Although organ preservation has gained popularity since the last decade in the treatment of advanced laryngeal or hypopharyngeal cancer, total laryngectomy with or without postoperative radiotherapy is still the standard treatment in many institutes. Restoring the phonation for communication is an important issue for laryngectomees. In Taiwan, there are 4 alaryngeal speech methods available: the pneumatic device (Taiwan tube), electrolaryngeal speech, esophageal speech, and tracheoesophageal prosthesis.

In Taiwan, however, the daily performance of these devices has never been reported. Therefore, in 2000 we conducted a questionnaire survey to members of the Taiwan Laryngectomees’ Association, in a hope that information thus obtained can be valuable for head and neck surgeons to consult the patients.

**Materials and Methods**

Literature about the communication after total laryngectomy was reviewed as references to construct this questionnaire. The content of the questionnaire was reviewed and verified by Profesor Chang, the Chief of Division of Laryngology-Head and Neck Surgery, Department of Otolaryngology, Taipei Veterans General Hospital, and National Yang-Ming University School of Medicine, Taipei, Taiwan, R.O.C.

**Key Words**
- alaryngeal speech
- laryngectomee
- rehabilitation
- total laryngectomy
Taiwan Laryngectomees’ Association and collected during their annual meeting. The questionnaire was composed of 7 parts: 1) basic data including name, sex, age, education, address, date of surgery, disease for total laryngectomy, receiving radiotherapy or not; 2) current working and family status; 3) the type of alaryngeal speech used and the reasons for the choice; 4) rehabilitation satisfaction; 5) life quality satisfaction in terms of breathing, swallowing, and speech; 6) performance of alaryngeal speech in various daily life tasks; and 7) subjective feeling about using alaryngeal speech. The last two parts were the focus of study. Part 6 focused on the performance of alaryngeal speech in daily life tasks in form of yes/no questions. Part 7 focused on subjective feelings in using alaryngeal speech by using a 5-point Likert scale where 1 = not at all, 2 = a little, 3 = generally, 4 = quite a bit and 5 = greatly. The data were processed using Statistical Package for Social Sciences system, version 10.0 (SPSS Inc, Chicago, Illinois, USA) for statistics. The reliability of the questions in parts 6 and 7 were tested using Cronbach’s α. The Kruskal Wallis test was used to compare differences among the 4 kinds of alaryngeal speech.

RESULTS

A total of 108 members of the Taiwan Laryngectomees’ Association responded to the questionnaires (160 questionnaires distributed). The mean age of respondents was 68.6 years, and 97% were male. The average time after surgery was 14.5 years. A total of 97.1% suffered from laryngeal or hypopharyngeal cancer, 63% did not receive radiotherapy, 83% were retired, and 86% lived with families. The pneumatic device was used by 58.8% of the responders, esophageal speech 24.7%, an electrolarynx by 10.3%, and a tracheoesophageal prosthesis by 6.2%.

The reliability (Cronbach’s α) of the questions in parts 6 and 7 were 0.77 and 0.89. The results of the performance of alaryngeal speech in various daily life tasks are shown in Table 1. There were no statistically significant differences between the 4 types of alaryngeal speech. The patient feelings about using their alaryngeal speech are shown in Table 2. The median scores of convenience and intelligibility were 4 and 3, respectively.

<table>
<thead>
<tr>
<th>Part</th>
<th>Pneumatic device</th>
<th>Esophageal</th>
<th>Electrolaryngeal</th>
<th>TEP*</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you able to</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speak to strangers on the phone</td>
<td>96</td>
<td>90.5</td>
<td>88.9</td>
<td>83.3</td>
<td>93</td>
</tr>
<tr>
<td>Speak to friends/family on the phone</td>
<td>92.3</td>
<td>90.9</td>
<td>100</td>
<td>83.3</td>
<td>92.1</td>
</tr>
<tr>
<td>Be heard in the next room at home</td>
<td>56.6</td>
<td>66.7</td>
<td>50</td>
<td>83.3</td>
<td>60</td>
</tr>
<tr>
<td>Be heard in a noisy environment</td>
<td>47.1</td>
<td>42.9</td>
<td>40</td>
<td>66.7</td>
<td>46.6</td>
</tr>
<tr>
<td>Communicate in your usual work</td>
<td>90.4</td>
<td>85.7</td>
<td>75</td>
<td>83.3</td>
<td>87.4</td>
</tr>
<tr>
<td>Communicate in your leisure activities</td>
<td>92.5</td>
<td>90.9</td>
<td>88.9</td>
<td>100</td>
<td>92</td>
</tr>
<tr>
<td>Change “tone of voice”</td>
<td>40.4</td>
<td>30</td>
<td>33.3</td>
<td>50</td>
<td>37.9</td>
</tr>
<tr>
<td>Express emotions</td>
<td>71.2</td>
<td>65</td>
<td>62.5</td>
<td>83.3</td>
<td>69.8</td>
</tr>
<tr>
<td>Order a meal in a restaurant</td>
<td>92</td>
<td>95.5</td>
<td>88.9</td>
<td>100</td>
<td>93.1</td>
</tr>
<tr>
<td>Talk to service providers in public</td>
<td>92</td>
<td>86.4</td>
<td>87.5</td>
<td>83.3</td>
<td>89.5</td>
</tr>
<tr>
<td>Chat with strangers</td>
<td>92.2</td>
<td>71.4</td>
<td>87.5</td>
<td>83.3</td>
<td>86</td>
</tr>
<tr>
<td>Chat with friends</td>
<td>96</td>
<td>90.9</td>
<td>100</td>
<td>100</td>
<td>95.4</td>
</tr>
<tr>
<td>Chat with family</td>
<td>100</td>
<td>95.5</td>
<td>100</td>
<td>100</td>
<td>98.9</td>
</tr>
</tbody>
</table>

Kruskal Wallis test showed no significant differences between the 4 types of alaryngeal speech.

*AEP = tracheoesophageal prosthesis.
Median scores of negative feelings (e.g., embarrassment, discomfort, effort, and inability) were all lower than 4. The Kruskal Wallis test showed statistical differences in 4 questions: convenience of alaryngeal speech, embarrassment in front of strangers, effort required to speak, and discomfort in throat/neck/mouth when speaking (\( p = 0.031, 0.006, 0.006, 0.049 \), respectively). We also found the following results: 1) the tracheoesophageal prosthesis showed to be the least convenient; 2) the pneumatic device was superior to the other 3 alaryngeal speech methods in terms of discomfort in throat/neck/mouth when speaking. The pneumatic device and the electrolaryngeal speech had better scores in terms of embarrassment in face of strangers, effort required to speak; and 3) the tracheoesophageal prosthesis seemed to be the worst in reducing in terms discomfort in throat/neck/mouth when speaking. However, the sample size was still too small in some groups to find statistical significance among groups.

**DISCUSSION**

Two features need to be considered in our study group. First, the average age time in ter val after surgery was 14.5 years, a period long enough for the laryngectomee to choose the best alaryngeal speech method. Second, most of questionnaire were collected during the annual meeting of the Taiwan Laryngectomees’ Association. Active participation exposed these patients to the chances to see and understand the advantages and disadvantages of different methods of alaryngeal speech. Based on these 2 factors, the methods of alaryngeal speech chosen by these respondents may represent the optimal ones in Taiwan.

We questioned the respondents about their ability to communicate in 13 different daily life situations to evaluate the details about how the various alaryngeal speech devices function. The results were relatively uniform, and with out differences among different choices. Thus, various alaryngeal speech methods are similar in the performance of daily life tasks if a laryngectomee is proficient at using the device. The most common limitation of alaryngeal speech was tone and loudness. It is interesting to find that only 37.9% of respondents changed their tone of voice, whereas 69.8% of them could express emotions. Thus it is in correct to assume that alaryngeal speech is a “robot voice” that cannot serve the function of emotional expression. The other common limitation was difficulty in being heard in a noisy environment (46.6%) and from the next room at home (60.0%). Be cause a louder voice may be needed in emergency situations, some sort of warning alarm maybe necessary for those who use alaryngeal speech.

The feelings about using alaryngeal speech might differ significantly among devices in 4 areas: convenience, embarrassment in front of strangers, effort required to speak, and discomfort in throat/neck/mouth when speaking. Ex cept for convenience, the pneumatic device was superior to all the other alaryngeal speech methods, although the difference was in con cussion due to small sample size in some groups. Although the esoph-
Alaryngeal speech was thought to provide an optimal alaryngeal speech,\(^1\) not every laryngectomee could successfully achieve that.\(^6,7\) Other studies have reported favorable results with the pneumatic device when compared with other forms of alaryngeal speech, especially in the area of tonal language used.\(^5,8-10\) These findings may help explain why such a large proportion (58.8\%) of laryngectomees in our study used pneumatic devices.

Tracheoesophageal speech was considered more intelligible than either esophageal or electrolaryngeal speech.\(^11-14\) However, our study found no statistical difference in the 4 kinds of alaryngeal speech in terms of intelligibility. Perhaps our respondents had been using alaryngeal speech for a long period of time and thus knew how to work the device to its best advantage. Although self-statement made by patients could be quite subjective, it has been reported as being fairly equivalent to evaluations by speech language pathologists.\(^3\)

In conclusion, our results showed that 4 alaryngeal speech methods can all serve most of the communication functions in daily life, with the only limitation being loudness and tone. None of the alaryngeal speech devices was better than any others in terms of intelligibility. The pneumatic device (Taiwan tube) had less negative ratings in terms of embarrassment in face of strangers, and the effort required to speak. We hope that our data are helpful to head and neck surgeons in consultation with patients to assist them in obtaining optimal alaryngeal speech.

REFERENCES