

Maiden morsel - feeding in cleft lip and palate infants

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Abstract

Cleft lip and cleft palate are the most common craniofacial anomalies that have an incidence of 0.28 to 3.74 per 1000 live births globally. Due to the great advancements in the field of medical science, these anomalies can today be corrected. However, it cannot be ignored that the parents of these patients may face psychological stress due to the cleft defects in the baby. Also, these conditions may cause financial difficulties to the parents and cause anxiety to the mother about the proper feeding of their infant. Feeding problems can range from excessive air intake to failure to thrive. As the management of such cases is lengthy and includes a multi-disciplinary team approach, it is the role of the Pediatrician/Pedodontist to educate the mother about the proper feeding techniques. In this article, we have reviewed and highlighted the various traditional and advanced devices and techniques which help in the successful management of these individuals.

Key words: *Cleft lip, cleft palate, feeding, specialized feeding equipment*

INTRODUCTION

Infants physiologically spend most of their early weeks in feeding and sleeping. Feeding is a time of not only gratifying the hunger and thirst of the infant, but also of social interaction when the baby is most alert, thus allowing the mother and child to bond.^[1] Babies use reflexes such as creating a negative intraoral negative and using rhythmic intra oral muscular movements while getting fed. This co-ordinated mechanism is hampered in situations such as clefts in the oro-facial region.^[2-4] Cleft means a 'split' or 'separation'. During the development of the fetus, separate areas of the face develop individually and then join together, and any disturbance in this fusion can result in cleft formation, the type and severity of which can vary depending upon the fusion defect. These clefts can range from a slight notch in the lip, to complete separation, and can involve the different regions of the oro-facial complex, either

independently or in combination. A cleft on one side of the face is called a unilateral cleft, and the one occurring on both the sides is a bilateral cleft.^[5]

The cleft deformities are the most common of the pediatric congenital anomalies and their incidence ranges from 0.28 to 3.74 in 1000 live births. The clefts in the craniofacial region result in a plethora of problems, and the management includes a multidisciplinary team approach.^[5,6] In the early stages after birth, an infant with a cleft lip and palate is not an immediate orthodontic or surgical problem; however, is a pediatric concern because the infant must be fed to maintain adequate nutritional intake. This is important to increase the resistance to infection, to promote adequate weight gain to allow for surgical interventions, to help build strength to meet the stress of surgery and to promote healing after the surgery is completed.^[2,7] Unfortunately, the literature pertaining to feeding infants with malformations like cleft lip or palate is sparse.^[8] Thus, this article reviews various problems, adaptations and specialized feeding devices which have been proven to be beneficial in these infants.

Problems associated with cleft lip &/ palate

As Barsch so aptly phrased, "no parent is ever prepared

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in advance to become the parent of a special child.^[9] The birth of such a child generally comes as a profound shock to the family, especially to the mother. The mother's feelings are a mixture of grief, dismay and overpowering guilt, and she requires immediate counseling to help her sort out these feelings, and adopt an attitude that is neither rejecting nor over protecting. Cooper rightly stated that first thing to be done when a child is born with cleft palate is to feed the child and treat the mother.^[10]

Feeding problems

Fabricus of aquapendente pointed out in 1619 that, infants with cleft palate were unable to suck and often would die of malnutrition.^[2] *Spriesterbach et al.* found that 91 out of 124 infants with cleft palate had moderate to severe feeding difficulties related to their reduced sucking efficiency. The most notable problems are insufficient suction, excessive air intake, choking, nasal regurgitation, fatigue, inadequate milk intake, failure to gain weight, and excessive time required to feed. Inability to feed satisfactorily can lead to maternal stress and anxiety, and thus lead to poor mother and infant bonding.^[3,7] The elements of the feeding problem and their interrelationships in infants with cleft palate are shown schematically in the Figure 1.^[11] The other problems include: failure to gain weight and growth retardation especially during the first few months of life;^[12-14] recurrent middle ear infections and acute otitis media which may lead to conductive hearing loss; poor speech due to altered intraoral anatomy;^[15] disturbed inter arch relationship due to altered growth of dental arches and malaligned teeth;^[16] and, increased incidence of dental caries attributable to the alternative feeding practices.^[17]

Goals in feeding cleft lip or cleft palate infants

The infant born with a cleft has similar nutritional requirements as other infants born without a cleft as long as no other systemic issues are involved.^[2] Morris in the year 1982 stated that an infant with cleft lip and / palate has similar feeding goals as any other normal infant. Maintaining the nutrition is the first priority, and finding a feeding technique as close to normal as possible is second. Mother's interest in breast feeding should never be summarily dismissed. In fact, breast feeding is a superior technique in certain cleft conditions. Finally, it is in the infants best interest to find a feeding technique that also maximizes stimulation; and it is likely that these movements facilitate oral motor development.^[8]

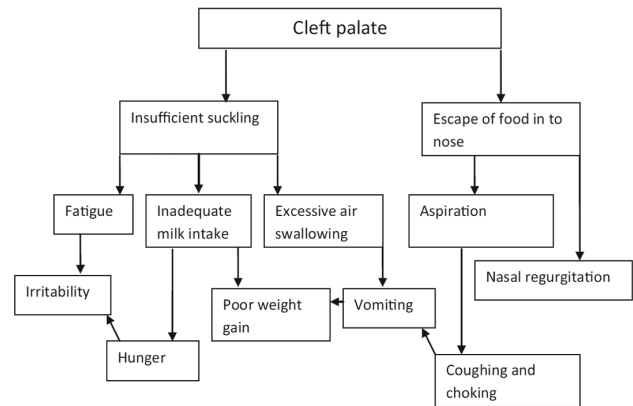


Figure 1: Elements of the feeding difficulty and their inter-relationship in infants with cleft palate

Assessment of sucking and feeding in cleft infants

Normal Sucking mechanism: Sucking, are the actions that draw milk into the mouth; and swallowing, is the movement that transfers milk from the oropharynx to the stomach. Sucking has been functionally defined by the amount of time it takes for an infant to consume a given volume of liquid.^[8] Efficient sucking in normal infants is produced by a negative pressure created by a tight lip seal around the nipple, together with elevation of the soft palate to close off the nasopharynx, and expanding the intra oral cavity, either through contraction of the tongue or by movement of the mandible. This is thus a co-ordinated neuromotor function.^[2,8]

Infants use different techniques to suck from bottles as compared to breast feeding. In breast feeding, infants use negative intraoral pressure primarily to position and stabilize the nipple, and they rely on the tongue to strip the milk from the breast mechanically. Bottle fed infants, principally use their gums and to a lesser extent their tongue and palate to stabilize the nipple and generate negative pressure to draw milk from the bottle. Because of these differences in specific situations, one technique succeeds over another.^[8]

Altered sucking mechanism in cleft infants

Infants with cleft lip, cleft palate or both as their sole health problem, swallow normally, however suck abnormally, due to their abnormal muscle attachments and abnormal communication between the nose and oral cavity.^[8] The levator and tensor muscles that attach along the back of the hard palate and extend along the midline in normal situation fail to do so when a cleft is present. This abnormal anatomy and architecture make it relatively impossible to isolate the oral cavity, build

negative pressure and create suction. Thus infants with cleft lip, cleft palate, or both, swallow normally however suck abnormally. The reflex for sucking and swallowing is usually intact in these infants; however, obtaining negative pressure is problematic.^[2,18] The difficulty can be overcome in the short term by feeding the infant through a naso-gastric tube or oro-gastric tube. Bottles using a variety of nipples including an enlarged soft nipple with a widened up cross cut aperture, may also be used to assist in the feeding.^[7] A lip seal is less important than a posterior oral seal, as babies with cleft lip have fewer problems than those with cleft palate, as found by measurements using pressure transducers in the teat of a feeding bottle. Infants with cleft palate with or without cleft lip had zero intra oral pressure, whereas infants with only cleft lip were successfully able to generate negative intra oral pressure.^[4]

General observations in different cleft conditions

Assessment of Sucking and feeding in different cleft situations is summarized in Table 1. According to Clarren *et al.* and Badwal *et al.*, isolated Cleft lip feeding was generally adequate, unless, the air leak from the cleft precludes the generation of negative pressure. When there is any impairment, plugging the cleft space solves the problem. Breast feeding is ideal since the breast conforms to the defect. Artificial nipples with a large soft base are also effective when the breast feeding is not desired.^[2,8] In isolated Cleft palate, breast feeding can be tried when the cleft is narrow and posterior, however, is less effective with more complete clefts of the bony palate. When the cleft was small, the infant could develop enough negative pressure to stabilize the nipple and mechanically work the breast between the intact anterior palate and the tongue. Regular bottle feeding cannot be advised, though enlarging the nipple opening in association with softer nipple often enables the tongue movements to express required quantity of milk. When the Cleft involves both the lip and palate,

regular breast feeding or bottle feeding did not work for these infants; apparently because these infants were unable to seal either their lips or their velopharynx. Any feeding device that delivers sufficient volumes of milk into the mouth and allows the infant to swallow will be effective.^[8] A soft plastic bottle which will give the feeding person an excellent control over the amount of milk delivered into the infants mouth is very useful in this situation. In an isolated Cleft of the Soft palate, infants were often fed completely normally, and if feeding was difficult, a nipple with a broader and a longer shaft usually resolved the problem. EvenFlo shape works better, because the longer shaft allows better mechanical movement as an adjunct to the formation of negative pressure.^[2,8,14]

Specialized feeding equipment

These infants with varying degree of feeding problems can be benefitted with the use of specialized feeding equipment. Keeping the baby at the breast helps preserve the mother-baby bond that only breast feeding can create. The feeding devices described here are designed to overcome circumstances that might otherwise impede a successful feeding. These devices are primarily of two types namely, those primarily intended to block the continuity of the oral cavity with the nasal cavity, and those that rely on decreasing the need for the baby to actually suck, thus making the infants responsibility in the feeding process primarily swallowing.^[2,19] The various delivery systems are summarized in Figure 2 and the details have been summarized below.

Those primarily intended to block the continuity of the oral cavity with the nasal cavity

Orthopedic plates

Some authors have reported that an early maxillary orthopedic plate closes the cleft in the alveolus and

Table 1: Assessment of sucking and feeding techniques for infants with clefts of lip and palate

| Condition | Generation of negative pressure | Ability to make mechanical movements | Feeding techniques |
|-----------------------------|---------------------------------|--------------------------------------|--|
| Cleft lip & palate | - | ± | Breast feeding unlikely to deliver milk into the mouth |
| Cleft palate only | ± | + | Breast feeding some times succeeds Soft artificial nipples with large openings effective. |
| Cleft of the soft palate | ± | + | Breast feeding or normal bottle feeding usually works well. |
| Robin malformation sequence | ± | - | Breast feeding unlikely, with bottle nipple position is critical. |
| Cleft lip only | ± | + | Breast feeding works well Artificial nipple with large base works well |

palate, and closes off the nasal cavity from the oral cavity in such a way that intraoral negative pressure is achieved by the sucking act (Hotz M 1983, Komposch G 1986, Schwenzer N1981, Trankmann J 1986). Choi *et al.* in 1991 conducted a study to measure the intra oral negative pressure and found that these plates did not produce any negative pressure, because they were apparently was unable to seal the alveolus, palate or the velvopharynx.^[4,7] In a study conducted by Trenouth MJ and Campbell AN, the feeding plate was more effective in cases of complete clefts as compared to cases of only posterior clefts. Fish demonstrated significant reduction in the cleft width in the plate group when compared to the control group.^[3] Though the feeding plate does not generate any negative pressure as described by Choi *et al.* objective data exists on the effectiveness of the feeding plate as it provides a false palate against which the infant can suck. Further, it keeps the tongue down and prevents the undue widening of the cleft,

contributes to the development of speech and reduces the infection in the nasopharyngeal area. Also, with continuous use of the appliance, orthopedic molding of the cleft segments in to approximation can be achieved and it finally provides the maxillary cross arch stability and prevents arch collapse after the surgical closure of the lip (Markovitz *et al.*, Jones *et al.* and Balluff and Udin).^[3,20,21] For the above mentioned reasons, most of the cleft rehabilitation centers advocate the use of feeding plate in cases of complete unilateral / bilateral clefts.

Those that decrease need for the baby to actually suck

Indicated in the situations of isolated clefts and in complete clefts along with feeding plate, these decrease the need for the baby to actually suck, thus making the infants responsibility in the feeding process primarily swallowing.^[2,7]

Aids in breast feeding

Mother should be encouraged to breast-feed her baby if it is at all possible not only for from the nutritional stand point, but also because it strengthens the emotional bond between the mother and child in a situation in which this bond is in a danger of being impaired by the mother’s ambivalent feeling towards her defective baby.^[10] Without proper guidance and support, feeding problems in these infants can be an added exercise in causing frustration to the parents.

Nipple shields

Helpful in babies with latch-on difficulties, nipple shields are made up of thin, pliable silicone for maximum comfort. When used, nipple shields open section aid for greater skin to skin contact [Figure 3a].

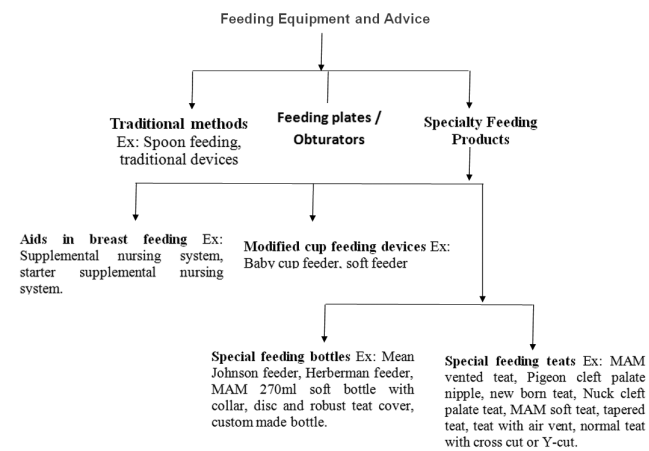


Figure 2: Categories of Special feeding devices

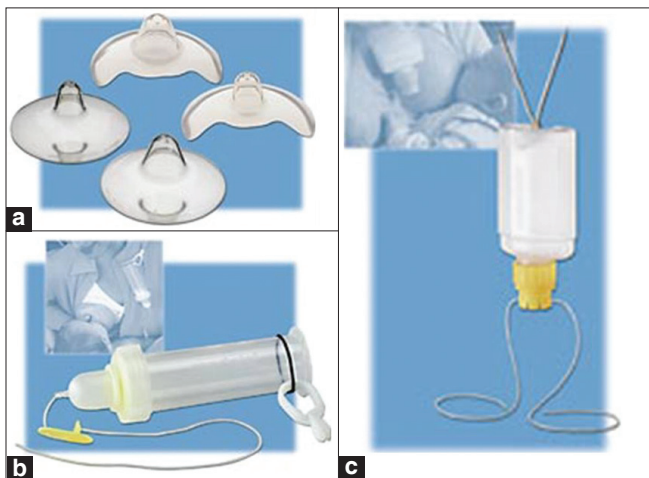


Figure 3: (a) Nipple shields (b) Supplemental nursing system (c) Starter supplemental nursing system



Figure 4: (a) Mead Johnson Soft bottle with cross cut teat (b) Herberman and Mini-Herberman feeders



Figure 5: (a) Baby cup feeder (b) Soft feeder



Figure 7: Proper feeding technique

Supplemental nursing system (SNS)

This includes a breastfeeding assistance kit for the mothers and babies facing special challenges, such as inducing lactation. This is ideal for long-term supplemental feedings at the breast. It has an adjustable flow-rate system with color-coded tubes for different feeding rates and also employs a neck strap for maximum convenience [Figure 3b]. A *Starter Supplemental Nursing System*: It is a disposable system ideal for short-term (24-hour) supplemental feedings at the breast. It has a Quick Clip that can be attached to mother's clothing for convenience.

Specialized feeding bottles

When breast feeding cannot be advocated, an alternative approach to the use of feeding plates has been to modify the standard feeding technique by careful positioning of the baby's head, or by using cups or spoons or an arrangement of modified teats or use of compressible feeding bottles.^[3] According to Kaufman LF, today the most successful device is a soft squeezable plastic bottle, such as Mead-Johnson cleft palate feeder, that affords a control of the milk volumes and flow rates

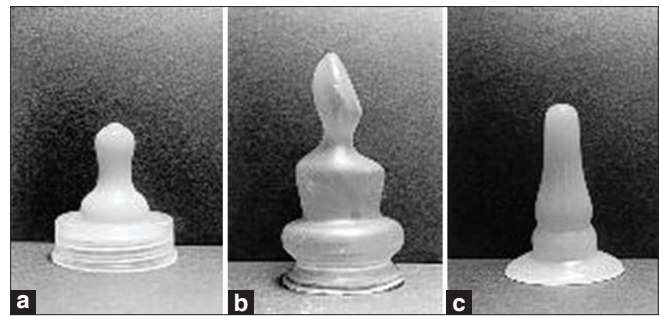


Figure 6: (a) MAM vented teat (b) NUK cleft palate teat (c) Tapered teat

that the infant can handle^[2,14] [Figure 4a]. Many other compressible feeding bottles are also available Ex: Beniflex cleft lip / palate nurser which functions quite satisfactorily for most of the infants with cleft palate. This is used in a widespread manner in the hospitals; however, is costly for its disposable use. To overcome this disadvantage, Paradise JL introduced modified the Playtex feeder which contains a rigid, plastic, slotted shell into which disposable milk containing plastic bag is placed, and to which conventional nipple carrying cap is screwed. The slots of the shell are wide enough to permit inserting a finger, so that gentle pressure can be applied to the milk containing bag throughout the feeding process.^[11]

A modified feeder for infants with cleft lip and /or palate was invented by Mrs. Mandy Haberman in response to the difficulties she encountered with her own child who was born with Perrie Robin syndrome. This feeder has been described by Campbell and Trenouth and was named as the *Haberman and Mini-Haberman Feeder*. The Haberman feeder allows the delivery of milk in response to the compression of the teat by the baby, no active suction being required.^[3] It has a variable flow rate which can be controlled both by feeder and baby. It is sensitive to the baby's feeding efforts. and a one-way valve prevents flooding of the contents. A Mini-Haberman teat is for smaller babies [Figure 4b].

Modified cup feeding devices

These are specialty feeding devices that are used when cup feeding is recommended. For example, a *Baby Cup Feeder* which comes as a small, 40 ml polypropylene cup with gradations for both ounces and milliliters. It has a smooth lip for the baby's comfort, a snap lid for convenient storage and a write-on surface for easy labeling [Figure 5]. Another one is the *Soft Feeder*, which is made up of a soft silicone special reservoir, and controls fluid unlike regular cups. The container can be used with breast pump kit.

Specialized feeding teats

In order to facilitate the mechanical assistance for milk flow in children with cleft lip and palate and with significant problems in generating an intra-oral negative pressure, various nipples have been tried, such as, those with a Cross-cut opening to allow for more gravitational milk flow with varying degree of success, so that the infant can only swallow without much effort in sucking, or those with enlarged openings.^[14]

MAM Vented Teat Size 1 and MAM Vented Teat Size 2

This consists of a soft orthodontic vented shaped teat. The NUK air system vent helps to prevent the teat from collapsing and prevents the infant swallowing air [Figure 6a].

NUK cleft palate teat

This consists of a large flat headed teat. Though not suitable for very small babies, its is sometimes useful if the baby does not feed well using other teats [Figure 6b].

Tapered teat

This consists of a 2" small soft tapered teat supplied without a hole [Figure 6c].

Technique for feeding special infants

Though there were many feeding devices, the technique of feeding is as important as device selection. Hence this section has been designed as a guide to some ways which can be used while feeding the infants with cleft lip and/or palate defects. Different methods have been described and used successfully throughout the years by various individuals and craniofacial treatment centers. Babies with cleft palate and other difficulties may need extra help. Babies with clefts may swallow more air than normal during feeding, especially if the flow of milk is either too slow or too fast, and may show this by having a blue moustache, being extra sleepy or bringing up some of their feed. If this is so, stopping 2 or 3 times during the feed to burp the baby, or sitting with the baby in a more upright position may be helpful.

How these babies are fed?

With the help of a feeding specialist, identifying the difference between a quiet dummy sucking where the baby simply breathes and sucks, and effective sucking where the baby co-ordinates sucking, breathing and swallowing is important.

A different approach to breast feeding

A differently shaped teat with enlarged or newly positioned holes can be tried. In the instances of breast feeding, pump the breast milk and then feed it to the baby through a bottle. Direct breast feeding is not an option because a child with a cleft palate cannot generate any suction.

A different approach to bottle feeding

A different bottle for bottle feeding can be used. Eg: a soft squeezable bottle to help the flow of milk or a bottle with a scoop attached may be helpful in these infants. Very occasionally, a thin feeding tube may be passed into the stomach through the nose or mouth to help those babies who also have a small jaw in the initial stages. All babies lose up to 10% of their birth weight and then usually regain it in 2-3 weeks. Babies with cleft lip or cleft palate may take longer to gain weight. If a baby is having 5-6 wet nappies a day and regular motions, is healthy and alert, it is indicated that he or she is being fed sufficiently. Make sure that the child is being fed in an upright position. Gravity will help prevent the milk from entering and coming out through the nose, and thus limits the choking and also decrease the risk of ear infections. Use a cleft palate bottle or other squeezable bottles; and, make the hole in the nipple bigger by cutting an X in the top. With a squeezable bottle, actually push the milk into child's mouth as he/she doesn't need to suck.

Burp the baby frequently

Infants with cleft palate tend to swallow a lot of air during feeding. Feeding time should be no more than 30 minutes for 2-3 ounces. Schedule weekly visits with pediatrician until child is eating well and gaining appropriate weight [Figure 7].

Important clues and possible solutions

Baby may not provide clear evidence that he / she is having trouble feeding efficiently and is frustrated. Some of the frequently noted symptoms include:

Situation 1: Discomfort / crying during the feeding which often reflects excessive air intake.

Solution: Burp frequently: Use orthodontic nipple, with cross cut which fills in more of the area of the cleft.

Situation 2: Going to sleep after taking in only one / two ounces.

Solution: Use squeezable bottles and assist your babies sucking attempts with the soft bottle.

Situation 3: Sustained rapid sucking that does not effectively extract any milk or formula.

Solution: Use squeezable bottles and squeeze

rhythmically, matching your baby's suck & swallow rhythm.

Situation 4: Excessive leaking of milk / formula out of the nose that distresses your baby and / or makes it difficult for him / her to breathe and eat at same time.

Solution: Check flow of milk from the nipple. The milk should drip slowly through the cross cut of the nipple and not flow freely, and make the baby sit upright.

Situation 5: Shaking the head, turning the head away from the nipple or spitting the nipple out.

Solution: Check flow from the nipple – the milk may be coming out too fast.

Situation 6: Feeding that routinely take longer than forty minutes

Solution: Use Cross cut nipples, Squeezable bottles or feed with syringe temporarily until the baby is little stronger

Situation 7: Lack of weight gain over 7- 10 day period and additional weight loss after first the week of life.

Solution: Keep a record of the ounces over 24 hours; and, subtract any liquid lost out of mouth / nose. Consult a pediatrician about calories required in a 24 hour period and discuss the possibility of increasing the calories per ounce temporarily to facilitate the weight gain.

CONCLUSION

Keeping in mind that all babies are different, the patterns of the cleft lip and/or palate are also diverse, and effective method of breast and/or bottle feeding has to be developed separately for every baby to best suit his/her requirements. Mothers should be encouraged to try their own method of preference, and through experimentation they may find a technique that works well for their child. Hence, there may not be any hard and fast rules. It is up to the primary care physician to monitor for any evidence of poor weight gain in the infant, or difficulties in the mother child bond due to frustrations. Make sure the baby is given enough time with one method of feeding before trying alternatives, and make a note of the feeding specialist in the cleft team, to help in the feeding related problems.

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