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Modification of the LaryButton for Tracheoesophageal Speech

Jan S. Lewin, PhD^a, Patti C. Montgomery^b, Katherine A. Hutcheson, MS^c, and Mark S. Chambers, DMD, MS^d

^aAssociate Professor, Department of Head and Neck Surgery, The University of Texas, M. D. Anderson Cancer Center, Houston, Tex

^bAnaplastologist, Department of Head and Neck Surgery, The University of Texas, M. D. Anderson Cancer Center, Houston, Tex

^cSpeech-Language Pathologist, Department of Head and Neck Surgery, The University of Texas, M. D. Anderson Cancer Center, Houston, Tex

^dProfessor, Department of Head and Neck Surgery, The University of Texas, M. D. Anderson Cancer Center, Houston, Tex

Abstract

Tracheoesophageal (TE) speech using a voice prosthesis and hands-free speaking valve with intraluminal attachment is the gold standard for voice restoration after total laryngectomy. Modification of a standard self-retaining silicone cannula or button often aids in the attachment of a speaking valve within the tracheal lumen for hands-free TE speech production. An increased number of laryngectomized individuals are able to achieve hands-free TE speech when the standard length, flange, and diameter of a silicone button is customized to accommodate individual tracheostomal contours. A technique is presented for modification of a standard silicone button, the LaryButton, to facilitate hands-free TE speech after total laryngectomy.

INTRODUCTION

Surgical prosthetic voice restoration, tracheoesophageal (TE) speech production, is the gold standard for voice rehabilitation after total laryngectomy. TE speech relies on the surgical creation of a controlled fistula, the TE puncture (TEP), placed between the party wall of the posterior trachea and anterior esophagus. A 1-way valved silicone voice prosthesis is placed into the TEP; the prosthesis remains closed at rest to protect the airway from aspiration during swallowing and opens to divert pulmonary air across the pharyngoesophageal mucosa for phonation when the tracheostoma is occluded. The vibration of the pharyngoesophageal mucosa produces sound that egresses superiorly into the oral cavity for speech production. TE speakers can occlude the tracheostoma to divert pulmonary air through the voice prosthesis in one of two ways: (1) manual occlusion of the stoma with a digit or (2) use of a hands-free speaking valve to automatically direct the air through the prosthesis during expiration. The valve can be adhered to the peristomal neck or attached

intraluminally within the tracheal lumen using a tracheostoma button such as the LaryButton.¹ (Fig. 1)

The LaryButton was introduced in 2006 as a new tracheostomal attachment for the hands-free speaking valve.² A technique was previously published to modify a similar device, the Barton button, that improved the ability to use a hands-free speaking valve from 57% using the standard Barton button to 85% after specific modifications were made to the device.^{3,4} Improved retention and seal of the button within the stoma were achieved after the diameter of the button, the length of the shaft, and the size of the posterior retention collar were customized. Herein, a similar technique is described for modifying the LaryButton to improve its fit in stomas of various shapes and sizes.

TECHNIQUE

The standard LaryButton is available in four outer shaft diameters (12, 14, 16, and 18 mm) and two lengths (8, and 18 mm). The LaryButton is made of a soft silicone rubber and has a conical shape designed to accommodate differences in stomal size. Wings allow attachment of a band or LaryClips to better secure the button within the stoma. The thickness of the external retainer, tracheal retention flange, and shaft remain consistent across all sizes and lengths² (Fig. 2).

The speech pathologist fits the LaryButton that most closely approximates the diameter and length of the stoma after the stoma has adequately healed. When the standard LaryButton does not fit properly or is not adequately retained within the stoma, the speech pathologist refers the patient to the maxillofacial prosthodontist or anaplastologist for modification of the device.

To modify the LaryButton, make changes to the length and thickness of the shaft and inner flange, and/or change the circumference of the tracheal retention flange using the steps outlined below. Figure 3 shows an example in which the shaft was reduced by 2mm and 2 mm thickness was added to the tracheal retention flange of a size 14/8 Provox LaryButton (O.D. 12 mm, L 8 mm) to improve the tracheal seal.

1. Insert a metal piston with the same diameter as the inner diameter of the shaft into the LaryButton.
2. Decrease the shaft length (if indicated) in mm increments. Cut the tracheal end first and then make a second cut in the shaft for the required reduction in shaft length. Save the cut-out for use in future modifications.
3. Replace the tracheal end onto the piston, and reapproximate it with the modified shaft. Fill any voids in this interface with baseplate wax (regular TruWax Baseplate Wax; Dentsply International Inc, York, PA). (Fig. 4)
4. At the time of flasking, fill the innermost portion of the appliance holder with vacuum-spatulated improved dental stone (PrimaRock High Strength Die Stone; Whip Mix Corp, Louisville, Ky) through a curved monojet syringe (Patterson Dental; Saint Paul, MN) to capture the undercuts. Fill the drag component of the flasking assembly at the same time. Set the button pattern into the drag and allow

the stone to harden. Brush a dental stone separating agent (Super-Sep; Kerr, Romulus, Mich) onto the contents of the drag. Next, position the cope onto the flasking assembly and insert spatulated dental stone into the assembly; first, syringe it onto the tracheal end of the button pattern, then position the cope and fill the assembly. Orient the lid onto the assembly and allow to harden (Fig. 5 and 6).

5. Separate the flasking assembly. Carefully remove the button pattern components. Examine the stone surfaces of the flasking assembly. If the surfaces are not smooth or imperfections are present, the button should be reprocessed. Leave the piston in position in the drag-half of the flask assembly. Place the assembly into a boilout tank (Glenn Electric Heater Corp.; Erie, Pa) for 10 minutes at 190°F then allow it to bench dry for 12 hours or until the stone is completely dry. Then, clean the assembly with isopropyl alcohol to remove any traces of contaminants (Fig. 7).
6. Next, package and process the button pattern. A number of silicone materials are available that vary in silicone hardness from the most flexible 30 durometer to a stiffer 70 durometer based on the Shore A scale. For this type of modification a 50 durometer platinum silicone elastomer (A-226-50 Factor II, parts A, B 1:1 ratio) is a good choice. Spatulate the silicone material onto a clean glass slab then remove the air bubbles in the spatulated silicone by placing the glass slab in a vacuum chamber for 10 minutes (Nalge Nunc Intl, Rochester, NY). Place the silicone into a curved monojet syringe and inject into the cope/drag of the flasking assembly (Fig. 8). Reconstitute the flasking assembly, then place it into a press and allow it to bench set for 5 minutes. Next, place the flasking assembly into a constant temperature cabinet (Stabil-Therm Constant Temperature Cabinet; Blue M Electric Co; Blue Island, Ill) at 87.5°C for at least 6 hours. Remove it from the oven and allow it to bench cool overnight before deflasking.
7. Finally, carefully remove the modified button from the assembly. Clean and polish the button. Carefully inspect the surface of the silicone button. If imperfections are present, the button should be reprocessed. If there are no imperfections, the button is then ready for patient delivery (Figs. 9 and 10).

DISCUSSION

Tracheal buttons with intraluminal attachment have become a preferred method for securing hands-free speaking valves to the stoma by many TE speakers because they eliminate the need for adhesives and glues that are often ineffective in sustaining a peristomal seal during speech production. The LaryButton offers another option for intraluminal attachment of speaking valves for hands-free TE speech. This button is made of a soft silicone rubber and has a conical shape designed to accommodate differences in stomal size. In addition, wings have been added to the LaryButton that provide additional attachment of a band or LaryClips to better secure the button within the stoma. Despite these design modifications, some patients are still unable to successfully wear the standard LaryButton, and benefit from customization of the device.

Lewin et al⁴ showed that poor retention of intraluminal buttons was due to irregular stomal configuration and/or the lack of a contiguous “stomal lip”. In some cases, the standard length of the button shaft blocked the entrance to the TE puncture and thus prevented airflow through the voice prosthesis. The authors found that 85% of patients were able to achieve successful hands-free TE speech after the intraluminal Barton button was customized.⁴ Herein a similar technique was described for modification of the Provox LaryButton that helps provide a snug and long-lasting intraluminal fit of the device for hands-free TE speech production. As is the case for any standard or customized prosthetic device, patients are advised as to the care and safe use of the device. It is important that patients gradually increase the amount of daily “wear time”, and learn to carefully and gently insert and remove the device to avoid mucosal irritation.

SUMMARY

The technique presented in this manuscript for customizing the LaryButton is a simple method that is easily performed in most dental clinics or laboratories. Experience has shown that a team of specialists including maxillofacial prosthodontists, anaplastologists, and speech pathologists must work together to accurately assess and customize intraluminal devices, such as the LaryButton. Custom buttons allow more patients to achieve hands-free TE speech with an improved quality of life after total laryngectomy.

Acknowledgments

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Fig. 1.
Lateral view of TE voice prosthesis stenting TEP with ideal position of LaryButton within stoma to allow pulmonary airflow through prosthesis for speech production.

Fig. 2.
LaryButton comprised of external retainer, wings, conical shield, shaft, and tracheal end.

Fig. 3. Metal piston within shaft of bisected button with 2 mm cut-out from shaft to be added to tracheal end (flange).

Fig. 4.
Metal piston inserted and 2 mm cut-out from shaft added to tracheal end (flange).

Fig. 5.
Dental stone injected onto tracheal end of button.

Fig. 6.
Button components in flask.

Fig. 7.
Button components retrieved from flask while piston remains embedded in stone during dewaxing.

Fig. 8.
Spatulated and vacuumed silicone injected into cope/drag flasking assembly.

Fig 9.
Final modified button after cleaning and polishing.

Fig 10.
Final modified button fit securely within the tracheostoma. Wings allow for use of LaryClip system for greater retention within stoma.