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Case Report

Customized feeding plate for nutritional and respiratory support in an infant with Pierre Robin sequence and cleft palate complicated by severe respiratory infections: A case report

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Abstract

Pierre Robin sequence (PRS) is a congenital condition characterized by micrognathia, glossoptosis, and airway obstruction, often accompanied by cleft palate. Feeding difficulties and respiratory compromise pose significant challenges in early management. While feeding plates are commonly used to improve feeding and airway stability, their application in infants with severe respiratory infections remains underreported. The aim of this study was to describe the challenges of impression-taking and feeding plate fabrication in an infant with PRS complicated by multiple congenital anomalies and severe respiratory complications, including bilateral pneumonia. A 23-day-old male infant was referred to the pediatric dentistry department of Pandega General Hospital, Pangandaran, Indonesia, with the chief complaints of feeding difficulties, recurrent choking episodes, and respiratory distress. The patient was diagnosed with PRS with a cleft palate, complicated by congenital tuberculosis and bilateral pneumonia, exacerbating respiratory compromise. Given the patient's fragile condition, impression-taking was performed with strict airway precautions, including lateral positioning, continuous oxygen monitoring, and suction readiness. High-viscosity alginate and a perforated stock tray were used to minimize aspiration risk. Two clinicians ensured airway security throughout the procedure. A customized acrylic feeding plate was fabricated with a palatal extension to prevent nasal regurgitation and a contoured surface to aid tongue positioning. The plate was polished for comfort, adjusted for retention, and fitted to accommodate maxillary growth, ensuring safe and effective feeding support. Within one month, the infant's weight increased from 2,200 g to 3,100 g, choking episodes significantly decreased, and a transition from orogastric tube to bottle feeding was achieved. In conclusion, this case highlights the feasibility and benefits of feeding plate adaptation in PRS management, even in the presence of severe respiratory infections. A non-invasive approach using a feeding plate can serve as an initial intervention before surgical correction, particularly in fragile neonates.

Keywords: Feeding plate, feeding support, breathing support, Pierre Robin sequence, cleft palate

Introduction

Pierre Robin sequence (PRS) is a rare congenital disorder characterized by micrognathia, glossoptosis, upper airway obstruction, and, frequently, cleft palate [1-3]. More than 75% of

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patients with PRS present with a broad, U-shaped cleft palate, as mandibular hypoplasia prevents proper descent of the tongue, thereby obstructing palatal shelf fusion during fetal development [4-8]. Consequently, infants with PRS commonly experience significant feeding and respiratory difficulties, necessitating early intervention to optimize growth and minimize complications [7,9,10].

PRS differs from syndromes, which result from a single cause, whereas sequences arise from a pre-existing anomaly [11]. PRS occurs in approximately 2.29 per 10,000 live births, with 69.7% of cases involving additional anomalies and 59.7% showing specific syndromic patterns [7]. Although the exact etiology remains unclear, genetic factors have been implicated [4,9]. PRS is typically non-inherited but may result from de novo mutations or, in some cases, follow an autosomal dominant pattern [11,12]. It can manifest as an isolated condition or as part of syndromic disorders such as Stickler syndrome, 22q11.2 deletion syndrome, or Treacher Collins syndrome [4]. Gene transcription abnormalities, including mutations in *SOX9*, *GAD67*, and *PVRL1*, influence facial morphogenesis by regulating collagen expression, with *SOX9* mutations frequently contributing to cleft palate formation [9].

The genetic anomalies interfere with mandibular growth during early embryogenesis, leading to micrognathia (underdeveloped lower jaw) [4]. This condition restricts the downward movement of the tongue, causing glossoptosis—a backward displacement of the tongue within the oral cavity [9]. This posterior tongue displacement obstructs palatal shelf fusion, resulting in cleft palate [5]. Glossoptosis also contributes to airway obstruction, a life-threatening complication associated with feeding difficulties, hypoxia, and failure to thrive [4,9]. PRS is often associated with congenital anomalies involving multiple organ systems, particularly the ears, face, neck, cardiovascular, musculoskeletal, urogenital, and central nervous systems [7]. Therefore, systematic assessment and multidisciplinary management are essential due to the condition's high variability and increased mortality risk [13].

Breathing and feeding difficulties are common in PRS, particularly in patients with recurrent aspiration pneumonia and respiratory complications, potentially leading to upper airway obstruction, apnea, hypoxia and respiratory failure, sudden infant death syndrome (SIDS), recurrent respiratory infections, and impaired growth and development [14,15]. The optimal initial management of respiratory issues remains a subject of debate [14]. Current treatment focuses on addressing airway obstruction and feeding difficulties to support growth [16]. Invasive interventions, such as mandibular distraction osteogenesis (MDO) and tracheostomy, have been developed to alleviate respiratory distress [17]. MDO enlarges the mandible to reduce airway obstruction, while tracheostomy is reserved for severe cases [18]. However, both procedures require general anesthesia and carry risks of postoperative complications, including infections and long-term respiratory issues [19].

A feeding plate is a non-invasive option for infants with PRS and cleft palate [14,20], covering the palatal cleft to enhance sucking, prevent aspiration, and improve feeding efficiency [21]. It reduces the need for prolonged orogastric tube use [21,22], supporting oral motor development and weight gain before surgical interventions such as palatoplasty [6]. While feeding plates aid nutritional intake and aspiration prevention [23], invasive procedures such as MDO or tracheostomy are required for severe airway obstruction or failed conservative management [24,25]. Delayed feeding plate fabrication or inadequate airway control increases the risk of life-threatening complications [26,27].

Improper impression-taking and feeding plate insertion can lead to serious complications, including hypoxia, respiratory distress, aspiration, and choking [28,29]. An excessively large or improperly extended feeding plate can obstruct the airway, posing a life-threatening risk [30]. Infants, particularly those with weaker reflexes, are highly susceptible to aspiration and respiratory difficulties if the device is not positioned correctly [31,32]. Additionally, improper placement can cause injuries to the oral mucosa, further complicating feeding and overall care [32]. Furthermore, limited resources and inadequate procedural planning increase the risk of adverse outcomes, emphasizing the need for meticulous execution [32].

Unlike standard feeding plates for isolated cleft palate, those for PRS require specific modifications to accommodate the smaller oral cavity and minimize glossoptosis risk [26]. This includes a thin, lightweight design to prevent excessive bulk that could further restrict the airway

[26]. To maintain airway patency and reduce aspiration risk, impression-taking must be performed carefully using a lateral positioning technique [33]. During insertion, continuous monitoring of the infant's respiratory status is essential to allow prompt adjustments and ensure respiratory stability [34].

Previous case reports have described the use of feeding plates in infants with PRS; however, most focus on cases without significant systemic complications or primarily address technical aspects of fabrication, with limited discussion of clinical challenges in complex cases [34-36]. The aim of this case report was to describe the challenges of impression-taking and feeding plate fabrication in an infant with PRS complicated by multiple congenital anomalies and severe respiratory complications, including bilateral pneumonia. It emphasizes the need for procedural modifications to ensure patient safety, such as oxygen supplementation, strategic positioning, and continuous multidisciplinary monitoring. Additionally, this case contributes to existing literature by demonstrating the feeding plate's role in improving feeding efficiency, respiratory function, and weight gain, thus, facilitating surgical preparation.

Case

A 23-day-old male infant was referred to the pediatric dentistry department of Pandega Hospital, Pangandaran, Indonesia, with chief complaints of breathing difficulties, recurrent choking episodes, and feeding difficulties. The patient was the third child in a family of three siblings, born to a 34-year-old mother with a history of tuberculosis diagnosed approximately 14 years ago. The mother had received incomplete tuberculosis treatment due to a loss of follow-up. The patient was delivered via spontaneous vaginal birth at 40 weeks of gestation, with a birth weight of 2,200 grams. The antenatal period was supervised at a primary health center, but no prenatal abnormalities were reported. The patient's mother reported frequent coughing during pregnancy; however, no diagnostic evaluations for pneumonia or tuberculosis had been performed at that time. The patient originated from a low socioeconomic background, which influenced access to healthcare and nutritional status. Upon admission, the patient had signs of respiratory distress and poor weight gain. The weight was 2,500 grams, with a respiratory rate of 60 breaths per minute, a heart rate of 146 bpm, and a body temperature of 36.9°C. Oxygen saturation was low at 90%, indicating hypoxemia. Extraoral examination showed mandibular micrognathia and multiple congenital anomalies, including right microtia, micropenis, and bilateral undescended testicles (**Figure 1**). Intraoral examination revealed U-shaped cleft palate (**Figure 2**).

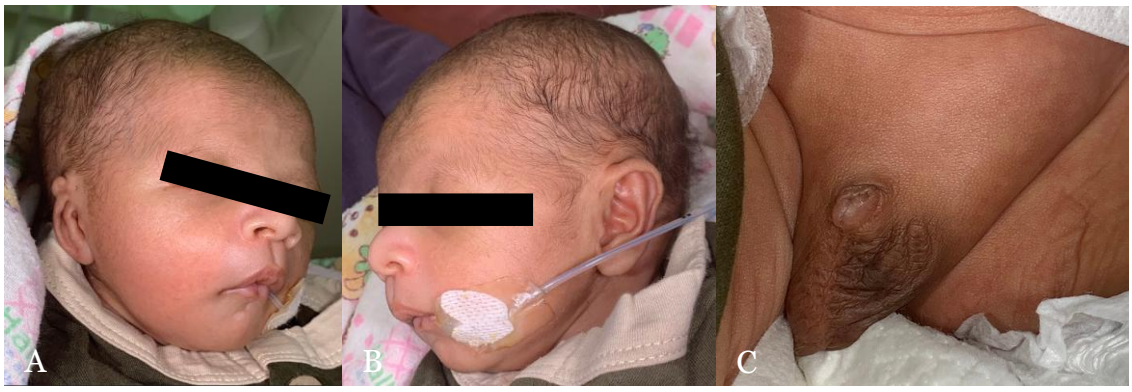

Figure 1. Extraoral examination showing congenital anomalies in a patient with Pierre Robin Sequence. (A) Right microtia, (B) micrognathia, (C) micropenis and bilateral undescended testicles.

Laboratory examination was conducted, the results indicated thrombocytosis, with an elevated platelet count of 493,000/µL, suggesting an ongoing inflammatory response (**Table 1**). Monocytosis (14%), eosinophilia (3%), and an increased total monocyte count (1.69×10³/µL) were also observed, further supporting the presence of an underlying infection. In contrast, the neutrophil band count (2%) and lymphocyte percentage (42%) were lower than expected, which may reflect an immune response shift associated with the patient's concurrent respiratory infection.

Table 1. Patient's laboratory findings at the time of admission

Parameter	Result
Platelets	493,000/µL (H)
Monocytes	14%
Eosinophils	3%
Total monocyte count	1.69×10^3/µL
Neutrophil band count	2%
Lymphocyte	42%
Hemoglobin	12.7 g/dL
Hematocrit	34.4%
Leukocyte	12.4×10^3/µL
Red blood cell	3.81×10^6/µL

Despite these hematological abnormalities, hemoglobin (12.7 g/dL), hematocrit (34.4%), total leukocyte count (12.4×10^3/µL), and red blood cell count (3.81×10^6/µL) remained within normal limits. The observed hematological abnormalities indicated systemic inflammation and immune activation.

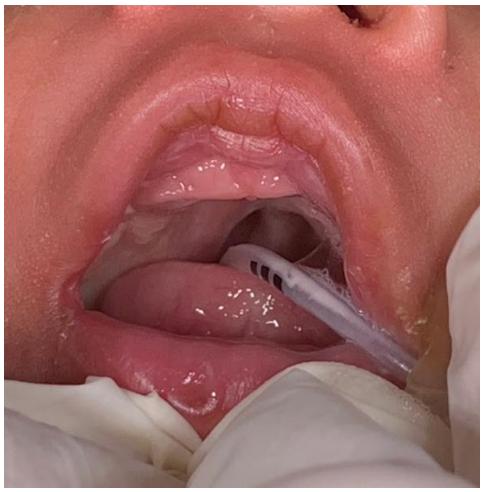

Figure 2. Intraoral examination revealing a cleft palate in a patient with Pierre Robin sequence.

Thoracic X-ray imaging, evaluated by a pediatric specialist, confirmed respiratory complications, including bilateral pneumonia and congenital tuberculosis, further exacerbating the patient's breathing difficulties (**Figure 3**). Based on clinical and radiographic findings, the patient was diagnosed with PRS.

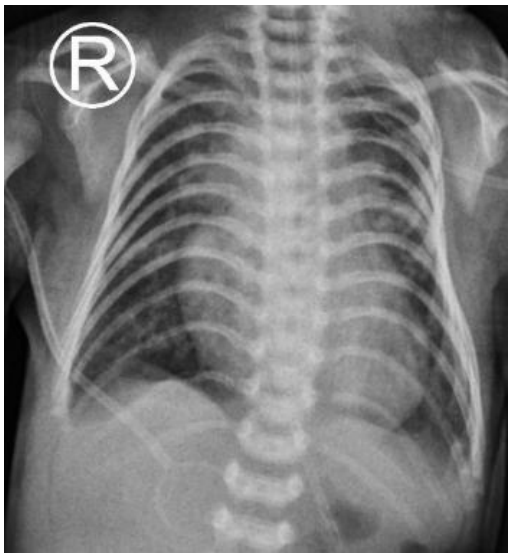

Figure 3. Thoracic X-ray examination revealed bilateral pneumonia and congenital tuberculosis, with infiltrative spots observed in the suprahilar and perihilar region.

The pediatric dentist planned to fabricate a feeding plate to improve the patient's feeding and respiratory function. Parental counseling was conducted to reduce anxiety and enhance understanding of the treatment objectives, ensuring better cooperation during the procedure. To minimize the risk of regurgitation and aspiration, the mother was instructed to fast the infant for four hours prior to impression-taking. The procedure was performed in the perinatal care unit under strict supervision by a pediatric specialist and the perinatal nursing team. The feeding tube was temporarily removed, and oxygen was administered via a simple mask at 5–8 L/min to maintain respiratory stability. A mouth mirror was used to depress the tongue and ensure airway patency, while high-volume suction was employed to prevent aspiration of impression material. The infant remained conscious throughout the procedure without anesthesia or premedication.

To ensure an open airway and reduce aspiration risk, the infant's feet were gently tapped to induce crying. Given the patient's fragile condition, impression-taking was performed with strict airway precautions. The infant was positioned laterally to minimize aspiration risk, and continuous oxygen saturation monitoring was conducted (**Figure 4A**). A high-viscosity alginate impression material was selected for its rapid setting time and reduced risk of airway obstruction. A custom acrylic impression tray was designed to ensure optimal fit while minimizing airway obstruction. The tray was carefully inserted into the patient's mouth, with proper positioning to reduce aspiration risk (**Figure 4B**). Impression-taking was conducted using a sterilized acrylic tray and heavy-body putty (PRESIDENT, Coltene, Switzerland), mixed in a 1:1 ratio and set for three minutes to ensure precise palatal replication while adhering to strict airway precautions (**Figure 4C**). Two clinicians performed the procedure—one securing the airway while the other conducted the impression. Suctioning equipment was readily available to manage potential airway compromise. The final impression captured detailed anatomical structures, facilitating the precise fabrication of a customized feeding plate (**Figure 4D**). The impression was then poured with type III dental stone (**Figure 5A**) and sent to the dental laboratory at Dr. Hasan Sadikin Hospital, Bandung, Indonesia, for feeding plate fabrication.

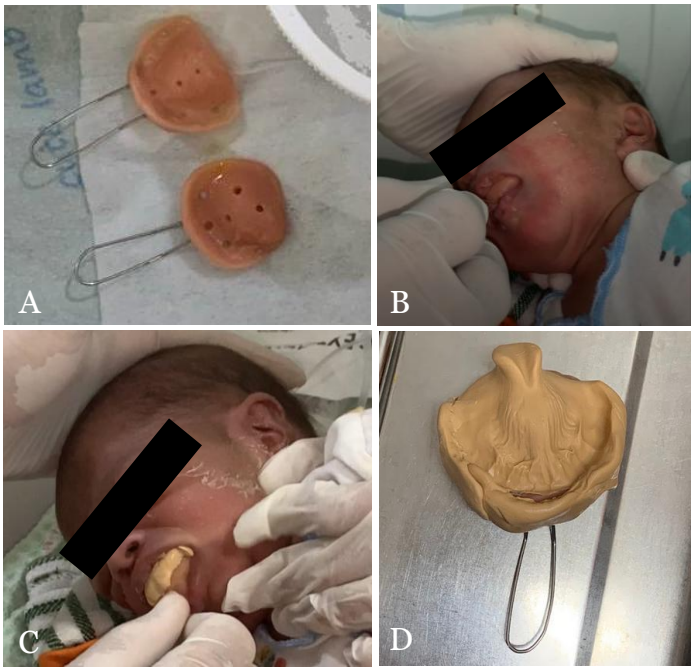

Figure 4. Feeding plate impression-taking process: (A) custom acrylic impression tray designed for optimal fit and minimal airway obstruction; (B) careful insertion of the tray while ensuring proper positioning to reduce aspiration risk; (C) impression-taking using heavy-body putty (regular set) for accurate replication of the palatal anatomy, performed under strict airway precautions; and (D) final impression of the upper jaw, capturing detailed anatomical structures to facilitate precise feeding plate fabrication.

Following successful impression-taking, a customized feeding plate was fabricated using biocompatible acrylic resin (**Figure 5B**). The plate was designed with a palatal extension to

prevent nasal regurgitation and a smooth, contoured surface to optimize tongue positioning and encourage proper swallowing. This design followed the principles of a modified Hotz-Kogo plate, which aids in improving feeding efficiency and supports maxillary growth by redirecting tongue pressure appropriately. The appliance was polished to eliminate rough edges, reducing mucosal irritation (**Figure 5C**). Upon insertion, intraoral examination confirmed a secure fit, with no excessive pressure on oral tissues. The feeding plate was adjusted to ensure adequate retention while allowing for maxillary growth.

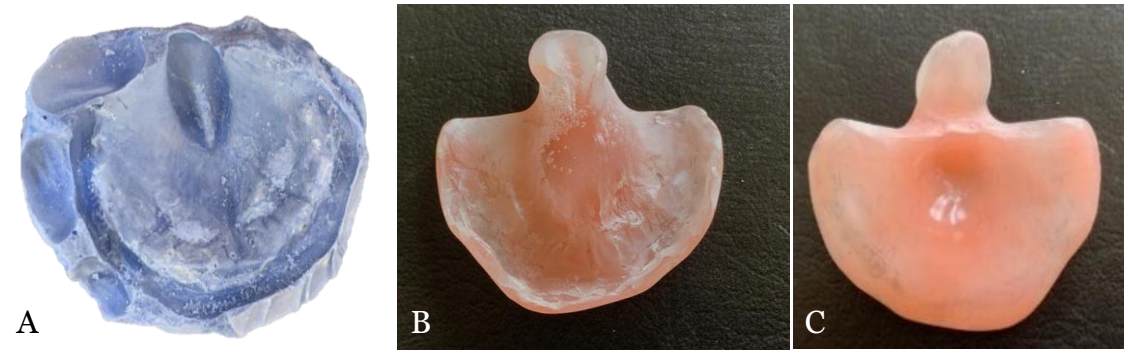

Figure 5. Feeding plate appliance: (A) master cast for the fabrication of patient's feeding plate; (B) anatomical surface of the feeding plate; and (C) mechanical surface of the feeding plate.

The feeding plate was carefully inserted into the patient's oral cavity, ensuring a secure fit without exerting excessive pressure on the oral tissues (**Figure 6A**). Proper positioning was confirmed to optimize feeding efficiency and prevent nasal regurgitation. Following insertion, the patient's adaptation process was closely monitored, with assessments of tongue movement, swallowing coordination, and overall comfort (**Figure 6B**). Necessary adjustments were made to enhance retention and accommodate maxillary growth. To evaluate the effectiveness of the feeding plate, functional testing was conducted using a baby bottle (**Figure 6C**). The appliance facilitated improved feeding mechanics, reducing choking episodes and minimizing the risk of aspiration.

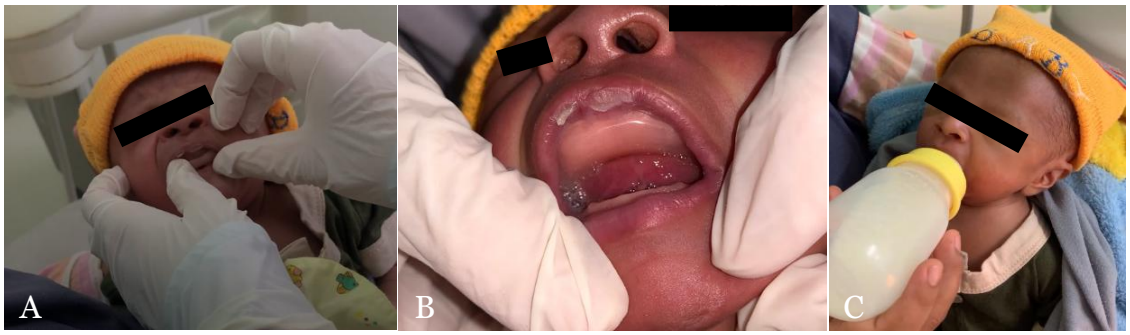

Figure 6. Feeding plate insertion process: (A) customized feeding plate was carefully inserted into the patient's oral cavity, ensuring a secure fit without excessive pressure on the oral tissues; (B) patient's adaptation process was observed, assessing tongue movement, swallowing coordination, and overall comfort; and (C) functional testing was performed using baby bottle to evaluate the infant's ability to suck and swallow effectively.

The patient remained under intensive monitoring and observation in the Neonatal Intensive Care Unit (NICU) with adjusted breathing assistance and tailored medication following his clinical development, utilizing assisted breathing on synchronized intermittent mandatory ventilation with pressure control (PC-SIMV) mode with FiO_2 100%, a positive end-expiratory pressure (PEEP) of 7 cmH_2O, and a peak inspiratory pressure (PIP) of 14 cmH_2O due to severe respiratory failure. Following clinical improvement, the patient was extubated and transitioned to continuous positive airway pressure (CPAP) with a pressure of 6 cmH_2O. Oxygen was gradually weaned, reducing FiO_2 stepwise until the patient was placed on a nasal cannula at 1 L/min and eventually discontinued supplemental oxygen. Oxygen saturation remained stable at ≥95% with

no episodes of apnea detected throughout the weaning process. Continuous monitoring was provided in the perinatal unit to ensure respiratory stability, including pulse oximetry and clinical assessment by a pediatric specialist at regular intervals. The patient remained under 24-hour observation, with adjustments to respiratory support as needed. After achieving clinical stability, the patient was discharged following three weeks of intensive care and continued anti-tuberculosis treatment at an outpatient facility under direct pediatric supervision. Anti-tuberculosis treatment consisted of rifampicin 50 mg, isoniazid 25 mg, pyrazinamide 100 mg, and ethambutol 50 mg, administered once daily in pulverized form, with continuation planned for six months.

The patient returned one week later for feeding plate insertion. The feeding tube was removed before placement, and the procedure was conducted in the perinatology unit. The patient adapted well to the device, which facilitated proper tongue positioning on the palatal plate and enhanced the sucking reflex, allowing effective milk intake using a baby bottle due to insufficient maternal breast milk production. The parents were also educated on the proper feeding position, which involves supporting the infant's head with the arms placed forward and the trunk aligned in the midline. The hips should be flexed, and the infant should be positioned at an upright angle of at least 60 degrees. This positioning helps utilize gravity to assist in the posterior flow of milk and improve the swallowing process [37].

The feeding plate effectively improved oral feeding, reduced aspiration risk and enhanced nutrient intake. Within one month of intervention, the infant's weight increased from 2,200 g to 3,100 g, choking episodes significantly decreased, and the transition from orogastric tube to bottle feeding was achieved. As the maxilla grew, monthly follow-up appointments were conducted to assess the fit and effectiveness of the feeding plate. These evaluations ensured that the device continued to provide adequate feeding support without causing discomfort or functional issues. If significant maxillary changes were observed, a new feeding plate was fabricated, while minor adjustments were made by adding heat-cured soft acrylic to the anatomical surface of the existing plate. This approach maintained stability, improved adaptation, and ensured continuous functionality until cleft surgery was performed. The importance of ongoing medical support was emphasized, and this approach was recommended for other families facing similar challenges.

Parental education was emphasized, focusing on proper feeding plate maintenance, hygiene practices, and early signs of appliance-related complications such as mucosal irritation, ulceration, or loosening of the appliance. Daily removal of the feeding plate is performed to allow for cleaning and to assess the oral mucosa for potential pressure sores or irritation [38]. After each feeding session, the plate should be rinsed thoroughly with water. In addition, it is recommended to clean the plate twice daily using a soft toothbrush while avoiding the use of toothpaste to prevent surface damage [38]. The palatal mucosa and alveolar ridge should be gently wiped with moistened gauze swabs to maintain oral hygiene and reduce the risk of mucosal infection. Structured counseling sessions improved parental confidence, ensuring adherence to home care instructions. The parents expressed relief and gratitude for the successful management of the infant's condition, highlighting the steady weight gain and enhanced feeding efficiency, which increased optimism about future surgical interventions.

Discussion

The management of PRS varies widely and depends on the severity of airway obstruction, feeding difficulties, and associated anomalies [5,16]. A previous study showed that orofacial clefts are more prevalent among individuals with indicators of low socioeconomic status, further complicating management [39]. Systemic complications, including hypoxia, aspiration, and malnutrition, necessitate a carefully planned intervention strategy and interdisciplinary collaboration to optimize outcomes [3,16]. The treatment of infants with cleft palate requires a multidisciplinary team comprising pediatricians, pediatric dentists, plastic surgeons, and prosthodontists [40]. Surgical repair, typically performed between 3 and 18 months of age, is guided by defect severity [33]. Millard's "rule of ten" serves as a preoperative guideline for elective surgery, recommending a minimum weight of 4.5 kg, hemoglobin level above 10 g/dL, and a white blood cell count below 10,000/mm^3 in infants older than ten weeks to minimize anesthesia-

related risks and postoperative complications [41]. Nutritional optimization is essential for adequate growth and surgical readiness [31]. While nasogastric and orogastric tubes can provide temporary feeding support, prolonged orogastric tube use is discouraged due to its potential to impair sucking ability and increase the risk of complications such as nasal alar necrosis, esophagitis, esophageal perforation, and pulmonary complications [5],[14],[29].

Infants with cleft palate have an elevated risk of pneumonia due to multiple contributing factors [42], including low birth weight, inadequate nutrition, lack of exclusive breastfeeding, exposure to air pollution, incomplete immunization, and human immunodeficiency virus (HIV) infection [43,44]. Anatomical abnormalities associated with cleft palate often result in food regurgitation into the nasal cavity and micro-aspiration [42], while breastfeeding difficulties further compromise immunity, increasing susceptibility to pneumonia and other respiratory infections [43]. In this case, congenital tuberculosis was also identified, which can occur through four primary routes: (1) transplacental hematogenous spread, indicated by hepatic lesions in the umbilical vein; (2) inhalation of infected amniotic fluid, characterized by pulmonary infiltrates; (3) infection acquired during passage through the birth canal; or (4) postnatal exposure from an infected mother, sibling, or healthcare worker [45]. Given these risks, comprehensive maternal evaluation is crucial, along with continuous respiratory monitoring to ensure adequate breathing during impression-taking and tuberculosis treatment [46].

The combination of cleft palate and PRS resulted in poor oral feeding, frequent choking, and an increased risk of aspiration pneumonia [14]. Glossoptosis, a hallmark of PRS, causes posterior displacement of the tongue, leading to contact with the pharyngeal wall and subsequent airway obstruction [47]. In PRS, glossoptosis is the primary cause of airway compromise, which may result in severe apnea, oxygen desaturation, and, in severe cases, mortality [5]. Respiratory function in this case was further compromised by bilateral pneumonia, exacerbating airway obstruction and increasing the risk of respiratory failure [48]. Infants with PRS and concurrent systemic infections are particularly vulnerable to airway collapse, as respiratory distress further impairs the ability to manage obstruction [13]. Effective management of PRS with cleft palate requires a multidisciplinary approach involving interventions that not only improve feeding efficiency but also contribute to airway patency and respiratory stability/ [21]. This includes the use of specialized feeding devices, such as a modified feeding plate, which helps to separate the oral and nasal cavities, reducing nasal regurgitation and aspiration risk [14,28]. Additionally, continuous monitoring of respiratory status during procedures such as impression taking, as well as appropriate feeding techniques and positioning, are essential to ensure patient safety and optimize clinical outcomes [32,38].

A pediatric dentist can fabricate a temporary feeding plate to promote weight gain and nutritional stability before surgical intervention [40,49]. This appliance restores the separation between the oral and nasal cavities, preventing cleft widening caused by tongue movement and function [33],[10]. In addition to providing nutritional support, a feeding plate contributes to airway maintenance by reducing the risk of aspiration [30]. The feeding plate was customized to optimize feeding efficiency and minimize aspiration, featuring a well-sealed palatal structure to prevent nasal regurgitation and an anatomically designed surface to enhance the sucking reflex [30]. This design facilitated effective feeding while supporting overall respiratory stability.

Unlike standard feeding plates that primarily improve feeding, PRS-specific modifications, such as posterior extensions and tongue barriers, have demonstrated efficacy in reducing airway obstruction [50]. Key modifications include an extended posterior support that gently repositions the tongue forward to prevent posterior collapse, a palatal shield that serves as a barrier to prevent airway obstruction and a smooth, contoured surface that guides tongue movement forward, enhancing coordination of sucking, swallowing, and breathing [10,51]. The Hotz and Kogo plates incorporate essential design adaptations to optimize both feeding and airway stability [52]. The Hotz plate features a posterior extension toward the uvular cleft, improving adaptation in the posterior region and facilitating a normal swallowing pattern [10,51]. In contrast, the Kogo plate includes an additional 2–3 mm posterior elevation, creating a closed-box effect that enhances negative pressure during sucking [51,52]. Some clinicians combine these two designs into a modified Hotz-Kogo plate to accommodate specific patient conditions [51]. This device facilitates tongue-palate contact during sucking, improving the sucking reflex and feeding efficiency [10].

By providing a stable structure and generating negative pressure, the feeding plate enables effective nipple or pacifier compression, facilitating milk intake [52]. It reduces nasal regurgitation, minimizes choking risk, shortens feeding time, and helps maintain airway patency [14]. Additionally, it prevents tongue intrusion into the cleft, promoting midline palatal growth and ensuring proper tongue positioning [21]. This contributes to oral muscle development, supporting essential functions such as chewing, swallowing, and sound production until surgical repair can be performed [14,21,22]. Parental education on feeding techniques, including the use of specialized bottles with controlled flow rates, is essential to prevent choking [10].

Severe respiratory complications, including bilateral pneumonia, posed significant challenges during impression-taking and feeding plate fabrication. Additional difficulties included limited mouth opening, small jaw size, anatomical variations, and lack of patient cooperation [31]. To minimize complications and associated risks, the impression was obtained with caution in a facility equipped for comprehensive emergency care [31]. Three primary challenges were identified in this case. First, airway obstruction due to glossoptosis led to episodes of hypoxia and respiratory distress. Second, feeding difficulties associated with cleft palate increased the risk of aspiration pneumonia and failure to thrive. Third, respiratory compromise during impression-taking posed a life-threatening risk due to potential airway obstruction and aspiration [32]. Addressing these challenges required a carefully tailored intervention strategy to balance patient safety with treatment efficacy [32]. To ensure optimal impression accuracy, the tray was designed to cover the lateral and posterior areas, including the maxillary tuberosity, while capturing the mucobuccal fold [33]. The procedure was performed while the infant was conscious to allow for physiological oral muscle movement during sucking, ensuring accurate reproduction of tissue contours and undercuts [36].

Several preventive measures were implemented in this case to reduce the risk of complications. Pre-procedural fasting for four hours minimized regurgitation and aspiration risk, while oxygen supplementation (5–8 L/min via a simple mask) helped maintain respiratory stability. Lateral positioning was used to keep the airway open during the impression procedure [28,32,40]. Crying stimulation through gentle foot tapping promoted airway patency and reduced the risk of passive aspiration of impression material [10]. Close monitoring by a pediatric specialist and perinatal nursing team ensured immediate intervention in case of respiratory distress [32]. Additionally, suction and resuscitation equipment were readily available to manage airway emergencies [53], and monitoring the infant's crying patterns facilitate early detection of potential aspiration of impression material [36].

Accurate impression-taking is crucial for ensuring optimal prosthesis quality [54]. Conventional techniques utilizing stock or custom trays are commonly employed to replicate anatomical structures [55]. However, in infants with PRS, who are at risk of airway obstruction, digital impression techniques are preferred due to their reduced risk of choking [56]. While digital impressions offer a safer alternative to conventional putty impressions, their availability remains limited in resource-constrained settings [57]. Consequently, traditional impression techniques are often necessary (**Table 2**) but must be performed with utmost caution, particularly in NICUs, where the infant's condition may be critical [33,55,58,59].

Table 2. Comparison between conventional and digital impression technique in infants with Pierre Robin sequence (PRS) and cleft palate

Aspect	Conventional impression	Digital impression
Airway safety	High risk of airway blockage due to tongue displacement and breathing difficulties [56]	Eliminates risk of airway obstruction from impression material. Lower risk of gagging/aspiration [56]
Accuracy	More accurate, but may have inaccuracies due to patient movement [55]	High accuracy comparable to conventional technique [54,59]
Patient comfort	Can cause severe gag reflex and possible aspiration [58,60]	More quick and comfortable [58,60]
Cost	Lower cost, but recurring expenses for material and possible need for retakes [61]	Higher initial cost for scanner and software [61]
Availability	Widely available [57]	Limited, due to high equipment cost and lack of trained personnel [57]

Aspect	Conventional impression	Digital impression
Operator training and skill	Familiar technique, but more technique sensitive, especially in patients with airway compromise [57]	Requires specialized training and experience [54]

Various patient positions have been proposed to minimize airway obstruction during impression-taking in infants with cleft palate [33]. Proper positioning is essential for optimizing the fabrication process of feeding appliances while ensuring patient safety [28]. The lateral position is preferred as it reduces the risk of airway compromise by preventing aspiration of impression material and posterior tongue displacement [6]. A previous study has supported the use of this position for maintaining airway patency during the procedure [3]. Although some reports suggest prone positioning as an alternative to improve airway stability [35,62], this approach is associated with an increased risk of SIDS and may complicate airway obstruction assessment [10]. Continuous monitoring for signs of oxygen desaturation, respiratory distress, aspiration, or choking is imperative during the procedure [32]. Early recognition of respiratory compromise and timely referral to a tertiary care center is critical, and the procedure should be postponed if the infant's condition is unstable [32]. Furthermore, parental education on the proper use and maintenance of feeding plates is essential to ensure appliance hygiene, prevent complications, and promote optimal oral health [35,36].

Long-term use of feeding plates presents several challenges, including the need for frequent adjustments to accommodate maxillary growth. Monthly follow-ups and minor modifications using soft acrylic are required to ensure proper fit and function [30,31]. Parental adherence to hygiene protocols is also critical, as improper maintenance may lead to oral infections or mucosal irritation [34]. Comprehensive parental education on feeding plate care, reinforced during follow-up visits, helps mitigate these risks [63]. Although feeding plates serve as a temporary solution, most infants with PRS require palatoplasty to restore oral function [5,16]. Close monitoring of growth, feeding ability, and airway stability is essential in determining the optimal timing for surgical intervention [64].

Several case reports on PRS have demonstrated the effectiveness of feeding plates in improving both feeding and airway stability [34,65]. However, limited literature discussed cases complicated by severe respiratory infections, such as bilateral pneumonia or congenital tuberculosis [65]. Wiechers *et al.* reported significant improvements in feeding and airway stability in PRS infants using feeding plates, but their study did not include cases with systemic infections [66]. Similarly, Abbas *et al.* compared feeding plates with MDO and found MDO to be more effective in reducing airway obstruction [20]. However, MDO carries surgical risks, making non-invasive feeding plate adaptation the preferred initial treatment for medically fragile neonates [18].

This case highlights the complexity of PRS management, particularly in infants with severe respiratory infections. The customized feeding plate effectively mitigated feeding difficulties and airway obstruction, reducing aspiration episodes and promoting weight gain [6,19,40]. A multidisciplinary approach was essential for ensuring safe impression-taking, feeding plate adaptation, and airway stability [10,33]. Comparisons with previous reports indicate that feeding plates remain a viable first-line intervention, particularly in medically fragile infants for whom surgical options pose significant risks [21,34,65].

PRS management requires an individualized approach, considering factors such as systemic infections, parental compliance, and long-term treatment planning. In this case, a multidisciplinary strategy ensured patient safety during impression-taking and feeding plate insertion [21]. The feeding plate, a non-invasive intervention, improved feeding and breathing, reducing the need for early surgical intervention [65]. Comprehensive parental counseling facilitated effective home management, while the use of locally available materials demonstrated feasibility in resource-limited settings.

However, several limitations were identified in this case report. This case report was based on a single case, limiting the generalizability of findings to other PRS patients. Additionally, the study provided only a short-term evaluation of the feeding plate's effectiveness without assessing long-term outcomes, such as its impact on growth, development, or surgical readiness. Reliance on parental feedback introduced potential bias due to the absence of standardized objective

measures. Future case reports should incorporate extended follow-up periods to evaluate the long-term efficacy of feeding plates in PRS infants. Comprehensive documentation of weight gain, nutritional status, respiratory function, and oral development over time would provide a more robust assessment of outcomes. Comparative studies on different impression-taking techniques, materials, and feeding plate modifications would help identify the safest and most effective approach.

Conclusion

This case highlights the feasibility and benefits of feeding plate adaptation in the management of PRS, even in the presence of severe respiratory infections. A non-invasive feeding plate can serve as an initial intervention before surgical correction, particularly in fragile neonates. PRS management requires an individualized, multidisciplinary approach, with careful planning of impression-taking procedures in infants with compromised airways. Continuous monitoring by a pediatric specialist was essential to ensure patient safety and minimize respiratory complications. The successful impression-taking enabled the fabrication of a modified Hotz-Kogo feeding plate, which improved feeding efficiency, respiratory function, and nutritional status. The patient had a weight increase from 2,200 g to 3,100 g within one month, a significant reduction in choking episodes, and a transition from orogastric tube to bottle feeding. Additionally, parents reported increased confidence, alleviating concerns regarding aspiration. While feeding plates offer substantial benefits, their effectiveness in cases complicated by systemic conditions requires further investigation. Larger, controlled studies with extended follow-up are needed to assess their long-term impact on oro-facial development and optimal surgical timing. Although a feeding plate serves as a non-invasive intervention for PRS with cleft palate, treatment should be tailored to each patient's clinical condition.

Ethics approval

The patient's parents have provided written informed consent for the publication of this case report, including relevant clinical details and images.

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Competing interests

All the authors declare that there are no conflicts of interest.

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Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

Declaration of artificial intelligence use

This study used artificial intelligence (AI) tool and methodology of which AI-based language model ChatGPT was employed in the language refinement (improving grammar, sentence structure, and readability of the manuscript). We confirm that all AI-assisted processes were critically reviewed by the authors to ensure the integrity and reliability of the results. The final decisions and interpretations presented in this article were solely made by the authors.

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