

Technique for Fabrication of Custom Tracheoesophageal Prosthesis to Reinstatement Speech: Editorial Commentary

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Abstract

Tracheoesophageal prosthesis is an exceptional treatment modality for restoration of speech in patients with total laryngectomy. This prosthesis helps to direct the tracheal air exhaled into pharynx through fistulous area created due to Tracheoesophageal Puncture (TEP). The accomplishment of voice rehabilitation treatment depends on placement of a suitable prosthesis with accurate measurements. This article documents the method for fabrication of a custom made tracheoesophageal prosthesis with medical grade silicone using conventional Prosthodontic technique.

Keywords: Tracheoesophageal prosthesis; Total laryngectomy; Speech rehabilitation; Tracheoesophageal Puncture (TEP); Pharynx

Introduction

Tracheoesophageal Puncture (TEP) followed by restoration of speech with the help of TEP prosthesis had been described by Singer and Blom as an excellent choice of treatment for voice restoration after total laryngectomy [1]. In this procedure a small opening is made in the wall between the trachea and esophagus. The tracheoesophageal prosthesis is inserted through this opening. This prosthesis is having through and through opening from tracheal end to esophageal end. Air from lung can be directed through the pharynx with the help of this opening in the prosthesis by closing off the stoma during exhalation. This redirected air will help to create vibrations during its passage through a narrowed segment of the esophagus, making speech possible for most of the patients.

Tracheoesophageal puncture is categorized as primary TEP and secondary TEP. Primary TEP is performed at the time of laryngectomy whereas secondary TEP is performed after a gap of time. Secondary TEP shows relatively lesser chances of fistula formation as well as wound infection along with 100% acquisition of fluent speech [2]. The success of voice rehabilitation treatment depends on placement of a suitable

prosthesis with precise measurements. Proper measurement of distance across puncture site will help predictable voice rehabilitation due to precision of fit of the prosthesis [3]. This article documents the procedure for fabrication of a custom made tracheoesophageal prosthesis with medical grade silicone using conventional Prosthodontic technique.

Technique

It represents a deeply recessed stoma along with the tracheoesophageal puncturesite (Figure 1).



Figure 1: Stoma showing the tracheoesophageal puncture.

- Fabricate two discs of same diameter with modeling wax after discussion with the surgeon as per instructions given by him. Fabricate a cylinder of the same wax with 4-5 mm lesser diameters. Join the discs with cylinder in such a manner that the cylinder will remain exactly in the center of the two discs (Figure 2). Get the dimensions approved by the surgeon.



Figure 2: Tracheoesophageal prosthesis in wax.

- Invest the wax pattern of the tracheoesophageal prosthesis in the lower part or drag of the conventional denture flasks with the help of dental stone. Apply separating medium when dental stone in lower part of the flask will set.
- Fit upper part of the flask i.e., copes with the lower part of the flask. Pour dental stone in upper part of the flask and close the lid of the flask. Allow dental stone to set completely.
- After the stone has set, put the flasks in the dewaxing unit and carry out dewaxing in conventional manner (**Figure 3**). Paint a coat of paraffin xylene solution after removal of the clay and allow it to dry. Solution of paraffin and xylene will act as a separating medium for silicone.



Figure 3: Flask after dewaxing.

- Cut the suitable quantity of High Temperature Vulcanizing (HTV) medical grade silicone material MDX 4-4515 which is available in slab form. Place small pieces of silicone in the hollowed out portion in the flask and close the flasks under the force of few thousand pounds [4]. Tighten the flasks to close them in proper manner.
- Cure the closed flask in hot air over at a temperature of 235°C for 1-5 hrs and at a temperature of 150°C for 4-5 hrs. After completion of curing, carry out cooling of the flasks under cold water.
- Open the flasks carefully and retrieve the prosthesis. Modify the diameter of hole in the prosthesis as per instructions of

the surgeon so that the air directed to the pharynx will have minimum resistance. Modify the diameter in a tapering manner from one end to other end for safety purpose. Finish and polish the tracheoesophageal prosthesis. Polish the cylindrical portion of the prosthesis adequately for smooth insertion through the tracheoesophageal puncture (**Figure 4**).



Figure 4: Final polished prosthesis.

- Sterilize the prosthesis by autoclaving or with ethylene oxide, followed by adequate ventilation.

Discussion

Appropriate length of the prosthesis is necessary for effective speech outcome and it can be achieved with the help of custom made tracheoesophageal prosthesis. The end of the prosthesis with smaller diameter is placed towards esophagus from safety point of view. The esophageal end can be kept closed during wax pattern fabrication as well as processing. Once the silicone has cured, a small cut can be made at the esophageal end. This cut will help the prosthetic device to work like one way valve due to elasticity of silicone. Flanges of the prosthesis in the form of discs create proper seal and prevent periprosthetic leakage. Flange of the prosthesis also prevents complete intrusion of the prosthesis into the esophagus. Nylon brushes with small diameter are used to clean the prosthesis on a regular basis. Patients are advised to have yogurt to restrict fungal growth. Certain carbonated drinks are also recommended to restrict fungal growth. In case of fungal infection Nystatin or Fluconazole can be prescribed depending upon clinical situation. Tracheoesophageal prosthesis being safe and simple procedure is more acceptable treatment alternative by patients compared to artificial larynx (electrolarynx) and esophageal speech. This technique makes the tracheo esophageal prosthesis more economical as compared to branded prosthesis.

Conclusion

The success of voice rehabilitation treatment depends on placement of a suitable prosthesis with precise measurements. This technique makes the tracheoesophageal economical as compared to branded one. This technique allows precise

fabrication of tracheoesophageal prosthesis in accordance with appropriate dimensions leading to natural phrasing of voice and acoustically normal speech.

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