Case report

Palatal Drop Augmentation and Tongue Prostheses: A Case Report

Dr. Nafij Bin Jamayet
BDS, Graduate Diploma,
MPH, MSc Resident Doctor
Maxillofacial Prosthetic Service
Faculty of Dentistry, Mahidol University
Bangkok, Thailand

Dr. Sumaiya Zabin Eusuf Zai
BDS, MPH
Lecturer
Department of Public Health
Faculty of Allied Health Science
Daffodil International University, Dhaka

Dr. Sharafat Hossain
BDS,MSc
Assistant Professor
Department of Prosthodontics
University Dental College,Dhaka

Sheikh Mohammad Alif
BDS, MPH, MRSPH(UK)
Senior Lecturer
Department of Public Health
Northern University Bangladesh, Dhaka

Correspondence to:
Dr. Nafij Bin Jamayet
BDS, Graduate Diploma, MPH,
MSc Resident Doctor
Maxillofacial Prosthetic Service
Faculty of Dentistry, Mahidol University
6 Yothi Road, Rajvithi Bangkok, 10400 Thailand
Cell Num: 01912117611, 01712262759 [Dhaka]
E-mail: dr.nafij@gmail.com

Abstract:

Background: After a total glossectomy, one lost the ability to speak and swallow due to the loss of tongue mobility and the increase of space between the palate and tongue remnants. To improve swallowing by creating negative pressure, tongue and palatal drop prostheses can be utilized. This prosthesis does not restore other tongue functions such as mastication, speech articulation and resonance because the prosthesis cannot reproduce natural tongue movements.

Purpose: To rehabilitate the tongue deformity due to the gun shot wound.

Methods and Materials: The case report revealed the total lost of tongue of a Bangladeshi patient who cannot be able to swallow and speak. The remaining teeth still fully intact but the palatal drop and tongue prosthesis was fabricated with the silicone prosthesis.

Results: Both palatal drop prosthesis and tongue prosthesis allowed the patient to increase the capacity to swallow and reduce the remaining odondus space. The speech appeared to be more intelligiable but cannot fully restore.

Conclusion: The quality of life of a patient after post operative follow-up appeared to be better; however, the physiologic function of the missing organ cannot fully restored.

Key words: Palatal drop augmentation, tongue prosthesis.

Introduction:

Tongue assists the oral function to process mastication, deglutination and speech. Mastication aids by directly crushing the food against the rugae of the hard palate. The muscles of the cheek and tongue control the food bolus by repositioning it onto the occlusal surfaces after each chewing stroke.[1] After that, saliva mixes into the bolus. Sensory nerve endings in the tongue help distinguish the texture and consistency of the food. When the bolus is ready for swallowing, the tongue helps in debridement of food in the buccal vestibule and the floor of the mouth.

Swallowing is composed of three stages: oral, pharyngeal and esophageal. The oral phase is under voluntary neuromuscular control and the later two phases are under involuntary neuromuscular control.[2]

During the oral phase of deglutition, the tongue gathers food into a bolus and positions the bolus between the dorsum of the tongue and the hard palate. As the middle tongue and palate contacts, the soft palate elevates in combination with the lateral and posterior pharyngeal walls forming a closed seal between the oral and nasal cavity. Thus for deglutition, the anterior two thirds of the tongue is critical at the initial phase of deglutition, while the posterior one third plays an important role in generating negative pressure to push the bolus of food down the alimentary canal.[3]

In the subsequent pharyngeal stage, as the bolus moves inferiorly from the base of the tongue, continual palatopharyngeal closure prevents food from the entering the nasopharynx.

Next, elevation of the larynx towards the base of the tongue is accomplished by the suprahyoid musculature. This is followed by closure of the larynx by inferoposterior rotation of the epiglottis. This is a laryngopharyngeal protective mechanism to prevent aspiration during swallowing. A finite period of apnea must necessarily take place with each swallow. Relating deglutition to respiration, deglutition most often occurs during expiration and includes a period of apnea ranging from 0.3- 2.5 seconds.[4]

The oral and pharyngeal stages of swallowing are physiologically and integrally related.

The esophageal stage is under involuntary neuromuscular control whereby the esophagus connects the pharynx to the stomach, and consists of entry of the bolus of the food into lumen of esophagus. The tongue is one of the major anatomical components modulating air to create speech. The tongue shapes the oral and pharyngeal cavity for vowel production. It also restricts air flow to produce consonants such as k, g, t, d, s, and z.[2]

Consequently, the tongue is a major articulator during production of all phonemes. The basic laryngeal vibrations are modified by mobile and fixed articulators to produce phonemes.[5]

Case Report:

A 31-years old Bangladeshi male was operated at Bangkok International Hospital for gunshot trauma entering at the right side of body of the mandible and traveling through the left body of the mandible. On May 28, 2010, the patient was reconstructed with a rectus abdominus flap at Rama 9 Hospital to close the submandibular-cervical defect. After the patient healed, the patient was referred to the Maxillofacial Prosthetic Service at Mahidol University for rehabilitation with tongue and palatal drop augmentation prostheses, using Obturasil 40 (Dreve-Dentamid, Unna, Germany) and autopolymerized acrylic resin for fabrication.

Tongue Prosthesis: Impressions were made with irreversible hydrocolloid material using a maxillary edentulous tray for both maxillary and mandibular arches. For the mandibular impression, a maxillary edentulous tray was modified with soft utility wax by building up the posterior border of the tray to prevent the impression material from flowing into the pharynx.

The impression was poured in dental stone and a permanent base was made. All the undesirable undercuts were blocked out in the floor of the mouth. Self-cure acrylic resin was poured in the lower cast to form a baseplate. Next, a 20-gauge wire clasp was used for the lower premolar, #35. A 19-gauge wrought wire clasp was put on # 47, and #36 was replaced with a denture tooth. The tongue prosthesis was sculpted in wax (Fig.1) and attached to the wire clasps retained acrylic resin base plate. A trough like groove was created in the posterior middle aspect of the tongue after evaluation of speech patterns described below.

Palatal Drop Augmentation Prosthesis: Self-cure acrylic resin was poured in the upper cast to form a baseplate. A 20-gauge wire clasp was used for the upper second premolars #15 and #25. The palatal drop portion was sculpted in pink baseplate wax (Fig.2).At the wax try-in appointment esthetics, swallowing, mastication, deglutition and speech were verified.

The patient was asked to repeat the linguloalveolar sounds e, g, k for posterior palatal tracing and linguovelar sounds t and d for the anterior palatal tracing. Pressure indicating paste was used to show the areas of contact. With the tongue prosthesis in place, the patient was able to improve mastication and deglutition immediately with out any exaggerated head movements.He also experienced an immediate improvement in the resonance and quality of his voice.[6]

The wax tracing was inspected and wax adjusted to ensure passive contact with the floor of the mouth during functional movement. Areas of contact between the two prostheses were glossy indicating that contact was made.

Mold Preparation: The silicone portion of the tongue and palatal drop augmentation prosthesis were packed in two-piece flasks.Once fabrication of the lower mold was completed; several indexing keys were made in the lower mold to prevent rotation and sliding of the upper and lower halves during flasking. Before creating the upper half of the mold, clear sulfur-free separating medium was applied to simplify separation of the upper and lower molds. The flasks were soaked in warm soapy water to help loosen the halves of the flask. Warm soapy water was used during dewaxing instead of boiling water, which increases the risk of mold fracture. When the mold was still warm and moist, a thin layer of clear sulfur-free separating medium was applied to all mold surfaces.

With a brush, Epicon 5 was applied to the 1-mm margin between the acrylic resin and silicone for bonding. After that, Obturasil 40 (Fig.3) was injected in thin layers around the lower baseplate, and on the surface of the upper mold. The upper and lower molds were quickly fitted before the material set. After the prosthesis polymerized, the prostheses were deflasked from the molds (Fig. 4, 5).

Excess material was cut using special foil scissors used for the thermo forming technique. Polishing was done with Ultra trim, flexible grinding wheels for the treatment of soft material (diameter 28-mm and light, medium and heavy textures). Grinding was accomplished with round Cap Holders (diameters 4.5, 6.5, 9.5, 14-mm)

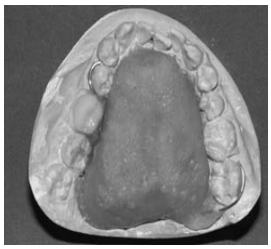

Fig. 1: Tongue prosthesis wax sculpting.

Fig. 2: Palatal drop augmentation.

Fig. 3: Obturasil 40.

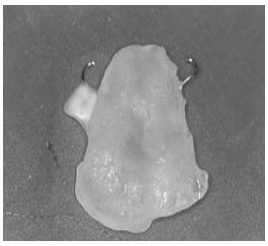

Fig. 4: Completed tongue prosthesis.

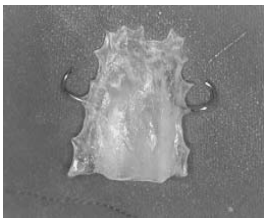

Fig. 5: Completed maxillary prosthesis.

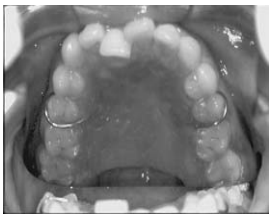

Fig. 6: Delivered palatal drop augmentation prosthesis.

Fig. 7: Delivered tongue prosthesis.

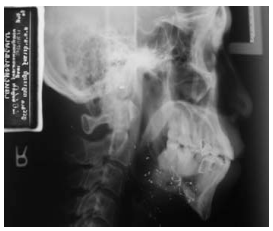

Fig. 8: Cephalometric film.

Delivery: The upper and lower prosthesis were seated on the maxilla and mandible, respectively. To reassess the patient's speech he was asked to pronounce phonemes e, g, k, t, and d. Again, the patient's ability to masticate and swallow was evaluated (Fig. 6, 7). Additionally a lateral cephalometric film was made to observe the degree of palatal augmentation and contact of the maxillary and mandibular prosthesis during closure (Fig.8).

Discussion:

Prosthetic rehabilitation of the tongue to enhance the functions of chewing, swallowing and speaking is limited.

The Space of Donders is essential for the successful function of the prostheses.7

Factors governing the success of the tongue or palatal augmentation prosthesis are as follows.1

1. Development of a surface for the residual tongue tissue to contact during speech and swallowing.
2. Reduction in the size of the oral cavity, thereby improving resonance characteristics.
3. Protection of the underlying fragile tissue.
4. Improvement of appearance and psychosocial adjustment.
5. Direction of food into the esophagus with the aid of a trough carved into the prosthetic tongue.

Oral rehabilitation of this patient with a tongue and palatal drop augmentation prosthesis alleviated difficulties with speech, mastication and deglutition. Through prosthetic management, articulation and resonance were improved. Food and beverages were more easily directed into the esophagus, tissues protection was improved and socialization was enhanced through improved appearance.

Conclusions:

It is impossible to restore the original function of the tongue either surgically or prosthetically. In patients with varying degrees of glossectomies, the capabilities of tongue movement may not be comparable from one case to another. Thus, the resulting limited functional outcome in speech and mastication of the prosthetically rehabilitated tongue defect is difficult to analyze as clinical research. However, the patient ultimately benefits from optimally created prostheses and can be ensured better function.

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