

SUCKLING AND NON-NUTRITIVE SUCKING HABIT: WHAT SHOULD WE KNOW?

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Abstract:

Correct breast feeding can be considered a tool for the post-natal prophylaxis of craniofacial abnormalities, or at least a way of reducing their extent.

Inadequate bottle feeding forces the tongue and cheek muscles to develop a compensating and atypical function, in order to obtain the milk. As a result, there can be an adaptation change of the dental and bone structures, leading to malocclusions.

Finger-sucking is normal in the first two-three years of life. It gives the child a feeling of relaxation; that is why it is usually practiced before sleeping. The effects of non-nutritive sucking on the developing dentition are minor in the child under 3 years of age and are usually limited to changes in the incisor position. Some upper or lower incisors (depend on how the finger has been sucked) become spontaneously tipped toward the lips, and/or others are prevented from erupting. Normally children abandon this habit between 2 and 4 years of age. If it persists after this age, it will be the cause for some dental-maxillary anomalies: open-bite, narrow maxilla with upper protrusion, cross-bite; all these could be accompanied by retrognathic mandible.

Keywords: suckling, malocclusion, non-nutritive sucking-habit, infant swallowing, adult-type swallowing

A. Suckling

Suckling is the determinant of newborn's facial growth, as it involves the facial muscles which generate considerable intermittent forces. These forces contribute to the maturation and synchronicity of muscular activity by simultaneous stimulation of several oral functions: respiration, suckling and swallowing.

During suckling, the activity of the musculature of the lips is intense- which allows a tight contact, sucker-like, of lips around the mother's breast. The propulsion of the mandible is important as well, as it produces a synergy of tongue moves and, finally, the high negative pressure inside the child's mouth allows for an efficient aspiration of milk.

Embryological data:

In the 60th day of intrauterine development, the first movements in the oral area occur. From this point, in the 10th week, suckling develops, followed by swallowing in the 12th week [1].

After birth growth and development:

This is the time when growth takes place most rapidly, twice as intense as the puberty period. This is why it is so important for the child's nutrition to offer all the necessary conditions for this development.

From a functional point of view, breast-feeding is strongly indicated for the first year of life, firstly for the newborn to benefit from the morphological development stimulus, and secondly because the mastication - due to the semisolid food at this age - does not offer the same muscular activity as suckling [2].

Morphological mediators during suckling

1. Condylar cartilage

This growth cartilage is very active during post-natal suckling. Starting with the end of the second year of life, cellular mitosis diminishes and slowly disappears. This evidence leads to the conclusion of a "suckling" biological and functional existence of the condylar cartilage.

Post-natal prophylaxis of mandibular deficiency depends on an efficient suckling, which stimulates the lateral pterygoid muscle, whose insertion on the temporo mandibular joint disc is an indispensable stimulus for the condyle secondary cartilaginous growth.

Manuscript received: 30.10.2013

Received in revised form: 07.01.2014

Accepted: 26.01.2014

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2. *The speno-mandibular ligament*

Due to the tension in the speno-mandibular ligaments during up-and-down as well as forward-backward movements of the mandible, suckling stimulates the growth of the horizontal ramus in the sagittal plane [1,2].

3. *The muscles*

Suckling activates a high number of muscles, which - through their insertion on the periosteum- stimulate directly or indirectly bone growth. During intrauterine development and then after birth, the intense muscular activity during suckling will determine the remodeling of the bones. The activated orbicularis and mentalis muscles stimulate and orient the morphogenesis. It is a real functional maturation, on which the facial development depends [3,4]. The duration of natural breastfeeding presents a positive effect over the mobility of the orofacial structures. Deleterious effects of the prolonged duration of artificial feeding and sucking habits in the oral motor control were confirmed [5].

4. *Innervation*

The rich and diverse innervations reflect the complexity and synchronicity of the vital functions it controls. A child's oral-motor movement models develop from coarse and all-embracing generalized reflexive patterns towards separate, voluntary muscle functions. Development of the oral-motor sensory system begins already during fetal life. Suckling is a rhythmic function that is programmed from foci formed by neural networks of the brainstem [6].

5. *Posture*

The balance of the mandible-hyoid complex during suckling is dependent on the pharynx-tongue complex- itself being secondary to posture and oral muscles activity. For that reason it is advised for the new-born to be held with the torso in a vertical position during breast feeding. For the first time, this position was described by Pierre Robin as "orthostatic suckling" [2].

Suckling allows learning and synchronicity of several functions that have an important morphogenetic role in the harmonious development of the craniofacial complex of the child. Correct breast feeding can be considered a tool for the post-natal prophylaxis of craniofacial abnormalities, or at least a way of reducing their extent. Even today, with such an advanced technology, no pacifier is able to substitute the functional advantages of breast feeding. Breastfeeding for a duration of more than 6 months is a protective factor against the persistence of pacifier sucking [7]. In some studies, it has been suggested that breastfeeding duration has an inversely proportional effect on the age of pacifier use persistence, but the highest level of evidence does not support an adverse relationship between pacifier use and breastfeeding duration or exclusivity. The association between shortened duration of breastfeeding and pacifier use in observational studies likely reflects a number of other complex factors, such as breastfeeding difficulties or intent to wean [8,9].

Bottle feeding is less active and less stimulating: the pacifier is less sucked, the lips tone is diminished as well as the mandible forward positioning. The vertical movements

to hold the pacifier squeeze the milk out of the bottle without an important negative pressure. Tongue movements and tone are also decreased. The inadequate bottle feeding, forces the tongue and cheek muscles to develop a compensating and atypical function, in order to obtain the milk. In consequence, there will be an adaptation change of the dental and bone structures, leading to malocclusions. If bottle feeding is absolutely necessary, the pacifier at the end of the bottle must be elastic, not too long, because there is a risk to develop an atypical swallowing, with a soft surface and a small diameter orifice to determine a 15-20 minutes long suckling effort from the baby, as the natural sucking does. The bottle must be also sterilized through boiling, before use [2]. Pacifiers may be an effective weaning mechanism used by mothers who have explicit or implicit difficulties in breastfeeding, but they are much less likely to affect infants whose mothers are confident about nursing. Breastfeeding promotion campaigns aimed specifically at reducing pacifier use will fail unless they also help women face the challenges of nursing and address their anxieties [10].

During post-natal period, the possibility of influencing the centers of growth through function is immense, so the new-born must not be deprived of it; or else, the massive growth spurt after the birth will decrease considerably [11,12,13].

B. Non-nutritive sucking

Questions often arise concerning infants and non-nutritive sucking. Non-nutritive sucking consists of sucking fingers, pacifiers, or other objects.

Non-nutritive sucking is considered a normal part of fetal and neonatal development. As early as 13-16 weeks in uterus, the fetus has started sucking and swallowing movements. Respiratory-like movements also begin during this stage. These fetal movements are considered to be important precursors for the life-sustaining requirements of respiration and deglutition. Non-nutritive sucking is intimately related with two reflexes present in the infant at birth. The rooting reflex is the movement of the infant's head and tongue towards an object touching its cheek. The object is usually the mother's breast, but may also be a finger or pacifier. The rooting reflex disappears in normal infants around 7 months of age. The sucking reflex expresses milk from the nipple and remains intact until 12 months of age. The disappearance of the sucking reflex does not mean that the infant cannot suckle; at this age of development, the infant has learned to feed and does not need the reflex to obtain nourishment.

During suckling, the infant will place the tongue beneath the nipple, in contact with the lower lip, and swallow with the jaws apart and the lips together. This is termed the infantile swallow. In contrast, the adult swallow is characterized by swallowing with the teeth together, the tongue against the palate, and the lips relaxed. The change from infantile to adult swallow is gradual. The suckling

reflex normally disappears during the first year of life [14]. As the diet of the infant changes from liquid to solid foods, there is increased activity in the muscles of mastication and the primary molars are brought into occlusion. The transitional swallow is commonly seen in children 3-10 years of age, and lip contraction and tongue to lower lip posture may or may not be present. The full adult swallow can be observed as early as 3-4 years of age and is usually present by age 9 or 10, but is never achieved in 10%-15% of population [14,15]. A delay in the normal swallow transition can be expected when a child has a sucking habit [14].

Non-nutritive sucking in infants is nearly universal and is considered normal. The point at which non-nutritive sucking becomes a habit and is not considered normal is unclear. Numerous studies on the prevalence of thumb and digit sucking indicate that a large majority of newborns suck their fingers but that percentage consistently drops with increasing age. These studies indicate that children spontaneously discontinue non-nutritive sucking sometime between 2 and 4 years of age [16].

A variety of non-nutritive sucking habits exist, but thumb, digit and pacifier sucking are most common. Pacifier habits are dependent on the cultural background, and may be encouraged in one setting and not in another- children usually have little choice in the matter. Children often combine a non-nutritive habit with another repetitive activity. For example, they may suck a thumb while carrying a personal blanket, stuffed toy, or favorite doll. Other children play with their hair or rub an article of clothing. In addition, certain situations and times of day influence the habit. Tired children are more likely to suck their thumb, as are children in new or threatening environments. The effects of non-nutritive sucking on the developing dentition are minor in the child under 3 years of age and are usually limited to changes in incisor position. Some upper or lower incisors become tipped toward the lips, and/or others are prevented from erupting. There is some controversy however, concerning the influence one habit has on the dentition compared with another. At this time, there seems to be no significant difference between digit and pacifier habits in terms of their effects on the dentition [17]. If these habits persist beyond the time that the permanent teeth begin to erupt, malocclusion characterized by flared and spaced maxillary incisors, lingually positioned lower incisors (or sometimes labially, with reverse occlusion, depend on sucking technique), anterior open-bite, narrow upper arch, cross-bite, distal occlusion, is the likely result [14]. The limited quantity of data in the literature show that the anterior open bite tends to disappear when the habit is abandoned, but the same does not occur in the case of posterior crossbite, and Class II malocclusion with increased overjet [18,19,20,21].

As breast feeding does not seem to completely satisfy children's need for suckling, a pacifier has been offered to bring additional satisfaction [6]. If parents choose to have their child use a pacifier, some precautions should be taken to

ensure their child's safety. The pacifier should never be attached to a ribbon or string around the child's neck because the string may get caught or tangled and cause serious injury or death by strangulation. Pacifiers must:

1. Be of sturdy, one piece construction with material that is non-toxic, flexible, and firm but not brittle;
2. Has easy grasped handles;
3. Have inseparable nipples and mouth guards;
4. Have mouth guards of adequate diameter to prevent aspiration and two ventilating holes;
5. Have a label warning against tying the pacifier around the infant's neck.

Additionally, parents should be encouraged to keep the pacifier clean, replace it when worn, and never place honey, sugar, or any sweet syrup on the nipple to encourage sucking.

Manufacturers have been quick to develop nipples and pacifiers that "closely resemble the mother's breast". These manufacturers maintain that because the pacifier resembles the breast, it is more natural and therefore best for the infant's growth and development. No long term controlled studies are available to support these claims. In this age group, active intervention to discourage non-nutritive sucking is contraindicated [22]. A period of watchful waiting is ordinarily successful because the majority of children spontaneously abandon the habit between 2 and 4 years of age [23]. In a large percentage of cases, any deleterious tooth movement resulting from the habit will tend to resolve if the activity is discontinued prior to eruption of the permanent teeth. Therefore, treatment is usually best deferred until the late primary or early mixed dentition stage.

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