Original Article

Complications Following Tracheoesophageal Puncture: A Tertiary Hospital Experience

Pengiran Suhaili Dayangku Norsuhazenah,[1]*MRCS*, Marina Mat Baki,[1]*MS ORL-HNS*, Mohd Razif Mohamad Yunus,[1]*MS ORL-HNS*, Primuharsa Putra Sabir Husin Athar,[2]*MS ORL-HNS*, Sani Abdullah,[1]*FRCS*

Abstract

Introduction: In laryngectomised patients, tracheoesophageal speech is the gold standard for voice rehabilitation. This study evaluated complications related to the tracheoesophageal puncture (TEP) and the success rate in voice prosthesis after total laryngectomy at our institution over a 10-year period. Materials and Methods: A retrospective review of 22 TEPs was performed between January 1998 and December 2008. The timing of TEP, type of voice prosthesis, surgical and prosthesis-related complications, and TEP closure were noted. Results: Eighteen percent of the patients underwent primary and 82% secondary TEP. Our patients were predominantly males (95.4%) of Chinese descent with a mean age of 62.1 years. The types of voice prostheses used were Provox™ (n = 15), Voicemasters (n = 6), and Blom-Singer (n = 1). Prosthesis- related complications occurred in 77.3%. Notable complications were leakage (82.5%), prosthesis displacement (41.2%), intractable aspiration (29.4%), and aspiration of prosthesis (23.5%). The most common surgical-related complication was tracheostomal stenosis. An array of interventions comprising resizing or changing prosthesis type, nasogastric catheter insertion, stomaplasty, purse string suturing, and bronchoscopic removal of bronchial aspirated prosthesis were implemented to address encountered complications. In a mean follow-up of 34.8 months, 68.2% of patients achieved functional tracheoesophageal speech (75% of primary TEP and 67% of secondary TEP). There were 7 TEP closures indicated by persistent leakage, recurrent dislodgement, phonatory failure and, in 1 patient, persistent pain. Conclusions: TEP has become an integral part in the rehabilitation of a laryngectomee. However, management of the frequent complications related to TEP requires specific efforts and specialistic commitments in order to treat them.

Ann Acad Med Singapore 2010;39:565-68

Key words: Total laryngectomy, Voice prosthesis rehabilitation, Voice rehabilitation

Introduction

It has been nearly 3 decades since tracheoesophageal puncture (TEP) with valve prosthesis placement was first introduced as an alternative means of achieving voice restoration in laryngectomised patients.[1] Interestingly, it had initially been advocated as an alternative to those patients in whom oesophageal or electrolaryngeal speech had failed. However, TEP has since evolved to become the current standard in voice rehabilitation of alaryngeal patients performed at the time of total laryngectomy. Certainly, the move towards primary TEP from secondary TEP has been apparent over the proceeding years according to a series reported in the literature.[2-6] The attractiveness of primary TEP lies in the provision of voice much earlier after the laryngectomy whereas reacquisition in secondary TEP is delayed after completion of subsequent complementary treatment such as radiotherapy or chemoradiotherapy. TEP speech 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.[7] These factors lend TEP superiority over the mechanical intonation of electrolarynx speech and the simplicity of training is preferred over the largely complex rehabilitation using oesophageal speech.

This study sought to evaluate complications related to TEP and, secondarily, the success rate in voice prosthesis after total laryngectomy at our institution over a 10-year period.

[1] Department of Otorhinolarygology, Head and Neck Surgery, Universiti Kebangsaan Malaysia Medical Centre, Kuala Lumpur, Malaysia.
[2] ENT-Head & Neck Consultant Clinic, KPJ Seremban Specialist Hospital, Negeri Sembilan, Malaysia.
Address for Correspondance: Dr Marina Mat Baki, Department of Otorhinolaryngology, Head and Neck Surgery, Universiti Kebangsaan Malaysia Medical Centre, Jalan Yaacob Latif, Cheras, 56000, Kuala Lumpur, Malaysia.
Email: marinadrent@gmail.com

Materials and Methods

A retrospective review of all TEP performed between January 1998 and December 2008 in a tertiary hospital was carried out. Among 29 patients submitted to TEP during that period, only 24 records were available for the review. The demographic data of the patients were recorded and details regarding the timing of TEP (either primary or secondary), type of voice prosthesis used, surgical and prosthesis-related complications, and TEP closure were noted.

Prosthesis-related complications were defined as those that necessitated intervention such as leakage either through or around the prosthesis, displacement of prosthesis and its bronchial aspiration.

Surgical-related complications of due interest included tracheostomal stenosis and widening of tracheoesophageal fistula.

Details regarding postoperative radiotherapy following total laryngectomy were also noted as we were interested in its relationship with TEP complications.

Results

Twenty-two patients had successful TEP whilst in the remaining 2, the surgical procedures failed and were therefore excluded from the study. Twenty-one of the patients were males and 1 female, age ranging from 41 to 79 years (mean, 62.1 years) with a predominance of Chinese ethnicity (68%). Out of 22 patients included in the study, only 18 had their total laryngectomies performed at the institution. The rest had theirs performed elsewhere. Notably 21 patients underwent total laryngectomy for laryngeal cancer and only 1 for hypopharyngeal cancer. Eighteen percent of patients underwent primary (n = 4) and 82% secondary (n = 18) TEP, respectively.

The types of voice prosthesis used were Provox™ (n = 15), Voicemasters (n = 6) and Blom-Singer (n = 1).

Prosthesis-related complications occurred in 77.3% cases with half of this seen in the primary TEP group and 38.9% noted in the secondary TEP groups. The main complications were leakage (82.5%), prosthesis displacement (41.2%), intractable aspiration (29.4%), and bronchial aspiration of prosthesis (23.5%) (Table 1).

The most common surgical related complication was tracheostomal stenosis with equal incidence in both primary and secondary TEP groups. Widening of the tracheoesophageal fistula is another notable complication, affecting 3 out of 18 patients in the secondary TEP.

In total, 12 of our patients had postoperative radiotherapy following total laryngectomy. Of these, 3 underwent primary TEP and 9 secondary TEP. Overall, prosthesis-related complications were observed in 10 patients who underwent postoperative radiotherapy whereas surgical related complications were noted in 7 of these patients. By comparison, 7 cases of prosthesis-related and 2 of surgical-related complications were seen in those who did not receive postoperative radiotherapy (Fig. 1).

Table 1. Tracheoesophageal Puncture Related Complications

Complication	No of patient	%
Leakage around/through prosthesis	14	64
Prosthesis displacement	7	32
Intractable aspiration of secretions or oral intake	5	23
Bronchial aspiration of prosthesis	4	18
Granulation tissue	4	18
Tracheostomal stenosis	11	50
Widening of tracheoesophageal fistula	3	14

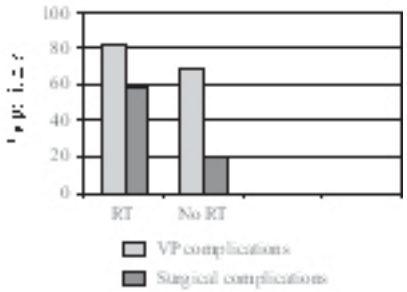

Fig. 1. TEP complications according to postoperative radiotherapy status.

An array of interventions were performed to overcome the various complications. They encompassed changes in size or type of prosthesis, insertion of nasogastric catheter, stomaplasty with laser or cold instruments, purse string suturing for widened tracheoesophageal fistula, and bronchoscopic removal of aspirated prosthesis.

Seven patients had closure of TEP, of which 3 were achieved surgically. The indications were persistent leakage (n = 2), recurrent prosthesis dislodgement (n = 3), and phonatory failure (n = 1). In one patient, his persistent pain required the removal of voice prosthesis with spontaneous closure of the tracheoesophageal fistula. Following closure, only 1 patient opted for further TEP one year later. Five resorted to gesturing and writing as their means of communications and 1 opted for electrolarynx.

The success of TEP is measured as the consistency of using the voice prosthesis as the primary mode of communication. After a mean follow-up of 34.8 months, 68.2% of patients achieved functional tracheoesophageal speech (75% of the primary TEPs performed and 67% of the secondary ones).

Discussion

Laryngectomy represents a significant burden for both function and patient's cosmesis. The greatest concern

is the profound impact it has on phonation. Therefore, effective voice restoration is of paramount importance in diminishing psychological and social distress with ensuring improvement of quality of life.[8-10] The most common means of voice restoration are electrolaryngeal speech, oesophageal speech, and tracheoesophageal speech via TEP and voice prosthesis placement. Although the electrolarynx is easy to learn and apply, it gives a rather mechanical tone to the voice produced which can be dissatisfying in some patients. The natural sounding oesophageal speech, on the other hand, requires great motivation from the patient in mastering the technique. Since its first introduction in 1980 by Singer and Blom,[1] TEP has evolved into the current standard in voice restoration in alaryngeal patients offering them better speech quality. The technique was initially described as a salvage procedure for those who had no benefit in either oesophageal or electrolaryngeal speech. Nowadays, it is used both at the time of total laryngectomy (primary) and in the secondary setting.

At our institution, TEP is largely performed as a secondary procedure following total laryngectomy through surgeon preference. Ideally, primary TEP should be advocated for surgical voice restoration. However, the authors' experience in this series is limited to 4 patients. The main advantage of primary TEP is the immediate reacquisition of speech. The fistula created offers a convenient route for the feeding catheter negating the need for the nasogastric tube, which is a source of discomfort as well as a potential risk of neopharyngeal suture disruption in the event of reinsertion. It also obviates the need for a second operative procedure. Reportedly, there is a difference in success rate between primary and secondary TEP.[3-5]

Long-term success rate is defined as the use of tracheoesophageal speech consistently or for the majority of verbal communication needs, and in the literature, this range between 78% and 96% in primary TEP and 70% and 75% in secondary TEP.[3,4] For short-term success rate, defined as the immediate acquisition of intelligible speech, the corresponding rates were between 67% and 100% in primary TEP and between 50% and 100% in secondary TEP.[3,4,6] Patients who underwent primary TEP had been observed to be less likely to use TEP long-term compared to those who underwent TEP as a secondary procedure. This is attributable to the latter group who had completed treatment and had been observed for a longer period of time and thus, are more likely to use this method of speech rehabilitation long-term. They are also more motivated with lower expectations of normal voice acquisition.[11] In the present study, 68.2% of our patients achieved functional tracheoesophageal speech over 34 months of follow-up with a success rate of 75% for primary TEPs and 67% for secondary TEPs. The authors believed that our limited experience with voice prosthesis device and the number of TEP performed may well be partly contributory to the lower success rate seen in our study. The limited resources in speech and language facilities for rehabilitation of our patients, together with logistical issues, are further compounding factors. Results in the secondary TEPs are comparable to other reported series. However, due to the small number in the primary TEP group, the authors are not at liberty to extrapolate their outcomes further. In other literature, the long-term success rate of voice rehabilitation using primary TEP in Chinese patients was shown to be lower at 52% suggesting that language plays an important role in determining the success of TEP speech.[12]

TEP is not entirely perfect. The complications observed in our patients were similar to those described elsewhere in the literature.[4,13-15] Some patients in both primary and secondary TEP groups have multiple complications. Cheng et al[4] in their retrospective study involving 68 patients who had undergone total laryngectomy and TEP did not find any significant difference with respect to complications between primary and secondary TEPs.

Leakage either through or around the prosthesis has a reported incidence of 73%.[14] The limitation of the current study is the lack of breakdown of leakage into early and late postoperative period which could account for the high leakage rate. Leakage occurring through the prosthesis heralds valve failure and usually would require replacement of the prosthesis whereas leakage around the prosthesis occurs because of either thinning of the tracheoesophageal wall or fistula widening.[14,16] Leakage of fluids or worse still, of food, has the potential of precipitating aspiration pneumonia and therefore must be treated with utmost attention. The insertion of small bore nasogastric catheter through the fistula is a measure used to allow fistula shrinkage followed by reinsertion of a new valve after a short time. However, this deprives the patient temporarily of tracheoesophageal speech.[14,16] Alternative method is purse string suturing around the fistula, but some would argue that this is only a temporary solution to leakage occurring around the prosthesis.[16] Nystatin suspension on a brush is used liberally in cleaning the voice prosthesis so as to limit colonisation by candida which can predispose to blockage and leakage around the prosthesis.

The complication of tracheostomal stenosis has been reported to have an overall incidence of 28% in the literature.[15] A stenosed tracheostoma will render difficulty in maintenance of the valve prosthesis and may warrant stomal revision. Contributory factors to tracheostomal stenosis include female gender (attributable to the smaller size trachea compared to male), technique of tracheal resection (with beveling having a lower incidence of stenosis compared to circular resection) as well as infection at the

mucocutaneous junction (leading to granulation tissue formation and healing by scarring which further reduces the stomal diameter). At our institution, tracheostomal stenosis is addressed by either cold instrument or laser stomaplasty.

Bronchial aspiration of voice prosthesis is a potentially life-threatening event and can occur in 0.75% to 13% of patients.[17] The incidence is higher in this study. Some of our patients had multiple episodes of bronchial aspiration of the prosthesis necessitating bronchoscopic removal of the foreign body. Poor selection of ill-fitting device and fistula widening, which had been described in the literature as 20% to 39%,[18] were felt to be contributing to a higher rate of bronchial aspiration of voice prosthesis in this study.

Most of the complications noted were amenable to some form of treatment. Once the various methods have been exhausted, closure of the tracheoesophageal fistula cannot be avoided. In our study, indications to TEP closure were intractable leakage, recurrent prosthesis dislodgement with bronchial aspiration, phonatory failure and persistent severe pain. Following closure, only 1 patient opted for further TEP. The majority resorted to gesturing and writing as their modes of communication.

In the 38 patients with primary and 4 with secondary TEP submitted to radiotherapy, Chone et al[3] did not find significant influence of radiotherapy on the success rate of either types of TEP. This was similarly observed by de Casso et al[19] and Boscolo-Rizzo et al.[5] From our observation, patients subjected to postoperative radiotherapy have an increased tendency for developing complications compared to their counterpart. However, concern over the effect of radiotherapy on timing of TEP becomes apparent in those patients who had salvage total laryngectomy following chemoradiation. Primary TEP has been identified as a significant risk factor for the dreaded pharyngocutaneous fistula in patients already treated by chemo-radiotherapy.[20]

Conclusion

TEP has become an integral part of the rehabilitation of the laryngectomised patients. However, the higher rate of complications seen in this study is a reflection on limitation faced in providing such a service. Our limited experience, patient selection, speech and therapy support resources, patient's socioeconomic and educational status were integral in the TEP success rate. In specific clinical settings with potential limitation in support resources, it would be judicious to plan for TEP well after the completion of complementary treatment.

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