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Customized Feeding Solutions for Neonates with Cleft Palate: Insights from A Case Series

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Abstract

One of the congenital abnormalities that affects the midface orofacial region is cleft palate. When there is a oronasal communication between the base of the nose and palate, a congenital deformity of the middle part of the face known as cleft palate results. Etiology can be due to chromosomal abnormalities or environmental causes, hereditary factors, dietary inadequacies, infections, radiation exposure during pregnancy, alcohol or cigarette usage, and other teratogenic chemical consumption are the other potential reasons. Feeding issues, Eustachian tube malfunction, middle ear infections, hearing loss, speech disabilities, dental, and orthodontic issues are linked to cleft palates. The purpose of a feeding plate is to close the cleft and reestablish the division between the nasal and oral cavity. This case series enlightens the various degree of defect, the usual problems associated with them and the immediate or first line of treatment modality for correcting the defect.

Keywords: Cleft palate, Feeding plate, Nasal regurgitation, Newborn

Introduction

A congenital abnormal gap in the palate, known as a cleft, can develop alone or in conjunction with a lip

and alveolar cleft.[1] There are two main sources of facial clefts: hereditary and environmental. Hypoplasia, aberrant mesenchymal process development in one direction or another, or a breakdown or failure of mesenchymal process fusion, are the causes of clefts. [2,3] Common orofacial clefts impact the alveolar ridge, nose, eyes, hard palate, soft palate, and upper lip.[4] Babies born with cleft lip and palate have oral communication problems, which reduces their capacity to produce the negative pressure needed for breastfeeding. [5,6,7,8] This hinders feeding, which in turn affects the child's nutrition and development. It can be very challenging to learn to live with a change in look brought on by an illness or injury. Globally, the frequency of cleft lip and palate is 6.64 per 10,000, while the prevalence of cleft lip alone is 3.28 per 10,000. The incidence of cleft lip and palate is 1 in 600. Male to female CL ratio is 2:1, although female cleft palate without cleft lip is more prevalent. [9,10] This is because girls palatine shelves fuse one week later than boys, which causes a higher incidence of cleft palate in girls.[1] One case of cleft lip, with or without cleft palate, is thought to occur for every 750 live births. Males are more likely to have cleft lip with or without cleft palate, whilst females are more likely to have isolated cleft palate.[2]

Cleft palate babies have trouble feeding, which can prevent them from thriving. The ability to generate negative pressure, which is required for breastfeeding, is reduced by oronasal communication. In order to overcome this, the baby forces its nipple between its tongue and its hard palate to expel liquids and milk but, if the gap is large and the nipple becomes caught within the defect, this mechanism is insufficient.[11] The complications that occur if cleft lip and cleft palate not treated immediately include exposure of primary teeth, nostril overexpansion, segment may get locked, failure to tape lip segments.[12] Patients with cleft lip and/or palate must begin therapy as soon as possible.

A multidisciplinary team approach is the best way to provide complete care for children born with cleft lip and palate. Dentists play a key part in the team, which collaborates closely with medical and allied health professionals.[13] However, timely intervention through the construction of a feeding plate by a prosthodontist can eliminate the immediate concerns, namely sufficient sustenance and infection prevention for the already debilitated newborn.

A feeding plate is a device that regulates the flow of milk by sealing the space between the nasal and oral chambers.[2] Given from birth until three months of age. The feeding device is placed over the baby's hard palate, creating a contact point that facilitates milk expression and makes it easier for the baby to compress the nipple.[14]

The purpose of this case series is to give a general overview degree of defect and problems associated with them, treatment modality for correcting the defect, care of a patient with cleft lip and palate, with a focus on the prosthodontist's role.

Case History:

Case report: 1

A 3-day old female neonate was referred to department of prosthodontics crown and bridge KIMS Dental College and Hospital, Amalapuram, from NICU pediatrics department along with parents complaining of difficulty in sucking of milk and regurgitation of milk through nose during feeding. This infant was the mother's first child, and her

pregnancy had gone smoothly. Neither the child's mother nor father had a history of craniofacial clefts. The family history reveled that the parents had a consanguineous marriage. On intra oral examination cleft is present in soft and hard palate not extending the incisive foramen (Veau's Class II defect) (Figure 1).

Figure 1: Veau's Class II defect

Steps in fabrication of Feeding plate:

Primary impression

Making an impression on a patient with cleft lip and palate is an important and difficult technique because of the size of infant's mouth cavity. Without the use of anesthetic or premedication, the impression was taken while the baby was completely conscious. The literature has described a variety of positions including facedown, upright, and even upside-down for Cleft Palate patients to adopt during impression-making in order to avoid airway obstruction. Several kinds of impression materials, including elastomeric, alginate, and low fusing compound, have been suggested in the literature for use in creating impressions in patients with cleft lip and palate. In this case during impression making the infant was held face down to prevent aspiration of regurgitated contents. While making the impression the babies are made to cry and that is good as it the best indicator for the operator that the airway is clear. Though there are several techniques used to make impression like with tea spoon, direct adaptation of impression compound or wax and with custom tray. In this case scenario the custom tray was used and tray positioned so that the impression material was barely starting to protrude from the rear edge. In this patient polyvinyl elastomeric putty consistency was used for impression making (Figure 2)

Figure 2: Primary impression

Primary cast preparation

The primary impression was poured with type III gypsum product and after manufacturer recommended setting time of gypsum the cast retrieval is done. Then the custom acrylic special tray was fabricated with self-cure material. Roughened surfaces are smoothened and polished (Figure 3).

Figure 3: Primary cast and Custom tray

Secondary impression and master cast

In order to record the fine details of the defect and surrounding structures final impression is recorded with putty and light body consistency elastomeric impression material. After impression making the

impression is poured with dental stone to fabricate master cast (Figure 4)

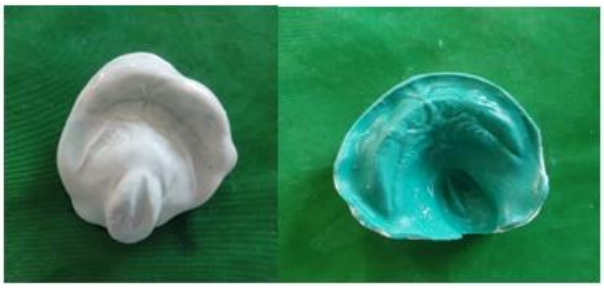

Figure 4: Final impression and master cast

Undercuts Blocking and Feeding plate

Then the undercuts are blocked with wax and curing was done. After curing the feeding plate is retrieved and trimmed. In order to make prosthesis insertion and removal easier and to prevent the appliance from being swallowed, a 10-inch silk suture was threaded through and fastened to the feeding plate's eyelet. The feeding plate stays in the oral cavity due to engaging in the natural undercuts (Figure 5).

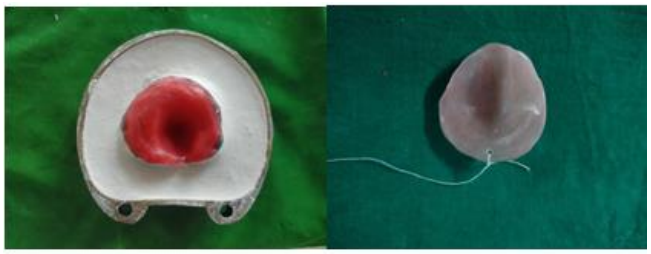

Figure 5: Adaptation of wax pattern to the master cas

Delivery and instructions to the parents

During delivery, the obturator was carefully inserted into the baby's mouth cavity, and floss was used to guide it (Figure 6). Parents were advised to utilize the plate as much as possible and to learn how to insert and remove it as well as maintain it on a regular basis. A week after the device was delivered, the patient was summoned back for any necessary modifications. Parents were also instructed to clean the palate and mouth with a small amount of sterile water, two to three teaspoons. The patient was recalled after one week, then two, and three months. The infant's mouth was checked for any potential sore spots or ulcers.

Figure 6: Delivery of feeding plate

Case report: 2

A 2 years old male patient named Adhi Narayana reported to the department of prosthodontics KIMS dental college and hospital, Amalapuram along with his parents complaining of discharge of liquids through nose during feeding and previous feeding plate is loose. The family history reveled that the parents had no consanguineous marriage. There was no history of previous treatment or surgery for the defect. On intra oral examination cleft is present in soft and hard palate (Veau's Class II defect). Deciduous teeth irt 51,54,61,64,71,72,74,81,82,84. The existing feeding plate is loose and there is no retention due to weight gain of the patient (Figure 7).

Figure 7: Cleft involving soft and hard palate

Primary impression was made with putty consistency elastomeric impression material under the supervision of a pediatrician. In order to prevent the airway obstruction, the impression is taken in head face downward position of the infant by mother. After

impression making cast is poured with type III gypsum product to fabricate custom tray (Figure 8).

Figure 8: Primary impression & Custom tray

Then the final impression is recorded with putty and light body consistency elastomeric material for precise recording of anatomic structures and defect area (Figure 9).

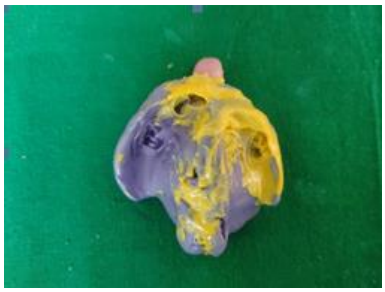

Figure 9: Final impression

The final impression is poured with die stone and undercuts are blocked with modelling wax (Figure 10).

Figure 10: Master cast and adaptation of wax pattern

After adaptation of wax patter to the master cast dewaxing and packing done with heat cure acrylic material followed by curing of the prosthesis. Then the feeding plate is trimmed and finishing and polishing done. In order to prevent the aspiration of feeing plate a silk thread of 10-inch length is tied near anterior region (Figure 11).

Figure 11: Finished feeding plate

After finishing and polishing the feeding plate is inserted in patients' mouth and minor corrections was made before final polishing (Figure 12). The mother is trained to how to use, clean and insert the feeding plate in the patient's mouth. The patient is recalled after 24 hrs. and monthly appointments was scheduled.

Figure 12: Insertion of feeding plate

Case report: 3

A three-day-old female neonate was referred from the pediatrics department [NICU] to department of prosthodontics crown and bridge KIMS dental college and hospital, Amalapuram along with parents. Her parents had expressed difficulty in sucking milk and regurgitating it through the nose during feeding. Family history reveled parents had a consanguineous marriage. On intra oral examination cleft is present in soft and hard palate (Figure 13).

Figure 13: Cleft involving soft and hard palate

Primary impressions was made with addition silicone elastomeric material. The mother is asked to hold the infant in head downward direction to prevent swallowing of excess material. After impression making the cast is poured with type III gypsum product (Figure 14).

Figure 14: Primary impression & Primary cast

The custom tray is fabricated with auto polymerizing resin and then final impression is recorded with elastomeric impression materia l(Figure 15).

Figure 15: Final impression

Then the final impression is poured with die stone and under cuts are blocked. After blocking the wax pattern is adapted and curing is done. Then the feeding plate is retrieved and excess is trimmed (Figure 16).

Figure 16: Mater cast and wax blockout

Finishing and polishing is done and then inserted in the patient mouth. To prevent swallowing of the feeding plate a hole is drilled near anterior region of the feeding plate. Through this hole an 10 inch silk thread is passed and tied (Figure 17).

Figure 17: Insertion of feeding plates

Discussion

From birth through adolescence, patients with cleft lip and palate abnormalities need coordinated treatment from several fields. When a newborn is born with an orofacial cleft, parents have a sense of trauma since there is an increased economical and social effects prior to the end of the initial course of treatment. A cleft lip or palate can also be a component of syndromes, such as Treacher Collin's syndrome and Down's syndrome.[15]

For successful habilitation, a constellation of issues related to cleft lip and palate must be resolved. The ability to generate negative pressure, which is required for breastfeeding, is reduced by oronasal communication. Nasal regurgitation of food and excessive air intake that necessitates frequent burping and choking further complicate the eating process.[16] Feeding takes a lot longer, which wears out the mother and the infant. In an ideal world, a team approach would be used to assess and care for these patients. Potential issues related to feeding difficulties include choking, excessive air intake, prolonged feeding times, nasal regurgitation, exhaustion from expending too much energy during eating, inadequate

suction, and poor weight gain from insufficient nutritional intake.[2] Due to eustachian tube dysfunction, children with clefts of soft palate are more likely to experience middle ear infections and the conductive hearing loss that goes along with them. Dhillon reports that among children with cleft palates under 24 months of age, the frequency of otitis media with effusion is 97%.[2] Palatal clefting may lead to velopharyngeal insufficiency (VPI), also known as velopharyngeal dysfunction (VPD). It may result in nasal air emission, hypernasality (a resonance condition), or both.

Deficient facial growth, dental issues, velo-pharyngeal incompetence, articulation defects, and otologic issues such as eustachian tube dysfunction are linked to patients with clefts. Early cleft palate surgery is essential since this, along with delayed speech, impairs the cognitive, linguistic, and emotional development of young kids.

Restoring normal anatomy is the fundamental objective of any strategy for treating cleft lip, palate, and alveolus, weather it is for unilateral or bilateral deformity. One the baby achieves rule of 10 [i.e 10 weeks of age, 10 pounds of weight, > 10g/dl of hemoglobin, white blood cells count < 10,000 /mm ^{3}] then the surgical procedure is advised. Prior to surgical correction, it is ideal for mispositioned structures to be realigned and for insufficient tissues to be expanded. This lays the groundwork for a surgical repair that requires less invasiveness. Presurgical infant orthopedic (PSTO) appliances, also known as molding plate therapy, have historically played a major role in helping to reduce the size of alveolar and hard palate clefts before surgery.[12] Many methods for shaping the intraoral alveolar segments closer together in unilateral and bilateral cleft situations have been documented since it was first introduced by McNeil in 1950.[17] The feeding plate closes the cleft and restores the barrier between the oral and nasal chambers. It forms a firm base against which the baby can press the nipple to obtain milk. It promotes eating, lowers nasal regurgitation, decreases the incidence of choking, and shortens the time required for feeding. [18,19]

Conclusion

The cases presented illustrate the diversity of feeding challenges faced by newborns with cleft palate and the effectiveness of tailored feeding solutions. The use of custom-designed feeding plates, specialized bottles, and nipple shields can significantly enhance feeding efficiency and address specific issues related to the cleft.[20] Early intervention with these feeding solutions can improve nutritional intake, promote healthy growth, and reduce feeding-related complications.

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