Postsurgical use of prosthetic palatal appliances. Two case reports.

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Patients with cleft lip or palate encounter a myriad of difficulties in their early years of life, some of which begin at birth. The defect often impairs suckling and deglutition in the neonate. It can hinder appropriate speech development and may impose undue social and psychological stresses. Surgical and orthodontic interventions are essential and prosthetic palatal appliances play an important role not only throughout the patient's treatment course, but also in the treatment of unfavorable surgical sequelae.

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INTRODUCTION

Cleft lip and palate are among the most common birth defects and are strongly related with a chronic disability from birth to the end of the second decade of life. Impaired suckling and deglutition in the neonate creating feeding difficulties, delayed and impaired speech development, medical and dental health problems, and psychosocial adjustments are maladjustments associated with these congenital malformations.[1-4] Multidisciplinary management and team approach are important in order to establish quality of life for the patients and their families. The multidisciplinary treatment team consists of an audiologist, a geneticist, an oral and maxillofacial surgeon, a plastic surgeon, an otorynolaryngologist, a pediatrician, an orthodontist, a pediatric dentist, a maxillofacial prosthodontist, a psychologist, a speech pathologist, a social worker, and a nurse coordinator. The roles of each team member are essential in providing the most accurate diagnosis and follow-up care for the patient and the family.

The treatment goals in repairing a cleft palate are to restore the barrier between the oral and nasal cavities and to rehabilitate the velopharyngeal function. Prosthetic palatal appliances have long been used in the rehabilitation of cleft palate defects. The first obturation of a cleft palate was done by Demosthenes (384-323 B.C).[5] Bien suggested that the great Greek orator used moderately sized pebbles to fill his palatal defect and improve his speech. Hollerius, Petronius, and Pare[5] in the 16th century described prostheses for obturation of palatal defects using sponges, wax, and silver as well as more modern materials and techniques. Snell, Stearn, Kingsley, and Suerson[5] in the 19th century described more current prosthetic designs. However, due to the increased knowledge in craniofacial growth and development and improved surgical and orthodontic treatment, the role of the maxillofacial prosthodontist in the management of patients with cleft palate has changed in the past 40 years.[6] Fixed prostheses utilizing the advances of implant dentistry are most commonly used as the definitive prosthetic rehabilitation following successful surgical interventions and orthodontic treatment.[7] Nevertheless, removable prostheses contribute significantly throughout the patients treatment course, are used presurgically in preparing the surgical site and enhancing the surgical outcome, and play a key

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role in restoring postsurgical functional and anatomical deficiencies.

Although plastic surgery has made great advances in the area of cleft palate surgery, surgical repair alone often cannot overcome the multiple problems associated with the cleft palate. Satisfactory surgical results depend on cleft type, technique used for repair, the experience of the surgeon, and the timing of the repair.[8] Extensive knowledge of the nasal and oral anatomy, scar formation, and facial development is mandatory for a favorable surgical outcome.[8] Following palatal repair surgical procedures, patients with clefts may experience chronic fistula formation refractive to surgical treatment. A palatal obturator can be used to cover the opening and restore the residual oronasal communication. The prosthesis eliminates hypernasality and prevents nasal regurgitation of food during chewing and swallowing. Palatoplasties and pharyngeal flaps are usually employed in order to correct problems associated with velopharyngeal inadequacy (VPI),[8,9] which results from the soft palate being too short (velopharyngeal insufficiency) or too weak (velopharyngeal incompetence) to occlude the nasopharynx during speech or swallowing.[10] If the surgical correction is not successful or a nonsurgical approach is used, a palatal appliance can be used to mitigate VPI symptoms. A palatal lift/pharyngeal obturator prosthesis is used as a definitive treatment option in order to recontour the oral cavity and alleviate speech and swallowing.

In the following section two clinical cases which illustrate the prosthetic rehabilitation of post surgical oronasal fistulation and velopharyngeal inadequacy are presented.

CLINICAL REPORT 1

A 3-year-old girl was referred to the Dental Oncology and Maxillofacial Prosthodontics Clinic, at The University of Texas M. D. Anderson Cancer Center (MDACC), for prosthetic rehabilitation. The patient presented with problems in speech and swallowing caused by oral-nasal fistula associated with cleft palate. The history of the present illness revealed four sequenced reconstructive surgeries to repair the cleft palate at The Texas Children's Hospital. At presentation to MDACC she had a remaining 2x2-cm palatal fistula that communicated with her nasal and maxillary sinus cavities. (Figure 1)

Other than the palatal defect, her medical history was unremarkable and negative for allergies or medications. Her radiographic evaluation (panoramic radiograph) revealed that she was at the primary dentition stage. No other lesions were noted. Oral examination indicated that her teeth were in good condition and her oral hygiene was above average. Upon examination her temporomandibular joint and her oral opening appeared to be within normal limits for a pediatric patient. There was no alveolar or lip clefting.

Figure1. Intraoral view of the palatal defect.

The treatment plan included fabrication of an obturator prosthesis with minimal extension inside the cleft/defect area which would improve her speech and swallowing, thereby preventing impaction of food and liquids into her nasal and maxillary sinus cavities. By covering the palatal opening, the prosthesis would contribute to speech intelligibility, eliminating hypernasality and compromised articulation, since it would not allow undesirable nasal-air emission. An impression of the maxillary arch and the palatal defect was made using polyvinylsiloxane impression material (Take 1; Kerr Corp., Orange, CA) with the heavy body-light body combination technique[11] Because of her minimal mouth opening a custom tray was fabricated using autopolymerizing acrylic resin (Truliner; Harry J. Bosworth Co., Skokie, IL). Two stainless steel ball clasps were added across the embrasures between her primary molars on each side for increased retention and an obturator prosthesis was fabricated using heat-cured acrylic resin material (Figures 2,3). Pressure-indicating paste (PIP; Kerr Corp.) was used to evaluate the adaptation of the prosthesis. Care was taken that the obturator portion of the prosthesis did not apply excessive pressure to the defect area, permitting appositional growth at the cleft margins. Maintenance, aspiration precautions and oral hygiene instructions were given to

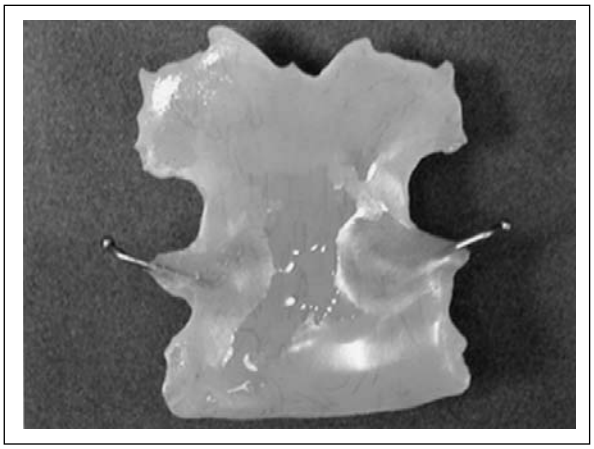

Figure 2. Cameo surface of the definitive obturator prosthesis.

Figure 3. Intaglio surface of the definitive obturator prosthesis.

the parents. Postinsertion adjustments were done at several follow-up appointments. Despite her young age, the girl appeared to acclimate to the prosthesis well. The parents noticed a significant difference in the patient's speech quality after the hypernasality was eliminated, and they mentioned that she was able to eat and swallow more efficiently. The patient was scheduled to return to the clinic 6 months after the prosthesis was placed for a follow-up examination and adjustments of the device as needed due to her expected growth.

CLINICAL REPORT 2

A 5-year-old girl was referred to the Dental Oncology and Maxillofacial Prosthodontics Clinic, at MDACC for prosthetic rehabilitation. The patient presented with severe speech and swallowing deficits secondary to VPI associated with cleft palate. The history of her illness included 6 reconstructive plastic surgeries related to lip, palate, and nasal deformity repair. A pharyngeal flap was placed in 2000 to eliminate the VPI and hypernasal resonance but was removed in 2003 due to sleep apnea.

The girl's medical history was significant for heart murmur and epileptic seizures that had been controlled with valproic acid (10 mg/kg/day by mouth). Her radiographic evaluation with a panoramic radiograph revealed a mixed dentition stage. No other pathologic lesions were noted. Aside from the palatal anomaly, oral examination revealed teeth in good condition and acceptable oral hygiene. Upon head and neck examination, her temporomandibular joint and her oral opening appeared to be within normal limits for a pediatric patient. This patient had alveolar and lip clefting. The soft palate was insufficient and incompetent, and she had minimal pharyngeal wall movement (Figure 4).

The treatment plan included the fabrication and placement of a palatal lift/pharyngeal obturator prosthesis to improve her speech and swallowing. Because of the removal of the pharyngeal flap, the soft palate appeared too short (insufficient) to make contact with

Figure 4. Intraoral view of the patient's hard and soft palate.

the pharyngeal walls during function and also of inadequate mobility to elevate and achieve velopharyngeal closure. As a result, there was excessive nasal airflow and inadequate intraoral pressure for proper speech and articulation. The prosthesis was considered to elevate and extend the soft palate to the proper position to achieve closure. It would stabilize the velopharyngeal sphincter function and increase muscle adaptation. An impression of the maxillary arch and the palatal defect was made using polyvinylsiloxane impression material (Take 1) with the heavy body-light body combination technique[11] using an autopolymerizing acrylic resin custom tray (Truliner). Because of her minimal mouth opening two stainless steel wrought-wire clasps were positioned at her permanent molars for retention. Tooth retention was enhanced by making retentive suprabulge areas using acid-etched resin composite build-up material. The palatal portion of the prosthesis was fabricated using a conventional prosthetic tech-

Figure 5. Wax-up of the palatal portion of the prosthesis.

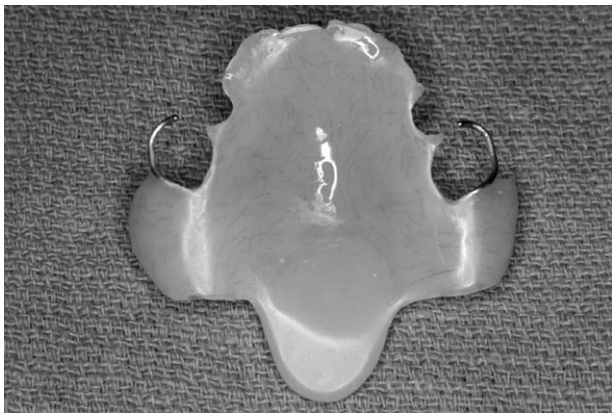

Figure 6. Cameo surface of the definitive palatal lift/obturator prosthesis.

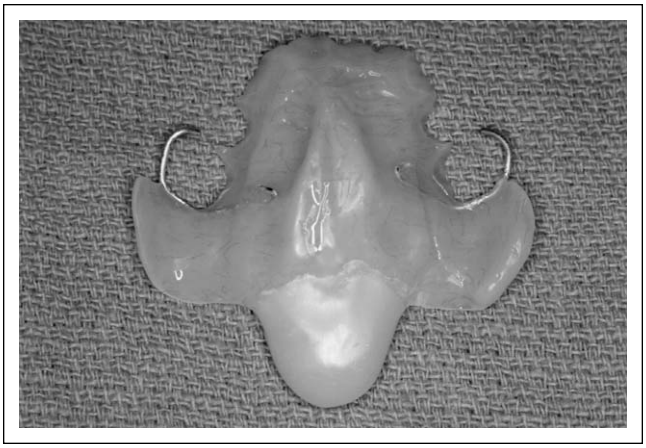

Figure 7. Intaglio surface of the definitive palatal lift/obturator prosthesis.

nique with heat-cured acrylic resin (Figure 5), and interim soft reline material (Trusoft; Harry J. Bosworth Co.) was used to make an impression of the pharyngeal area. For the impression molding, the patient was instructed to rotate her head and neck side-to-side, lower the chin toward the chest, and extend the head backward. This would trace the lateral and posterior pharyngeal area and would allow adequate build-up of the prosthesis for proper contact and velopharyngeal closure. Maintenance and oral hygiene instructions were given to the parents. Postinsertion adjustments were done at several follow-up appointments, and as soon as appropriate extension of the posterior portion of the prosthesis was achieved, this was rebased using heat-cured acrylic resin (Figures 6,7). The patient tolerated the prosthesis well and was scheduled to return to the clinic 6 months after the prosthesis was placed for adjustments and modifications as needed.

CONCLUSIONS

Prosthetic appliances play a key role in the treatment of patients with cleft palate by restoring normal speech and swallowing and by preparing the patient for successful surgical procedures. In addition, palatal obturator and palatal lift/pharyngeal obturator prostheses are used as definitive treatment options in cases in which oral-nasal fistulation or VPI occurs as a consequence of surgery.

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