KEY WORDS
Breastfeeding, bottle feeding, occlusion, dental development

LEARNING OBJECTIVES

- To facilitate all dental care professionals being up to date with the latest evidence on breastfeeding and bottle feeding and how they may affect the occlusion
- To gain an understanding of the possible effects of breastfeeding and bottle feeding on the occlusion
- To be able to advise parents regarding their feeding choice and the possible effects on the occlusion

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BREASTFEEDING – DOES IT AFFECT THE OCCLUSION?

ABSTRACT
The effects of breastfeeding on the occlusion have been much debated, and it is often suggested that breastfeeding facilitates optimal development of the jaws and the dentition, thus preventing the development of a malocclusion. Despite these claims, the evidence is equivocal, and the majority of studies are of low quality and only assess the deciduous dentition. Therefore, at present there is currently no high quality evidence to support claims that breastfeeding has a positive effect on the occlusion, thus the method of feeding should be chosen due to the health benefits and personal preference, not due to any claims regarding occlusal benefits that cannot be substantiated.

Introduction

Breastfeeding is common practice in England for feeding newborn babies and infants. Mothers can choose to breastfeed or bottle feed, or use a combination of the two. Exclusive breastfeeding is defined as giving an infant only breast milk; no water, no formula milk and no other liquids or solids.[1] Non-exclusive breastfeeding is when an infant is breastfed in conjunction with other liquids or solids.

The World Health Organisation (WHO) currently recommends exclusive breastfeeding for the first six months of an infant's life, and then continued breastfeeding alongside solid foods for the next 12 to 24 months, or for as long as the mother and baby desire.[2] This recommendation is supported in England by the National Health Service (NHS).[3]

Health benefits of breastfeeding

Breastfeeding is advocated due to its many recognised health benefits for growth and development and for the overall health outcomes of infants.[4] These benefits are summarised in Box 1. Breastmilk is an excellent source of nutrition and it contains immune cells, antibodies and digestive enzymes.[2] Therefore, breastmilk offers immunological protection to the potentially immature immune system of newborns, and it helps the infants' immune and digestive systems to develop.[2] This contributes to both short-term and long-term immunological protection for the infant and has been found to help protect infants from infections, including ear infections and respiratory tract infections.[4,5] The IgG and IgA immune complexes within breastmilk have also been found to contribute to protecting infants from

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BOX 1

A SUMMARY OF THE HEALTH BENEFITS OF BREASTFEEDING

The overall health benefits of breastfeeding

- Aids overall infant growth and development
- Offers immunological protection
- Aids development of the digestive system
- Helps protect against ear infections
- Helps protect against respiratory tract infections
- Helps prevent the development of asthma
- Helps protect against diarrhoea and gastroenteritis
- Helps protects against obesity
- Helps protect against diabetes
- Reduces the risk of diabetes in mothers
- Reduces the risk of ovarian cancer in mothers

developing asthma.[4,6] Additionally, it protects against diarrhoea and gastroenteritis by coating the intestinal lining and killing pathogens that can cause infections.[7] A unique property of breastmilk is that as an infant grows and develops, the composition of the breastmilk changes to accommodate the infant's nutritional and immunological needs.[4]

A recent study looking at the short-term and long-term benefits of breastfeeding for infants and mothers found that breastfeeding helped to reduce levels of morbidity and mortality in children caused by infections. It also protects against obesity and diabetes in children and helps to reduce the risk of diabetes, ovarian cancer and breast cancer in mothers.[8]

Breastfeeding and oral development

As well as the overall health benefits, some schools of thought propose that breastfeeding also has positive effects on the development of the oral cavity. These include improved shaping of the hard palate, resulting in the correct alignment of the deciduous dentition and fewer problems with malocclusion.[9] However, the extent of these claims is uncertain, and any evidence is limited, often of low quality and confined to the deciduous dentition.

The proposed occlusal benefits of breastfeeding are listed in Box 2. The proposed ways in which breastfeeding differs from bottle feeding and the suggested affects on the occlusion are:

1. Infants use *different sucking techniques* for breastfeeding and bottle feeding, which is suggested to affect the development of the occlusion.
2. Breastfeeding utilises *muscle activity* from the muscles of mastication and facial muscles more than bottle feeding, which is suggested to lead to better development of the maxilla and the mandible, therefore preventing the development of malocclusion.
3. The different *shape and flexibility of the human breast* compared to a bottle teat, and it is suggested this affects shaping of the oral cavity.
4. Breastfeeding allows an *oral seal* to be achieved, which it is suggested leads to infants developing the ability to breathe through their nose and thus limiting mouth-breathing and reduces the chance of developing an anterior open bite.
5. Breastfeeding has been proposed to prevent the formation of *upper midline diastemas*.

BOX 2

THE PROPOSED OCCLUSAL BENEFITS OF BREASTFEEDING

The proposed occlusal benefits of breastfeeding

- Optimal development of the maxilla and mandible
- Preferable shaping of the oral cavity and hard palate
- Prevention of posterior crossbites
- Prevention of anterior open bite
- Prevention of the development of upper midline diastemas

Different sucking techniques

It has been suggested that the sucking mechanisms used by infants for breastfeeding and bottle feeding are different, and that the sucking mechanism used in bottle feeding may predispose infants to the development of a malocclusion.[10]

Two different sucking mechanisms are proposed to exist:

1. Sucking
2. Suckling

Sucking is the action used during bottle feeding where a piston-like sucking action is used on the teat of the bottle to yield milk.[10] Suckling, however, describes the action used to yield milk in breastfeeding where an infant uses a squeezing action and the tongue compresses the breast against the hard palate using a peristaltic-like motion.[10]

The sucking, piston-like action used to obtain milk from a bottle is more powerful than the suckling action used in breastfeeding. Therefore, it has been suggested that this increased pressure from the oral musculature with the cheeks drawn in increases pressure on the gingiva and the dentition, and narrows the maxilla, thus predisposing infants to the development of buccal crossbites (Figure 1).[10,11]

Conversely, during breastfeeding, the suckling pressure is placed towards the back of the mouth with the tongue resting against the palate, which is suggested to contribute to the correct development of the palate, which allows space to accommodate the full dentition and may

Figure 1: A patient in the mixed dentition with bilateral buccal crossbites

also prevent buccal crossbites developing.[12] Another possible reason why breastfeeding reduces the risk of posterior crossbites is that during breastfeeding, the mandible is advanced and raised, and the tongue is lowered, which promotes balanced musculature development.[11]

Muscle activity

Craniofacial growth and development are affected by functional stimuli, such as breathing, swallowing, chewing and sucking.[13] The largest increments in craniofacial growth occur within the first four years of life, a period where the mode of feeding may have an effect.

During breastfeeding, the infant moves the muscles of mastication and facial muscles in a natural physiological manner to aid compression of the breast to yield milk. This muscular action is believed to promote optimal craniofacial growth and development compared to bottle feeding.[14–16]

Shape and flexibility of the human breast

In the early stages of oral development, the palate is malleable and therefore can be moulded and shaped. The human breast is soft and flexible and changes shape to take the form of the oral cavity, whereas an artificial bottle teat has a pre-formed shape and is stiffer and less flexible. Therefore, during bottle feeding, the artificial teat can press on the palate and cause it to develop into a narrow, unnatural V-shape which, it has been suggested, can lead to a lack of space to accommodate the dentition and transverse discrepancies.[17]

Conversely, it is suggested that during breastfeeding, as the infant draws milk out of the breast with a peristaltic-like tongue action, the breast flattens and broadens. This action leads to shaping of the palate into a physiological round U-shape which allows space for the developing dentition and reduces the incidence of crossbites.

Oral seal

Another aspect of anatomy in favour of breastfeeding is that the mother's nipple adapts to the internal shape of the oral cavity, enabling a perfect oral seal to be achieved, which in turn leads to the satisfactory development of nasal breathing. It has been proposed that children with nasal breathing do not mouth-breath, and so are less likely to develop excessive vertical facial dimensions and anterior open bites (Figure 2).[18]

Figure 2: A patient in the mixed dentition with an anterior open bite

Some schools of thought also believe that bottle feeding can lead to the development of tongue thrusts. This is because in order to stop the flow of milk from a bottle, an infant has to hold their tongue up against the hole in the teat. This is an abnormal muscular action which can lead to the development of a tongue thrust and a resultant anterior open bite.[9]

Upper midline diastema

Some clinicians believe that breastfeeding prevents the formation of upper midline diastemas (Figure 3). However, this is purely based on clinician opinion and there is currently no published evidence in this area. Therefore, it cannot be said if there is an association with breastfeeding and upper midline diastemas.

Figure 3: A patient with a low frenal attachment and an upper midline diastema

Review of the evidence

Occlusal benefits

Although there are multiple theories on how breastfeeding and bottle feeding may affect the occlusion, there is very little evidence to support these claims and the majority of evidence is of low quality and only assessed the deciduous dentition with no long-term follow up of patients. Therefore, it is not possible to know if any of the postulated occlusal effects are due to the mode of feeding and if any of the proposed effects in the deciduous dentition continue into the permanent dentition.

Historic evaluation of dry skulls of infants who were breastfed found that 98% did not have any features of malocclusion.[9] These skulls had broad, U-shaped palates and good dental alignment. However, this study did not have any control patients and the history of breastfeeding was based on it being normal practice for the recruited population. Thus, it cannot be accurately determined if any of the observed characteristics are specifically due to the mode of feeding.

Electromyography has been used in some research to investigate the different sucking mechanisms and the different muscular activity in breastfeeding and bottle feeding. These studies found that infants who are exclusively breastfed were less likely to develop dysfunctional muscular patters that might predispose them to developing a malocclusion.[14,15]

More recently, systematic reviews and meta-analyses have been carried out to try to ascertain if breastfeeding has any effect on the occlusion. A systematic review and meta-analysis in 2015 found that the presence of malocclusion was 46% lower in children who were exclusively breastfed than in those who were not exclusively breastfed.[19] However, these findings were purely in the deciduous dentition and patients were only followed up until they were five years old. It was also unclear how malocclusion was classified and how the severity of the features of malocclusion reported. This study also found that infants who were breastfed for longer periods of time were 60% less likely to develop malocclusion compared to those who were breastfed for shorter periods (less than six months).[19] Other studies

have also found the duration of breastfeeding to be important and that a longer duration of breastfeeding is more protective against the development of posterior crossbites in the deciduous and mixed dentition.[12]

A more recent systematic review and meta-analysis found breastfeeding to be a protective factor against the development of anterior open bites.[20] This study also found an association between the duration of breastfeeding and its effects, with infants who were breastfeeding for 12 months or longer having a lower chance of developing overjets, anterior open bites and posterior crossbite. However, the studies included in the review were of low quality and heterogeneity, and therefore these results should be treated with caution.[20]

Despite there being multiple studies stating the beneficial effects of breastfeeding on the occlusion, there are numerous studies showing that there is no association between the method of feeding and the development of any features of malocclusion, especially anterior open bites and posterior crossbites.[12,19–22] A recent systematic review assessing the effects of breastfeeding on the mixed and permanent dentition did not find any evidence to support an association between breastfeeding, bottle feeding and the occurrence of malocclusion in the mixed or permanent dentition.[23] Of the six studies that were included in the systematic review, only three studies found significant results. Of these, one study found that breastfeeding for longer than six months led to greater proclination of the lower permanent incisors. One study found that breastfeeding was associated with both class II and class III malocclusions, and the final study found that breastfeeding was associated with a reduction in malocclusion. Overall, the systematic review concluded that there was no evidence to support an association between breastfeeding and malocclusion.

This is further supported by another recent systematic review which found that it was not possible to confirm if any types of malocclusion were associated with the type of feeding.[24] Additionally, it was found that it is not possible to advise on how long breastfeeding should be maintained to prevent any features of malocclusion and, therefore, the recommended duration of breastfeeding is advised purely on medical grounds.

Duration of follow up

Overall, the majority of research on breastfeeding and the occlusion has been carried out in the deciduous dentition with very little research assessing the effects in the permanent dentition. Most studies are retrospective or cross-sectional in nature and do not accurately assess the occlusion or take measures to exclude or evenly distribute any confounding factors. In order to access the proposed effects of breastfeeding on the occlusion accurately, higher quality research with prospective longitudinal studies and a long-term follow up needs to be performed.

Dental health

Whilst the main focus of this article is the occlusion, it is important also to appreciate the effects that breastfeeding and bottle feeding can have on overall dental health. An understanding of the role that breastfeeding and bottle feeding can play in the development of caries during childhood is essential in allowing clinicians to provide the best possible care and advice to their patients and their families. A position statement produced by the British Society of Paediatric Dentistry (BSPD) on infant feeding provides evidence-based recommendations to help clinicians provide appropriate advice to parents on feeding and weaning their babies.[25]

Extensive bottle feeding after the age of one year is often reported to be associated with a higher incidence of childhood caries, often termed "bottle caries". This is supported by recent research which has found breastfed children to be less affected by dental caries than bottle-fed children.[26] It has also been found that breastfeeding is beneficial in protecting against the development of caries in children up to the age of one year.[27] However, evidence has recently been published suggesting that breastfeeding on demand and through the night after the age of one, and following the introduction of solid foods, may be linked to caries.[28]

To clarify its recommendations based on the most up to date research, the BSPD advises parents who are bottle feeding to stop bottle feeding by one year old, and for parents who are breastfeeding to consider reducing night-time feeds. If breastfeeding is continued past one year of age, a low sugar diet should be ensured as well as the use of fluoride toothpaste.

Information provision

A plethora of easily accessible information is available via the internet and on social media sites on breastfeeding and bottle feeding and their effect on occlusion and oral health. However, clinicians and parents should always be mindful of the source of information and if it is robust, based on scientific evidence.

An interesting study carried out recently assessed the quality of the evidence on breastfeeding available to the public on the internet.[29] This is important, especially in the modern era where many people's first port of call for information is the internet. Therefore, if inaccurate information is publicised on the internet, parents as well as professionals, may be ill advised and may therefore carry out a type of feeding for inaccurate reasons. This study found that nearly half of the websites cited moderate to very low quality evidence and that the information available to the public was of moderate quality at best.[29] This reinforces the need for higher quality research on breastfeeding and the occlusion so that comprehensive information can be provided to patients and families.

The Public Health England website and websites of accredited societies, such as the British Society of Paediatric Dentistry, are good sources of accurate information to which parents can be directed to gain more information on infant feeding and oral health.[30,31]

Conclusion

Despite there being many proposed benefits of breastfeeding on the

occlusion, there is no high quality evidence to support any of these claims. The majority of research in this area is low quality and only assesses the deciduous dentition. Therefore, it is not possible to say accurately if the method of feeding has any effect on the occlusion and if any of these effects continue into the permanent dentition. There is a need for high quality, prospective, longitudinal research in this area before any accurate conclusions and recommendations can be made. At present, the method of feeding should be chosen due to the health benefits and personal preference, not due to any claims regarding the occlusion as these cannot be substantiated.

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