


Fig. 2. A crying infant with the tongue lifted high towards the palate.

ceded the rooting reflex if the infant was in an alert state. This might indicate another biological function; the infant has to get the nipple erect by licking in order to attach to it. Preliminary observations indicate that this is common behavior at the breast.

Other preliminary observations indicate that healthy infants place their tongue in the palate when crying (Fig. 2). This might be a security reflex, to prevent obstruction of the trachea during the inspiration phase.

One way the problem of infants placing their tongue in their palate might come about is in the process of forcing a crying baby to the breast, even if the force is gentle. At the next feed the infant might remember the

forced situation and defend itself by placing its tongue in its palate. The problem might also originate from a situation where an infant who is not hungry is forced to the breast, i.e. an infant with low reflexes. The infant in our study who showed low interest in feeding, as well as an indistinct rooting reflex and lifting of the tongue, might be an example of an infant who would be forced to the breast by the staff. This might in turn result in a disturbed rooting-tongue reflex system.

Instead, a healthy infant should be left in peace until it shows hunger and optimal reflexes and is capable of attaching to the nipple by itself. It should be remembered that this licking and rooting procedure can take some time.

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that the foregoing Patent Owners' Exhibit 2075 is being served on May 12, 2024, by filing this document through the Patent Trial and Appeal Case Tracking System (P-TACTS) and by electronic mail as directed by Petition upon the following counsel of record for Petitioners:

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