

# Infant Sucking Assessment: The Latest Studies on Sucking, Digital and External Sucking Assessment

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Knowing how to assess an infant's suck is essential to understanding breastfeeding difficulties. This requires a combination of manual assessment and an understanding of the sucking mechanism.

When a mother comes to us with her baby because she's in pain, or because her baby isn't gaining enough weight, our role as lactation consultants is to look for anything that might be influencing the situation. A baby who isn't getting enough milk may have an ineffective suck that is preventing them from getting their milk ration.

To assess the effectiveness of this sucking mechanism, it is important both to know the role of each oral structure and to be able to identify the one that is malfunctioning. Then we need to understand why it's malfunctioning, so we can do something about it.

In the following article, I will first present my current concept of the physiological mechanism of suckling, followed by a discussion of possible causes of impairment and how these can be diagnosed by digital examination and breastfeeding observation. This presentation is based on the cited scientific literature and my experiences in my breastfeeding clinic in Paris, France.

## The physiology of the sucking mechanism

All the structures of the baby's oral cavity are involved in the development of effective sucking and they all interact with each other. More than 40 muscles are involved in coordinating the movement of food and air into the oral cavity. We will therefore review the function of each of these structures in the establishment of effective sucking.

### The lips

The lips help with locating the nipple and place it in the mouth. They stabilise the breast in the mouth and make a seal on the breast. The labial frenula attach the lips to the gums. The lips must be closed when the baby is asleep (*Campanha et al., 2021*). They are curled out or neutral when feeding and exert a slight pressure on the breast with the moist part of the lip to create a seal. I've observed that the seal is made correctly when the wet part of the lips is in contact with the breast rather than the dry part. I think this is why it's often said that the lips should be curled out when the baby is at the breast. But even when they are not, I have personally observed that it's the moist part of the lip that makes the seal and prevents air from passing through. When the dry part of the lip is placed on the breast, it tends to rub and blister

### The jaw

The jaw is innervated by the 5<sup>th</sup> cranial nerve, the trigeminal nerve (*Nguyen, 2010; p. 250*). The motor function of its mandibular branch serves as the base for the movements of the tongue, lips and cheeks. The jaw's downward movement during sucking increases the size of the oral cavity to create suction (*Azarnooosh & Hassanipour, 2021; Elad et al., 2014; Mills et al., 2020*). ›



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### › The cheeks

The cheeks provide stability of the breast in the mouth through Bichat's buccal pads in infants up to 8 months of age, and then through the cheek muscles. They help to maintain the shape of the mouth. The cheeks must be symmetrical. Bichat's buccal pads allow for a good latch and good sucking action. The cheeks must be well toned when sucking (Watson Genna, 2023, pp. 27–37).

### The tongue

The tongue is innervated by the 7<sup>th</sup> cranial nerve (sensory innervation), the 9<sup>th</sup> cranial nerve (responsible for taste in the posterior third of the tongue and enabling swallowing by connecting to the stylopharyngeus muscle to lift larynx and pharynx) and the 12<sup>th</sup> cranial nerve (motor of the tongue muscles), also called the hypoglossal nerve (Nguyen, 2010). The nipple and breast tissue are scooped up by the tongue which stabilises the breast in the mouth. It helps to create a seal when the breast is in the mouth. The tongue should be soft when resting. So, when sucking, the back of the tongue can easily rise towards the soft palate. It is cupped during sucking to bring the milk to the pharynx (Mills et al., 2020). The lingual frenulum attaches the tongue to the floor of the mouth. Sucking movements place the tongue in the region of the palate behind the incisors, which prevents air from passing through and thus promotes nasal breathing (Mills et al., 2020). At rest, the tongue should be positioned at the roof of the mouth (Martinelli et al., 2021). The floor of the mouth supports the movement of the tongue and, according to my observation, allows it to rise higher or lower depending on its flexibility. Usually, the gums are smooth and serve as a frame for the tongue's movement.

### The palate

The palate consists of two distinct parts: the hard (bony) palate and the soft palate. It should be slightly concave and rounded in shape. The soft palate is made of a layer of fibrous tissue to which the muscles are attached. It is fleshy and mobile. It rises during swallowing so that the milk passes into the oesophagus and not into the nasal cavity (Mills et al., 2020). The uvula hangs over the posterior edge of the soft palate. It contains muscle fibres (Nguyen, 2010).

### The importance of reflexes

The infant has many primal reflexes at birth and a number of these enable the baby to feed (Watson Genna, 2023; pp. 11 f., pp. 118 f.).

- › **Swallowing** is already present and active in utero. It is a complex process coordinated by multiple levels of neural control:
- › The **sucking** reflex: changes from a reflex to a voluntary movement around 3 months.
- › The **gag** reflex: allows the baby to protect himself/herself and prevents ingestion of something dangerous.
- › The **bite** reflex
- › The **rooting** reflex

### The act of suction

Until the early 2000s, there was a mistaken view of the baby's sucking movement. The use of new imaging equipment has led to a better understanding of how sucking works in babies. Several studies over the last 20 years have refined our knowledge of sucking (Azarnoosh & Hassanipour, 2021; Cannon et al., 2016; Elad et al., 2014; Geddes et al., 2008; Mills et al., 2020; Mortazavi et al., 2017; Sakalidis & Geddes, 2017).

Sucking takes place within a suck-swallow-breath coordination. When the baby latches onto the breast, he/she opens his/her mouth wide and sticks his/her tongue out under the nipple/areola area in a down and forward manner. The anterior part of the tongue is thus extended beyond the gum. The nipple is drawn into the oral cavity and placed at or near the junction of the hard and soft palate. The tongue then makes a slight undulating movement and the posterior part of the tongue meets the soft palate. Then a vacuum is generated when the back of the tongue and the soft palate move downwards. The vacuum peak occurs when the posterior part of the tongue is in the lowest position. The maximum distance between the back of the tongue and the hard palate coincides with the peak vacuum. The nipple becomes larger as the tongue is lowered. The nipple diameter is increased when the tongue is in the lower position (Geddes et al., 2008).

The milk is extracted through the nipple due to the vacuum generated by the tongue. When the tongue is in the lowest position and the vacuum reaches its peak, the milk flows out of the ducts. As

the vacuum is released, the anterior part of the tongue rises slightly and the milk flows under the soft palate. The back of the tongue and the soft palate then rise, with the milk continuing to flow towards the pharyngeal region for swallowing. When the back of the tongue reaches the roof of the mouth (high position), the vacuum level returns to normal. The vacuum plays an important role in the extraction of the milk (Geddes et al., 2008).

At the beginning of the feeding, during the non-nutritive sucking that precedes the milk ejection reflex, there is a peristaltic movement of the tongue. This peristaltic movement also helps to draw the milk into the oropharynx. The anterior part of the tongue moves like a rigid body according to the movements of the mandible. The posterior part of the tongue undulates in a peristaltic movement that facilitates the swallowing of the milk bolus. These two movements are complementary and allow efficient sucking. The anterior part of the tongue, when moving with the mandible, moves slightly forward (out of the mouth) when the mandible moves down (Elad et al., 2014).



**Fig. 1:** Orbicularis muscles are too tight

### When the baby is ineffective at the breast.

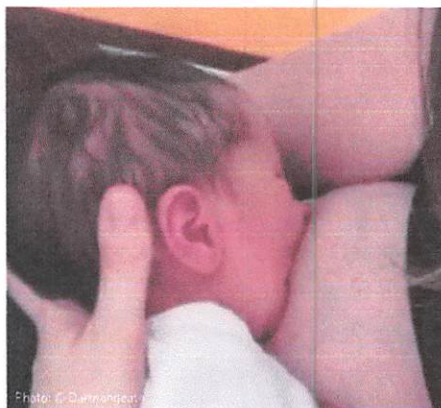
When a family encounters breastfeeding problems (pain, poor weight gain, ineffective feeding, ...), it is important to be able to assess the baby's sucking and the use of all the elements of the oral cavity for optimal sucking. It is also essential to be aware of anything that may interfere with its proper use.

#### The lips

The baby may have a cleft lip (unilateral or bilateral) that prevents the creation of a vacuum by letting air through. A baby may also have lip tone problems when the orbicular muscles of the lips are not functioning optimally (Jacinto-Gonçalves *et al.*, 2004). Conversely, when the orbicularis muscles are too tight, they lead the baby to retract his/her lip (15) (see **Fig. 1**). A particularly short labial frenulum can also prevent the lip from making an effective seal, but this situation is extremely rare (Genna *et al.* 2021).

#### The jaw

If the mandible is retracted (retrognathic), the baby positions the tongue backwards, which can obstruct the airway and interfere with good nasal breathing (Harari *et al.*, 2010). In this case, the tongue is normal in size but positioned backwards, so it cannot move normally (Kooiman *et al.*, 2018) and I've also noticed that these babies often have trouble opening their mouths wide. If the mandible is shifted forward, the baby is prognathic and the tongue is not positioned correctly in relation to the palate.



**Fig. 2:** Cheeks dimpled

The mouth opening is not optimal either (Watson Genna, 2023).

If the mandible is shifted to the side, the opening is weak, tensions appear in the jaw and in the tongue which can no longer move in its normal axis. This may be due to a suboptimal position in utero or a result of congenital torticollis (Watson Genna, 2023).

#### The cheeks

If the tone is poor, the cheeks will be dimpled when sucking and less suction is created (see **Fig. 2**). If cranial nerves 7 (facial) and 5 (trigeminal) are affected (e.g. during a forceps delivery), the cheek tone is poor. If the tongue remains behind the gum during sucking, cheek tone is decreased. To evaluate the tone of the cheeks, one can take the bouncy part of the cheek between the thumb and the middle finger to feel the Bichat balls (Watson Genna, 2023).

#### The tongue

In some newborns, the tip of the tongue sticks to the roof of the mouth behind the gum. I have found that the baby then struggles to latch on because the nipple is placed under the tongue. In other cases, the tongue may be curled, retracted or at the back of the mouth. It may be hypotonic or remain protruding. This may be due to a breathing problem: the baby pulls the tongue out to make space for breathing (Huang & Guillemineault, 2012). The hypoglossal nerve may be pinched along its path: when the baby is extracted with forceps or during a caesarean section, the cervical vertebrae may move and cause a pinching of the nerve. This leads to inconsistent sucking (Nguyen, 2010). A lingual frenulum that is too short or tight can prevent normal tongue mobility.

#### The palate

The bony palate must be intact. The tongue must be able to fit comfortably. The soft palate should be firm but spongy. It should not collapse to one side. The uvula should be in the middle and intact.

The palate may have a cleft, including or not including the soft palate. This allows air to pass through the nasal cavity and prevents a vacuum from being created (Becker de Oliveira, 2023). Be particularly vigilant for submucous palatal clefts,

invisible to the naked eye but equally problematic for sucking. In the case of a submucous cleft, the baby cannot create a vacuum and makes a very peculiar sound when sucking, due to the passage of air through the cleft via the soft palate. According to my observation, when the palate has a particular shape (bubble palate, very concave palate, ...), the nipple can be poorly positioned in the mouth and hinder a good tongue movement.

### The digital assessment of infant sucking behaviour

In the following section I would like to present how you can assess a baby's sucking. Please note, that so far, there is no scientifically validated guidance for studying infant sucking behaviour. I describe below my proposal, which has worked well in my practice.

When you want to assess a baby's sucking, it can be useful to do a finger evaluation which allows you to feel more precisely what is happening in the mouth. Always remember that a baby does not do the same thing with a finger as with a breast. The finger is much stiffer and less voluminous in the mouth.

It is important to ask the parents' permission to offer the baby the finger to suckle. The baby is also asked for permission: we explain what we are going to do and we offer the finger on the philtrum, leaving him to take it or not. Hands should be freshly washed with soap and water and vinyl or nitrile gloves should be worn. Latex gloves are not recommended, as they can trigger an allergy in the baby. Nitrile gloves provide a good feel for the observer, but take on a very slightly grainy texture when moistened by the baby's saliva. This can be uncomfortable for some babies with sensitive palates, causing a gag reflex. Vinyl gloves are very smooth and do not bother the baby, but they are thicker and the observer's sensations are less precise. Fingernails should be short and free of varnish.

Your finger should learn how a baby's mouth and sucking feels like. It is easier to use the same finger over and over again, so sensations can be memorised. It is also important to practise on babies who are sucking well to get a good idea of what is "normal".

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- › You can perform the digital examination as follows:
  - › Present your finger, pad up, on the baby's philtrum (see **Fig. 3**).
  - › Let baby take the lead.
  - › Baby should open his/her mouth wide, move his/her tongue forward and catch your finger by himself/herself.
  - › Baby brings the finger to the back of his/her mouth.
  - › Feel the movement of the tongue, forward and backward.
  - › Feel the level of tongue depression created by the baby.
  - › Then pass the finger between the gums on the left and right to feel the correct alignment of the jaw and the pressure exerted (see **Fig. 4**).
  - › Pass the finger over the roof of the mouth to feel the shape of the mouth.
  - › Turn the finger over and run it under the tongue to feel both the lingual frenulum and the flexibility of the floor of the mouth (see **Fig. 5**).
  - › If necessary, look at the tongue frenulum with two fingers.
  - › Pass the finger between the gum and the cheeks/lips to feel the softness of the passage.
- › The baby should create a tongue depression that prevents you from easily removing the finger from his/her mouth.
- › The jaw pressure should be low, the baby should not bite. Your finger should not be painful.
- › The jaw should be well aligned (right/left and up/down).
- › Your finger should not trigger a gag reflex. In a baby with no sucking problems, the finger is placed either close to or at the hard palate/soft palate junction, without triggering any gag reflex. If the emetic reflex is triggered, this generally indicates that the palate has not been completely desensitized by the tongue. In fact, the tongue must be completely glued to the palate when resting, so it desensitizes the palate (Martinelli et al., 2021). It would seem that if the tongue doesn't stick completely to the palate at rest, it doesn't desensitize the palate, and the baby's gag reflex is triggered when the finger moves over the un-desensitized area.

A digital assessment must always be complemented by a breastfeeding assessment:

- › Is the mouth opening correctly?
- › Are the cheeks full and rounded?
- › When the baby is at the breast, if the breast is lightly pressed away from the baby's mouth, is the tongue visible at the corner of the mouth?
- › Is the baby's suction tight?
- › Are the swallows visible and regular?
- › Is the movement of the mandible wide and harmonious?
- › Does the baby make other noises than swallowing noises when sucking?
- › Is the baby able to handle a large flow of milk without choking?

When the baby releases the breast, remember to observe the nipple: it should not have changed shape or colour. If it comes out lipstick-shaped, it's usually a baby who's holding his tongue back and not advancing it properly. One of the most common causes is a tongue-tie that is too short. If it comes out pinched or flattened, the mouth opening may be poor or the jaw tension too great (McClellan et al., 2015).

Finally, do not forget to observe the baby in other circumstances. When the baby cries, does the tongue come up to the roof of the mouth? When the baby sleeps, is the mouth closed? When the baby sleeps, is the tongue resting at the roof of the mouth?

Assessing a baby's suck takes practice. The more infants you observe sucking, the more you refine your understanding of sucking.

#### How to proceed when ineffective sucking was identified

I won't go into all the solutions to these problems here, but I'll tell you how I approach them. At the Breastfeeding Centre I set up, I work with a team of different professionals, each of whom has a role to play in treating these sucking problems. We always start with the least invasive actions. If there's tension in the baby, the osteopath works to relieve it, allowing the tongue to settle more easily, the jaw to relax, and the mandible to reposition itself if there's a shift in the mandible. If, after this, the tongue-tie is still troublesome, the ENT specialist will perform the frenotomy. If a gag reflex persists, the speech therapist will work to eliminate it. If there is a cleft



**Fig. 3:** Present your finger on the baby's philtrum.



**Fig. 4:** Pass the finger between the gums



**Fig. 5:** Turn the finger over and run it under the tongue

palate, the hospital's surgical team will take charge, but we will ensure that breastfeeding continues under the best possible conditions. If we suspect a neurological problem, our doctor will refer the baby to the appropriate hospital department. This multidisciplinary approach enables us to respond to all suckling problems.

We follow around 600 families a year. This represents around 450 babies with sucking problems. At least 400 families continue to breastfeed at least partially, or exclusively. The reasons for discontinuing breastfeeding are not always because the sucking problem has not been resolved, but also for other reasons (return to work, other pathologies, etc.). The duration of treatment varies enormously: sometimes the problem is solved in a few days, while for other babies it may take several months.

### Conclusion

Sucking assessment requires experience, constant updating of theoretical knowledge and a great deal of exchange with other professionals involved in the family's care.

The method I describe in this article only reflects our current practice. This practice has evolved and will continue to evolve.

My aim, therefore, is not to suggest the best way to practice, but rather to give guidance that you can adapt to your own practice.



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