Introduction

Language expressed through speech is a fundamental characteristic of human communication. Laryngectomy leaves patients without their natural voice. Voice restoration following total laryngectomy is an important and challenging goal for head and neck surgeons and speech pathologists. Throughout the last century, a wide variety of voice restoration methods have been developed and used with varying degrees of success. Although voice rehabilitation has been mainly achieved using esophageal or electrolarynx speech, nowadays prosthetic voice yields the best results.

Patients and Methods

A total of 12 patients underwent laryngectomy at the Department of Otorhinolaryngology, University Hospital, Patras, Greece, between February 2006 and May 2007. All patients had advanced laryngeal squamous cell carcinoma. Eight patients had primary voice prosthesis inserted and four patients had a tracheo-esophageal puncture (TEP) carried out as a secondary procedure.

Results: The majority of the patients (80%) from both the primary insertion or the secondary insertion group, developed good and understood speech using the prosthesis. No significant difference in quality of speech was found between the two subgroups. Four patients required replacement of the prosthesis at intervals of 8 and 10 months after insertion, because of salivary leakage and granulation formation around the fistula, while 3 patients developed a mild mucositis and tracheitis due to postoperative radiotherapy.

Discussion: TEP puncture and prosthesis insertion is a relatively simple, safe and effective surgical procedure for voice restoration after laryngectomy. Provox 2 (generation II) voice prosthesis is a new and useful modified device that has overcome the previous prosthesis drawbacks, is well tolerated by the patients and can be easily changed via the front-loading technique.

Key Words:

Tracheo-esophageal puncture (TEP), Voice prosthesis, Provox 2 (generation II) prosthesis.
versity Hospital Patras, Patras, Greece, from February 2006 to May 2007. Five patients received previously a complete radiotherapy course and then they had had salvage laryngectomies after radiotherapy failure. Six patients received a complete course of planned postoperative radiotherapy averaging 65 Gy. Eight patients underwent primary insertion of the Provox voice prosthesis (Atos Medical GmbH, Wiesbaden, Germany) (group A). Four patients were not eligible for primary speech prosthesis, because of social causes (2 patients) and age (2 patients) and they had a tracheo-esophageal puncture (TEP) carried out as a secondary procedure (group B). All were men, with a median age of 64 years. All patients had an indwelling Provox prosthesis inserted (Provox 2) (Atos Medical GmbH, Wiesbaden, Germany). A cricopharyngeal myotomy was performed as a standard procedure in all patients6-7. Speech practice was started after removal of nasogastric tube in patients with primary insertion of the prosthesis and the next day after insertion in patients in whom prosthesis was inserted as a secondary procedure. The speech therapist worked with each patient postoperatively to give instructions about use and care of the prosthesis. For patients with primary punctures who postoperatively underwent radiotherapy, instructions were given to stop using TEP for about 1 week, when tracheitis or mucositis was developed.

We designed a questionnaire consisted of 3 statements, each one followed by three possible answers (I). Patients were instructed to circle the most appropriate answer. For statistical analysis we used the Student’s t-test.

Results

Totally, 10 out of the 12 patients (80%) were able to phonate with the prosthesis. In the primary insertion group one patient never learned to speak well with the prosthesis, but he developed an acceptable esophageal voice and felt better without the prosthesis. One patient lost the prosthesis under unknown reasons, 7 months after the primary insertion, and a reininsertion was performed. In a case more than 1 month had passed before the patient was able to use the prosthesis, due to surgical complications. In the secondary insertion group, one patient was not able to speak well with the prosthesis and two months after the insertion had discontinued the prosthesis, starting practice to develop an appropriate esophageal voice.

Table II shows the quality of speech in the two groups of patients. Speech quality was subjectively evaluated by patients. Six patients responded within 1 month after the insertion of voice assistance, and six patients who postoperatively underwent radiotherapy, responded within 4 months after the operation.

Figure 1 illustrates the quality of speech reported by each group with 100% corresponding to excellent and 0% corresponding to extremely poor quality. Good vocal quality with the ability to communicate in small and large environments without difficulties was rated as excellent, whereas patients whose vocal quality was very weak with numerous difficulties in groups were rated as poor. No significant difference in quality of speech was found between the two subgroups.

Even in secondary insertion group, it was found that patients had the same quality of speech compared with patients of group A, probably due to the cricopharyngeal myotomy procedure done at the time of the laryngectomy in all the patients6-7.

Four patients required replacement of the prosthesis at intervals of 8 and 10 months after insertion. Two of these had salivary leakage around the prosthesis and two had formation of granulations around the fistula. The granulation tissue was removed using local cauterization and then a new prosthesis was placed. Three patients who had received postoperatively radiotherapy developed a moderate local mucositis and tracheitis due to acute radiation reaction.

Table I. Patients question.

<table>
<thead>
<tr>
<th>Please mark a circle at the point most closely resembles your answer</th>
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<tbody>
<tr>
<td>1. My speech is:</td>
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<tr>
<td>2. Are you satisfied with your method of speech?</td>
</tr>
<tr>
<td>3. My communication with other people is:</td>
</tr>
</tbody>
</table>
Discussion

Our data confirm the results of other investigators that TEP for voice restoration in postlaryngectomy patients is an effective and safe technique. Primary TEP for voice restoration should be considered in all patients undergoing laryngectomy. The great advantage of the technique is that patients are speaking and communicating approximately the third postoperative week.

TEP is a relatively simple surgical procedure and the speech is achieved rapidly. Among the available methods for voice restoration, tracheoesophageal prosthesis speech has been shown to offer the best results in terms of quality of speech.

The development of the Provox voice prosthesis in 1990 and its further modifications like Provox 2 has solved many of the drawbacks of the earlier prosthesis. The self-retaining Provox prosthesis has a low opening pressure and is well tolerated by the patients. Generation II prosthesis offers the patient an easier change via the front-loading technique.

The effect of local mucositis and tracheitis during radiation treatment on TEP can be minimized by avoiding manipulation and using the prosthesis 1 week before and during therapy.

For best results it is of outmost importance a good working relationship with the speech therapist postoperatively.

A long list of complications has been reported in literature, but we have only experienced leakage and granulation tissue formation around the fistula.

Our results confirm that the quality of speech was the same good for patients underwent either the primary or the secondary insertion technique. Thus, we strongly recommend in our patients TEP with prosthesis insertion as the procedure of choice for restoration of voice after total laryngectomy. Esophageal and other methods of speech are effective alternatives.

Table II. Quality of speech.

<table>
<thead>
<tr>
<th>Surgical procedure</th>
<th>No. of patients (N = 12)</th>
<th>Quality of speech</th>
<th>No. of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary insertion of prosthesis</td>
<td>8</td>
<td>Excellent</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poor</td>
<td>1</td>
</tr>
<tr>
<td>Secondary procedure</td>
<td>4</td>
<td>Excellent</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poor</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 1. Results referring to the quality of speech in patients with primary insertion of prosthesis (A) and patients with secondary procedure (B). *P < 0.05
References


3) **HILGERS FJM, SCHOUWENBURG PF.** A new low-resistance, self-retaining prosthesis (Provox) for voice rehabilitation after total laryngectomy. Laryngoscope 1990; 100: 1202-1207.


