Technology

Feeding Management of Infants with Cleft Lip and Palate and Micrognathia

The baby with a cleft lip, palate, and/or micrognathia presents a feeding challenge for both parents and health professionals. These oral-facial anomalies may disrupt the feeding process and put the baby at risk for growth failure and sometimes aspiration. The feeding difficulties of these babies are widely reported in the literature, but no consensus on how to select the most appropriate remediation techniques is evident. This article outlines the components of the normal infant feeding process and how they are affected by these oral-facial anomalies. Based on the child's specific pattern of anomalies, this article discusses a variety of feeding techniques and management strategies and develops a rationale for their use in bottle and breastfeeding of infants with cleft lip, palate, and/or micrognathia. Key words: *cleft lip, cleft palate, feeding management of infants, micrognathia*

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CLEFT LIP AND/OR palate and micrognathia are congenital defects that alter the oral-facial anatomy, and therefore have the potential to adversely affect feeding abilities, especially in the newborn. The family of a baby born with an oral-facial anomaly may find themselves not only dealing with the emotions surrounding the birth of a baby with a congenital defect, but also struggling to feed their baby.[1] These feeding difficulties may erode parental confidence and self-esteem, and further inhibit the bonding process at a vulnerable time.[2] The infant's growth is often poor, adding to the family's stress around feeding.[3] Inaccurate information, however well intended, can frustrate families with babies who have oral-facial anomalies and lead to the perception of lack of assistance or support by health care providers.[4] For this reason, health professionals who work with these infants and their families need to have accurate information about the management of feeding difficulties in this population in order to make a comprehensive plan.

This article will outline the components of the normal infant feeding process and the effect of a cleft lip, palate, and micrognathia on this process. A variety of feeding techniques and interventions for both bottle and breastfeeding will be described, along with information to help successfully apply these techniques based on a specific infant's oral-facial anomalies.

Inf Young Children 1999; 12(1): 70–81

FOUNDATIONS OF INFANT FEEDING

To assess the impact of cleft lip, palate, or micrognathia on the feeding process, and to create an optimal management plan, the clinician must understand the feeding process in the normally developing infant. Sucking, swallowing, and breathing are the triad of skills that are the foundation of infant feeding at bottle or breast.[5] Highlights of these skills will be presented, focusing on the components most relevant to infants with cleft lip, palate, and micrognathia.

Sucking brings food into the mouth by creating pressure gradients. Positive pressure develops when the nipple is compressed, expelling fluid into the oral cavity. Negative pressure, or suction, is created when the sealed oral cavity is enlarged slightly, and a fluid bolus is drawn into the mouth. On the typical bottle, compression expels a relatively small amount of fluid, while suction creates a greater fluid flow. At the breast, suction is required to latch onto the breast and maintain the position of the breast in the baby's mouth, with both compression and suction playing a role in milk delivery.

During sucking, the oral structures work together to stabilize the nipple, create pressure gradients, and control the bolus before swallowing. Table 1 describes the functions for each of the primary oral structures. Oral-facial anomalies have the potential to alter sucking abilities by changing the type of pressure that a baby can create, and by altering the function of the oral structures involved in sucking.

Swallowing transfers food from the mouth to the stomach. As food moves through the pharynx, various mechanisms channel it so that it passes the airway safely, without aspiration. The airway is protected by the closure of the true and false vocal folds and sealed by the epiglottis. The soft palate also elevates to close the nasal opening and prevent food from entering the nasopharynx. Swallowing dysfunction can lead to aspiration but may be missed during clinical evaluation. A videofluoro-

Table 1. Functions for each of the primary oral structures

Structure	Function
Tongue	Seals oral cavity: anteriorly with lips, posteriorly with soft palate Creates positive pressure by compressing nipple against hard palate Creates negative pressure in sealed oral cavity by lowering slightly, thus enlarging the space Stabilizes nipple Channels liquid by forming "central groove" Holds bolus in mouth until swallow triggered
Jaw	Creates stable base for movement of tongue Helps create negative pressure by lowering slightly to assist in enlarging oral cavity
Lips	Create anterior seal of oral cavity with tongue and nipple Stabilize nipple position
Cheeks	Provide stability as intra oral pressure changes Assist in channeling flow of bolus
Hard Palate	Works with tongue to create positive pressure
Soft Palate	Works with tongue to create posterior seal of oral cavity

scopic swallowing study, or modified barium swallow, can accurately identify the type and extent of swallowing dysfunction, and help determine effective treatment interventions.

Breathing is necessary to support feeding. It provides oxygen to all of the systems and removes carbon dioxide from the blood. During feeding, automatic adjustments are made to respiratory rate and depth to accommodate the "work" of feeding. If the work of breathing at rest is high, the infant may not have the respiratory reserve to make adjustments to accommodate the increased demands during feeding. For air to flow smoothly in and out of the upper airway and the lungs, the airway must be open, stable, and free from obstruction. Neural and structural mechanisms typically keep the airway open despite changes in pressure during breathing and with changes in head position. When there is blockage or collapse of the airways, air flow to support the work of feeding is often inadequate.

Since the pharynx is a shared space for both breathing and swallowing, to successfully feed, the infant must be able to coordinate sucking and swallowing with breathing in a precise sequence. Poor timing or incoordination can result in infant stress, apnea, aspiration, or poor intake due to inefficient feeding. One aspect of this coordination is the need for breathing to cease momentarily with each swallow.[6,7] During active feeding, this suppression of breathing will result in a decrease in the breathing rate and/or depth of respiration. During sucking pauses, the healthy baby quickly recovers. Respiratory compromise can magnify these changes and interfere with recovery of respiration during feeding. The rate of fluid flow can also affect coordination of sucking, swallowing, and breathing. As fluid flow increases, either from a higher rate of sucking or larger bolus size, the rate of swallowing also increases. When the rate of swallowing increases, since swallowing suppresses breathing, there is the potential for a decrease in the amount of time available for breathing. This can lead to the over suppression of respiration and possible oxygen desaturation.

CLEFT LIP, CLEFT PALATE, AND CLEFT LIP AND PALATE

Clefts of the lip and palate are fusion disorders of the midfacial skeleton, occurring between the 7th and 12th week of embryonic development. The incidence is about 1–2 per 1,000 live births.[8] Although the etiology is not fully understood, it appears that both genetic and environmental factors may both play a role.[9] Clefts may be unilateral or bilateral and can include the lips, alveolus, hard and soft palate (Fig 1). Primary surgical closure of the cleft lip generally occurs within the first several months of life. Surgery to close the palate typically occurs within a few months of the first birthday. Timing of surgery attempts to maximize speech development and minimize problems of maxillofacial growth. Secondary surgeries are frequently required when the child is older.[9] When a cleft is present, associated problems can include feeding, speech development, orthodontic abnormalities, chronic otitis media, and psychosocial development.[10] While all types of clefts can occur as isolated defects, as many as 35% may be associated with other defects, disorders or syndromes.[11]

For infants with isolated cleft lip and/or palate, it is the cleft or opening in oral area that is primarily responsible for the feeding problems. Efficient sucking is dependent on the creation of negative pressure suction. The presence of a cleft impairs the baby's ability to seal the oral cavity and create adequate suction, so the baby is unable to draw fluid into the mouth efficiently. Sucking may appear rhythmic but only positive pressure is created, leading to diminished intake. The specific location and size of the cleft will influence the particular problem in creating suction, and affect the treatment approach selected.[12]

Cleft Lip

Clefts of the lip may be unilateral or bilateral and may or may not extend into the alveolus. In any case, the anterior oral seal formed by the lips, tongue, and nipple will be compromised. Other oral functions should be intact. If an adequate anterior seal can not be created with the nipple or

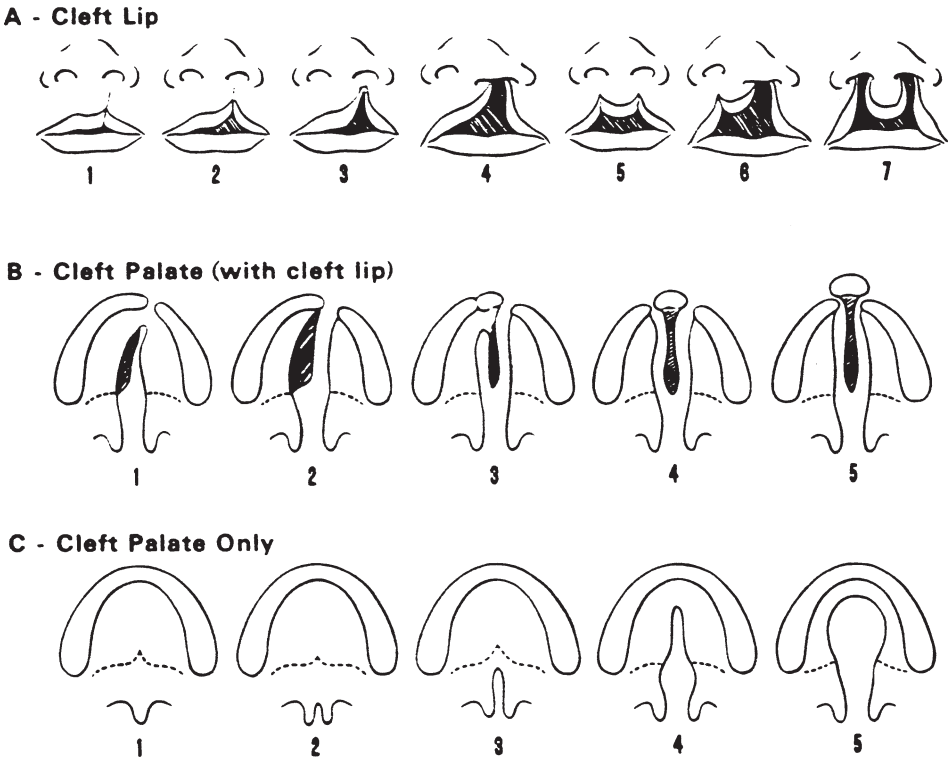

Fig 1. Range of severity for clefts of the lip and palate. **A**: Clefts of the lip can be unilateral or bilateral and can involve just the lip or can extend into the nares; viewed from inside the mouth looking up at the palate; **B**: Clefts of the lip and palate can be unilateral or bilateral; **C**: Clefts of the palate only are bilateral, but can range from submucous clefts without obvious structural changes (1), to small posterior clefts of the soft palate (3), to full clefts of the hard and soft palate (5). Reprinted with permission from Bernstein L. Congenital defects of the oral cavity. In: Paparella MM, Shumrick DA, Gluckman JL, Meyerhoff WL, eds. *Otolaryngology.* Vol II, 3rd ed. Philadelphia, PA: WB Saunders Co; 1991.

the position of the breast, assisted milk delivery systems should be considered. If "kissing" sounds are heard during feeding, it indicates that the anterior seal is being broken intermittently, and this may compromise intake with each suck.

Cleft Palate

A cleft of the palate alone can include the hard and/or soft palate. Tongue movements during sucking are generally normal. Based on the size and location of the cleft, compression can be created if there is adequate hard palate surface to compress against. A cleft in the palate, however, always compromises the infant's ability to seal the oral cavity and create suction, and so milk delivery must be assisted to allow adequate intake. With a hard palate cleft, the soft palate is also typically involved. In this case, the nasopharynx may be open during swallowing, often resulting in reflux of milk into the nasal cavity and air swallowing during feeding.

Small clefts of the soft palate or submucous clefts can be missed or appear to be insignificant problems, yet can lead to substantial feeding problems.[13] When there is a small soft palate cleft, the degree to which it compromises the development

of suction is often overlooked. Some infants may occlude the cleft with the tongue, allowing adequate suction for effective feeding. Other times this is not the case and rhythmic sucking motions with compression are observed, but suction is limited and intake is poor. If clicking sounds are heard during sucking, it indicates breaks in suction, which can reduce fluid flow. For both hard and soft palate clefts, assisted milk delivery is indicated.

Cleft lip and Palate

The generation of intraoral suction is severely compromised by both the inability to form an adequate anterior seal with the lips, and the inability to seal the interior oral cavity due to the palatal cleft. Tongue movements are often fairly normal during sucking. If the cleft palate is bilateral, however, it may be difficult to compress the nipple between the tongue and palate. In clefts of the palate, closure of the nasopharynx during swallowing is poor, so nasopharyngeal reflux of liquid and air swallowing are common. Assisted milk delivery systems are required for adequate intake, and proper feeding positioning is important.

Treatment Strategies for Clefts

Feeding methods should be selected on the basis of feeding efficiency and safety. An oral feeding should be completed within 20–30 minutes.[14] Longer feedings may lead to a net caloric loss due to excessive energy output. If intake is not adequate within this time frame, supplemental tube feedings should be considered. If signs of aspiration such as frequent coughing, choking, sputtering, or color change are observed, the feeding method may be unsafe for the infant.

Feeding position

When a cleft palate is present, the open communication between the oral and nasal cavity places food and oral secretions in close proximity to the eustachian tubes.[9,10] This leads to a high incidence of chronic otitis media in children with clefts. Upright positioning during feeding can utilize gravity to channel food through the hypopharynx and away from the eustachian tubes and nasopharynx. Inefficient sealing of the oral cavity frequently results in air intake into the stomach. The maintenance of the upright position during and after feeding, combined with breaks for thorough burping during the feeding, may mobilize this air and diminish spitting and gas pains. When the frequency of spitting is decreased, the exposure of the eustachian tubes to refluxed food is reduced.

Obturators

An obturator is a prosthedontic device that is custom molded to fit in a cleft palate to occlude the cleft. They are not useful in children with only soft palate or submucous clefts.[15] By restoring the division between the oral and nasal cavities, it is felt to aid feeding and speech development. Obturators are controversial, however, particularly as they relate to early feeding. Theoretically, occluding the cleft should allow the development of intraoral suction; however, several reports suggest otherwise.[16,17] Kogo and colleagues[18] found that obturator design determined whether or not intraoral pressure could be created. By extending the obturator 2–3 mm behind the hard palate, the tongue could contact the device, closing the oral cavity and creating pressure. Even with this design, however, breast feeding babies still required supplementation for adequate intake. Although obturators may not allow suction to fully develop during feeding, the firm palatal surface may help the infant to compress the nipple.[16]

Assisted milk delivery systems

As discussed above, while a baby with a cleft may create positive pressure or compression during feeding, they are generally not able to create negative pressure or suction. This severely diminishes intake from either the breast or bottle. Thus, almost all infants with clefts require some modification to the feeding system to compensate for the lack of intraoral suction. Babies with only a cleft lip that can be occluded during feeding may not need this assistance.

Squeeze bottles (Fig 2) are a simple and effective method of providing assisted milk delivery to infants with clefts. Mead Johnson has a commercially available bottle, and some clinicians have modified "bottles with bags" to allow compression of the bag and augment milk flow. [19,20] Flow rate is primarily controlled by the feeder and can be adjusted as needed. The nipple is typically positioned in the midline of the mouth, allowing the infant to use normal tongue movements.

Nipple selection is important to give an adequate rate of flow in a smooth manner. A soft nipple with a standard size, dimension hole will give a smooth and predictable stream of milk during each squeeze. Cross-cut nipples can give a high flow rate, but flow may be uneven and impair coordination of swallowing and breathing, particularly for newborn babies. Squeezing should be rhythmic and done in time to the infant's sucking. Continuous squeezing should be avoided, as ongoing flow makes it difficult for the infant to pause to breathe during feeding. Frequency of squeezing is determined by the infant's response to the flow rate. The flow rate should be high enough to allow for appropriate intake in a reasonable length of time, but not so high as to compromise swallowing and breathing. Since infants feed most vigorously and can handle the highest flow in the first minutes of a feeding, regular squeezing early in the feeding can help ensure adequate intake in a timely manner.

The Haberman feeder (Fig 3) was developed to compensate for the particular problems of babies with cleft palate.[21] It has a one-way valve for adequate fluid delivery by compression alone, compensating for the baby's inability to generate suction. The nipple has a slit opening that allows

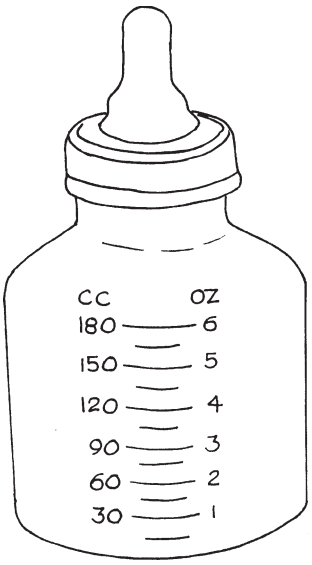

Fig 2. Mead Johnson Cleft Lip and Palate Feeder. This soft plastic bottle is squeezed to enhance fluid flow. In this picture it is fitted with a single hole nipple for smooth flow.

Fig 3. Haberman Feeder by Medela. The one-way valve keeps the soft nipple full of fluid. This allows efficient flow as the baby compresses the nipple, and suction is not required.

adjustment of flow rate by changing the orientation of the slit in the baby's mouth. This bottle can also be squeezed slightly if additional milk delivery is needed. This nipple works well for babies with good compression between the tongue and palate, and those with weak suction. If a baby with a cleft can independently obtain adequate milk flow from this nipple, it allows the baby to control the flow, minimizing difficulties with coordination of swallowing and breathing that can occur when the feeder squeezes the nipple.

Using nipples with enlarged holes has also been promoted. Typically a cross cut 0.5–1 cm long is made in a standard nipple.[22–25] While this can increase flow and compensate for inability to create suction, the rate of flow is difficult to control and is often very high. To accommodate for the high flow rate, Richard[22] describes a method of removing the bottle to stop flow based on the infants stress cues.

Breastfeeding

Health professionals agree that provision of breast milk to the baby with a cleft of the lip and/or palate, either from the breast or as expressed breast milk, is important because it provides the baby with greater protection from middle ear infection—a common problem associated with clefts.[26] There is less agreement about whether the baby with a cleft of the palate can obtain sufficient nutrition in a reasonable length of time directly from the breast.[16,27,28] The variety of sizes and positions of clefts, in combination with the large variety of breast nipple shapes and sizes, milk flow patterns, and maternal motivation toward breastfeeding, lead to a large range of reports regarding the outcome of breastfeeding.[16,18,20,27–29]

During breastfeeding, the development of intraoral suction is required to draw the breast into the mouth during latch on, and to maintain the breast nipple in an elongated position during sucking. Milk flow is stimulated by a combination of compression and suction. Thus, as in bottle feeding, it is the difficulty creating intraoral suction that compromises breastfeeding in the infant with cleft lip and palate.

The baby with a cleft of the lip alone is usually able to obtain adequate nutrition directly from the breast with only minor modifications. The breast tissue can conform to the cleft and assist in creating an anterior seal. The mother may need to press part of her breast into the cleft to obtain an adequate seal. Using a more upright "football hold" and firmly holding the baby to the breast may also improve nursing.[20]

For the baby with a cleft of the palate with or without a cleft lip, the potential to receive full nutrition directly from the breast is limited. Regardless of the size and placement of the cleft, the baby's ability to produce suction is restricted, and therefore the baby will have limited success shaping the breast and pulling the nipple into the mouth. Depending upon the shape and placement of the cleft palate, the baby may have limited palatal surface area against which to compress the breast by the tongue.

Babies with cleft palate can be put to the breast, but will not be effective in obtaining adequate nutrition without supplements or specialized techniques. Some mothers can hand express breast milk into the baby's mouth. Some babies suckle at the breast and stimulate a let down of milk. Without suction, however, the baby will not be able to empty the mother's breast and gain adequate nutrition. Additional milk flow can be provided using a feeding tube device such as a Supplemental Nursing System (SNS) (Medela), but the mother will still need to assist the milk flow out of the device.[20] Feeding obturators have been suggested as a way to improve a baby's ability to breastfeed but have not been shown to produce total breastfeeding.[18] Some mothers put their baby to breast for bonding and a small amount of milk flow, then supplement with a cleft bottle.

Micrognathia can also limit breastfeeding. Even the baby with a mildly recessed jaw may have difficulty with latch on and have an ineffective suck due to malalignment of the gum ridges. Strategies such as using the football hold or nipple shields may help the baby achieve breastfeeding. It is unlikely that a baby with severe micrognathia can

latch on the breast. The mother may desire skin to skin contact with her baby at the breast to enhance her milk supply, but nutrition will be primarily received off of the breast.

Health professionals should be sensitive but realistic when approaching breastfeeding with the mother of a baby with cleft palate. The baby's overall nutrition and weight gain, realistic time demands on the mother in terms of time spent feeding and/or pumping, along with the mother's desire for breastfeeding activity, need to be prioritized in formulating a feeding plan. The vast majority of babies with cleft palates will have their primary nutritional needs met through expressed breast milk in some type of cleft bottle, with milk coming directly from the breast as small, secondary source. Since all mothers should be encouraged to provide pumped breast milk as long as possible, a pumping program to maintain milk supply should be established.

MICROGNATHIA

Micrognathia or mandibular hypoplasia is characterized by a small, recessed jaw (Fig 4). While more mild forms may be an isolated anomaly, it also occurs in conjunction with other anomalies. Mandibular hypoplasia occurs at approximately 7–11 weeks of gestation and positions the tongue high within the nasopharynx. This tongue position can then block fusion of the palatal shelves, and result in a U-shaped or V-shaped cleft of the soft palate.[30] One of the most frequent associations is micrognathia, a U-shaped cleft of the soft palate, and upper airway obstruction—the Robin sequence. Micrognathia has multiple etiologies including genetic and chromosomal syndromes, teratogenic influences, mechanically induced factors of intrauterine constraint, neurologic or neuromuscular abnormalities, and connective tissue disorders.[30,31] Thus, children with micrognathia, with or without Robin, are a heterogeneous group, ranging from those with only micrognathia to those with more complicated diagnoses such as the Robin sequence, Trisomy 18, velocardiofacial, Treacher-Collins, Stickler, or Nager syndromes.[30,31]

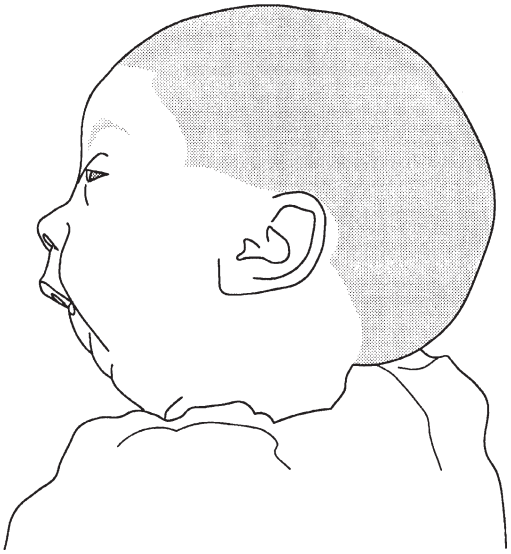

Fig 4. Infant with micrognathia. The lower lip and chin are set back, reflecting the posterior position of the mandible. Reprinted with permission from Wolf LS, Glass RP. *Feeding and Swallowing Disorders in Infancy: Assessment and Management.* San Antonio, TX: Therapy Skill Builders; 1992.

Micrognathia, with or without a cleft, is frequently accompanied by airway obstruction. Mechanical obstruction by the base of tongue positioned partially in the pharynx, called glossoptosis, is a primary cause, but other factors can also play a role. These include weakness of the tongue protractors further aggravating the glossoptosis; hypotonia of the pharynx resulting in lateral collapse of the pharyngeal walls; negative pressure created during regular inspiration, which further pulls the tongue back into the airway; and tightness in the muscular insertions between the tongue and the mandible, which limits tongue range and pulls the tongue backwards.[30, 33–35]

Impact of Micrognathia on Feeding

When significant micrognathia is present, such as in Robin sequence, both the jaw and the tongue are recessed.[36] Relative to the jaw position, the tongue may lie even further back in the mouth with

the tip elevated toward the palate. These features make it extremely difficult for the tongue to be in the appropriate downward and forward position to attach to the nipple for sucking. Since babies with micrognathia may also initially have limited mouth opening, it can be difficult to place the nipple correctly on the tongue. Inadvertently, the nipple may be positioned in front of the tongue and, thus, the baby may not be able to use the tongue to compress the nipple. Liquid may squirt out from the front of the mouth with each successive suck or move piecemeal into the pharynx, affecting bolus control during swallowing.

While the small jaw and tongue position may affect sucking mechanics, a greater, more life-threatening problem is airway obstruction.[31,34] Since a patent airway in necessary for both adequate respiratory support for feeding and the smooth coordination of breathing with swallowing, airway obstruction is a major factor interfering with the feeding performance of babies with Robin sequence. Maintaining a stable and patent airway, therefore, becomes the first priority for these babies, even before considering a feeding method.[32]

Feeding problems that are typical for the baby with airway obstruction due to micrognathia include prolonged feeding times; oxygen desaturation during feeding; lack of coordination between sucking, swallowing, and breathing; and/or aspiration.[31] Thus, weight gain may be poor. To a large extent, the method chosen to maintain the baby's airway will determine the appropriate feeding strategies. The baby's response to feeding should be monitored with pulse oximetry to assess whether air flow and respiratory support are adequate.

Treatment Strategies for Airway Management

Prone positioning

Positioning the baby in prone may allow gravity to bring the tongue forward, relieving airway obstruction. Effectiveness of this approach is variable and often limited.[30,34,37] If prone positioning is necessary to maintain the baby's airway, however, it is unlikely that the baby will be able to feed comfortably and effectively in a conventional supine position. Positioning the baby in sidelying may work for some babies. If a cleft is present, a squeeze bottle or Habermann feeder will be necessary for milk delivery, but gravity and the lack of suction may allow the liquid to run out of the mouth and reduce intake. In this case, supplemental nasogastric feedings may be necessary.

Nasopharyngeal tube

Placement of a nasopharyngeal (NP) tube into one nares and extending approximately 8 cm into the pharynx can frequently provide a patent, stable airway and may assist in keeping the tongue forward.[34,38] When feeding a baby with an NP tube, milk has the potential of entering the tube and impeding breathing during feeding. The NP tube may need to be suctioned frequently to keep it clear of milk and secretions. If the baby is fed in an upright position and smaller boluses are given, milk is less likely to move up into the tube. The pace at which each bolus is delivered is extremely important for the baby with an NP tube. The baby should have sufficient time between each bolus of milk to clear the previous one from both the pharynx and the NP tube. Many babies with an NP tube can take a large percentage of their feedings orally; however, fatigue and lack of endurance may limit intake. If oral intake is not sufficient, supplementation by nasogastric tube or gastrostomy may be needed.[34,37]

Surgical management

A tongue to lip adhesion or glossopexy has been used in some centers to maintain the tongue in a forward position and reduce airway obstruction. Patient selection based on the mechanism of airway obstruction is important, as complications such as wound infections and dehiscence can occur.[30,39,40] A subperiosteal surgical release of the floor of the mouth has also been used to correct severe airway obstruction. By releasing tight muscle insertions of the tongue, the tongue has greater freedom of forward movement, and airway obstruction is relieved.[35] In both of these surgeries, elimination of airway obstruction should result in improved feed-

ing. Reports by Argamaso[39] and Caouette-Laberge[35] demonstrate that most infants achieved full oral feeding after surgery. As both surgeries alter the tongue, however, it was not clear how specific tongue movements were impacted and whether special bottles and feeding techniques were needed.

Tracheostomy

Another approach to treating severe airway obstruction is a tracheostomy. This surgically placed airway should be stable and patent. Some centers prefer this method to the surgeries described above if other techniques have not be successful.[32,34,40,41] Once this stable airway is in place, decisions about the feeding method would be made based on factors such as oral skill, swallowing ability, coordination of sucking, swallowing and breathing, and endurance level.

Treatment Strategies for Milk Delivery

Reducing tongue elevation/retraction

Facilitation techniques may be used to alter the elevated and retracted tongue position seen in many infants with micrognathia. Firmly stroking the body of the tongue from back to front using a downward and forward motion may help seat the tongue in the floor of the mouth and bring the tongue forward. In this position, the tongue may be more effective during sucking.

Nipple/bottle selection

Selecting a long, firm, and round cross-section nipple can also assist with tongue position and movement. A long nipple will have better contact on the tongue, and a firm nipple, along with downward pressure of the nipple on the midline of the tongue, can help stimulate appropriate tongue movement. Babies who also have a cleft palate will typically need assisted milk flow for adequate intake. One of the techniques described for cleft palate should be selected.

Rate of milk flow

When breathing during feeding is compromised by any degree of airway obstruction, the infant often becomes very sensitive to the rate of milk flow. High milk flow requires frequent swallowing; thus there is frequent suppression of respiration. Coordination of swallowing and breathing in this situation becomes quite difficult for the infant who has even intermittent airway obstruction. The feeder, therefore, must carefully control the rate and volume of milk flow. For the baby without a cleft, this can be done by selecting a low flow nipple and pacing. To pace a baby during feeding, the bottle is periodically removed from the mouth to allow breathing pauses. Babies with poor control of swallow/breathe coordination may need the bottle removed as often as every 1–2 sucks. If a cleft is present and a squeeze bottle is used to assist milk delivery, squeezing should occur at a rate that allows the baby sufficient time to clear each bolus before the next bolus is delivered. If breathing is difficult for the infant, squeezing may only occur every 3–5 sucks, and the size of the bolus may need to be small. If the baby only tolerates a very low flow, supplemental tube feeding may be required.

CONCLUSION

Feeding the baby with a cleft lip, palate, or micrognathia presents a challenge for parents and health professionals. Assessment of the effect of the oral-facial anomaly on the normal infant feeding process is an important first step to identify effective feeding strategies. For babies who also have neurologic and/or developmental problems, the impact of these additional factors on feeding must also be considered. As the feeding plan is developed, a priority must be given to feeding methods that are safe for the baby and support optimal nutrition. While oral feeding is desirable and can often be achieved effectively, infants with the most severe feeding problems may require some amount of tube feeding. Health professionals must understand the family's concerns and desires and involve them in feeding choices when possible. By working together, solutions to the most difficult feeding problems can be found that support both the family and the infant's overall health status.

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