

Aspirated Voice Prosthesis: A Unique Complication of Post Total Laryngectomy Voice Rehabilitation

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ABSTRACT

Background/objectives: Prosthetic voice rehabilitation after total laryngectomy has proven to be successful in restoring proper speech function in over 90% of patients. The possibility of achieving effective speech using the voice prosthesis is superior to esophageal speech and electrolarynx.

Setting: Department of Head and Neck Oncosurgery, Kidwai Memorial Institute of Oncology, Bengaluru.

Case report: A 75-year-old female who had undergone wide field laryngectomy 14 months back came with history of lost voice prosthesis which was later found aspirated. It was removed by the bronchoscopic forceps under topical anesthesia by visualizing it by a nasal 0° wide angle endoscope. The puncture site was cleaned and allowed to cicatrize and narrow down. The fistula was closed by topical application of silver nitrate.

Conclusion: Tracheoesophageal puncture and prosthesis rehabilitation has emerged as the standard voice rehabilitation of laryngectomized patients. Patient education regarding maintenance of the prosthesis and the care for the tracheostoma is important in reducing the complications.

Keywords: Voice prosthesis, Total laryngectomy, Tracheoesophageal puncture, Aspiration.

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INTRODUCTION

Voice rehabilitation after total laryngectomy is totally centered around tracheoesophageal puncture and prosthesis, since the first successful placement by Singer and Bloom in 1980.¹ Prosthetic voice rehabilitation after total laryngectomy has proven to be successful in restoring proper speech function in over 90% of patients and is nowadays the method of choice in most developed countries.^{2,3} The possibility of achieving effective speech using the voice prosthesis is superior to the esophageal speech and electrolarynx.^{4,5}

The voice prosthesis is a silicone device placed in a fistula created through the tracheoesophageal wall either at the time of the primary operation or later as a second stage independent procedure.⁶ It is self-retaining and has got an average life span of 3 to 6 months.⁷ Speech produced by the prosthesis is rated to be of enhanced quality with better

intelligibility, higher restoration and longer phonatory time which seem to be unaffected by age or radiotherapy.⁸

These factors make tracheoesophageal puncture (TEP) speech superior over the mechanical intonation of electrolarynx speech and the simplicity of training is preferred over the largely complex rehabilitation using esophageal speech.⁸ TEP prosthesis speech was initially advocated for esophageal or electrolaryngeal speech failed patients.⁸ Later, it has evolved as a current standard in voice rehabilitation of alaryngeal patients performed at the time of total laryngectomy.⁸

Primary TEP introduction is more widely preferred over secondary as the provision of voice much earlier after the laryngectomy whereas reacquisition in secondary TEP is delayed after completion of subsequent adjuvant treatment, such as radiotherapy or chemoradiotherapy.⁸

Aspiration of the prosthesis is a rare complication usually occurring when the patient himself attempts to replace the dislodged prosthesis while cleaning.⁹ We report a case of aspirated voice prosthesis detected early and managed without any complications.

CASE REPORT

A 75-year-old female who had undergone wide field laryngectomy 14 months back came for follow-up with history of chronic cough and viscus tracheobronchial secretions. The patient had undergone tracheostomy 15 months back for stridor when she was diagnosed as right-sided transglottic cancer with 2 cm right-sided level II node (Fig. 1). Direct

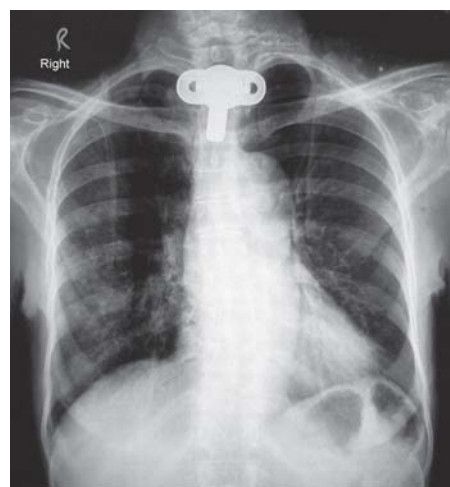


Fig. 1: Tracheostomy done with a metal tube in

laryngoscopic evaluation and frozen section analysis showed poorly differentiated squamous cell carcinoma in the transglottic region, later proceeded with wide field laryngectomy. The patient did not agree for primary tracheo-esophageal puncture and voice prosthesis due to financial constraints.

The postoperative period was uneventful. Squamous cell carcinoma grade III was seen on microscopy, and all the mucosal margins were free of tumor. Thyroid cartilage was infiltrated, paraglottic space free, preepiglottic space involved by the tumor. All the lymph nodes removed showed no metastasis.

The patient was advised postoperative radiotherapy with intensity modulated radiotherapy 60 Gy over 30 fractions. Six cycles of nimotuzumab 200 mg (epidermal growth factor receptor blocker) were also given. Later, the patient was very much motivated for having her voice rehabilitated. Secondary tracheoesophageal puncture was done 4 months later and provox prosthesis was introduced. She received speech therapy and had voice rehabilitation and was going well till recently she had loosening of the voice prosthesis while cleaning and lost it later due to dislodgement. She later developed cough and expectoration without distress and reported to the outpatients where a suspicion of aspiration was done. Plain X-ray chest revealed the prosthesis lodged in the tracheal bifurcation (Fig. 2).

After applying topical anesthesia, a diagnostic endoscopic examination of the tracheostomal opening was done where the prosthesis was seen at the bifurcation. It was removed by the bronchoscopic forceps under topical anesthesia by visualizing it by a nasal 0° wide angle endoscope (Figs 3 to 5). The puncture site was cleaned and allowed to cicatrize and narrow down. The fistula was closed by topical application of silver nitrate. The patient was kept on nasogastric feeding till the fistula closed (Fig. 6).



Fig. 2: Aspirated voice prosthesis at the carina



Fig. 3: Voice prosthesis being visualized



Fig. 4: Voice prosthesis being removed



Fig. 5: Prosthesis out and the fistula after AgNO₃ application



Fig. 6: Nasogastric tube introduced due to the fistula

DISCUSSION

Total laryngectomy represents a significant burden on patients function and cosmesis but the greatest concern is the profound impact on phonation.⁷ Effective voice rehabilitation is important in diminishing psychological and social distress with ensuring improvement of quality of life.¹⁰⁻¹²

Voice rehabilitation are done by electrolaryngeal speech, esophageal speech and tracheoesophageal speech via TEP and voice prosthesis placement.⁷ Electrolarynx needs lesser

expertise but gives a mechanical tone to the voice produced which can be dissatisfying in some patients.⁷ The natural sounding esophageal speech, on the other hand, requires great motivation from the patient in mastering the technique.⁷

A voice prosthesis introduced after tracheoesophageal puncture is a silico-based semipermanent implant requiring occasional replacement. Its lifetime varies from a few weeks to a couple of years, but on average is reported to be several months.¹³ The main advantage of primary TEP compared with secondary TEP is the immediate reacquisition of speech and no second operative procedure and a better success rate.¹⁴⁻¹⁷ Success rates on a long-term basis is defined as use of TEP speech consistently for the majority of verbal communication and literature is 78 to 96% in primary and 70 to 75% in secondary.¹⁴⁻¹⁷ Short-term success rates defined as the immediate acquisition of intelligible speech is 67 to 100% in primary TEP and 50 to 100% in secondary TEP.¹⁴⁻¹⁷ The patients with secondary TEP use the prosthesis for longer duration compared to primary as the earlier have completed treatment and are observed for longer time with more motivation and lower expectations of normal voice acquisition.¹⁸

Complications of these prosthesis are minimal which include colonization of the pharynx with *Candida* causing leakage around the prosthesis, displacement, intractable aspiration of secretions, granulation tissue, tracheostomal stenosis and widening of the tracheoesophageal fistula.¹⁹ Leakage around the prosthesis is reported to the extent of 73% and seen in both primary and secondary may be due to tracheoesophageal wall thinning or fistula widening.⁷

Cheng et al did not find any significant difference with respect to complications between primary and secondary TEPs prosthesis in their 68 cases retrospective study.¹⁵ They noted prosthesis failure when a leakage through it was seen and fistula widening or thinning when leak around it was seen.^{20,21} Nystatin suspension cleaning of the prosthesis to limit *Candida* colonization which cause blockage and leaks, purse string suturing around the fistula are also advised.¹⁹ Tracheostomal stenosis seen in 28% causing difficulty in prosthesis cleaning warrant stomal revision.⁷ Stenosis depends on gender where female have small diameter trachea, technique of tracheal resection, infection at the mucocutaneous junction scarring and stomal stenosis.⁷

Aspiration of the prosthesis in the tracheobronchial tree is a potentially fatal seen in 0.75 to 13%.⁷ Reports of multiple episodes of bronchial aspiration of the prosthesis necessitating bronchoscopic removal of the foreign body have been reported.⁷ Poor selection of the size of the prosthesis and fistula widening seen in 20 to 39% were responsible for these aspiration.²¹ Replacement should be

always done by the surgeon only and never by the patient.⁶ Even in accidental aspiration, the prosthesis usually lodges above the carina and a good stomal occlusion followed by a forceful cough is all that is necessary to expel it.²²

Rarely pulmonary complications like collapse and severe pneumonia induced by aspiration of a voice prosthesis has been reported.^{11,24} Intractable leakage, recurrent prosthesis dislodgement with bronchial aspiration, phonatory failure and persistent severe pain are indications to TEP closure.⁷ Chone et al, Casso et al and Boscolo-Rizzo et al in their independent studies reported no significant influence of radiotherapy on the success rate on primary or secondary TEP.¹⁴⁻¹⁷ Norsuhaznah et al reported that postoperative radiotherapy have an increased tendency for developing complications.⁷ Primary TEP following salvage laryngectomy is a significant risk factor for the dreaded pharyngocutaneous fistula in postchemoradiotherapy patients and so not practised in our institution.⁷

Removal of these aspirated foreign bodies are usually done by rigid bronchoscopy and sometimes removal may be difficult in permanent stoma, with a high percentage of these requiring a thoracotomy, especially for the removal of sharp objects such as pins, wild barley, coarse cloth or a fractured tracheostomy tube.^{24,25}

Initial flexible bronchoscopy may be tried, if the FB is higher and sometimes even rigid bronchoscopy may be risky officiating the need for open surgery.²⁶ Flexible bronchopical removal can be done easily under local anesthesia with 86 to 90% success rates.^{27,28} Technical improvement with videobronchoendoscopy, a broad variety of forceps and safer anesthesia has reduced the postbronchoscopic removal complication to less than 5%.²⁶

Aspirated FBs reported in literature include nuts, vegetable matter, bones, metal and plastic objects, pills, safety pins, turban scarf pins, plastic spoons, fishing weight, cockroaches, straight pin, small plastic objects.²⁶ A laryngectomized patient with a permanent tracheal stoma should realize that the stoma is now part of their airway and it renders direct and easy access to their lower tracheobronchial tree, and also increases the risk of FB aspiration.²⁶

Patients should also know that the negative intrapleural pressure gradient that is generated during deep breathing or paroxysms of coughing may cause aspiration of an object held loosely around the stoma.²⁹ An emphasis on patient education regarding the handling of objects around the stoma after laryngectomy is important in preventing complications.²⁷ Candidal biofilms on the esophageal surface of the prosthesis is the main cause of valve loosening and leakage requiring replacement.³⁰ Varied correlation between radiotherapy and device lifetime is seen in many studies as

radiation induced xerostomia leads to a decrease of antibacterial and antifungal salivary peptides, which increases the chance of biofilm formation.³⁰ The efficacy of the widely used antifungal oral preparations and topical applications are doubtful.³⁰

CONCLUSION

Tracheoesophageal puncture and prosthesis rehabilitation has emerged as the standard voice rehabilitation of laryngectomized patients. Patient education regarding maintenance of the prosthesis and the care for the tracheostoma is important in reducing the complications. The inevitable pharyngocutaneous fistula arising as a result of the prosthesis dislodgement should be managed promptly to reduce subsequent morbidity.

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