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The Influence of Electrolarynx Use on Postlaryngectomy Voice-Related Quality of Life

Steven R. Cox, MA1,2, and Philip C. Doyle, PhD1,2,3,4

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Abstract

Objective. To investigate voice-related quality of life in an effort to index self-assessed voice disability in speakers who use the electrolarynx and to determine the perceived level of influence of the electrolarynx on vocal communication.

Study Design. Prospective study.

Setting. This study was conducted at a tertiary care facility.

Subjects and Methods. Forty laryngectomized adults (25 men, 15 women) who used the electrolarynx as a primary method of communication served as participants. The Voice-Related Quality of Life measure was administered and scored in standard fashion and descriptive data generated for physical, social-emotional, and total scores.

Results. Data indicate substantial variability in self-perceived quality of life specific to voice use; a wide range of physical, social-emotional, and total scores were observed. Only one-quarter of these participants rated themselves as having "poor/fair" voice-related quality of life.

Conclusion. Our findings suggest that use of the electrolarynx as a postlaryngectomy method of verbal communication has a wide-ranging influence on self-perceived voice-related quality of life and that mean scores from prior studies may not accurately reflect the potential value of the electrolarynx. Communication disability related to electrolarynx use does in fact vary; however, it is not uniformly poor, and some may be highly proficient users. Consequently, the Voice-Related Quality of Life measure may also serve as a useful tool for clinical documentation of rehabilitation outcomes in those who use the electrolarynx as a postlaryngectomy method of speech.

Keywords

- total laryngectomy
- alaryngeal speech
- electrolarynx
- quality of life

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reasons. However, the EL has been demonstrated to be an important and viable option of postlaryngectomy communication in those who experience difficulty acquiring other methods, restrictions, or complications with other postlaryngectomy communication options.2 However, from the auditory-perceptual perspective of the listener, it is well documented that EL speech is not without limitations; relative to esophageal speech and TEP voice restoration, EL is clearly identified by the listener as being more mechanical and unnatural in its overall sound quality.1,4,5 The identification of the EL voice as being “different” or “mechanical” is easily perceived as nonnormal. The electronic nature of the EL voice signal may have direct implications for social interactions and communication effectiveness. Thus, EL users may experience challenges in their communicative daily lives due to these identifiable perceptual differences, and the potential impact on social functioning may be substantial for some.6,7 Furthermore, the literature provides some suggestion that EL use may affect males and females differently.6,9 however, clear indications underlying this suggestion are unclear. If Xi’s3 suggestion that our understanding of communication effectiveness will be facilitated through acquisition of subjective information, then seeking the EL as their sole method of communication is warranted. In addition, while some negative attitudes concerning EL use have persisted for many years, we also believe that a range of satisfaction with voice-related performance using the EL may be observed. Thus, the primary purpose of the present study sought to investigate voice-related disability experienced by EL speakers and to provide initial information concerning the potential range of voice-related disability in this unique group of postlaryngectomy speakers. In seeking to meet this objective in a time-efficient manner that is of low burden to the patient, we chose to employ a measure termed the Voice-Related Quality of Life10 instrument in an effort to quantify self-assessments of EL use and potential limitations experienced by EL speakers.

Methods

Study Design

A prospective study of voice-related quality of life was conducted in participants who use the EL following TL. Forty consecutive patients presenting to the outpatient Head and Neck Clinic at Victoria Hospital in London, Ontario, Canada, were included in this study, and 5 consecutive additional participants were obtained as part of a clinical exchange during a professional conference. Prior to their participation, the researchers obtained written informed consent with each potential participant in accordance with the full approval of the authors’ Institutional Research Ethics Board. Each participant completed the questionnaire independently on a single occasion after a brief introduction by the one of the authors (S.R.C.).

Assessment Instrument

The Voice-Related Quality of Life measure (V-RQOL) is a 10-item patient-completed questionnaire that assesses the impact of vocal ability and any deficits experienced on one’s daily life.10 Six of the 10 questions pertain to “physical” issues related to voice use, while 4 relate to “social-emotional” issues. Questions are answered using a 5-point Likert-style scale that is rated by the participant; responses to each question can range from a 1 (none, not a problem) to a 5 (problem is as bad as it can be). Scoring is completed using a standard algorithm and scaled score transformation that results in 2 subscores (social-emotional [SE] and physical functioning [PF]) and a total V-RQOL score.10 The total transformed V-RQOL score, which is a composite of all 10 questions, ranges from 0 to 100, with higher scores indicating better self-perceived voice-related quality of life.10

Statistical Analysis

Statistical analyses were initially conducted by participant gender for the SE, PF, and total V-RQOL scores between men and women. Data were analyzed using commercially available software (SPSS Statistics for Windows, version 20.0, Armonk, NY). SE, PF, and total V-RQOL subscores were generated according to V-RQOL guidelines. Two-tailed independent t tests were used to compare SE, PF, and total VRQOL scores between men and women; an a priori significance level of P < .05 was used.

Results

Patient Population and Demographics

Forty laryngectomized adults (25 men, 15 women) participated in this study. Potential participants were excluded from consideration if they were younger than 30 years but no older than 85 years; all were required to be at least 12 months posttreatment. Individuals who had a recurrence, or were suspected by their physician of a recurrence, were also excluded from participation. Participants ranged in age from 41 to 83 years (mean, 62.4 years), and the mean time postsurgery was 54.2 months (range, 12-115 months; see Table 1). All participants reported that they used EL speech with transcervical placement as their primary method of verbal communication, and this was confirmed by one of the investigators prior to data collection; all of them were judged by experienced speech-language pathologists (SLPs) to be highly intelligible, proficient, and effective EL users. All speakers had pure-tone hearing within normal limits (<30 dBHL) for the octave frequencies of 250 to 2000 Hz, were self-reported to be in good health at the time of recordings, and were native English speakers. No adverse events were encountered during the conduct of this study.

Speaker Sex Comparisons

No statistically significant difference in speaker sex was found across either of the 2 V-RQOL subscores or for the total score. As a result, all the data were next considered as
a group, but we remained mindful of patterns of performance across gender. Overall, our group data indicate substantial variability in self-perceived evaluation of EL voice use based on the responses to questions posed in the V-RQOL. A summary of the SE, PF, and total V-RQOL mean scores is shown in Table 2, and these data are graphically represented in Figure 1. For comparative purposes, individual V-RQOL total scores by speaker gender are shown in Figure 2.

In seeking to further understand our V-RQOL data relative to EL voice, we evaluated the performance of participants’ raw scaled scores on all 10 questions. In doing so, “poor/fair” voice-related quality of life was arbitrarily decided as those participants who rated themselves as having a perceived “moderate” or greater problem with their voice specific to the question posed (ie, a rating ≥3). Consequently, a transformed cutoff score of 50 was used for PF, SE, and total scores. This finding can also be inferred from the summary data presented in Figure 2, where it can be seen that while some individuals appear to exhibit voice functioning using the EL that is quite good, others perceive considerable deficits related to their voice use in the areas explored using the V-RQOL. Through application of this method, approximately one-quarter of patients (9/40) rated themselves as having “poor/fair” voice-related quality of life.

**Discussion**

The objective of this study was directed at identifying voice-related quality of life in a group of 40 participants who had undergone TL and used the EL as their primary means of postlaryngectomy communication. No significant differences in V-RQOL scores by speaker sex were observed for either subscore or the total score (P > .05). In fact, a rather similar pattern of PF, SE, and total scores was noted based on means values; a substantial range of scores based on self-perception specific to the questions posed was observed. This variability in perception was demonstrated despite the fact that all of these participants were judged to be proficient users of the EL and were highly intelligible based on judgments of experienced SLPs. This finding indicates that individual participant factors, as well as potential consideration of communication needs and demands, may play a substantial role in perceived levels of voice-related quality of life. The reasons why the EL was selected by this group of patients over other possible alaryngeal speech methods (ie, TE puncture voice restoration or traditional esophageal speech) were very individualized. For example, reasons varied from the desire of some to avoid another surgery (TEP) or those who did not wish to have to attend to a prosthetic device, to those who could not acquire esophageal voice, did not have ready access to professional assistance should complications occur, to those who had risk factors related to past treatment and/or extended surgical reconstruction. As a consequence, the ultimate decision for selecting the EL for postlaryngectomy communication was the choice of that particular individual given his or her specific status and perceived communication needs. Information on other postlaryngectomy speech options is provided to all patients, and we have always chosen to respect their

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**Table 1.** Demographic Characteristics of Electrolarynx Users.

<table>
<thead>
<tr>
<th></th>
<th>Average Age (Range), y</th>
<th>Average Time Postperation (Range), mo</th>
</tr>
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<tbody>
<tr>
<td>All (N = 40)</td>
<td>62.4 (41-83)</td>
<td>54.2 (12-115)</td>
</tr>
<tr>
<td>Men (n = 25)</td>
<td>63.6 (49-83)</td>
<td>54.4 (12-115)</td>
</tr>
<tr>
<td>Women (n = 15)</td>
<td>60.5 (41-81)</td>
<td>53.9 (12-100)</td>
</tr>
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**Table 2.** Mean (Standard Deviation) for Physical Functioning, Social-Emotional, and Total Voice-Related Quality of Life (V-RQOL) Scores.

<table>
<thead>
<tr>
<th></th>
<th>Physical Functioning</th>
<th>Social-Emotional</th>
<th>Total V-RQOL</th>
</tr>
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<tbody>
<tr>
<td>Male</td>
<td>62.8 (18.8)</td>
<td>68.75 (25.8)</td>
<td>65.2 (19.2)</td>
</tr>
<tr>
<td>Female</td>
<td>55.6 (22.7)</td>
<td>60.8 (29.5)</td>
<td>57.7 (23.8)</td>
</tr>
<tr>
<td>Significance level</td>
<td>P = .424</td>
<td>P = .200</td>
<td>P = .145</td>
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**Figure 1.** Mean Voice-Related Quality of Life domain and total scores.

**Figure 2.** Mean Voice-Related Quality of Life total scores.
autonomy to make the best decision. We also adhere to the notion that providing fair and data-based information on the physical, auditory-perceptual, and self-assessed characteristics of each potential choice, along with relative advantages and disadvantages, is essential. The present data serve to provide such information in the context of the EL.

Obviously, we would not expect all individuals to perform in the same way or respond to the V-RQOL questions posed; however, despite past criticism in the literature, it is clear that some EL users do not demonstrate substantial reductions in self-perceived voice-related quality of life. More specifically, female participants indicated that they were at least moderately anxious or frustrated, were at least moderately depressed, and reported that going out socially was a moderate problem. This does raise some concerns relative to the potential impact on communication that the EL may have on women. Although we did not identify any significant difference between men and women for any V-RQOL score, identification of issues of communication anxiety or frustration, which may create additional problems such as depression and social restriction, indicates that further research is required. Reductions in voice-related performance were exhibited by both men and women in the current sample. Yet if more data on EL speakers can be gathered, the SE subscore of the V-RQOL may provide a sensitive indicator of voice performance and challenges that are experienced by some individuals who use the EL for postlaryngectomy communication. Inspection of data presented in Figure 2 demonstrates that problems exist for some speakers independent of gender. This finding provides an important illustration of the frailty of mean scores in representing any clinical population. In the present case, only a small percentage of men and women would be accurately described by the mean V-RQOL values. However, the external validity of the present findings is somewhat limited to some extent because of the relatively small sample represented in the current work. As a result, additional study may provide valuable information specific to anticipated vocal outcomes in those who chose to use an EL for postlaryngectomy communication.

Since its introduction as a potential clinical metric to identify specific areas of limitations in those who exhibit voice disorders, the V-RQOL continues to provide a simple and time-efficient method of determining the relative degree of disability that may be experienced. In the present study, we have extended this finding to those who have undergone laryngectomy and now employ a unique method of alaryngeal speech—the artificial EL. The present data clearly indicate that this short, clinically accessible measure can serve as a means of documenting changes in one’s perceived level of quality of life in the context of voice use. Based on the differential profiles of participant perceptions via their response to questions posed on the V-RQOL (see Figure 2), we believe that this measure may provide a simple means of documenting voice outcomes in those who use the EL. As such, it may also serve as a simple yet very effective means of gathering both short- and longer-term follow-up information on postlaryngectomy communication rehabilitation. However, and based on responses to some of the questions posed on the V-RQOL, a larger participant sample may offer clearer insight into possible trends that could then be targeted via communication rehabilitation strategies to help reduce the problems experienced. Under these circumstances, the sensitivity of particular questions and/or subscores from the V-RQOL may prove to be of value clinically.

With respect to the present study, however, questions regarding our choice of measurement instrument may be raised. Within the realm of postlaryngectomy voice and speech, currently no gold standard of assessing voice-related disability exists. In fact, the ability to assess the status of alaryngeal speakers has frequently not been considered within the context of voice disorders because of its unique nature and multiple rehabilitation options available. Although we selected the V-RQOL because of its brevity and psychometric properties (eg, validity and reliability), other tools such as the Voice Handicap Index could be employed. However, the structure and content of the V-RQOL appeared to offer relative advantages relative to the present population. Clearly, the ability to establish any given tool as a gold standard for future evaluation of those who use any method of postlaryngectomy speech would be of great value from a clinical perspective.

**Conclusion**

Based on the present data, we have observed considerable differences in EL performance, ranging from those who report considerable challenges to those who perform without apparent difficulty. Finally, while other postlaryngectomy speech rehabilitation options do exist (esophageal speech and TEP voice restoration), the EL remains as an important, frequently used, and very viable communication option for many who undergo laryngectomy. Despite the clear limitations of the artificial EL at the perceptual level relative to its mechanical, nonnormal quality, effective communication is possible with systematic instruction. Perceived disability specific to EL use was found to vary substantially in the present participants regardless of gender. The ability to communicate provides a critical dimension of postlaryngectomy recovery and rehabilitation. In providing options to those who are laryngectomized, the ability to offer information on the potential degree of variability for both physical and social-emotional functioning would be of value. The present data show that a substantial range of performance capacity exists, and the logical question raised is whether improvements can be achieved. At the very least, the present data provide valuable information on the range of potential problems that may be experienced when using an EL and therefore may provide a data-based source of information concerning its use postlaryngectomy.

**Author Contributions**

Steven R. Cox, data collection, data analysis and interpretation, critically revising, final approval; Philip C. Doyle, data analysis and interpretation, drafting, critically revising, final approval.
Disclosures

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References


