

Breast Feeding v/s Bottle Feeding: Effects on Occlusion

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Abstract

Human breast milk is the healthiest form of milk for human babies. Breastfeeding promotes health, helps to prevent disease, and reduces health care and feeding costs. There is another compelling benefit to exclusive breastfeeding: positive effects on the development of an infant's oral cavity, including improved shaping of the hard palate resulting in proper alignment of teeth and the proper development of the swallowing action of the tongue. The purpose of this article is to stimulate further research as well as to propose the importance of breastfeeding to developing and maintaining the physiologic integrity of the oral cavity.

Key words: Breast feeding; Oral cavity; Cranio-facial development; Malocclusion; Bottle feeding.

Introduction

Human breast milk is the healthiest form of milk for human babies. There are few exceptions, such as when the mother is taking certain drugs or is infected with tuberculosis or HIV. Breastfeeding promotes health, helps to prevent disease, and reduces health care and feeding costs. Breast milk is made from nutrients in the mother's bloodstream and bodily stores. It has just the right amount of fat, sugar, water, and protein that is needed for a baby's growth and development. During breastfeeding antibodies pass to the baby. It contains several anti-infective factors such as bile salt stimulated lipase (protecting against amoebic infections), lactoferrin (which binds

to iron and inhibits the growth of intestinal bacteria) and immunoglobulin A protecting against microorganisms.^[1,2] Merits of human breast milk as compared to artificial feeds include ideal nutritional content, better absorption, fewer food-related allergies, more favorable psychological development, better immunologic defenses, and a substantial economic advantage. There is another compelling benefit to exclusive breastfeeding: positive effects on the development of an infant's oral cavity, including improved shaping of the hard palate resulting in proper alignment of teeth and the proper development of the swallowing action of the tongue.^[3,4] The swallowing pattern developed during infancy extends into adulthood.

Growth of the craniofacial area naturally involves an increase in size as well as dramatic changes in proportion. At birth, the cranium is slightly more than 60% complete, whereas the face is only 40% complete. The mandible is underdeveloped at this time, exhibiting an obtuse shape of the facial profile.^[5] Growth does not mean just an increase in size but also changes in shape and orientation. During growth, the bone undergoes a remodeling and displacement process. The rate of change is different in different areas. The control of the growth involves a complex interaction with local functions, responding to local signals, which must act in concert with other

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regions.^[6] Growth is strongly influenced by genetic, functional and environmental factors.

Process of breast feeding

The key to successful breastfeeding is a proper “latch-on” and swallow by the infant as described by Woolridge,^[7] Escott,^[8] Weber,^[9] and Bosma.^[10] During effective latch-on, the infant draws both the nipple and some of the surrounding areolar tissue into the mouth as far back as the junction of hard and soft tissue palates^[11] and extends the tongue over the lower gum pad. Infant feeding takes place by the rhythmic pumping action known as ‘suckling’. In the first few days after birth, the lips are not readily poised, but a primitive rooting reflex exists and when the child is nursed, it turns its head naturally to the breast.^[12] The lips form a seal and the mouth cavity is enlarged as the jaw moves. The whole of the lower jaw is raised and lowered alternately with a rocking motion. The tongue is protruded and remains in contact with the lower lip throughout. As the jaw is lowered, the body of the tongue moves downwards and forward. The nipple is considerably extended and taken well back into the mouth, and the squeezing action is completed by the contraction of the floor of the mouth.^[12] The movement of the tongue is described as a peristaltic, rolling motion.^[13] This produces a low or negative pressure in the oral cavity, which facilitates the passage of milk from the nipple, although the oxytocin-induced milk let-down reflex triggered by touch receptors in and around the nipple is sufficient to give a flow of milk.^[14] The upward movement of the mandible with upward and backward movement of the body of the tongue increase pressure in the oral cavity and force the contents into the upper part of the pharynx, initiating relaxation and then contraction of the pharyngeal constrictors. The airway is maintained during suckling.^[14,15,16]

Process of bottle feeding

The tongue action for bottle-fed babies was more piston-like or a squeezing motion. A proper swallowing action may not develop

and a tongue-thrust may develop instead. Some of the time during bottle-feeding, the infant only needs to squeeze on the nipple to express formula from the bottle. At other times, the infant may have to suck excessively to remove formula from the bottle. Since the hole at the tip of the nipple is not regulated to a standard size, the size of the hole can be quite variable. A nipple with a large hole may gush out an excessive amount of formula that could possibly choke the infant. The infant has to place the tongue at the back of the throat in a protective posture so that too much formula does not go down the throat. This abnormal motor activity of the tongue is referred to as a tongue thrust or a deviate swallow.

If the hole is too small, the infant may have to suck on the nipple excessively to express the formula. As formula is removed, a vacuum can be created inside the bottle. More suction is then needed to remove the formula. The greater the sucking action needed within the mouth, the greater the potential for collapse of the oral cavity.

Since most bottle-nipples are firmer than the breast, the tongue gets drawn inside the mouth to protect the bottom side of the tongue from being traumatized by the gum pad.

Effects of Breast and Bottle Feeding on Oral Cavity Development

Active breastfeeding encourages mandibular development, with a strengthening of the jaw muscles. The tongue, lower lip, and mandible move in concert to draw the nipple into the mouth and to empty it rhythmically by a series of compressions in a front-to-back sequence. Weber^[9] concluded that the “stripping” movement of the tongue in breastfeeding was more important than suction in obtaining milk. Picard^[17] suggested that the undesirable effects of artificial nipples on infants were permanent, and that correction in later life would be extremely difficult because muscle development would be affected. The forceful breastfeeding motion encouraged mandibular development, while bottle feeding could actually hinder the formation of strong jaw muscles.

Drane^[18] noted that during breastfeeding, the shape of the breast-nipple is dictated by the internal geometry of the infant's mouth. However, an artificial teat is already formed, with a specific shape, and is made from a material stiffer than breast tissue. The piston-like action used to obtain milk from the bottle is more explosive and more powerful than the action used in breastfeeding. Therefore, greater pressure is applied to the artificial teat than is applied to the breast-nipple. This pressure is produced predominantly by the oral musculature. Koenig^[19] stated that during bottle-feeding, the infant produced oral suction with the oral musculature rather than with thoracic musculature. Woolridge^[7] has also demonstrated that less suction is needed during breastfeeding than during bottle feeding. Forceful action causes the cheeks to draw in, putting pressure on the gums and teeth, affecting the position of teeth. This action can also cause an implosion of the oropharynx, and thereby affect the development of the oropharynx. During breastfeeding, the infant has to work the jaws and tongue in a natural physiological manner to aid in the compression of the lactiferous sinus. This action, plus normal swallowing motions, help to develop proper perioral (around the mouth and jaw) musculature. Not much muscle coordination is needed during most bottle-feeding, so perioral, facial, and TMJ musculature may not develop properly. It was also observed that breast fed infants have the lowest prevalence of digital habits. They found a positive association between bottle feeding and over jet. Breast-feeding also lowers the risk of the antero-posterior mal-relationships. However the breast-fed infants showed the least amount of relative change in maxillary arch length and palatal depth.

Cranio-Facial Development and the Etiology of Malocclusions

Shepard,^[20] noted that the largest increments in craniofacial growth occurred within the first 4 years of life, and that craniofacial development is 90% completed by 12 years of age. The flexible and soft human breast nipple tissue is beneficial in shaping the hard palate

because it flattens and broadens in response to the infant's tongue action. As the infant uses a peristaltic-like motion to "strip" milk from the mother's nipple/areolar area, the hard palate is gently shaped by the infant's tongue to a rounded U-shaped configuration. A physiologically and appropriately shaped palate aligns the teeth properly and reduces the incidence of malocclusions.

In the early stages of oral cavity development, the palate is almost as malleable as softened wax. Thus, when any object is pressed against the soft bones of the palate, these bones can be molded into a narrow, unnatural shape. This eventually leads to the poor alignment of teeth, and the "V-shaped" palate found in many people with malocclusions. This dynamics also explains how the upper back teeth are pulled inward to cause "cross-bite."

Other infant habits, unrelated to feeding, may contribute to malocclusions. Prolonged finger sucking caused an anterior open bite, proclination and protrusion of the maxillary incisors, a lengthening of the upper arch and the anterior displacement of the maxilla. In addition, studies by Bowden,^[21] Melsen,^[22] Paunio,^[23] and Ogaard^[24] found a positive association between the use of pacifiers and malocclusion. The forms of malocclusion described by these authors included cross bite, reduced arch width, and lower anterior facial height, rotation of mandibular plane angle, open bite, and tongue thrust swallow.

Another problem that occurs during early oral cavity development is that of infringement on the space of the nasal cavity. When the roof of the mouth is pushed up, the floor of the nasal cavity rises as well. Since the bridge of the nose does not rise accordingly, there is a decrease in the total nasal space. This can have a dramatic effect on the individual's breathing efficiency because the size of the nasal chamber is reduced. Kushida et al.^[25] have shown that a high palate and narrow arch, as described here, are good predictors of snoring and obstructive sleep apnea. Individuals with good occlusion normally have a well-rounded and full "U-shaped" arch.

Summary

Preventing disease, in a natural way, far outweighs the alternative: treating the disease with our newest medical technologies, which can be costly and time consuming. Breastfeeding has been shown to be immunologically, emotionally and nutritionally advantageous; there are also the benefits of a reduced risk of Obstructive Sleep Apnea/Sleep Disordered Breathing. All health care providers need to understand the benefits of breast-feeding and need to encourage it as much as possible.

Breastfed babies have a better chance of dental health than artificially-fed infants because of the effects of breastfeeding on the development of the oral cavity and airway. With fewer malocclusions, these children may have a reduced need for orthodontic intervention. In addition, children with the proper development of a well-rounded, "U-shaped" dental arch, which is found more commonly in breastfed children, may have fewer problems with snoring and sleep apnea in later life. The purpose of this article is to stimulate further research as well as to propose the importance of breastfeeding to developing and maintaining the physiologic integrity of the oral cavity.

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