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Prosthodontic Rehabilitation of the Adult Cleft Palate Patient: A Case Report

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ABSTRACT

Clefts result from incomplete development of the lip and/or palate. They are sometimes isolated to cleft lip or cleft palate or a combination of the two. The causes of clefting have ranged from congenital abnormalities and facial deformity syndromes to genetics and teratogenic factors. The cleft lip or palate patient will typically have to endure various oral and plastic surgeries, dental treatment, and may even have to suffer through psychological management with in their life span. The adult cleft palate patient often has to tolerate feeding dilemmas, social/psychological problems, ear infections with possible hearing loss, dental problems, and delayed speech and language. Fortunately, there are a few current methods to prosthodontically rehabilitate the adult cleft palate. Overdentures

with gold alloy copings, removable dentures, and the use of implants have been widely used in the past. In this paper two different designs for overdentures were used to treat two different adult cleft palate patients. The designs for the two patients encompassed utilization of complete maxillary overdenture frameworks with attachments for retention based upon overdenture castings. One method had splinted copings and intra-coronal attachments and the other had mainly an anterior clip-bar, single unit copings and overcopings. Both methods provided functional prostheses that could serve the individual needs of their cleft palates.

INTRODUCTION

History of Cleft Lip and Palate

Cleft lip and cleft palate are congenital abnormalities of the lip and mouth. Clefts result from incomplete development of the lip and/or palate in the early few weeks of pregnancy. During this time, the face is being formed; the top and the two sides develop at the same time and grow towards each other, finally fusing in the middle. The lip and primary palate develop at 4 to 6 weeks of gestation, while the secondary palate develops at approximately nine weeks¹. Primary palate clefts are a result of failed infiltration of mesodermal tissue in between the space of the medial and nasal maxillary processes which lead to incomplete merger of the processes. Secondary palate clefts are a result of incomplete fusion of the two palatine shelves¹. Clefts have also been associated from embryological facial deformity syndromes². The cleft lip or palate patient will have to undergo series of surgeries, dental treatment, an possibly psychological treatment with in their lifetime¹. This treatment involves a multidisciplinary team including specialists in prosthodontics.

Epidemiology of Cleft Lip and Palate

In the United States, about 1 in 600 to 1000 babies are born with cleft lip or cleft palate. There, however, can be seen varied research reports on the incidence of cleft throughout the world. Many figures are based on voluntary data and not proper record keeping throughout the world. In the United States, the incidences of cleft lip/palate are categorized according to race³. On one end of the spectrum, Asians have an incidence of 1.7 per 1000 births and African Americans have an incidence of 1 per 2500 births. Isolated cleft palate risks seem to be similar across all racial groups. The incidence of cleft palate alone is about 1 in 2000 births³. Males are affected 3:2 compared to females¹.

Combined cleft lip and palate represents approximately half of incidents, cleft palate alone approximately a third of incidents, and cleft lip alone approximately a fifth of incidents². Greater than seventy percent of babies born with cleft lip will also have cleft palate². Less than ten percent of cleft lips are bilateral.

Etiology of Cleft Lip/Palate

The causes of clefting are thought to be multifactorial. Genes may play a roll and the chances of developing a cleft seem to increase with an increase in family members affected². Dietary factors may also be contributory. Folic acid and B vitamins are important in fetal development of neural tubes. Medications and chemical toxins can cause depletion of folic acid. Birth control medications have been shown to deplete women's folic acid, along with Dilantin, some anti-seizure medications, and methotrexate (which are used for the treatment of cancer, arthritis, and psoriasis, found in some insecticides and RU-486). High levels of Vitamin A and medications that increase Vitamin A such as Accutane or Retin-A can increase the risk of developing clefts. Drinking heavily during pregnancy increases the risk of Fetal Alcohol Syndrome, which can include clefting. Use of PCP and other hallucinogenic drugs during pregnancy may also have an increased risk of cleft lip or palate. A gene in some individuals causing cleft palate when exposed to cigarette smoke is also a possibility still being researched². Cleft palate and lip are manifested from Van der Woude syndrome. About two percent of the patients with cleft palate and lip have this syndrome. Research is currently being done to isolate the gene RF6 which when malfunctioning has been speculated in abnormal formation of genitalia, skin, palate, and lips⁴. A genetic counselor consultation may be a necessary step in treatment of the cleft palate patient.

Prosthodontic Treatment Methods and Considerations

Problems associated with cleft lip and palate include: feeding difficulties, ear infections and hearing loss, speech and language delay, dental problems, and social/psychological effects⁵. Missing teeth and typically class III malocclusion, as well as nasal deformities are often present¹. The maxilla is underdeveloped due to a variety of causes which may include lack of blood supply. Infants with cleft palate may have difficulty sucking properly when breast or bottle feeding due to the malformed roof of the mouth. Food may also get trapped into the nasal cavity, which would complicate swallowing or chewing. Due to the opening in the palate, some sounds may project as unintelligible. Speech may be delayed or unusual. Children with cleft palates tend to have a high caries index, ectopically erupted, and supernumerary teeth⁶. Family members, parents, friends, and the child may have a difficult time adjusting to the esthetic facial defects connected with cleft palate and/or cleft lip⁷. There may be dramatic repercussions on the person’s self esteem and regular psychosocial development⁷.

There are currently few methods for treating the adult cleft palate. These range from overdentures with gold alloy copings to conventional fixed partial dentures. Unprepared natural teeth

may also be utilized to retain overdentures. Removable dentures have also been used to treat the adult cleft palate, as well as cast framework partial dentures. Gold coping overlay removable partial dentures have also been employed successfully for adults with cleft palate⁸. Implants might also be utilized in the totally or partially edentulous patient; however, the compromised vascularity plus the unusual lack of available bone in the strategic area of the maxilla may effect the prognosis of the implants. The prosthodontist plays a key role in helping maintain anatomical structures, tooth positioning, maxillary arch stabilization, speech and esthetics⁵.

CLINICAL REPORT

Patient (A), a fifty-eight year old male, was referred to the Division of Prosthodontics Maxillofacial Prosthetic Center at Columbia-Presbyterian Medical Center from the Center for Craniofacial Reconstruction and Rehabilitation at Columbia Presbyterian Medical Center.

Patient (A) History and Evaluation

The patient was diagnosed with bilateral cleft lip and palate. The patient was concerned about his remaining maxillary dentition and his maxillary prosthesis, which lacked retention and stability

Patient A

<p>Intra-Oral Exam Missing pre-maxilla, V-shaped maxilla and a bilateral crossbite Multiple cariously involved and non-restorable teeth Generalized moderate to severe plaque and calculus</p> <p>Dental History Lip repair Palate repair including removal of pre-maxilla Orthodontic treatment Pharyngeal flap procedure</p>	<p>Medical History Hypertension</p> <p>Current Medications Norvasc</p> <p>Allergies No known drug allergies or patient denies</p>
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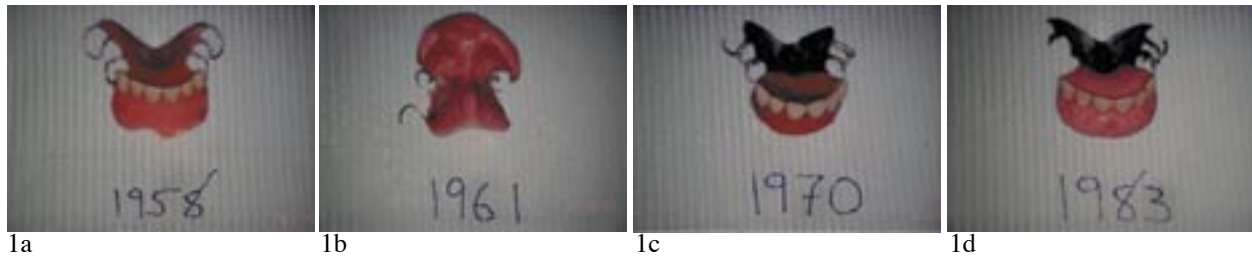


Figure 1 Patient (A) Maxillary Prostheses

1a. 1958 Max RPD, 1b. 1961 Max RPD, 1c. 1970 Max RPD, 1d. 1983 Max RPD, 1e. Patient's collection container brought for initial visit containing all his maxillary prostheses

(Figure 1e). The patient also admitted to being very concerned with his speech quality, which was borderline intelligible with hypernasality.

and hard tissue, tooth contour and reconstruction of the anterior maxilla. The prosthesis was unstable, non-retentive, and poorly fitting. The patient's oral cavity contained several cariously involved, non-restorable teeth.

Patient (B) History and Evaluation

The initial stage for the long road to rehabilitation for the patient began at Columbia Presbyterian Medical Center where he underwent lip repair in 1943. Palate repair was done in 1948, which included removal of the pre-maxilla. In 1958, the patient underwent orthodontic treatment, and in, 1969, a pharyngeal flap procedure was done on the patient. A few other revisionary surgical procedures were also achieved. The patient was wearing a maxillary removable partial denture prosthesis that restored both soft

Patient (B), a thirty-nine year old male, was referred to the Division of Prosthodontics Maxillofacial Prosthetic Center at Columbia-Presbyterian Medical Center from an oral and maxillofacial surgeon. The patient had a repaired midline cleft lip and palate. The oral surgeon assessed that surgical closure of the defect would not significantly enhance function, would pose an unnecessary risk, and therefore, was not recommended. The patient was then referred to the prosthodontist for a new prosthe-

Patient B

<p>Intra-Oral Exam Missing pre-maxilla, V-shaped maxilla and a bilateral crossbite Multiple recurrent decayed crowned teeth Generalized moderate to severe plaque and calculus</p> <p>Dental History Lip repair Palate repair including removal of pre-maxilla Several Prostheses Nasal Reconstruction</p>	<p>Medical History Asthma Arthritis-Inflammatory in feet Ulcerative Colitis(1990)</p> <p>Current Medications none</p> <p>Allergies Nausea from Codeine Pollen</p>
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2a



2b

Figure 2 Patient (A) 2a. Pre-treatment maxillary diagnostic cast: anterior view after mounted on a semi-adjustable articulator utilizing a face bow transfer, 2b. Pretreatment maxillary diagnostic cast- occlusal view.

sis. The patient was concerned with oral nasal reflux, the diminishing function of his current prosthesis, and the possibility of repairing or making a new prosthesis.

The patient presented with teeth #2, 3, 4, 14, and 15 crowned and there was recurrent decay associated with all five of these crowns. Teeth #6, 11, and 12 were natural teeth overdentures that had been treated with silver nitrate (when the patient was an adolescent) to prevent tooth decay. Teeth #6, 11, & 12 served as natural

tooth overdenture abutments. The patient was believed to have had lip repair surgery at age six months and palate repair surgery at age eighteen months as ascertained by the patient's parents. He has since had numerous lip and palate revisions including nasal reconstruction and gone through several prostheses since age fifteen. The patient had lost or decreased occlusal dimension. There was also rampant marginal decay with the existing copings. Most of the surgical procedures were performed at Columbia-Presbyterian Medical Center. He has a retruded maxilla and severe class III malocclusion. The patient was wearing a maxillary over-denture type prosthesis that also served as an obturator.

REHABILITATIVE PROCEDURES

In both patient treatments a prosthodontist performed the comprehensive diagnosis treatment planning, and the patient was seen at Columbia Eastside dental faculty practice. The data collection included an intra-oral exam, charting of teeth and existing restorations and preliminary impressions for diagnostic casts. The patients were referred to periodontists for assessment of their periodontal status and to address hygiene. Utilizing a face bow transfer, the diagnostic casts were mounted on semi-adjustable articulators for analysis.

After the periodontal evaluations performed by periodontists, it was decided that the best treatment for patient (A) was to perform pocket tissue reduction periodontal surgery involving all four quadrants. This was indicated due to the hypertrophy of the gingiva from medication and for an overall improvement and future management of oral hygiene. The periodontal procedure also enhanced the fixed prosthodontic results by providing more accessible margins. All remaining teeth in the maxilla that were periodontally compromised or carious and

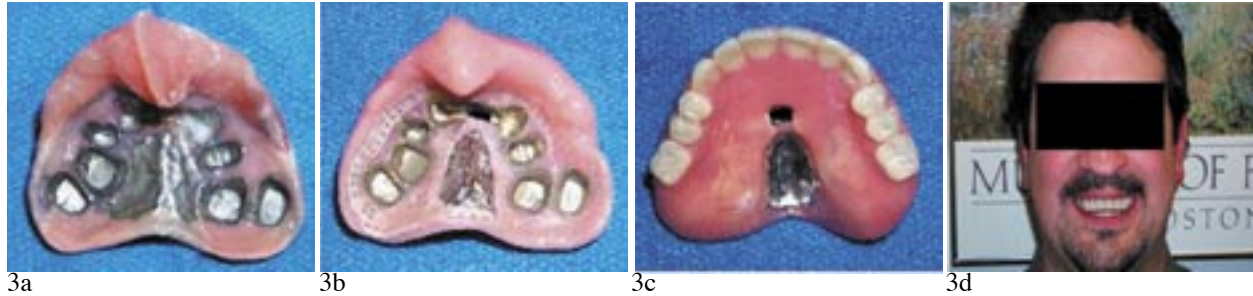


Figure 3 Patient (B) 3a. Tissue surface of the telescopic overdenture with the clip inserted to aid in retention by engaging in the anterior bar (#6-11), 3b. Tissue surface reveals that the telescopic copings were soldered to the chrome–cobalt framework to aid in retention, 3c. Polished and occlusal view of the final prosthesis, 3d. Facial view of the patient post-treatment.

non-restorable were to be extracted. It was determined that the best treatment for patient (B) was to perform crown lengthening surgery on all ten remaining crowned teeth due to the lack of biological width and subsequent gingivectomies to remove hyperplastic gingiva engulfing these teeth. Upon completion of the periodontal surgeries and standard healing time of six weeks, the prosthodontic treatments began.

After careful data collection and consultation with the periodontists the decision was made to utilize new prostheses designs. The designs encompassed utilization of complete maxillary overdentures that used friction and spring-locks for retention, clip–bar plus parallel, telescopic copings based upon overdenture castings. Patient (A) would receive a maxillary overdenture with splinted (type III gold) cast copings and patient (B) would receive single unit (silver/palladium alloy) telescopic cast overcopings soldered directly to a (chrome/cobalt alloy) obturator framework and an anterior clip–bar utilizing teeth #6 and #11 as abutments. All remaining natural teeth for patient (B) would be crowned with cast copings.

On patient (A), teeth # 3-4-5 and teeth # 12-13 were prepared for overdenture castings. On patient (B), teeth #2,3,4,6,11,12,14 and 15 were prepared for overdenture castings. The teeth were prepared, provisionals were made, and

working cast impressions were taken. The castings (made of a Type III Gold Alloy) were tried in as one-piece castings being splinted together for patient (A). A solder index was obtained and the castings were splinted on only teeth #6 and #11 for patient (B). On patient (B) #6 and #11 were splinted with a bar for clip–bar retention. The crown fit was verified clinically and radiographically with successful results. The patients’ vertical dimensions at rest as well as the vertical dimensions of occlusion were obtained using record bases and wax rims following standard procedures for occlusal vertical dimension and horizontal maxillo-mandibular records. The shade and mould of teeth were selected. The maxillary dentures were tried in with wax to verify their esthetics, phonetics,



Figure 4 Patient (B) Occlusal view of 6 single copings and anterior bar clip. Single copings reveal parallel walls to aid in retention.

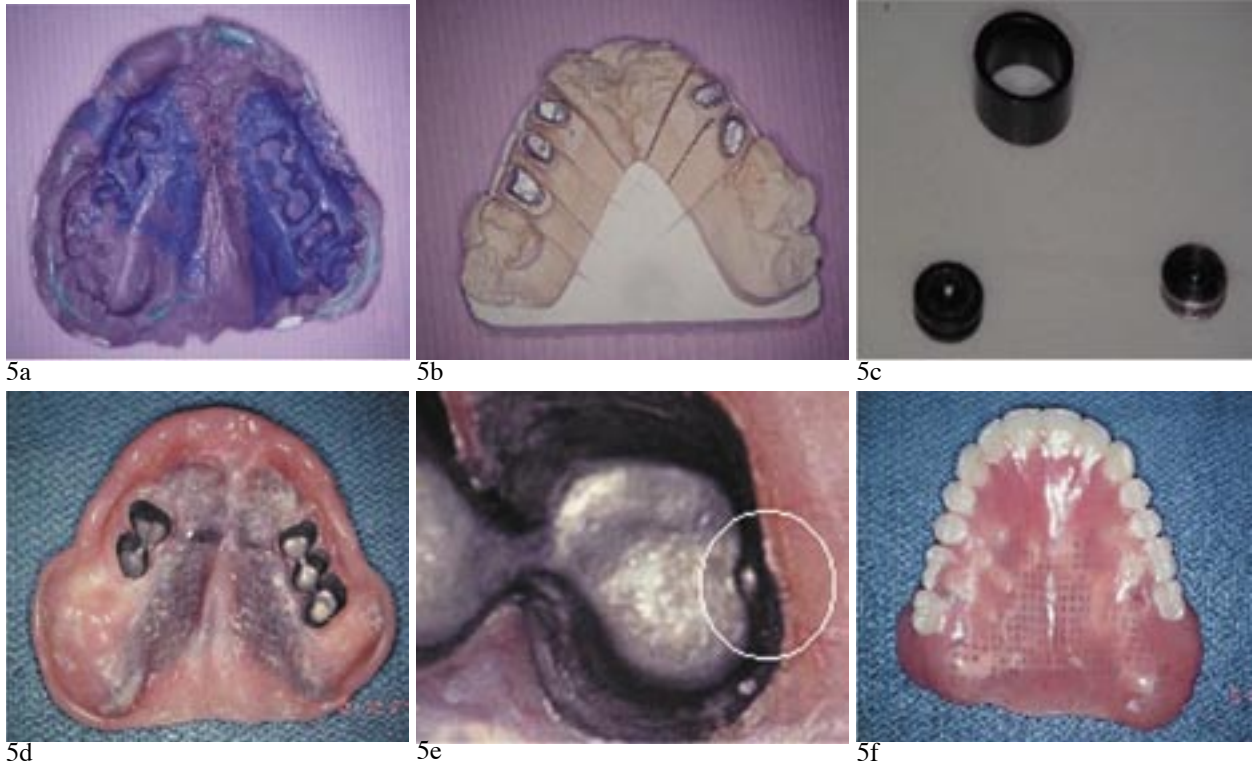


Figure 5 Close-up view of Housing for Patient (A) 5a. Maxillary final impression made with custom tray and polyether impression material, 5b. Maxillary master cast with ditched dies, prior to wax-up of gold cast copings, 5c. Hannes Anchor attachments used to provide additional retention, 5d. Tissue surface of completed telescopic overdenture, 5e. Close-up view of tissue surface of prosthesis containing metal housing for telescopic copings (notice on distal of metal housing where intra-coronal attachments engage by spring loading into dimple of casting), 5f. Polished occlusal surface of the final prosthesis.

and occlusions. A trial arrangement was also accomplished to assist with precise polished surface contours of the defining prosthesis to allow for proper positioning of the prosthetic teeth for a better esthetic result.

During the trial arrangement appointment, both patients noticed a significant improvement in speech. Patient (A) verified the change in speech by tape recording his voice and phoning his wife, who did not recognize his voice! Patient (B) was a regionally recognized singer that had noted improvement in his voice projection and voice quality. Both patients were extremely satisfied with the prosthesis try-in and upgraded phonetics and gave a resounding acceptance of the trial arrangement. At the next visit, the non-restorable teeth of patient (A) were extracted. After an adequate amount of healing time of six

weeks due to the large extraction sites, the gold castings were permanently cemented into place on patient (A). The prostheses for both patients were eventually tried in and delivered. Both prostheses were stable and retentive, which the patients noticed. Immediately, the patients noticed a remarkable improvement in speech.

Several post-operative adjustments were made to relieve sore-spots as well as to adjust and modify occlusion. Both patients were placed on recall every 4 months for maintenance and hygiene. The patients were given oral hygiene and home care instructions. These patients demonstrated an increase in oral hygiene. Patients who undergo this treatment must be placed on daily topical fluoride and a fluoride mouth rinse of neutral pH fluoride application. The dentures themselves can serve as the fluoride trays.

DISCUSSION

Prosthodontists are often involved in the rehabilitation of adult cleft palate patients with reduced horizontal development and reduced vertical development of the maxilla. These patients often require removable prosthesis and the presence of abutment teeth aid in retention. The designs encompassed with these two patients encompassed utilization of complete maxillary overdenture frameworks with precision attachments for retention based upon overdenture castings. One method had splinted copings and the other had mainly single unit copings and overcopings. Both methods provided functional prostheses that could serve patients with adult cleft palates. These new and innovative design principles are individualized for each particular patient's needs, but can also be extrapolated for utilization of more than just cleft palates. The designs also addressed and aided in relieving some of the problems associated with adult cleft palate such as speech, dental problems, and social/psychological effects. An improvement in an adult cleft palate patient's quality of life can be accomplished through the use of dental prosthesis.

SUMMARY

Cleft plate treatment for the adult cleft palate patient requires a team approach. Careful treatment planning, cooperation between various

dental specialties, and consultation with a patient's physician is crucial for successful results in treating a cleft palate patient. A complete maxillary overdenture prosthesis was made for two adult cleft palate patients. Appropriate referrals, data collection, and innovative careful treatment planning were all essential elements for the successful outcome. These complex prosthodontic case rehabilitations illustrated the role of the prosthodontist in providing fixed and removable prosthodontic care for special need adult cleft palate patients. The patient care also fulfilled the goals and expectations of the prosthodontists: the elimination of disease, the restoration of function, and comfort in an esthetically pleasing manner. The prosthodontic care improved the quality of life for these adult cleft palate patients.

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Figure 6 Patient (A) post-treatment 6a. Maxillary occlusal view of five soldered gold metal copings cemented into place, 6b. Facial view of maxillary prosthesis in maximum intercuspation, 6c. Left-side maximum intercuspation.

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