Case Report

# Rehabilitation Using Hybrid Technique for Feeding Plate Fabrication in a 3-Month-Old Infant with Cleft Palate Defect Utilising Digital and Conventional Method: A Case Report

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## Abstract

Cleft palate leads to difficulty in suckling, speech abnormalities, dental problems, hearing loss and middle ear infections. Feeding plate acts as a barrier between the oral and nasal cavities allowing the normal development of jaws and enhanced nutritional supply to the patient. Fabrication of the feeding plate using digital means provide better adaptability due to the engagement of all the possible favourable anatomic undercuts, thereby, providing better retention. This case report discusses the hybrid technique including both the digital and conventional means for fabrication of a feeding plate to obturate the defect between the oral and nasal cavity.

**Keywords:** Cleft palate, digital dentistry, feeding plate, three-dimensional printing

## Introduction

With a global prevalence of 1.5/1000 live births, cleft lip and palate is one of the most prevalent congenital malformations of the orofacial region.[1] Orofacial clefts lead to several difficulties including dental problems, speech distortion, disordered swallowing, velopharyngeal incompetence, otolaryngologic problems and growth challenges in addition to the cosmetic impairments.[2] It also affects the mental health of the parents considerably owing to the emotional, psychological and social difficulties which significantly affect the child care.[3] Cleft palate repair is delayed from 9 months to 18 months of age as early repair of palate have a negative effect on the growth of the maxilla. The role of feeding plate, hence, becomes urgent and significant in cleft palate patients considering the health of the patient. Feeding plate is a prosthetic aid to obturate the cleft and to restore the separation between the oral and nasal cavities. It acts as a firm foundation for the infant to press against to extract milk from the nipple, thereby, functions to shorten the duration of feeding, reduces nasal regurgitation and minimises the risk of choking. It prevents the tongue from entering the defect and allows spontaneous growth of the palatal shelves towards the midline. The correct positioning of the tongue is guided by the obturator which further contributes to the functional development of jaws. The obturator further prevents food from entering the nasopharynx, lowering the risk of otitis media and nasopharyngeal infections.[4,5]

The use of digital technologies in dentistry has been a key breakthrough in recent years. Additive manufacturing technology such as three-dimensional (3D) printing is preferred over the subtractive ones (computer-aided design and computer-aided manufacturing) due to reduction in the material wastage. Further, the digital technology provides the benefit of accurate and precise fabrication of the prosthesis.[6] This case report presents a hybrid technique using combination of both digital and conventional means to fabricate a feeding plate in an infant having a defect of cleft palate.

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## Case Report

A 3-month-old infant was brought by her parents with the history of cleft palate [Figure 1a]. The chief complaint was difficulty in feeding and inability to gain weight. There was no history of previous surgery of the defect. No paternal or maternal history of orofacial cleft was found. On intraoral examination, Veau's Class II defect involving the hard and soft palate was observed. A feeding plate using the thermoplastic sheet [Figure 1b] was previously fabricated at the age of one month to obturate the defect. After the follow-up of 2 months, digital fabrication of the feeding plate was planned. An informed consent of the parents was obtained for the fabrication of the prosthesis.

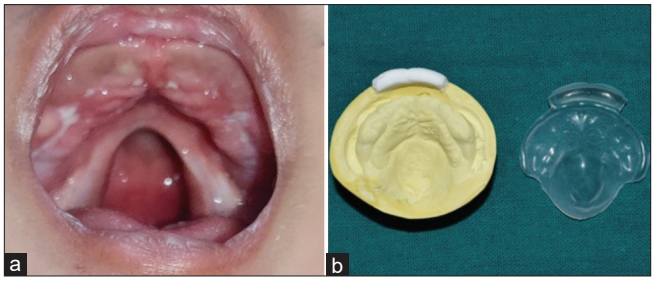


**Figure 1:** Primary visit: (a) preoperative intraoral view of the cleft palate, (b) feeding plate fabricated using a thermoplastic sheet

A self-polymerising custom tray was fabricated using the previously obtained master cast [Figure 2a]. The fit and adaptation of the custom tray was checked. Uniform holes were made in the custom tray using tungsten carbide bur (DMX Lab Carbide Burs, USA). Tray adhesive (3M ESPE Tray Adhesive, Bengaluru, Karnataka, India) was applied on the special tray and the impression was made using putty consistency addition



**Figure 2:** Two months follow-up visit: (a) customised tray fabricated from the previous master cast, (b) impression made using putty consistency addition silicone impression material and (c) final impression made using light consistency addition silicone impression material

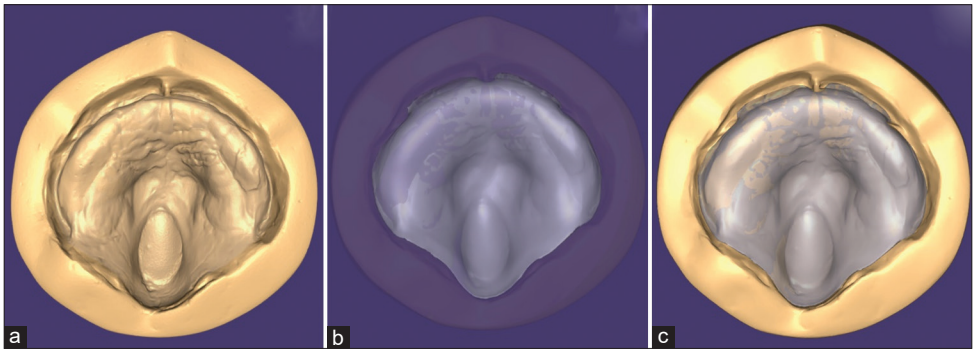


**Figure 3:** (a) Digital image of the cast obtained after scanning the impression, (b) digital designing of feeding plate and (c) adaptation of feeding plate on the cast



**Figure 4:** (a) Polished surface of the 3D printed feeding plate, (b) impression surface of the feeding plate and (c) adaptation of the feeding plate on the cast. 3D: Three-dimensional



**Figure 5:** Adaptation of the digitally fabricated feeding plate intraorally

silicone impression material [Figure 2b]. The final impression was made using light body consistency (Zhermack Elite HD+, Italy) addition silicone impression material [Figure 2c].

The impression was scanned extraorally with an extraoral scanner (Dentsply Sirona In EOS X5) to generate a standard tessellation language (STL) file and a digital image of the cast was obtained [Figure 3a]. Designing of the feeding plate was carried out using EXOCAD software and a.STL file of the designed prosthesis was created [Figure 3b and c]. NextDent Denture 3D+ resin was activated by ultraviolet light and poured into the 3D printer container (NextDent 5100 printer). The generated.STL file of the designed feeding plate was fed into the printer. Prosthesis was built layer by layer in additive manner. The ultraviolet light (405 nm) cured each layer and hardened a thin layer of the polymer. To remove and clean the uncured resin, printed prosthesis was cleaned with 96% isopropyl alcohol. Post-processing and curing of 3D printed feeding plate was then done. The NextDent LC3DPrint Box (wavelength 350–550 nm) was used for 10 min for post-curing of 3D printed resin material to reduce the residual monomer to a minimum and produce a biocompatible product. The 3D printed feeding plate was obtained and adaptation was checked on the master cast [Figure 4]. Thereafter, fit of the prosthesis was assessed in the oral cavity and after verification, the prosthesis was inserted [Figure 5]. The retention of the prosthesis was reinforced with a dental floss and a medical adhesive tape.

## Discussion

Breastfeeding is one of the major problems faced by the infant with cleft palate. Although, various feeding methods such as Habermann feeder, Montgomery nipple, bulb syringe, and pigeon feeder have been published in literature,[7] still management in patients with large sized clefts poses feeding challenges. Feeding plate in such cases offers a feasible alternative. The advantages of feeding plate are feeding convenience, normalisation of tongue position, guidance of maxillary development, prevention of collapse of maxillary segments as well as the improvement in the parental psychology.[8]

In recent years, there is a progressive transition from the analogic to the digital dentistry. This case report focuses on the 3D fabrication of the feeding plate after scanning the impression made by conventional methods. Additive manufacturing or 3D printing encircles variety of technologies which differ in the way that each layer is deposited and processed rather than the milling of a block. It allows replacement of the materials with the digital data thereby economising the laboratory materials and the manual work to fabricate the model casts. 3D printed models allows precise recording of all the anatomic details due to less manual and technical errors.[6] The digital workflow in this case report required scanning of the impression using an extraoral scanner. Although both intraoral and extraoral scanners have comparative accuracy and precision, extraoral scanners are recommended during scanning of the entire arch due to its higher precision.[9] In addition, scanning with the extraoral scanners was a more convenient and feasible option in an infant. The digital workflow enabled processing of a more accurate feeding plate with better adaptability, stability and retention.[10]

This case report discusses the amalgam of both conventional and digital means for the fabrication of a feeding plate for a cleft palate patient. The impression making using conventional means provided the ease of convenience in impression making whereas the digital workflow enabled better recording of anatomic details in the impression leading to fabrication of the feeding plate with higher accuracy and precision.

## Conclusion

Feeding plate is practical and feasible alternative in infants with cleft palate defect. This clinical report describes the hybrid of both the conventional and digital means for the fabrication of a feeding plate, to gain the maximum benefit possible from both the ends.

The conventional means of the digital workflow enhances the better utilisation of the anatomic details recorded and fabrication of a more retentive and stable prosthesis.

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### Conflicts of interest

There are no conflicts of interest.

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