Prosthetic rehabilitation of a total laryngectomy patient

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Abstract
The fundamental objective in restoring a defect created after total laryngectomy with a custom made silicone prosthesis is to enable the patient to cope better with the difficult process of rehabilitation after a major surgery has been performed. A cosmetically acceptable prosthesis that reproduces the color and form and allows the patient to return to his/her accustomed lifestyle. A sequence of steps for construction of custom-made laryngeal prosthesis is outlined in this case report using the readily available materials and method which any prosthodontist can readily understand and deliver.

Key Words: Maxillofacial prosthesis, prosthetics, total laryngectomy

INTRODUCTION
Total laryngectomy is the surgical procedure in which the larynx is totally removed, and the airway is interrupted; the respiration is performed through a tracheal stoma resulting from the tracheostomy. This creates a complete and permanent separation of the superior part of the airway from the inferior one, resulting in loss of voice and olfaction.

This surgery is performed mainly in advanced laryngeal malignancy or malignancy of adjacent anatomical structures, but can be performed in cases of posttraumatic laryngeal stenosis, which is insurmountable by other methods or cases of benign, extensive tumors with malignancy potential such as recurrent laryngo-tracheal papillomatosis.[¹]

Voice impairment is one of the most important occurring problems as a result of larynx carcinoma surgeries. Especially total laryngectomy operations have quite unfavorable effects on the quality of life.[²]

Currently, there are four main methods of voice rehabilitation for the laryngectomized patients: Esophageal voice, electrolarynx, the pneumatic artificial larynx, and tracheoesophageal shunt prosthesis. Among these the vocal rehabilitation by voice prosthesis, after total laryngectomy has represented the gold standard for the last two decades.[³,⁴]

Squamous cell carcinoma of larynx is common in the patients who use tobacco products. Depending on the extent of the carcinoma surgical removal of larynx might be required. Hence, an alternative airway has to be provided to allow communication with the tracheo-branchial tree. Therefore, patients who have undergone laryngectomy may be required to wear prosthesis
either periodically or constantly to maintain the respiratory pathway.

After laryngectomy patient has to undergo tracheostomy to maintain a patent airway. This Tracheostomy creates a permanent stoma in the suprasternal notch area of the neck.

Tracheostomy itself poses some difficulties such as: (i) Stenosis of the stoma (opening), (ii) Infections, (iii) Entry of dust particles may cause respiratory disorders, (iv) Seeping in of water while taking bath, (v) Esthetics are hampered.

Rehabilitation includes maintenance of – (i) Airway, (ii) Phonetics (speech), (iii) Prevention of respiratory disorders, (iv) Esthetics.

Life of patients who have to undergo total laryngectomy takes a major turn in terms of social, emotional, physical, and sexual life. Patient’s life style has to undergo a major makeover for the patient to effectively cope up with such a major surgery. On the psychological context, the self-image of patients after the surgery may be devastating for the patient, plus the radical change in life style may lead the patient in a further compromised state. Patients who undergo total laryngectomy experience some physical and psycho-social problems such as problems in sleep (31.6%), smell (52.6%), taste (36.8%), and difficulty in swallowing solid foods (36.8%). The patients experienced many physical, social, and psychological problems.

CASE REPORT

The Patient reported to the Swami Vivekanand Subharti University with a chief complaint of inhalation of dust during breathing and difficulty in bathing due to an opening in the supra-sternal area in the neck region through which water seeped in.

On taking medical history, it was found out that total laryngectomy had been done 19 years ago due to squamous cell carcinoma of the larynx. Along with it, tracheostomy was performed to maintain a patent airway, due to which breathing had to be done through the stomal opening formed in the supra-sternal region of the neck; also water seeped in through the opening during bathing. The patient presented with no history of smoking or using any tobacco product during any part of his life.

It was found that a prefabricated commercially available “Provox voice prosthesis” was surgically placed to aid the patient in speaking after laryngectomy, the patient could speak by manually occluding the stomal opening with a finger to redirect the air through the voice prosthesis and then through the mouth to produce speech [Figure 1].

On examination, it was found that the stomal opening measured 1 cm × 1 cm during full blowing out through the stoma [Figure 2] and 1 cm × 0.7 cm at rest.

Patient was explained that the prosthesis would help in reducing the inhalation of the dust and would avoid entry of water in to the stomal opening during bathing or in instances of rain; but might not be aesthetically pleasing. The patient agreed.

Primary impression was recorded in irreversible hydrocolloid impression material (Imprint, DPI) [Figure 3] to which dental plaster (Kalabhai) was added as a backing material to provide strength to the impression material; the irreversible hydrocolloid impression [Figure 4] from which the primary cast [Figure 5] was fabricated on which wax – spacer was put with tissue stops and special tray was fabricated with auto polymerizing acrylic resin [Figure 6].

The tray was then adjusted during head movements for stability [Figure 7]. Final impression was then made with the light body polyvinyl siloxane impression material (Express, 3M Espe) [Figure 8]. From which final cast was fabricated from orthocal (Kalabhai) and the wax pattern was fabricated [Figure 9]. During the try-in stage, stability was checked, and required modifications were done to the wax pattern during head movements from left to right and up and down [Figure 10].

In accordance, to the size of the opening in the wax pattern [Figure 10] a clear acrylic resin device [Figure 11] was
fabricated, for filtering air with semi-circular micropore filters placed alternatingly at both the ends to make sure for adequate filtration and also ensuring adequate air flow for respiration. The acrylic resin device was fabricated such that the patient could easily remove and re-insert it for cleaning of the dust accumulated.

The final prosthesis was fabricated in room temperature vulcanizing
silicone (A-225-60, Bluestar LSR-4360/V50102) and a washer at the lower end of the prosthesis was sealed with the help of cyanoacrylate adhesive for a close adaptation with the stomal opening [Figure 12] and the filter inserted through the other end. A final prosthesis in place secured with the help of adhesive (pros aide, factor II) [Figure 13]. The patient was satisfied with the results, as the patient could now breathe filtered air devoid of dust particles, and also could bathe easily without the fear of
the entry of water into the respiratory tract.

**CONCLUSION**

This prosthesis fulfills all the requirements of a laryngectomy patient: Respiration of filtered air and also prevents entry of water into the respiratory tract.

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