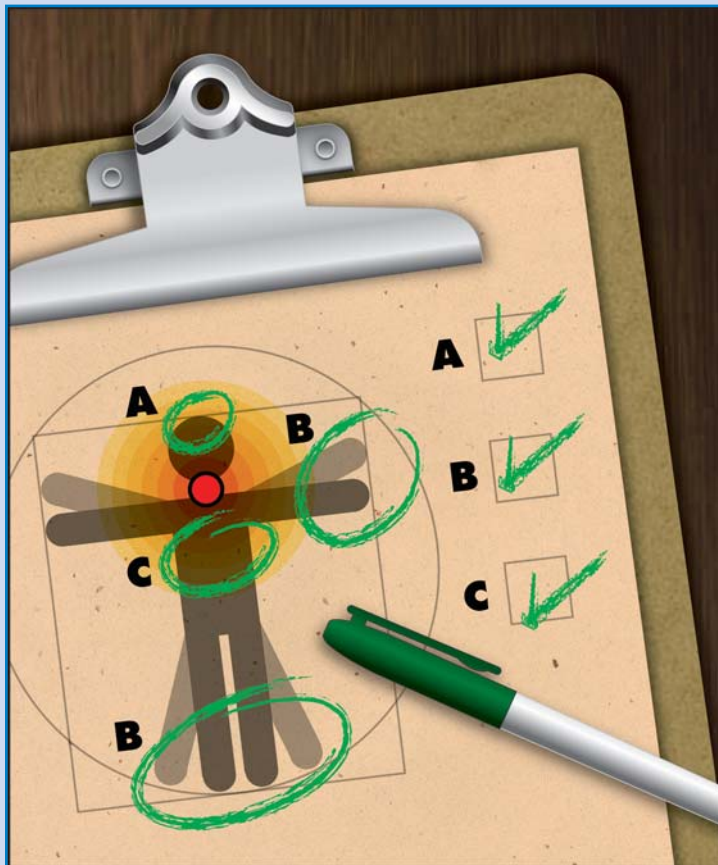


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d'orthophonie et
d'audiologie***



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Special Issue: Head and Neck Cancer

- ▶ *A Study of the Knowledge of Health Care Providers Regarding Laryngectomy Care*
- ▶ *The Utility of Symptom Checklists in Long-Term Postlaryngectomy Follow-Up of Tracheoesophageal Speakers*
- ▶ *Linking the Art of Practice in Head and Neck Cancer Rehabilitation with the Scientists' Art of Research: A case study on reflective practice*
- ▶ *Quality of Life in Patients with Hemiglossectomy: Comparison of the EORTC QLQ-H&N35 and a semi-structured interview*
- ▶ *Speech After Tongue Reconstruction and use of a Palatal Augmentation Prosthesis: An acoustic case study*
- ▶ *Speech Outcomes for Partial Glossectomy Surgery: Measures of speech articulation and listener perception*

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The Canadian Association of Speech-Language Pathologists and Audiologists (CASLPA) is the only national body that supports and represents the professional needs of speech-language pathologists, audiologists and supportive personnel inclusively within one organization. Through this support, CASLPA champions the needs of people with communications disorders. The association was founded in 1964 and incorporated under federal charter in 1975. CASLPA's periodical publications program began in 1973.

The purpose of the *Canadian Journal of Speech-Language Pathology and Audiology* (CJSLPA) is to disseminate contemporary knowledge pertaining to normal human communication and related disorders of communication that influence speech, language, and hearing processes. The scope of the Journal is broadly defined so as to provide the most inclusive venue for work in human communication and its disorders. CJSLPA publishes both applied and basic research, reports of clinical and laboratory inquiry, as well as educational articles related to normal and disordered speech, language, and hearing in all age groups. Classes of manuscripts suitable for publication consideration in CJSLPA include tutorials; traditional research or review articles; clinical, field, and brief reports; research notes; and letters to the editor (see Information to Contributors). CJSLPA seeks to publish articles that reflect the broad range of interests in speech-language pathology and audiology, speech sciences, hearing science, and that of related professions. The Journal also publishes book reviews, as well as independent reviews of commercially available clinical materials and resources.

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Mission

The Canadian Association of Speech-Language Pathologists and Audiologists...supporting and empowering our members to maximize the communication and hearing potential of the people of Canada

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L'Association canadienne des orthophonistes et audiologistes (ACOA) est l'association professionnelle nationale reconnue des orthophonistes et des audiologistes du Canada. L'Association a été fondée en 1964 et incorporée en vertu de la charte fédérale en 1975. L'Association s'engage à favoriser la meilleure qualité de services aux personnes atteintes de troubles de la communication et à leurs familles. Dans ce but, l'Association entend, entre autres, contribuer au corpus de connaissances dans le domaine des communications humaines et des troubles qui s'y rapportent. L'Association a mis sur pied son programme de publications en 1973.

L'objet de la *Revue canadienne d'orthophonie et d'audiologie* (RCOA) est de diffuser des connaissances relatives à la communication humaine et aux troubles de la communication qui influencent la parole, le langage et l'audition. La portée de la Revue est plutôt générale de manière à offrir un véhicule des plus compréhensifs pour la recherche effectuée sur la communication humaine et les troubles qui s'y rapportent. La RCOA publie à la fois les ouvrages de recherche appliquée et fondamentale, les comptes rendus de recherche clinique et en laboratoire, ainsi que des articles éducatifs portant sur la parole, le langage et l'audition normaux ou désordonnés pour tous les groupes d'âge. Les catégories de manuscrits susceptibles d'être publiés dans la RCOA comprennent les tutoriels, les articles de recherche conventionnelle ou de synthèse, les comptes rendus cliniques, pratiques et sommaires, les notes de recherche, et les courriers des lecteurs (voir Renseignements à l'intention des collaborateurs). La RCOA cherche à publier des articles qui reflètent une vaste gamme d'intérêts en orthophonie et en audiologie, en sciences de la parole, en science de l'audition et en diverses professions connexes. La Revue publie également des critiques de livres ainsi que des critiques indépendantes de matériel et de ressources cliniques offerts commercialement.

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Mission

L'Association canadienne des orthophonistes et audiologistes appuie et habilite ses membres en vue de maximiser le potentiel en communication et en audition de la population canadienne.

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Special Issue on Head and Neck Cancer

Winter Issue



Head and neck cancer accounts for approximately 5% of all cancers diagnosed in Canada. This statistic translates into approximately 4,000 Canadians who will be given this frightening diagnosis every year. Most patients will receive their oncological treatment in urban centres that specialize in head and neck cancer. Patients who live near these centres will also receive rehabilitative treatment there, while others will return home to rural areas after treatment and will require rehabilitation there. Thus, no matter if you are a clinician in a rural or an urban setting, it is likely that a head and neck cancer patient will enter your practice at some point in time. The speech, swallowing, and quality of life changes that head and neck cancer patients experience can be very dramatic, challenging each and every clinician who is charged with providing rehabilitation.

In this issue, we have three articles that focus specifically on laryngectomy and issues with rehabilitation related to laryngeal cancer. The first article by Mosters-Benoit and Rammage addresses the topic of education regarding laryngectomy rehabilitation. This article will challenge you to consider how comfortable you feel with laryngectomy rehabilitation. The second article by Doyle, Day, Whitney, Myers, and Eadie raises the issue of long-term follow up of the laryngectomy population. Do we hold a view of rehabilitation for this population that is adequately long-term? Finally, Caty, Kinsella, and Doyle raise the topic of evolving expertise in this area of rehabilitation. The article investigates how we, as clinicians, learn from challenging clinical situations and how these situations influence research initiatives in the field of head and neck cancer.

The remaining three articles deal with hemiglossectomy treatment for oral cancer. Loewen, Boliek, Seikaly, Harris, and Reiger investigate the validity of quality of life questionnaires in capturing patients' perceptions of their functional outcomes after hemiglossectomy. The following two articles are concerned with the articulatory challenges and the resulting social repercussions that hemiglossectomy patients face. Based on a case study, Laaksonen, Loewen, Wolfaardt, Rieger, Seikaly, and Harris discuss the potential benefits of a palatal augmentation prosthesis in hemiglossectomy rehabilitation. Finally, Bressmann, Jacobs, Quintero, and Irish report on articulation and social perception of speech after hemiglossectomy.

It is my hope that these articles will provide new insights and broaden your knowledge of head and neck cancer rehabilitation issues. The articles in this issue also provide different research and clinical perspectives from across Canada. Hopefully, we will stimulate your interest and tempt you to read more and learn more to enhance your own clinical practice with this challenging but often tragically underserved group of patients.

Jana Rieger
Guest Editor

Édition spéciale : le cancer de la tête et du cou

Numéro d'hiver



Le cancer de la tête et du cou représente environ 5 % de tous les cancers diagnostiqués au Canada. Cela signifie qu'au pays, chaque année, 4 000 personnes reçoivent ce diagnostic effroyable. La plupart des patients suivent leur traitement d'oncologie en milieu urbain, dans des centres spécialisés dans le cancer de la tête et du cou. Les patients habitant près de ces centres y feront aussi leur réadaptation, tandis que les autres retourneront chez eux en milieu rural pour le faire. Par conséquent, que vous soyez cliniciens en milieu rural ou urbain, il est probable que vous recevrez un patient atteint du cancer de la tête et du cou un jour dans votre pratique. Les changements dans la parole, la déglutition et la qualité de vie causés par le cancer de la tête et du cou peuvent être dramatiques pour les personnes atteintes et posent des défis pour tout clinicien chargé de la réadaptation.

Le présent numéro contient trois articles portant nommément sur la laryngectomie et les enjeux entourant la réadaptation dans le cas d'un cancer de l'oropharynx. Le premier article, de Mosters-Benoit et Rammage, aborde la formation sur la réadaptation après une laryngectomie. Il vous incitera à évaluer jusqu'à quel point vous vous sentez à l'aise de prendre en charge une rééducation de ce type. Le second article de Doyle, Day, Whitney, Myers, et Eadie examine la durée du suivi à long terme des personnes laryngectomisées. Le temps que nous jugeons nécessaire à leur réadaptation est-il suffisamment long? Enfin, Caty, Kinsella, et Doyle soulèvent la question de l'expertise en évolution dans ce domaine de réadaptation. Leur article examine comment nous, les cliniciens, nous nous tirons des situations cliniques difficiles et comment ces situations influencent les initiatives de recherche sur le cancer de la tête et du cou.

Les trois articles restants abordent le traitement à la suite d'une hémiglossectomie pour un cancer de la bouche. Loewen, Boliek, Seikaly, Harris, et Reiger évaluent la validité des questionnaires sur la qualité de vie pour saisir la perception qu'ont les patients de leur fonctionnalité après une hémiglossectomie. Les deux autres articles portent sur les difficultés articulatoires et les répercussions sociales que vivent les patients après une hémiglossectomie. À partir d'une étude de cas, Laaksonen, Loewen, Wolfaardt, Rieger, Seikaly, et Harris discutent des avantages éventuels d'une prothèse palatine de suppléance pour la réadaptation après une hémiglossectomie. Enfin, Bressmann, Jacobs, Quintero, et Irish étudient l'articulation après une hémiglossectomie et la perception sociale de la parole.

Je souhaite que ces articles vous fassent voir d'un nouvel œil les questions entourant la rééducation pour un cancer de la tête et du cou et qu'ils enrichissent vos connaissances dans ce domaine. Ces articles présentent aussi divers points de vue de la recherche et de l'exercice clinique des quatre coins du Canada. J'espère que nous stimulerons votre intérêt et que nous vous inciterons à continuer à lire et à apprendre pour améliorer votre pratique clinique auprès de ce groupe de patients présentant un défi de taille pour les cliniciens et qui est très nettement mal desservi.

Jana Rieger
Rédactrice

■ A Study of the Knowledge of Health Care Providers Regarding Laryngectomy Care

■ Une étude sur les connaissances des fournisseurs de soins de santé auprès des personnes laryngectomisées

Mia Mosters-Benoit

Linda Rammage

Abstract

Laryngectomized individuals living in British Columbia were surveyed to determine experiences with tracheoesophageal prosthesis (TEP) crises. Subsequently, a questionnaire probing experience, knowledge, comfort level and education on laryngectomy was developed and distributed to front-line health care professionals working in BC. Information provided by patients and front-line health care professionals indicated a need for further education and training of those who may provide front-line services to laryngectomized individuals, specifically TEP crisis management. More than half of the laryngectomized respondents expressed concern about not being able to access the help they require during a TEP crisis. The demographics of specialized health care services suggest that patients living in small and remote areas of the province may have less access to health care professionals who can assist them during a TEP crisis. Fundamental elements of an education program for front-line health professionals are described.

Abrégé

On a sondé les personnes laryngectomisées habitant en Colombie-Britannique pour déterminer comment elles vivent les situations d'urgence reliées à leur prothèse trachéo-œsophagienne. Par la suite, on a élaboré un questionnaire qu'on a distribué aux professionnels de la santé de première ligne de la Colombie-Britannique pour évaluer leur expérience, leur savoir, leur niveau de confort et leur formation à l'égard de la laryngectomie. L'information fournie par les patients et les professionnels de première ligne montre la nécessité d'approfondir la formation et le perfectionnement des personnes qui pourraient offrir des services de première ligne aux personnes laryngectomisées, surtout en ce qui a trait à la prise en charge des urgences affectant une prothèse trachéo-œsophagienne. Plus de la moitié des répondants laryngectomisés ont indiqué être préoccupés par le fait de ne pas avoir accès à l'aide dont ils ont besoin en cas d'urgence affectant leur prothèse. Les données démographiques des services de santé spécialisés indiquent que les patients habitant dans de petites collectivités éloignées de la province auraient encore moins accès à des professionnels de la santé capables de les aider en cas d'urgence. On termine en décrivant les éléments fondamentaux d'un programme d'éducation pour les professionnels de la santé de première ligne.

Key words: laryngectomy, TEP crisis, tracheoesophageal prosthesis, healthcare professional knowledge

Undergoing a laryngectomy is a life altering experience. After the initial trauma of a cancer diagnosis, the laryngectomized individual has to undergo major ablative surgery and subsequently adapt to the anatomical and physiological changes created by the surgery.

In Canada, major head and neck surgeries such as laryngectomy are performed in hospitals with specialized staff and services, typically in the medical teaching hospitals of urban centres (Brown et al., 2000). The specialized human resources, including

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surgeons, physicians, therapists, and nurses, are accessed from the time of diagnosis through to discharge from the medical centre. The team of specially trained professionals in the surgical and rehabilitation centre embraces patients in a safe and supportive environment. Once patients are discharged and return to their community, they may feel less confident about their medical status and access to appropriate services in the event of an emergency.

Allen et al. (1998) found that no clear standards exist for pre- and post-operative services for laryngectomized individuals. Although primary responsibility for post-operative care, education, and counselling was primarily with the surgical facility for the first 6 months, during the 7–12 month postoperative period this responsibility shifted to homecare or to personnel from other facilities. In the 7–12 month period, individuals would likely have returned home, often to areas quite a distance away from their surgical centre.

Several authors have proposed models for an “ideal laryngectomy team” that would allow immediate and direct access, as required, to the appropriate professional on the inter-professional team (Allen et al, 1998; Frowen & Perry, 2000; Gates, Ryan, & Lauder, 1982). Recommended team composition typically includes surgeon; speech-language pathologist (S-LP); lay-laryngectomy advisor; social worker, psychologist, or counsellor; dietician; and audiologist. In addition to providing necessary patient education and resources, the team should develop a plan for all possible circumstances so that the laryngectomy and his/her family always know where to go and who to contact in their community should a need arise. In an Ontario study, findings indicated that patients returning home to smaller centres do not have access to a specialized oncological team care and often they do not have regular access to S-LP services in their communities (Brown et al, 2000).

Having a basic level of care available in or close to their community gives people a sense of comfort and has been shown to enhance the rehabilitation process. A South African study (Frowen & Perry, 2000) revealed that a higher TEP success rate coincided with a multi-disciplinary team approach and patients consistently being seen by their operating surgeon as well as an S-LP. Allen et al. (1998) also found that patients judged S-LP involvement as an important part of their rehabilitation process.

For Canadians living in rural and remote regions of the country, ongoing access to specialized multi-professional team services may not be feasible. The Ontario study by Brown et al. (2000) highlighted this fact, and anecdotes from our patients in British Columbia reinforce it.

A laryngectomy surgery results in complex anatomical changes, some readily apparent and others less so. The tracheostoma is one of the most obvious changes; it dramatically alters the respiratory tract. Although visible when the anterior neck is not covered, its physiological implications may not be readily apparent to the general public or to health care professionals who are inexperienced

with head and neck surgery. In the case of a respiratory emergency requiring oxygen or resuscitation, it is critical for front-line health care professionals to understand changes in protocol required for a neck breather. Patients express concern about the possibility that uninformed health care professionals may lose valuable resuscitation time when attempting to assist them in a respiratory crisis.

Perhaps less well understood is the purpose and placement of a tracheoesophageal prosthesis (TEP), although it has become the most popular technique for post-laryngectomy voice restoration. Many individuals with a TEP live independently and are able to change and care for their prosthesis without assistance. Even for these individuals, however, crises can occur and having access to a knowledgeable health care professional is crucial for expedient and effective resolution of the problem.

The most common TEP crisis involves difficulty reinserting a dislodged prosthesis. This should be considered a respiratory emergency, because without the protective valve function of the prosthesis, aspiration of food or fluids is possible and, for at least a few hours or days, probable. In this situation, the attending health care professional needs sufficient understanding of the altered anatomy to guide decisions about preventing immediate aspiration and to take stop-gap measures such as inserting a soft rubber catheter into the tracheoesophageal fistula.

Of secondary concern in cases of a dislodged prosthesis is the rapid reduction of the fistula diameter, which, in the absence of intervention, will inevitably close. When the fistula shrinks, it has to be dilated in order for a new prosthesis to be placed. Although this procedure is not particularly painful, it can be uncomfortable for the patient. The process draws on health care resources and requires expertise. Once the fistula closes completely, the patient has to undergo a repeat tracheoesophageal puncture procedure, which entails minor surgery under general anesthetic.

In addition to the time and inconvenience for the laryngectomized individual and the additional health care resources required if an appropriate intervention is delayed, TEP crises can be frightening for the patient. From the moment that the TEP is dislodged, tracheoesophageal speech becomes impossible and an alternate means of communication is required. This means that during the time of crisis, the individual is not able to express his needs to the health care professional or to explain what is happening. For this reason, it is crucial that health care professionals have a basic knowledge of what to do in a TEP crisis. Ideally, every TEP speaker should be able to feel confident that appropriate health care will be available in a crisis.

How knowledgeable and skilled are front-line health care professionals in resolving emergencies such as a TEP crisis? What are the consequences to the patient who lives in a remote area without health care teams who are specialized in laryngectomy care?

Purpose

The main purposes of this study were to determine the level of experience, knowledge, confidence, and skill of a variety of front-line health care professionals who might assist an individual who is experiencing a TEP crisis and to identify gaps in knowledge and skills among front-line health care professionals. Information obtained from both laryngectomized individuals and health care professionals was used to develop a set of guidelines to describe the minimum knowledge that health care professionals require to assist individuals who have undergone a laryngectomy.

Methods

Survey of Laryngectomized Individuals

A survey to determine the occurrence and nature of TEP emergencies and their health-care experiences during crises was developed and disseminated to laryngectomized individuals throughout British Columbia (Appendix A). The questionnaire sent to laryngectomees consisted of two primary questions; both requested a Yes or No answer and both provided opportunities to describe experiences and concerns. Participants were also asked to identify their location.

The questionnaires were disseminated by mail to approximately 80 laryngectomized individuals through the offices of the surgeons performing the majority of laryngectomy surgeries in British Columbia. Anonymity of the respondents was maintained by requesting that they refrain from including any identifying information, other than location, on the form or the envelope.

Health Care Professionals Questionnaire

A questionnaire was developed to determine level of experience, training, knowledge, and comfort level (confidence) of health care professionals regarding laryngectomy anatomy and special health care needs. To test content validity, 10 health care professionals, five S-LPs, three registered nurses (RN), and two otolaryngologists (OTL), with variable levels of experience with laryngectomy were asked to complete and comment on the draft questionnaire. Nine were completed and returned. Feedback provided by the respondents resulted in minor wording changes to the questionnaire. The most common general comment from respondents was that the questions reminded them how much they had forgotten about laryngectomees and how quickly they had forgotten. This was a common response from S-LPs. One of the RNs who responded said she learned from the questionnaire that there were obviously gaps in the outpatient services that laryngectomized individuals receive.

The final questionnaire consisted of eight questions including knowledge questions and questions about training and comfort level in working with laryngectomized individuals (Appendix B). The questionnaires were sent to 97 facilities province wide, including hospitals and health units. They were addressed generically to emergency physicians and RNs, homecare RNs, and where applicable

S-LPs and OTLs. Along with the questionnaire(s), a pre-addressed and pre-stamped envelope was included. Anonymity of the respondents was maintained by requesting that they refrain from including any identifying information, other than location, on the form or the envelope.

Responses were coded using ordered numeric values for questions 1, 7, and 8; using binary numeric codes for correct (1) or incorrect (0) for questions 2-5; and using binary numeric code for affirmative (1) or negative (0) for question 6. Chi square comparisons were conducted to determine the significance of differences in knowledge question scores by profession, and chi square tests for likelihood ratios were performed to determine linear trends predicting knowledge question performance by experience or professional preparedness.

Results

Survey of Laryngectomized Individuals

Eighteen completed questionnaires were returned. Many of the respondents took the time to write lengthy answers to the questions. Two respondents returned 1-2 page letters sharing stories of numerous crises they had experienced and expressing their concerns about the lack of help they had received and the lack of familiarity their health care providers had regarding laryngectomy. Some individuals left their phone numbers in case there were any more questions, and four people expressed gratitude that the survey was undertaken. As one respondent wrote: *"There is not enough talked about in the media, the public does not have information about laryngectomees or laryngeal cancer, not like other cancers which receive great amounts of attention and publicity."*

Ten of 18 individuals who responded to the questionnaire reported having had a TEP crisis. Of these, four were satisfied with the help they received, three were not, and three were satisfied in the end, after a protracted ordeal. When asked if they had any concerns should a TEP crisis ever happen, 11 out of the 18 respondents replied *yes*, primarily because they would not be able to access help in their community. Other concerns expressed included the increasingly burdensome cost of TEPs, not having anyone in their community with the same "problem," and not having adequate training to care independently for their TEP.

Health Care Professionals Questionnaire

Thirty-six completed health care professionals questionnaires were returned. The respondents included 13 S-LPs, 16 RNs, five physician/surgeons (two of whom were OTLs), and two respiratory therapists (RTs).

The majority (16) of the non-SLP health care respondents were from small and remote communities, estimated to be a minimum of 300 km from the closest city. The majority of S-LP respondents were from large towns and cities.

Because of the similarity of knowledge, skills, training, and small *n* for RTs and S-LPs, the RT responses are reported with those of the S-LPs. Otherwise, responses

were analyzed separately for each profession to determine inter-professional differences.

Experience with laryngectomees seen in the previous five years varied greatly by profession (see Table 1). Of the five physicians/surgeons (hereafter referred to as physicians), three had seen 1–5 laryngectomees, one had seen 10–25, and one had seen more than 25. The two who had more experience were both OTLs. Among S-LPs, eight of 13 had seen 0–10 laryngectomees, two of 13 had seen 10–25, and three of 13 had seen more than 25 laryngectomees. Both RTs who responded had seen more than 25 patients in the previous five years. Of all the professions, RNs had seen the fewest laryngectomees. Nine of 16 RNs had seen no laryngectomees and only seven of the 16 had seen 1–5. None of the RNs in the study had seen more than five laryngectomees in the previous 5 years.

The knowledge questions yielded additional information (Table 2). Four out of five of the physicians responded correctly to question 2, three of five responded correctly to question 3, and four of five responded correctly to question 5. Twelve out of 16 of the RNs responded correctly to question 2, two of the 16 responded correctly to question 3, and nine of 16 responded correctly to question 5. S-LPs (including the two RTs) had the largest percentage of correct responses to the knowledge questions, 100% responded correctly to questions 2 and 5, and 14 of 15 responded correctly to question 3.

Question 4 probes practical knowledge and targets the primary focus of this study, which is to predict the appropriateness of health care that laryngectomized individuals will receive in the event of a TEP crisis. The responses to this question varied considerably between the professions (see Figure 1). Two of the five physicians (the two OTLs), six of 16 of the RNs and 13 of the 15 of the S-LPs (including the two RTs) responded correctly to question 4.

The results of the knowledge question scores revealed that RNs had the lowest percentage of correct responses on the knowledge questions, including question 4. Chi square statistics revealed interprofessional differences in correct/incorrect response ratios. Significantly lower scores were found for RNs for questions 3, 4, and 5. Significantly higher scores were found for S-LPs and RTs for questions 3 ($p = .0015$), 4 ($p = .0305$), and 5 ($p = .0226$).

Significant chi square tests for linear trend discovery suggested that the more laryngectomees who health care professionals had seen, the more likely they were to give a correct response to questions 3 ($p = .0030$), 4 ($p = .0081$), and 5 ($p = .0048$).

Question 6 probed professional education about laryngectomy and the care of laryngectomized individuals (Figure 2). Three of the five physicians (those who were not OTLs) and 13 of the 16 RNs reported having no specialized education. All of the S-LPs and RTs reported having had specialized education about laryngectomy.

Questions 7 and 8 elicited self-ratings of comfort level and preparedness in working with laryngectomized

Table 1

Laryngectomy Experience by Profession

Question 1: How many laryngectomy patients have you seen in the last 5 years?

Number seen	RT	S-LP	RN	Physician
0	0	4	9	0
1–5	0	3	7	3
6–10	0	1	0	0
11–25	0	2	0	1
More than 26	2	3	0	1

Table 2

Knowledge Question Responses by Profession

Question 2: A patient who has undergone a total laryngectomy breathes from her/his...

Profession	RT	S-LP	RN	Physician	Total
Correct	2	13	12	4	31
Incorrect	0	0	4	1	5
Total	2	13	16	5	

Question 3: A TEP (tracheo-esophageal puncture) allows communication between the...

Profession	RT	S-LP	RN	Physician	Total
Correct	2	12	2	3	19
Incorrect	0	1	14	2	17
Total	2	13	16	5	

Question 4: In the event that the TEP is dislodged, what is the most critical action (i.e. the first step) that must be taken?

Profession	RT	S-LP	RN	Physician	Total
Correct	2	11	6	2	21
Incorrect	0	2	10	3	15
Total	2	13	16	5	

Question 5: The trachea-stoma leads to the...

Profession	RT	S-LP	RN	Physician	Total
Correct	2	13	9	4	28
Incorrect	0	0	7	1	8
Total	2	13	16	5	

individuals (Figures 3, 4). Two of the five physicians (the two OTLs) reported feeling very comfortable and completely prepared to work with an individual who has undergone a laryngectomy. The same number (two of five) reported feeling very uncomfortable and not at all prepared. One physician reported feeling not very comfortable and not very prepared. For the S-LP/RT group, seven of 15 reported feeling very comfortable and completely prepared, three of 15 reported feeling fairly comfortable, and five of 15

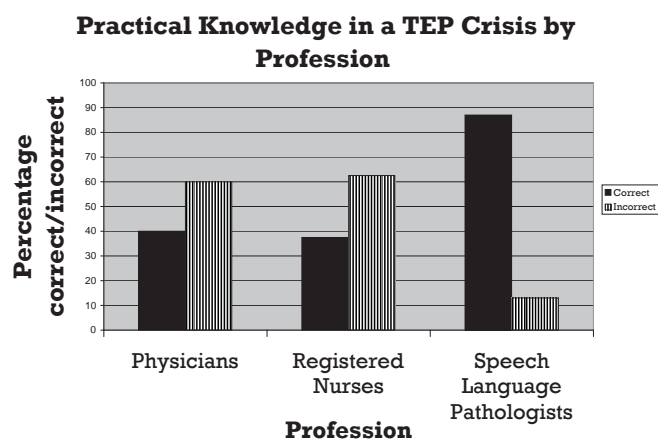


Figure 1. Practical knowledge in a TEP crisis by profession

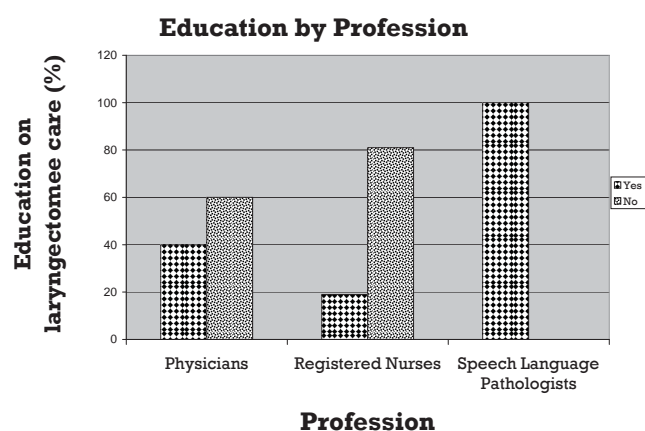


Figure 2. Education by profession

were either very uncomfortable or not very comfortable. Two of 15 responded feeling fairly well prepared, and the remaining six of the 15 reported feeling either not very prepared or not at all prepared. Of the RNs, two of 16 reported feeling fairly comfortable, and 14 of 16 reported feeling either not very comfortable or very uncomfortable. Two of the 16 RNs reported feeling fairly well prepared, and the remaining 14 reported feeling either not very prepared or not at all prepared. No RNs felt very comfortable or completely prepared to work with individuals who have undergone a laryngectomy.

Both of the two S-LPs who responded incorrectly to question 4 rated themselves as not very comfortable and not very prepared.

Chi square statistics suggest that the higher the professional's knowledge self-ratings was, the more likely he/she was to respond correctly to questions 3 ($p = .0004$), 4 ($p = .0211$) and 5 ($p = .0133$).

Discussion

The present study investigated the knowledge of health care providers regarding laryngectomy care. Among the most intriguing results were the relatively low performance on knowledge questions and the low self-ratings for comfort and knowledge by the front-line health care professionals,

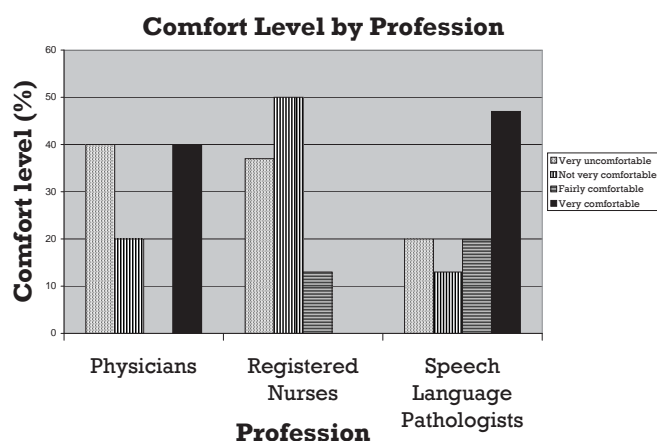


Figure 3. Comfort level by profession

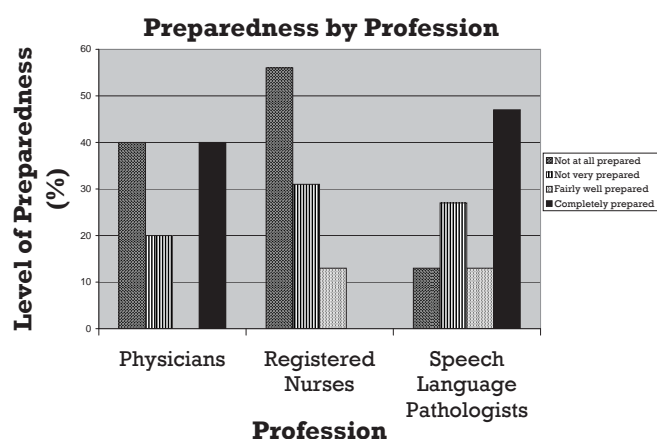


Figure 4. Preparedness by profession

(non OTL) physicians and RNs, compared to S-LPs and RTs. As has been noted in other regions of Canada (eg., Brown et al., 2000), teams of professionals specializing in the care of laryngectomized individuals tend to be focused in urban centres, and specialized medical/S-LP services typically are not available in smaller centres. S-LPs providing services in remote regions of BC tend to work as itinerants, and if practicing locally, work out of schools or public health clinics, primarily with children. The apparent knowledge advantage of the S-LPs may be of little practical consequence if they are not positioned to assist laryngectomized individuals at the time of a crisis.

If S-LPs in outlying and rural areas are not the professionals serving the laryngectomy population, who is and do they have the education/training to be able to deliver the care needed? During a respiratory crisis, front-line health care professionals are most likely accessed in local hospitals and health clinics. In rural or outlying areas, doctors and nurses are the front-line health care professionals, and therefore they are the ones dealing with situations such as TEP crises. In urban centres, S-LPs experienced in TEP management may be more accessible. The majority of the RN and physician/surgeon respondents in this study lived and worked in small and remote communities. This geographical situation no doubt puts a constraint on the

number of laryngectomized individuals in the community to whom a health care professional might be exposed, and the results of our statistical analysis suggest that experience in this area predicts textbook and practical knowledge.

Assuming basic textbook and practical knowledge are prerequisites for appropriate intervention, many front-line professionals may not have sufficient education and training to ensure effective and timely service for laryngectomized patients in a crisis, and the service gap that is implied is most likely to affect individuals living in smaller and more remote areas of the province. In this study, fewer than half of the front-line health care professionals (RNs and physicians) had any special education in laryngectomy care. In a recent survey of S-LPs, 94% of the respondents believed there is a need for more formal education/training in the area of head and neck cancer, including laryngeal cancer (Beaudin, Godes, Gowan, & Minuk, 2003).

Study limitations and Future Research

A primary limitation of this study was the small sample size. Survey research by mail typically exposes itself to selection biases that can be difficult to control. Although only a small number of former patients responded, their comments mirror those heard from clinicians and laryngectomized individuals who are seen frequently through our provincial resource program. The predominance of professional respondents from small and remote centres of BC may reflect a specific concern or curiosity about this population. This provides a starting point for future research and professional education targeting specific professional groups. The low numbers of physician/surgeon responses must be considered when interpreting the results. The low response rate from non-SLP health care professionals practicing in urban centres may reflect the assumption that special problems are typically dealt with by specialized professionals and teams. Patients living in or close to centres with specialized head and neck teams tend to rely on those professionals at times of TEP crisis.

Conclusions

Information provided by patients and front-line health care professionals indicated a need for further education and training by those who may provide services to laryngectomized individuals, specifically TEP crisis management. More than half of the laryngectomized respondents expressed concern about not being able to access the help they require during a TEP crisis. Professional teams and S-LPs who have specialized knowledge and experience in TEP management tend to be located in urban centres and are therefore inaccessible to those living in remote regions, which leaves a service gap for smaller centres and puts the responsibility on RNs, physicians, and other health care professionals who may not have the necessary specialized training about laryngectomy offered in their professional curriculum.

The minimum you should know about emergency care for patients with laryngectomies and tracheoesophageal prostheses: A short tutorial

Two practical objectives of this study were to determine the need for education and training among front-line health care professionals so they can deliver appropriate care to individuals who have undergone a laryngectomy and to develop minimum knowledge and skill criteria to ensure timely and effective care in a TEP crisis. It is also the goal of this special issue of the *Canadian Journal of Speech-Language Pathology and Audiology* to educate the readership about different aspects of head and neck cancer. We are including the following text to acquaint you with some of the fundamentals of TEP surgery and care. Like other front-line health care professionals, you should have a fundamental understanding of laryngectomy surgery, implications for breathing and speech, voice rehabilitation surgery, and implications and procedures for crisis intervention. We also recommend that you seek some practical training in this area, even if you do not necessarily expect to work frequently with laryngectomy patients.

1. Anatomical Changes.

Following a laryngectomy, individuals breathe solely through the tracheostoma in their neck and not at all from their nose or mouth. In the case of an emergency where oxygen is required, the oxygen must be placed over the tracheostoma and not over the nose or mouth.

The majority of individuals who have undergone a laryngectomy in the past two decades have also had a tracheoesophageal puncture, which is a minor surgical procedure to restore voice. This procedure creates a fistula between the upper back wall of the trachea and the esophagus, effectively pairing the air and food pipes for the purposes of supplying pulmonary airflow to a voice source in the esophagus (crico-pharyngeus muscle). A TEP is a small device that is inserted into the fistula. The TEP keeps the fistula patent and acts as a two-way valve, keeping food and fluid out of the trachea while allowing air to flow into the esophagus to create voice. In the event that the prosthesis valve is no longer effective or is dislodged or removed, anything that is swallowed will travel through the fistula and go directly into the trachea and lungs (aspiration). Within a few hours, the tracheoesophageal fistula will begin to shrink. Eventually it will close completely if nothing is inserted in it to keep it patent. If the fistula is left open, aspiration is inevitable until the fistula is completely closed, which could take several days.

2. Practical knowledge

If a TEP is dislodged (falls out or is pulled out), it is crucial that the fistula be occluded as soon as possible. For various reasons, it may not be possible to re-insert the TEP or to insert a new one; in any instance, the TEP should only be inserted by an individual who has training in the procedure. In this situation, a soft rubber catheter of similar diameter to the prosthesis must be inserted through the fistula and several inches into the esophagus to prevent

aspiration. The distal end is taped to the neck to ensure the catheter will stay in place. The goal of the catheter is to prevent food and fluid from leaking out of the fistula and into the lungs; this is best achieved with a catheter that is slightly larger than the prosthesis diameter.

TEPs need to be replaced periodically, typically when the two-way valve begins to fail and cause aspiration. If an in-situ TEP is leaking sufficiently to cause aspiration, it should be removed by pulling the prosthesis away from the fistula site and out of the stoma, from the external tab, if there is one. If there is no tab, the prosthesis should be grasped firmly using a hemostat (not forceps) that can be locked onto the prosthesis and pulled away from the fistula site and out of the stoma. While removing a TEP, the utmost care must be taken that the TEP does not fall into the trachea! After safely removing the TEP, a catheter should immediately be inserted into the open fistula to keep the fistula patent and to prevent aspiration.

References

- Allen, S. M., Culhane, R. W., Johnston, H., Laksmanis, L., Pouteau, K., Quinn, D. M., et al. (1998). Laryngectomy services in Canada: A preliminary survey. *Journal of Speech-Language Pathology and Audiology*, 22(3), 176–187.
- Beaudin, P. G., Godes, J. R., Gowan, A. C., & Minuk, J. L. (2003). An education and training survey of speech-language pathologists working with individuals with cancer of the larynx. *Journal of Speech-Language Pathology and Audiology*, 27(3), 144–154.
- Brown, S. I., Ferri, C. L., Griffiths, J., Lynch, T., Welch-West, P., & Doyle, P. C. (2000). Service delivery in rural centres of Ontario to individuals who are laryngectomized. *Journal of Speech-Language Pathology and Audiology*, 24(1), 10–18.
- Frowen, J., & Perry, A. (2000). Reasons for success or failure in surgical voice restoration after total laryngectomy: An Australian study. *The Journal of Laryngology and Otology*, 115, 393–399.
- Gates, G. A., Ryan, W., & Lauder, E. (1982). Current status of laryngectomy rehabilitation: IV. Attitudes about laryngectomy rehabilitation should change. *American Journal of Otolaryngology*, 3, 97–103.

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Appendix A

Questions for Laryngectomees with Tracheoesophageal Prosthesis (TEP)

1. Please tell us where you live: _____
2. (a) Have you ever had a TEP “crisis”? (Example, your TE prosthesis falls out, you’re home alone, and you can’t get it back in.)
(Circle): Yes No

(b) Please describe the “crisis” (What type of problem you were experiencing, what you did, where you went for help, who helped you, the outcome):

- (c) Were you satisfied with the help you received? (Circle): Yes No
3. (a) Do you have any concerns that you will not be able to access the help you need in your community in the event of a TEP “crisis” (whether or not you’ve already experienced a TEP crisis)?
(Circle): Yes No

(b) If yes, please describe your concerns:

Thank you for taking time to complete this questionnaire. You may mail or fax it to:

Linda Rammage, Director, Provincial Voice Care Resource Program
4th Floor, Willow Pavilion, 805 West 12th Ave.
Vancouver, BC, V5Z 1M9
Fax #: 604-875-5382

Appendix B

Questions for Health Care Professionals re TEP

Please indicate your professional title: _____

Instructions: Please check the box that indicates the best answer for each question, or write your response in the space provided.

In order to maintain anonymity, please do not write your name anywhere on this questionnaire.

1. How many laryngectomy patients have you seen in the last 5 years?

- ☐ 0 ☐ 1–5 ☐ 6–10 ☐ 11–25 ☐ more than 26

2. A patient who has undergone a total laryngectomy breathes from her/his...

- ☐ mouth ☐ nose ☐ tracheostoma
☐ tracheoesophageal fistula ☐ eustachian tube

3. A TEP (tracheoesophageal puncture) allows communication between the...

- ☐ stomach and esophagus ☐ pharynx and trachea
☐ trachea and atmosphere ☐ trachea and vocal cords
☐ trachea and larynx

4. In the event that the TEP is dislodged, what is the most critical action (i.e. the first step) that must be taken?

- ☐ lie the patient on her/his back ☐ clean the fistula and TEP
☐ give the patient a glass of water ☐ insert a soft rubber catheter
☐ lie the patient on her/his right side

5. The tracheostoma leads to the...

- ☐ stomach ☐ lungs ☐ larynx ☐ esophagus

6. Did you have any education/training about laryngectomy? ☐ yes ☐ no

If **yes**, what kind? (eg., about the surgery, patient care, patient needs, general knowledge, etc.) how much and how? (eg., 1-hour lecture/seminar, on the job training, full-day/week workshops, in-services, courses, medical residency, etc.)

7. How comfortable would you feel working with a patient who has undergone a laryngectomy (i.e. understanding and meeting their needs)

- ☐ very uncomfortable ☐ not very comfortable
☐ fairly comfortable ☐ very comfortable

8. Please estimate your level of knowledge of laryngectomees and rate how prepared you currently feel about working with a patient who has undergone a laryngectomy (i.e. knowing about and dealing with their needs)

- ☐ not at all prepared ☐ not very prepared
☐ fairly well prepared ☐ completely prepared

Thank you for completing and returning this questionnaire!

It will help us improve health care for laryngectomees.

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United States

■ The Utility of Symptom Checklists in Long-Term Postlaryngectomy Follow-Up of Tracheoesophageal Speakers

■ L'utilité d'une liste des symptômes pour le suivi à long terme après une laryngectomie chez les locuteurs ayant recours à la parole trachéo-œsophagienne

Philip C. Doyle
Adam M. B. Day
Heather D. Whitney
Candace Myers
Tanya L. Eadie

Abstract

This study evaluated the application and clinical utility of the Rotterdam Symptom Checklist (RSCL) in the long-term follow up of individuals who had undergone total laryngectomy. The RSCL provides an index of physical, psychological, and activity status in those who experience illness and/or disability. Twenty-four adults (12 men and 12 women) served as participants. All 24 speakers used tracheoesophageal (TE) speech as their primary mode of alaryngeal communication. Based on the data obtained, substantial variability was observed for both women and men who participated. While extensive deficits were not noted for some areas of assessment addressed in the RSCL, this symptom assessment instrument appears to be sensitive to a variety of concerns that may exist in the more extended postlaryngectomy period. Such evaluations are not typically considered in the long-term period postlaryngectomy after regular medical surveillance has been completed. Thus, the findings of the present study suggest that the use of such symptom checklists could provide an ongoing baseline measure across the three domains represented in the RSCL. The value of this type of continuous baseline over the course of long-term follow up by speech-language pathologists would seem to offer considerable value to evaluating rehabilitation and the process of monitoring both short- and long-term postlaryngectomy outcomes.

Abrégé

La présente étude a évalué l'utilisation et l'utilité clinique de la Liste des symptômes de Rotterdam pour le suivi à long terme des personnes ayant subi une laryngectomie totale. Cette liste fournit un index de l'état physique, psychologique et du niveau d'activités des personnes malades ou ayant une incapacité. Vingt-quatre adultes (12 hommes et 12 femmes) ont agi comme participants. Les 24 locuteurs avaient principalement recours à la parole trachéo-œsophagienne comme mode de communication alaryngée. Selon les données obtenues, il existe une variation substantielle pour les femmes et les hommes ayant participé à l'étude. Bien que l'on n'ait pas relevé de déficits considérables pour certains aspects contenus dans la liste, cet outil d'évaluation des symptômes semble être sensible à un éventail de préoccupations qui peuvent se faire sentir dans la période prolongée suivant la laryngectomie. De telles évaluations ne sont généralement pas prises en compte pour une période prolongée à la suite de la laryngectomie et une fois que le suivi médical régulier a pris fin. Ainsi, les résultats de la présente étude montrent que l'utilisation d'un tel outil peut servir de mesure de base permanente pour les trois aspects évalués par la Liste des symptômes de Rotterdam. La valeur de ce type de mesure de base permanente dans le cadre d'un suivi à long terme effectué par des orthophonistes semble considérable pour évaluer la réadaptation et faire le suivi des résultats à court et à long termes après une laryngectomie.

Key words: laryngectomy, head and neck cancer, quality of life, laryngeal cancer, symptom checklists, rehabilitation

Based on current statistics provided by the Canadian Cancer Society (2009), the diagnosis of laryngeal cancer represents approximately 1% of all new cancer sites in men and less than 0.5% in women. Despite the infrequent occurrence of laryngeal cancer relative to more widely recognized sites of malignancy (e.g., breast, prostate, lung, etc.), the consequences of laryngeal cancer are indeed dramatic. The diagnosis of laryngeal cancer and its treatment clearly may produce adverse physical and psychological effects on the individual (DeSanto, Olsen, Perry, Rohe, & Keith, 1995; Devins et al., 1994; Doyle, 1994, 1999, 2005). More specifically, a variety of changes secondary to the treatment of laryngeal cancer will cross anatomic, physiologic, psychological, social, and emotional boundaries. Changes across these domains will ultimately influence the individual's ability to participate fully in a variety of activities that frequently took place with ease prior to cancer treatment. Although such concerns cross a wide range of head and neck cancers (Rieger, Zalmanowitz, & Wolfaardt, 2006), the focus within the present treatise is specifically related to laryngeal malignancy and treatment via total laryngectomy. When considered collectively, the impact of these types of changes will have a corollary influence on the individual relative to one's general well-being (Doyle, 2005) and overall "quality of life" (QOL; Hassan & Weymuller, 1993). Further, it is well documented that verbal communication and swallowing are significantly influenced in those who are treated with radical surgical procedures such as total laryngectomy (Ackerstaff, Hilgers, Aaronson, & Balm, 1994; List et al., 1996; Ward, Bishop, Frisby, & Stevens, 2002). Taken together, a diagnosis and subsequent treatment of laryngeal cancer is likely to have a direct influence on one's general activity level and well-being, as well as creating the potential for physical and psychological symptom distress. The presence of distress broadly defined at any point in the post-treatment period (regardless of treatment modality) is an essential dimension to monitor and document. Thus, the ability to easily and efficiently identify and monitor such changes in the postlaryngectomy period may be viewed as an essential and necessary component of the short- and long-term rehabilitation process.

It is well-recognized in the communication disorders literature that the speech-language pathologist (S-LP) often plays a critical role in the care of those individuals who are diagnosed with laryngeal cancer (Doyle, 1994; Doyle & Keith, 2005; Edels, 1983; Myers, 2005; Salmon & Mount, 1991; Snidecor, 1968; and others). Although the primary role of the S-LP has traditionally focused on seeking to provide voice and speech rehabilitation, as well as dysphagia and diet management, the role of the S-LP is often more extensive. Frequently, the responsibilities assumed by the S-LP extend considerably beyond communication, eating, and swallowing in this clinical population. The duties and responsibilities of the S-LP are indeed multidimensional in many health care settings. The role of the S-LP in direct patient care often begins in close proximity to the time of diagnosis with preoperative counseling (Doyle, 1994;

Salmon & Mount, 1991). The continued involvement of the S-LP will then most likely involve the formal aspects of voice, speech, and dysphagia rehabilitation with subsequent broad-based counseling occurring in the early postoperative period. In many cases, rehabilitation extends into the months and even years following surgery (Doyle, 1994). However, a frequently unacknowledged yet critical aspect of the S-LP's responsibility often rests with long-term follow up issues. For example, in many instances it is not unusual for the S-LP to have close, regular, and long-term professional contact with those who have been treated for laryngeal cancer. As a result, post-treatment clinical visits with the S-LP provide an easy and valuable opportunity for regular assessment of not only the individual's general communication, but, perhaps more importantly, of the individual's general physical and psychological status and well-being (Doyle, 2005; Myers, 2005).

Ideally, postlaryngectomy clinical visits involve regular appointments with the S-LP after "formal" communication and swallowing treatment has been completed. For example, these sessions may involve aspects of tracheoesophageal prosthesis management, troubleshooting with an electrolarynx, or answering questions related to dietary restrictions and associated management. These clinical appointments with the S-LP often provide the opportunity to directly address any problems that have been encountered over the course of recovery and rehabilitation and provide information and resources as needed (Doyle, 1994; Doyle & Keith, 2005). Many experienced clinicians will attest to the wide array of concerns that emerge within such contacts. In such circumstances, the S-LP may be able to provide information, recommendations, and solutions to specific problems, or if the concerns are out of their professional domain, the S-LP can serve a valuable role in seeking appropriate referral(s) for the individual and his or her specific problems or concerns (Doyle, 1994, 1999). Thus, with exception of regular medical follow-up for those who have been treated for laryngeal cancer, the S-LP may have the greatest opportunity for the most regular and longest term contact with the individual in the post-treatment period. Consequently, the S-LP may be in an ideal position to identify problems that might require more expedient levels of consultation with other health care professionals.

If the S-LP maintains regular contact with the individual who is laryngectomized, this may suggest that the individual's general health status, and perhaps better stated, one's functional status and health related QOL (Trew & Maguire, 1982), could be easily and effectively monitored in a longitudinal fashion. Because laryngeal cancer and its treatment hold the potential for changes in one's level of distress and associated levels of physical and psychological symptoms that may certainly change over time (List et al., 1996; Nalbadian et al., 2001; Terrell, Fisher, & Wolf, 1998), we believe that the S-LP might be in the best position to assess related areas of change or concern over the longer term of recovery, rehabilitation, and ideally, social re-entry. One method that could prove to be a valuable addition to

post-treatment clinical follow-up visits to the S-LP would be through the use of simple "symptom" checklists (Myers, 2005). The use of checklists to monitor an individual's health and functional status in the presence of a disease or following curative treatment has been reported in a number of works that have focused on issues underlying QOL (Bruera et al., 1991; de Haes, van Knippenberg, & Neijt, 1990; Myers, 2005) and indeed appears to be gaining wider acceptance in a variety of clinical venues that address concerns of those with cancer.

Over the years, several instruments have been designed to specifically measure symptom clusters, including the Edmonton Symptom Assessment Scale (ESAS), the M. D. Anderson Symptom Inventory (MDASI), the Memorial Symptom Assessment Scale (MSAS), the Symptom Distress Scale (SDS), the Rotterdam Symptom Checklist (RSCL), and others. The general goal of such tools is to address one's abilities (or reductions in ability) within specific domains of function. It is common to see several areas addressed in an effort to identify changes in physical and psychological symptoms and/or alterations in one's physical abilities or activities. It is, however, generally agreed that measurement instruments of this type can serve to reliably identify, and perhaps index, one's functional status for a given time period.

In this regard, it may be suggested that such a checklist also might provide a measure of the individual's status over the post-treatment period. Thus, if problems were identified in a timely fashion, they could then be addressed in a more expedient manner and could have an impact on the success of the rehabilitation process (Paice, 2004). For example, it has often been reported that concerns related to speech and swallowing impairments diminish as an individual learns to adapt to his or her condition post-treatment for laryngeal cancer (Nalbadian et al., 2001), yet concerns related to physical pain and psychological well-being may continue to exist even 10 years after treatment (Terrell et al., 1998). In addition, concerns related to speech or swallowing in every day activities may remain (Ward, Koh, Frisby, & Hodge, 2003). In such cases, the benefits of using symptom checklists would be twofold: (1) results could be used to identify areas of concern for referral to other health care professionals and (2) if other areas of concern were treated (e.g., mental health, pain), this could benefit areas within the scope of practice for the S-LP (e.g., social participation and communication; sharing mealtimes with friends and family). Thus, the purpose of this preliminary study was to assess the utility of a well-established symptom checklist that is designed to address physical, psychological, and activity status for a fixed interval of time. By undertaking this preliminary assessment, we reasoned that areas of concern addressed within the symptom checklist potentially could be used as a method of indexing the overall status of individuals who completed this simple tool. It was reasoned that the symptom checklist could serve as an ongoing measure of rehabilitation status, and possibly provide an efficient,

yet relatively concise measure of QOL in the postlaryngectomy period. These data might then support the use of such symptom checklists as a simple yet valuable tool in on-going assessments of those who have been treated for laryngeal cancer. Thus, while the primary objective of this study was directed at providing descriptive data for TE speakers relative to symptom report across physical, psychological, and activity domains, several specific research questions were posed: (a) Do differences in the report of postlaryngectomy symptoms exist between men and women? (b) Do demographic factors correlate with symptom outcome? and (c) Does self-perception of speech performance correlate with symptom outcome?

In considering our desire to evaluate the potential application and clinical utility of symptom checklists as a means of assessing long-term postlaryngectomy outcomes, we sought to eliminate a potentially primary confounding variable related to one's chosen method of alaryngeal speech. In doing so, the present study included only individuals who had undergone tracheoesophageal (TE) voice restoration (Singer & Blom, 1980). The selection of only those who used TE speech was undertaken for two reasons. First, because TE voice restoration has been shown to be a generally viable and successful method of postlaryngectomy "alaryngeal" communication for more than 25 years, these participants may be perceived as experiencing fewer overall communication difficulties relative to their counterparts who use esophageal speech or the artificial larynx (Ward et al., 2002). As such, we felt that by reducing the overall potential for explicit communication difficulties related to inadequate acquisition of some mode of alaryngeal speech (e.g., esophageal and/or electrolaryngeal speech), questions posed in the present study could be addressed in a more independent fashion. Second, because TE is widely employed today in North America, we felt the present data might have more widespread initial application (Iverson-Thoburn & Hayden, 2000). Thus, it was anticipated that "communication" issues would be less likely to influence the responses they would provide to the symptoms addressed.¹ Additionally, recent work by Day, Dzioba, Beaudin, Eadie, & Doyle (2008) and Moukarbel, Doyle, Yoo, Franklin, Day, & Fung (2008) suggests that those who use TE speech may experience less voice-related disability relative to other alaryngeal methods. Hence, we believed that evaluation of TE speakers would reduce, at least to some extent, the potential negative influence of vocal disability on the measures gathered in this evaluation of long-term functioning and symptoms.

¹It should be noted that no questions directly related to communication status were included as part of the measurement tool evaluated in this investigation. However, communication limitations might have had some influence on several areas explored in the *psychological* and *activity* domains, thus our desire to reduce the potential influence of overall communication problems by using TE speakers.

Methods

Participants

The participants for this preliminary study were 24 adults who had undergone total laryngectomy. All participants had undergone TE puncture voice restoration (Singer & Blom, 1980) and currently used TE speech as their primary method of alaryngeal verbal communication. Participants included 12 males (mean age = 65 years 3 months; range = 49–81 years) and 12 females (mean age = 54 years 8 months; range = 39–60 years). Participants selected for inclusion were required to be at least 36 months postlaryngectomy. The mean period postlaryngectomy was 49.9 months for males and 57.5 months for females. The population assessed in the present study involved participants who were matched by gender relative to time postlaryngectomy; most participant pairs (male/female) were matched within one year, but no difference exceeding 18 months existed for any participant pairing. Table 1 presents demographic characteristics of the 24 individuals who participated in this study.

Additional Participant Demographics

Of the 24 participants, the males had used TE speech for a period ranging from 1 year 11 months to 5 years, 6 months; females had used TE speech from two years to 7 years, 6 months. Three males and six females had undergone primary TE puncture, with the remaining participants undergoing secondary puncture postlaryngectomy. Eleven males received radiation therapy as part of their cancer treatment; six males received preoperative radiation treatment and five males received postoperative treatments. In contrast, six females received radiation therapy, three preoperatively and three postoperatively.

Finally, as one component of the study, all participants were asked to provide a self-assessment of their own overall TE (communication) speech ability. No definition was provided other than a request for categorical identification of self-assessments. For males, three rated their speech as *excellent*, three assessed their speech as *above average*, and six assessed their speech as *average*. For females, six judged their TE speech as *excellent*, two assessed their speech as *above average*, two assessed their speech as *average*, and two assessed their speech as *below average* (see Table 2).

Procedure

All participants who agreed to participate in this preliminary investigation were contacted by an independent third party and asked if they would be interested in completing a brief questionnaire that focused on postlaryngectomy health issues. The contacting agent was a distributor for TE puncture voice prostheses and associated laryngectomy supplies (InHealth Technologies, Carpinteria, CA). The procedure that took place was as follows: When an individual contacted the distributor via phone to place a prosthesis order, the agent asked that person if they would be interested in completing a questionnaire as part of a study being conducted by an independent,

Table 1

Demographic Information for Male and Female Participants

Sex	Age ¹	Period PL ²	TE speech ³	Rad Tx ⁴
Male	65.3 (49–81)	49.9 (29–72)	44.2 (23–66)	Pre-op = 6
				Post-op = 5
				None = 1
Female	54.7 (39–68)	57.5 (24–90)	54.5 (24–90)	Pre-op = 3
				Post-op = 3
				None = 6

Notes: ¹Mean age is in years and months (range); ²period postlaryngectomy is in months (range); ³mean time using TE speech is in months (range); ⁴radiation therapy received (yes/no, pre-op/post-op).

Table 2

*Self-Ratings of Speech Proficiency for Female and Male Participants**

	Poor	Below average	Average	Above average	Excellent
Females		2	2	2	6
Males			6	3	3

*No descriptions other than the categorical labels for proficiency identified above were provided to participants.

external research group. If the individual agreed, the questionnaire, a letter of information, a consent form (in accordance with the ethical approval for the study), and a pre-addressed, postage-paid envelope was forwarded to the potential participant along with their order. Those who responded to this solicitation represented multiple geographic locales across North America. From the larger pool of TE participants who responded ($n > 90$), the gender- and time postlaryngectomy-matched group assessed in the current project was selected based on the previously outlined selection criteria.

Measurement Tool

The measurement tool employed in this investigation was the Rotterdam Symptom Checklist (RSCL) developed by de Haes and colleagues (1996) at the Northern Centre for Health Care Research in the Netherlands. The RSCL is a 38-item self-assessment instrument that requires the participant to identify one of four categories of response for a series of questions in three domains of inquiry. The ratings provided by the respondent to each area of inquiry represent a judgment of the degree to which the respondent experiences the presence of the given “symptom” within the past week (de Haes, Van Knippenberg, & Neijt, 1990). Of the 38 questions posed, 23 addressed symptoms in the *physical* domain, seven addressed *psychological* symptoms, and eight addressed symptoms dealing with *activity*. Each of the questions is then rated by the respondent with one

of four response choices that represent the presence or frequency of the symptom in question: *not at all*, *a little*, *quite a bit*, and *very much*. Once the respondent has completed the symptom checklist, the clinician/experimenter assigns a score of from 1 to 4 for each response (1 = *not at all*, 2 = *a little*, 3 = *quite a bit*, and 4 = *very much*). According to the authors of the RSCL (de Haes et al., 1996), a higher score for any question is seen to reflect a “higher level of burden or impairment.” Examples of symptoms addressed in the physical domain include lack of appetite, sore muscles, headache, etc. In the psychological domain, symptoms included irritability, worrying, etc. Finally, in the activity level domain, areas addressed included care for myself, go shopping, etc. Additionally, an overall valuation of life question is posed at the end of the RSCL to assess the individual’s perceived QOL (using a 7-point scale ranging from *extremely poor* [7] to *excellent* [1]). Finally, in addition to the RSCL, each participant was asked to complete a brief personal history questionnaire that provided demographic information in order to better define their status within their peer group of TE speakers. Thus, the RSCL may be viewed as a simple, composite instrument that seeks to capture the individual’s functional performance across the domains noted

Data Analysis

From the 24 RSCL instruments gathered in the present study, the response data were calculated using the method described in the RSCL guidelines (de Haes et al., 1996). First, the sum of scores for all questions in each of the three symptom subscales (i.e., physical, psychological, and activity) was calculated and an overall raw score was generated. As stated by de Haes and colleagues, a higher score on any given symptom addressed in the physical or psychological content areas, or in any respective domain of evaluation, can be associated with a greater “level of burden or impairment.” In contrast, a higher numeric response in the activity level is associated with lesser burden or impairment. This is also true for the responses provided in the respondent’s overall valuation of life. Once a raw summation of item scores in each of the three domains included in the RSCL was completed, additional analyses were performed on the data. The individual scores within each of the three domains were then converted into a standard score using the following procedure recommended by de Haes et al. (1996). The analyses involved the generation of what the authors of the RSCL have called “transformed” scores (de Haes et al., 1996). The transformation of raw scores is undertaken in order to comparatively evaluate the level of impairment in one domain to that of another. This transformation involves applying the following procedure to an individual’s score in any of the three domains:

$$\frac{\text{raw scaled score} - \text{minimum raw score}}{\text{maximum score} - \text{minimum score}} \times 100 = \text{transformed score}$$

The transformation of raw scores that are initially generated allows the clinician or experimenter to represent

a transformed score of 0 with no identified impairment and a score of 100 with the greatest impairment.

Results were calculated independently for each male and female participant. Normalized data scores were then analyzed for differences due to gender and other demographic variables using both parametric and nonparametric statistics. The relationship between RSCL domains to any demographic variables were determined using Spearman correlation coefficients with the exception of gender, which was calculated with rank-order biserial correlations because of its nominal nature. A predetermined level of statistical significance ($p < .05$) was used for all analyses.

Results

RSCL Scores

Based on RSCL data obtained, a composite picture of the male and female participants was generated for each specific symptom domain of interest. Specifically, the individual participant physical symptom raw scores were found to range from 23 to 50 for females and from 24 to 51 for males (the possible scores ranged from a low of 23 to a high of 92)². The transformed physical scores for women ranged from a low of 0 to a high of 39.13 and the range for was men from 1.45 to 40.58. In the psychological domain, the scores ranged from 7 to 19 for females and from 7 to 22 for males (range of possible scores: 7 to 32). The transformed psychological scores for women were determined to range from a low of 0 ($n = 3$) to a high of 48; for men, these scores ranged from 0 ($n = 2$) to 60. Finally, within the activity domain, the total score was found to range from 19 to 32 for females and from 26 to 32 for males (range of possible scores being 8 to 32). Transformed activity scores for women ranged from 4.17 to 100 ($n = 6$) and for men ranged from 16.67 to 100 ($n = 5$). Taken together, these scores indicated substantial variability across both women and men who participated.

The final data analyzed as part of this investigation related to the participants’ overall valuation of life requiring a single numeric response from a 7-point equal appearing interval scale. The overall mean score for women participants was 1.42 (falling between *excellent* and *good*) and for men it was 2.08 (*good*). The means and standard deviations for all normalized scores of the RSCL domains and overall valuation of life for all 24 participants can be found in Table 3.

Differences between the RSCL domain scores and overall valuation of life scores for men and women were not found to be significantly different from one another.

²Assuming that a score of 1 is provided for all possible symptoms addressed within the subscale pertaining to this domain, a score of 23 would be achieved; conversely, if a score of 4 is provided for all symptoms, a maximum score of 92 would be achieved. The minimum and maximum scores for the other domains of inquiry would be generated in the same manner.

Table 3

Mean and SD for Domains of RSCL for Male and Female Participants

RSCL domain	Male		Female	
	Mean	SD	Mean	SD
Physical	18.00	12.01	13.65	11.47
Psychological	20.67	18.20	13.33	17.75
Activity	14.24	13.23	10.76	16.23
Overall valuation	2.08		1.42	

Notes: Transformed RSCL scores may range from 0 to 100 with higher scores reflecting poorer functioning or more substantial symptoms (i.e., greater levels of potential disability).

SD = Standard Deviation

Relationship between RSCL scores and demographic factors

Relationships between RSCL domain scores and demographic variables were calculated using Spearman correlation coefficients. Based on these analyses, no significant relationships were found. One significant relationship was found between presence/absence of radiation and scores on activity domain of the RSCL ($r = .620$), with those who had radiation showing worse activity scores. Overall valuation of life showed two significant relationships, the first to number of months since laryngectomy ($r = -.697$) and the second to time that the individual had used TE speech as their primary mode of communication ($r = -.620$); both relationships were found to be significant at a probability level of $< .05$.

Relationship between RSCL scores and self-rated speech scores

Each of the RSCL domain scores were significantly related to self-rated speech (physical, $r = -.580$; psychological, $r = -.694$; $r = -.635$, $p < .05$). However, overall valuation of life scores were not found to be significantly related to self-rated speech scores.

Discussion

The purpose of this preliminary study was directed at assessing the utility of a commonly used symptom checklist in the monitoring of individuals who had received a total laryngectomy as treatment for laryngeal cancer. All participants currently used TE speech as their method of alaryngeal communication. The specific measurement tool used, the *Rotterdam Symptom Checklist* (RSCL), was designed to evaluate the individual's status within physical, psychological, and activity domains, as well as obtaining a simple measure of one's overall valuation of life. Prior to conducting this preliminary study, it was believed that the three domains addressed within the RSCL could be useful in indexing the overall health-related QOL status of these individuals. We also believed that such measures could serve as a simple but valuable index of one's symptom status at a relatively fixed point in time (i.e., based upon

assessments of the symptom over the previous week). It was anticipated that symptom concerns as represented by questions included within the RSCL would emerge if information was solicited as part of this project. If true, it was anticipated that the RSCL or a similar type of symptom checklist instrument could serve as an ongoing, longitudinal measure of one's health status and/or health-related QOL over the extended course of the postlaryngectomy period. Results are discussed relative to RSCL group data, individual differences, and clinical implications of the utility of symptom checklists.

RSCL Group Data

From the standpoint of the "symptoms" assessed and the domains represented using the RSCL, the present data suggest that few symptoms were identified as being problematic at the time these participants completed the RSCL. These results are consistent with those found by previous studies, in that individuals who use TE speech as their primary mode of communication generally report good overall quality of life scores, particularly when this is evaluated many years postlaryngectomy (Eadie & Doyle, 2005; Hanna et al., 2004; Nalbadian et al., 2001; Weymuller et al., 2000). These results also are supported by the correlation that was found between time since surgery and the one question related to overall valuation of life ($r = -.697$). These results indicated better self-rated valuation of life as more time had passed since the individual had undergone surgery and had begun using TE speech as the primary mode of communication. Interestingly, no significant relationships were found between time variables and any of the domain scores. These results could have been masked by the fact that most participants in this investigation were between 4 and 5 years postlaryngectomy. Further investigation into these results is warranted, with the use of prospective studies. However, it should also be pointed out that while few symptoms were identified in the present group of participants, some symptoms were noted by some individuals, and when identified, the assessed magnitude of those symptoms was quite variable.

An additional significant relationship was found between presence of radiation and activity scores ($r = -.620$). That is, individuals who had radiation therapy, either pre- or postoperatively, reported reduced RSCL activity scores more often than did those individuals who did not receive radiation therapy. Although one might speculate that there were long-term effects of radiation that affected participation in activities, one might also expect that this might be generated through reduction in physical functions. Since the correlation with physical functioning was not significant, it appears that this was not the case. Instead, this result might be a reflection of the increased severity of disease in individuals who received both radiation and surgical therapy as opposed to surgery alone. It is clear that radiation does have side effects that are persistent throughout the life of the individual, and subsequently, the ability to monitor an array of symptoms that persist over time is clear. Further, as more aggressive treatment

protocols such as chemoradiation become the standard of care for some cancers, it would seem obvious that the ability to assess longer term outcomes is necessary. We are currently engaged in a prospective longitudinal study of such concerns and the progression of symptoms (either increases or decreases) over time.

Individual Differences Among RSCL Data

Although group mean values for the RSCL indicated high levels of functioning, it was anticipated that the checklists would be sensitive to individual differences and that some symptoms would emerge as problematic for some participants but not for others. That is, we believed that while these 24 participants would not identify a substantial number of symptoms or associated distress as a group, individuals would be able to document the presence of isolated symptoms that are represented within one or more of the three domains of the RSCL. These results are reflected in the variability and range of observed scores, demonstrating the sensitivity of the tool to various difficulties. Clearly, the present work was descriptive. However, we cannot stress the importance of considering the individual within the context of the present work (Doyle & Keith, 2005). While group performance and/or functioning specific to symptoms may not emerge explicitly, it is incumbent upon clinicians to understand that unique individual profiles will be observed and may change over time. Thus, although we pursued the present study as a pseudo-group design, we do not wish to degrade the critical importance of the individual in the context of our desire to monitor symptoms over an extended post-treatment period of time.

As noted, no group differences were found between male and female participants for domain scores. These results are similar to those found by previous researchers who used a disease-specific quality of life instrument (Eadie & Doyle, 2004). However, it was interesting to note that when the entire body of raw data was evaluated to determine if any particular symptoms clearly stood out within any given domain evaluated, some commonalities across men and women were observed, as well as some unique patterns of symptom identification. Namely, men consistently identified increased levels of symptomology in their responses to the symptoms of decreased sexual interest and acid indigestion, both symptoms being represented in the physical subscale. Distress associated with the symptom of acid indigestion also was reported for the women participants. In contrast to men, however, women reported that they experienced increased levels of distress associated with the physical symptoms of shortness of breath and dry mouth.

Despite the small sample from which these data were obtained, it may be suggested that as a result of the symptoms identified by some respondents, some clinical attention would be considered both at a group level and at the individual level. For example, the prevalence of concern about decreased sexual interest expressed by men indicates that issues of sexuality in the postlaryngectomy period cannot be discounted. This suggestion becomes even

more significant as one considers the potential for younger individuals undergoing treatment for laryngeal cancer, in addition to the increasing life expectancy despite cancer diagnosis and treatment (American Cancer Society, 2003). It is not unreasonable to assume that concerns about sexual interest and performance would be acknowledged given the importance of such behaviour in personal relationships. Doyle (1999) has recommended that while discussions of sexuality often have been avoided as part of counseling in those who are laryngectomized, such discussions are a mandatory component of comprehensive clinical care for those with laryngeal cancer, in that the impact of such changes are often dramatic with subsequent reductions in one's QOL. Although it is clear that such discussions may not fall within the expertise of the S-LP, the responsibility to ensure that an appropriate referral is provided cannot be overlooked.

Similarly, the concern raised by women regarding shortness of breath should be carefully evaluated in order to determine if such a physical symptom may relate, at least in the present sample, to the use of a TE puncture voice prosthesis in the presence of a tracheal airway with a typically smaller cross-sectional area relative to men. The impact of such symptoms reported by women is clear in that reductions in breathing likely may have an impact on the performance of other physical activities, and hence may limit one's ability to perform activities of daily living or those related to employment. Again, although group trends from this preliminary evaluation of the RSCL lack external validity, the concerns raised may be common concerns that likely merit follow-up and possible referral to other health professionals. For example, if issues related to breathing were addressed, this could increase general levels of activity, thereby reducing fatigue and increasing independence (Ackerstaff et al., 1993, 1995). This also could increase social participation, which has been reported to be the most important concern among those who undergo total laryngectomy (DeSanto et al., 1995). Similarly, when collective information on the presence and severity of symptoms is reported by individuals, this information may form a comparative base from which potential patterns of difficulty may be discerned.

Utility of Symptom Checklists

Through such comparative assessments of ongoing symptom checklists, symptoms that persist may suggest that appropriate action be pursued by the S-LP. Thus, use of such symptom checklists may affect rehabilitation success by removing barriers to clinical assessment of symptoms. Paice (2004) indicates that there are three kinds of barriers to assessment of symptoms: (a) those related to the health care professional; (b) those related to the patient; and (c) those related to the health care system. Health care professional barriers include the subjectivity of cancer-related symptoms and the assumption that patients will voluntarily report these sensations. Patient-related barriers include many of these shared assumptions, for example, the patient may assume that the health care professional

will anticipate problems, making reporting unnecessary. Patients are further reluctant to report symptoms because they do not want to bother their physician or family member. Finally, the health care system produces barriers, including time limits on the health care professional. Thus, the use of standardized symptom assessment tools would make it easier for otherwise unreported symptoms to be treated by appropriate members of the health care team (Myers, 2005).

The findings of the present study suggest that the use of such symptom checklists could provide an ongoing baseline measure across the three domains represented in the RSCL. The value of this type of continuous baseline over the course of long-term follow up by S-LPs would seem to offer considerable value to the monitoring process. Specifically, if changes are noted over time within or across any of the three domains represented on the RSCL, the clinician could then seek further clarification from the individual patient and make recommendations and/or referrals as deemed appropriate under the circumstances. Minimally, the clinician can solicit additional information from the person about the level and or severity of the symptom(s). Obviously, of greatest interest here is the fact that if changes are observed, the clinician could then perform a re-assessment, if necessary, prior to making any type of decision about follow-up. However, because S-LPs frequently develop substantial professional relationships with those who are diagnosed and treated for head and neck cancer, the method of evaluating whether such changes are caused by less significant reasons (e.g., patient was at the end stages of a cold, etc.) or by more significant reasons (e.g., potential disease recurrence or developing pathology) seems quite realistic. As with any type of high-quality clinical care, the clinician and patient must enter into a dialogue in order to fully evaluate problems and hopefully provide prompt suggestions and/or referrals for further help.

Results derived from symptom checklists also may provide reasons for success/lack of success with speech and/or swallowing outcomes. For example, results from the present study indicate significant results between self-rated speech and all domains of the RSCL. These results are consistent with those found by others, who have highlighted the importance of communication and social and psychological well-being. Previous results also indicate that coping strategies, adjustment, social support, social well-being, and psychological issues are positive predictors of post-laryngectomy outcomes (Blood et al., 1992, 1994; Doyle, 2005; Doyle & Keith, 2005; Palmer & Graham, 2004). Thus, use of symptom checklists also could inform the S-LP of possible causes of problems in their own scope of practice (Myers, 2005). Referrals to psychosocial programs also could bolster comprehensive speech and/or swallowing outcomes. For example, even when no dysphagia is indicated, individuals may still report distress (Ward et al., 2002).

Based on the present data, we feel that the use of symptom checklists such as the RSCL, or tools that are similar in their design and intent, could prove as a

valuable adjunct for the S-LP who works with individuals who are laryngectomized. Although the present work centered on those laryngectomized persons who used tracheoesophageal speech as their primary mode of verbal communication, the present data also may be reflective of other alaryngeal speaker groups. The important issue here is the desire to monitor individuals and if a problem emerges, to seek to remedy the problem in a timely manner and through the most appropriate means. The primary finding of the present project focuses clearly on the ability to monitor individual patients in an efficient and consistent fashion. Therefore, the present findings support the potential utility of symptom checklists as a simple and viable means of documenting issues that may underlie the health related QOL in individuals who are treated for laryngeal cancer, and perhaps those who are treated for other types of head and neck cancer, and who may be followed by speech-language pathologists (Doyle, 2005; Myers, 2005).

Conclusions

This preliminary study assessed the utility of a commonly used symptom checklist in the monitoring of individuals who had undergone total laryngectomy as treatment for laryngeal cancer. All participants currently used TE speech as their method of alaryngeal communication. The Rotterdam Symptom Checklist is designed to evaluate the individual's status within physical, psychological, and activity domains, as well as to obtain a simple measure of one's overall valuation of life. The underlying premise of this work centers on the fact that S-LPs may be in an ideal position to monitor health related changes, particularly those that could be addressed through use of a simple symptom checklist. The viability of this approach has been documented in the current project. Based on the information gathered, the utility of symptom checklists as part of the regular follow-up protocol for individuals treated for laryngeal cancer appears to be supported. Although further and larger scale research is required, these preliminary data support use of tools similar in construct to that of the RSCL. We are continuing to explore this important area of clinical outcome in those who have been laryngectomized and use a variety of alaryngeal voice and speech options.

References

- Ackerstaff, A. H., Hilgers, F. J. M., Aaronson, N. K., & Balm, A. J. (1994). Communication, functional disorders and lifestyle changes after total laryngectomy. *Clinical Otolaryngology*, 19, 295-300.
- Ackerstaff, A. H., Hilgers, F. J. M., Aaronson, N. K., Balm, A. J., & van Zandwijk, N. (1993). Improvements in respiratory and psychosocial functioning following total laryngectomy by the use of a heat and moisture exchanger. *Annals of Otolaryngology and Laryngology*, 102, 878-883.
- Ackerstaff A. H., Hilgers, F. J. M., Aaronson N. K., De Boer, M. F., Meeuwis, C. A., Knegt, P. P., et al. (1995). Heat and moisture exchangers as a treatment option in the post-operative rehabilitation of laryngectomized patients. *Clinical Otolaryngology*, 20, 504-509.
- American Cancer Society. (2003). *Cancer facts and figures - 2003*. Atlanta, GA: American Cancer Society.
- Blood, G. W., Luther, A. R., & Stemple, J. C. (1992). Coping and adjustment in alaryngeal speakers. *American Journal of Speech-Language Pathology*, 1, 63-69.
- Blood, G. W., Raimondi, S. C., Dineen, M., Kauffman, S. M., & Stagaard, K. A. (1994). Social support in laryngeal cancer survivors: Voice and adjustment issues. *American Journal of Speech-Language Pathology*, 3, 37-44.

- Bruera, E., Kuehn, N., Miller, M. J., Selmser, P., & Macmillan, K. (1991). The Edmonstron Symptom Assessment System (ESAS): A simple method for the assessment of palliative care patients. *Journal of Palliative Care*, 7(2), 6-9.
- Canadian Cancer Society, Statistics Canada, and Public Health Agency of Canada. Canadian Cancer Statistics (2009). Incidence and Mortality by Cancer Site (pp. 11-15). www.cancer.ca.
- Day, A. M. B., Dzioba, A., Beaudin, P., Eadie, T., & Doyle, P. C. (2008, November). Voice disability secondary to total laryngectomy and use of alaryngeal speech. Presented at the Annual Convention of the American Speech-Language, Hearing Association, Chicago, IL.
- de Haes, J. C. M., Olschewski, M., Fayers, P., Visser, M. R. M., Cull, A., Hopwood, P., et al. (1996). *The Rotterdam Symptom Checklist: A manual*. The Netherlands: Northern Centre for Healthcare Research (NCH), University of Groningen.
- de Haes, J. C. M., Van Knippenberg, F. C. E., & Neijt, J. P. (1990). Measuring psychological and physical distress in cancer patients: Structure and application of the Rotterdam Symptom Checklist. *British Journal of Cancer*, 62, 1034-1038.
- DeSanto, L. W., Olsen, K. D., Perry, W. C., Rohe, D. E., & Keith, R. L. (1995). Quality of life after surgical treatment of cancer of the larynx. *Annals of Otolaryngology, Rhinology and Laryngology*, 104, 763-769.
- Devins, G. M., Stam, H. J., & Koopmans, J. P. (1994). Psychosocial impact of laryngectomy mediated by perceived stigma and illness intrusiveness. *Canadian Journal of Psychiatry*, 39, 608-616.
- Doyle, P. C. (2005). Rehabilitation in head and neck cancer. In P. C. Doyle & R. L. Keith (Eds.), *Contemporary considerations in the treatment and rehabilitation of head and neck cancer: Voice, speech, and swallowing* (pp. 737-754). Austin, TX: ProEd.
- Doyle, P. C. (1999). Postlaryngectomy speech rehabilitation: Contemporary considerations in clinical care. *Journal of Speech-Language Pathology and Audiology*, 23, 109-116.
- Doyle, P. C. (1994). *Foundations of voice and speech rehabilitation following laryngeal cancer*. San Diego: Singular Publishing Group.
- Doyle, P. C., & Keith, R. L. (2005). *Contemporary considerations in the treatment and rehabilitation of head and neck cancer: Voice, speech, and swallowing*. Austin, TX: ProEd.
- Eadie, T. L., & Doyle, P. C. (2005). Quality of life in male tracheoesophageal (TE) speakers. *Journal of Rehabilitation Research and Development*, 42, 115-124.
- Eadie, T. L., & Doyle, P. C. (2004). Auditory-perceptual scaling and quality of life in tracheoesophageal speakers. *Laryngoscope*, 114, 753-759.
- Edels, Y. (1983). *Laryngectomy: Diagnosis to rehabilitation*. Rockville, MD: Aspen Press.
- Hanna, E., Sherman, A., Cash, D., Adams, D., Vural, E., Fan, C. Y., et al. (2004). Quality of life for patients following total laryngectomy vs. chemoradiation for laryngeal preservation. *Archives of Otolaryngology - Head & Neck Surgery*, 130, 875-879.
- Hassan, S. J., & Weymuller E. A. (1993). Assessment of quality of life in head and neck cancer patients. *Head and Neck Surgery*, 15, 485-495.
- Iverson-Thoburn, S. K., & Hayden, P. A. (2000). Alaryngeal speech utilization: A survey. *Journal of Medical Speech-Language Pathology*, 8, 85-99.
- List, M. A., Ritter-Sterr, C. A., Baker, T. M., Colangelo, L. A., Matz, G., Pauloski, B. R., et al. (1996). Longitudinal assessment of quality of life in laryngeal cancer patients. *Head & Neck*, 1, 1-10.
- Moukarbel, R., Doyle, P. C., Yoo, J., Franklin, J. H., Day, A., & Fung, K. (2008, June). Voice-related quality of life (V-RQL) following laryngectomy. Paper presented at the 67th Annual Meeting of the Canadian Otolaryngology Society, Jasper, AB.
- Myers, C. (2005). Quality of life and head and neck cancer. In P. C. Doyle & R. L. Keith (Eds.), *Contemporary considerations in the treatment and rehabilitation of head and neck cancer: Voice, speech, and swallowing* (pp. 697-736). Austin, TX: ProEd.
- Nalbadian, M., Nikolaou, A., Nikolaidis, V., Petridis, D., Themelis, C., & Daniilidis, I. (2001). Factors influencing quality of life in laryngectomized patients. *European Archives of Otorhinolaryngology*, 258, 336-240.
- Paice, J. A. (2004). Assessment of symptom clusters in people with cancer. *Journal of the National Cancer Institute Monographs*, 32, 98-102.
- Palmer, A. D., & Graham, M. S. (2004). The relationship between communication and quality of life in alaryngeal speakers. *Journal of Speech-Language Pathology and Audiology*, 28(1), 6-24.
- Rieger, J. M., Zalmanowitz, J. G., & Wolfaardt, J. F. (2006). Functional outcomes after organ preservation treatment in head and neck cancer: A critical review of the literature. *International Journal of Oral and Maxillofacial Surgery*, 35, 581-587.
- Salmon, S. J., & Mount, K. H. (1991). *Alaryngeal speech rehabilitation: For clinicians by clinicians*. Austin, TX: ProEd.
- Singer, M. I., & Blom, E. D. (1980). An endoscopic technique for restoration of voice after laryngectomy. *Annals of Otolaryngology and Rhinology*, 89, 529-533.
- Snidecor, J. C. (1968). *Speech rehabilitation of the laryngectomized* (2nd ed). Springfield, IL: Charles C. Thomas.
- Terrell, J. E., Fisher, S. G., & Wolf, G. T. (1998). Long-term quality of life after treatment of laryngeal cancer. The Veterans Affairs Laryngeal Cancer Study Group. *Archives of Otolaryngology - Head & Neck Surgery*, 124, 964-971.
- Trew, M., & Maguire, P. (1982). Further comparison of two instruments for measuring quality of life in cancer patients. In J. Beckman (Ed.), *Quality of Life*. Proceedings of the Third Workshop of the EORTC Study Group on Quality of Life (pp. 111-127). Paris, France.
- Ward, E. C., Bishop, B., Frisby, J., & Stevens, M. (2002). Swallowing outcomes following laryngectomy and pharyngolaryngectomy. *Archives of Otolaryngology - Head & Neck Surgery*, 128, 181-186.
- Ward, E. C., Koh, S. K., Frisby, J., & Hodge, R. (2003). Differential modes of alaryngeal communication and long-term voice outcomes following pharyngolaryngectomy and laryngectomy. *Folia Phoniatrica et Logopaedica*, 55(1), 39-49.
- Weymuller Jr., E. A., Yueh, B., Deleyiannis, F. W. B., Kuntz, A. L., Ramsey, A., & Coltrera, M. D. (2000). Quality of life in patients with head and neck cancer. *Archives of Otolaryngology - Head and Neck Surgery*, 126, 329-335.

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■ Linking the Art of Practice in Head and Neck Cancer Rehabilitation with the Scientists' Art of Research: A case study on reflective practice

■ Allier l'art à la science en réadaptation des cas de cancer de la tête et du cou : Une étude de cas portant sur la pratique axée sur la réflexion

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Abstract

Despite the important role that speech-language pathologists (S-LPs) play in laryngeal cancer rehabilitation, there appears to be little training or continuing education for practitioners in this specialized area. This is a particularly demanding area of practice, and practitioners frequently encounter challenging situations with no clear pathway for treatment. Practitioners working in this area frequently appear to use processes of reflection to monitor the outcomes of their professional actions, to determine actions, and to become more skillful in practice. This paper examines how reflective processes may inform clinical decision-making and foster the development of professional practice knowledge for speech rehabilitation of clients who underwent tracheoesophageal (TE) voice restoration following total laryngectomy. A retrospective case study using a reflective practice framework was undertaken. Clinical problems encountered by an S-LP during the postlaryngectomy voice rehabilitation of two patients were analyzed and recorded. The findings suggest that a practitioner's processes of reflection on both general and specific issues of practice are important for advancing professional practice knowledge and for the development of expertise in head and neck cancer rehabilitation.

Abrégé

Malgré le rôle important que jouent les orthophonistes dans la réadaptation des personnes atteintes d'un cancer du larynx, peu de formations ou d'occasions de perfectionnement sont offertes dans ce domaine spécialisé, et particulièrement exigeant. Les praticiens sont souvent confrontés à des situations difficiles, pour lesquelles il n'est pas évident d'établir un traitement clair. Les praticiens œuvrant dans ce domaine semblent fréquemment recourir à une démarche de réflexion pour examiner les résultats de leurs actions professionnelles, pour déterminer les futures actions requises et pour améliorer leurs compétences clinique.

Dans le présent article, les auteurs examinent la façon dont la démarche de réflexion peut informer la prise de décisions clinique et favoriser l'acquisition de connaissances professionnelles lors de la rééducation de la voix trachéo-œsophagienne après une laryngectomie totale. Une étude de cas rétrospective fut menée en utilisant un schéma de pratique axée sur la réflexion. Les difficultés cliniques rencontrées par une orthophoniste au cours de la rééducation vocale post-laryngectomie de deux patients furent analysées et consignées pour cette étude.

Les résultats suggèrent que la démarche de réflexion d'un praticien, en ce qui a trait tant à des enjeux généraux que spécifiques de la pratique, est importante pour faire progresser les connaissances professionnelles et l'expertise dans le domaine de la réadaptation des personnes atteintes d'un cancer de la tête et du cou.

Key words: reflective practice, professional practice knowledge, expertise, laryngeal cancer, speech therapy

Postlaryngectomy rehabilitation encompasses more than the learning of a new mode of verbal communication. Monitoring all areas of postlaryngectomy functioning (physical, physiological, psychological, social, and psychosocial) is essential to offer the best level of care and, therefore, the best short- and long-term outcomes (Doyle, 1994, 2005). Parameters that influence the success of laryngectomy rehabilitation, such as psychosocial and sociodemographic factors, are mentioned as frequently as other influential key issues such as medical factors (Singer, Merbach, Dietz, & Schwartz, 2007). Despite this growing attention to the complexity of successful client outcomes, little research has examined the expertise of the practitioner and the implications for successful laryngectomy rehabilitation. Despite the obvious impact that clinician experience has on patient care and the resultant outcomes observed, such concerns are seldom addressed in the literature. For this reason, a critical question emerges relative to clinical practice. Specifically, the question raised pertains to whether therapeutic outcomes and comprehensive services are influenced by the expertise and experience of the practitioner.

Although Kasperbauer and Thomas (2004) acknowledge that successful vocal rehabilitation relies on the integrated expertise of the surgeon and S-LP, few other studies report on this topic. Indeed, little research addresses the nature and development of S-LP expertise whereas the development of professional expertise has been studied and written about in medicine (Moulton, Regehr, Mylopoulos, & MacRae, 2007), nursing (Cutcliffe, 1997), physiotherapy (Resnik & Jensen, 2003) and occupational therapy (Unsworth, 2001). The influence of S-LP expertise on assessment or therapy outcomes is essentially unknown. In his article *Toward a Theory of Clinical Expertise in Speech-Language Pathology*, Kahmi (1995) concluded that the profession's ideas concerning clinical expertise "need to be supported by future studies that address the relationship between the knowledge and skills that define clinical expertise and measures of treatment outcomes" (p. 356). More recently, while evaluating factors influencing therapeutic outcomes, Bernstein-Ratner (2006) also was concerned with the "therapist quality," highlighting the relationship between practitioner expertise and clinical outcomes. While research and continuing education opportunities have increased specialization in particular areas such as that related to head and neck cancer rehabilitation (McAllister, 2005), repeated findings continue to show that S-LPs are often uncomfortable working with this specialized population (Yaruss & Quesal, 2002) and that there is a need for accessible education and training for these special populations. However, it is not unusual for S-LPs to receive little training about head and neck cancer during their formal education (Melvin, Frank, & Robinson, 2001; Beaudin, Godes, Gowan, & Minuk, 2003).

Drawing on the seminal writing of Donald Schön (1983, 1987), the importance of practitioner reflection for the development of professional practice knowledge and the development of professional expertise has been widely

documented in other health care fields (Benner, 2001; Kinsella, 2000, 2001; Higgs & Titchen, 2001; Fish, 1998; Bereiter & Scardamalia, 1993). Reflective practice offers a means by which clinicians monitor the outcomes of professional actions and determine actions in practice (Kinsella, 2001). Reflective practice is recognized as an approach that facilitates the development of expertise in therapeutic practice (Benner, 2001; Schön, 1987), yet little research has examined processes of reflection by practitioners in the context of head and neck cancer rehabilitation.

Treatment modalities for laryngeal cancer have expanded with the advancement of organ (voice) preservation therapy (radiotherapy and/or chemotherapy) and attempts to avoid total laryngectomy. As a consequence, the head and neck cancer team is faced with increasingly complex uncertain and unique circumstances and outcomes for patients. Thus, the practitioner in this context must negotiate what Schön called the "indeterminate zones" of professional practice, meaning those situations that fall outside of the realm of clear-cut cases and for which technical and scientific approaches tend to be unsuccessful (Kinsella & Whiteford, 2008). Different approaches, therefore, are required to negotiate these challenges successfully (Kinsella, 2007). Further, because of the varied and often unpredictable events associated with treatment modalities, sudden changes, which frequently require careful and immediate consideration, may occur as part of the clinical process. Such practice context and clinical processes are recognized to increase the likelihood of the use of reflection (Lowe, Rappolt, Jaglal, & MacDonald, 2007). Schön (1983, 1987) argued that practitioners frequently rely on reflective processes to monitor the outcomes of professional actions and to determine actions in professional practice.

Schön (1987) describes reflective practice as "a dialogue of thinking and doing through which I become more skillful" (p. 31). His point is that practitioners are involved in a dialectic conversation (reflective processes) with and within the situation, its actors, and the underlying beliefs from which practitioners use evidence for negotiating the complexities of practice and learning from this experience. Schön's (1983, 1987) work illuminates the ways in which practitioners may be researchers of their own professional practices through *frame reflection*, *reflection-in-action*, and *reflection-on-action*.

- **Frame reflection**—Frame reflection focuses on the ways in which practitioners engage in reflective conversations (in the midst of the treatment and/or after) with the situations of practice (clinical issues) and "set the problems" toward which they focus their attention. Schön (1983) suggests that problem setting is a process by which practitioners critically select the problematic characteristic of a situation (i.e., name the problem) and frame the context in which it will be attended to (e.g., practitioner's role or values at stake in the situation).
- **Reflection-in-action**—Reflection-in-action is reflection that occurs in the midst of action when the action can still make a difference to the situation (Schön, 1983).

Schön writes that “when someone reflects-in-action, he[she] becomes a researcher in the practice context” (p.68). Reflection is often stimulated when practitioners apply their theoretical/scientific knowledge and are then met with an unexpected outcome (Kinsella, 2000) or, in Schön’s words, when practitioners experience surprise in the midst of practice.

- **Reflection-on-action**—Reflection-on-action is reflection that occurs following an event; it is a process of thinking back on action taken (Schön, 1983). Reflection on action allows the clinician to further explore what arose from the situations of practice and to acknowledge the professional learning that occurred through the expected or unexpected outcomes encountered in that situation (Kinsella, 2007). In addition, this can be a time to reflect upon other dimensions of practice experience, such as one’s assumptions, beliefs, ideas, feelings, action, and behaviours.

Purpose

Current literature suggests that the development of professional expertise requires practitioners to engage in processes of reflection, as well as in evidence-informed practice. While evidence-informed practice has become part of the professional lexicon, little research has been done to investigate how reflective practice occurs in the clinical process and the potential contribution to S-LP professional practice knowledge. Thus, the purpose of this case study (Stake, 2003; Yin, 2003) was to illuminate the ways in which practitioner reflection is implicated in the development of S-LP expertise in the context of head and neck cancer rehabilitation. Specifically, we examined how reflective processes inform clinical decision-making and foster the development of professional practice knowledge for speech rehabilitation in two patients who underwent total laryngectomy and received tracheoesophageal (TE) voice restoration and had encountered problems including stoma stenosis and TE puncture tract dilatation. The ultimate objective was to consider the question “In what ways does practitioner reflection-in-action and reflection-on-action contribute to the understanding about the development of professional expertise relevant to S-LP practice in head and neck cancer rehabilitation?”

Method

Participants

Both patients were seen by an S-LP with 5 years of clinical experience in outpatient services for voice disorders and laryngeal cancers in a university hospital setting. This case study focuses on one practitioner’s retrospective analysis of reflective processes about two clinical cases. The first author is the practitioner described in the study.

The first patient was a 55-year-old Caucasian male diagnosed with a recurrence of an epidermoid carcinoma ($T_2N_0M_0$) of the left vocal fold. He underwent total laryngectomy with primary puncture and myotomy of the

cricopharyngeus muscle. Radiation therapy was given 53 days preoperatively. A tracheoesophageal puncture (TEP) voice prosthesis was fitted at 29 days post-surgery. This patient demonstrated functional use of TEP at 71 days post-surgery, and no swallowing problems were reported. Follow-up problems concerned stoma stenosis and inadvertent prosthesis dislodgment with fistula closure.

The second patient was a 64-year-old Caucasian female diagnosed with epidermoid carcinoma ($T_2N_0M_0$) of the right pyriform sinus. She underwent total laryngectomy with primary TEP and received radiation therapy prior to laryngectomy. The patient experienced swallowing problems and reduced oral opening prior to laryngectomy. A TEP was fitted at 21 days post-surgery. At 434 days post-surgery, functional use of the TEP for speech was not yet attained. Follow-up mainly concerned issues related to pharyngoesophageal segment stenosis.

Data Collection and Analysis

Data collection was conducted retrospectively and consisted of a review of the medical files of the two patients and an in-depth analysis of the S-LP’s professional records. Files and records were searched to identify clinical troubleshooting situations encountered in laryngectomy rehabilitation. Reflective notes were kept by the first author about critical moments identified. Critical moments are clinical/therapeutic accounts of critical clinical issues that were documented by the S-LP in the patients’ charts. Critical moments frequently depicted times when the practitioner’s application of theoretical/scientific knowledge was met with an unexpected outcome (Kinsella, 2000, 2001; Kinsella & Jenkins, 2007). Decisions regarding which critical moments to analyze within the present study were based on opportunities to: (a) understand the application of reflective practice and the implications for professional learning and (b) the possibility for transfer of knowledge beyond this particular case (i.e., the representativeness of the clinical problem encountered).

An analytic framework of reflective practice drawing on the seminal theoretical work of Donald Schön (1983, 1987) was utilized to analyze the way in which the practitioner: (a) framed the clinical issue, (b) re-framed the problem through reflection-in-action, and (c) retrospectively reflected on action and identified new practice knowledge gained.

Results

Clinical Case A: Tracheostoma stenosis

(a) Frame Reflection

Framing the clinical issue: A small stoma diameter impedes the individual’s ability to place and remove the TEP voice prosthesis. A recommended strategy to address this issue is to dilate the tracheostoma with a laryngectomy tube (Monahan, 2005). Since air needs to move from the trachea through the voice prosthesis and then into the esophageal reservoir for TEP speech, it is preferable to use

a fenestrated laryngectomy tube or to modify the length or shape of the tube.

Critical moment: A fenestration was performed to prevent catching the voice prosthesis during removal of the laryngectomy tube for cleaning (voice prosthesis positioned behind the tube). Upon evaluation, the clinician noticed prosthesis dislodgement during laryngectomy tube removal.

(b) Reflection-in-action

Reframing the problem: A slight variation in the tube positioning displaced the voice prosthesis in front of the laryngectomy tube.

Change-in-action: The decision was made to widen the fenestration.

Outcome: The patient found it easier to remove the laryngectomy tube and began wearing it on a regular basis.

(c) Reflection-on-action

Following the initial fitting of the laryngectomy tube, the patient experienced breathing problems because the laryngectomy tube narrowed the airway. The tube was removed.

Practice knowledge gained: The clinician learned that it is crucial to counsel the patient about a possible subjective feeling of respiratory distress related to a tracheostoma tube prior to the intervention.

Clinical Case B: Dehiscence of the tracheoesophageal puncture

(a) Frame Reflection

Framing the clinical issue: Even when caution is taken while inserting the voice prosthesis, tissue trauma may result in minor bleeding (Doyle & Keith, 2005).

Critical moment: While performing a routine change of the voice prosthesis, the clinician noticed a larger amount of bleeding and untightening of the TEP tract's walls.

(b) Reflection-in-action

Reframing the problem: A significant amount of bleeding is not a common observation during voice prosthesis insertion. In this case, the patient had undergone radiation therapy and the tissues of the tracheoesophageal wall had been affected. Because irradiated tissue differs from normal tissue, it may be more prone to dehiscence and granulomatous changes from repeated trauma during voice prosthesis change (Gress & Singer, 2005; Malik, Bruce, & Cherry, 2007). Consequently, this may have explained the increased amount of bleeding observed with TEP insertion. In this case, late post-radiation changes in TE wall tissue problems prevented the placement of the voice prosthesis.

Change-in-action: A rubber catheter was inserted to keep the tracheoesophageal puncture patent while allowing tissue healing to occur.

Outcome: One month later, sufficient healing had occurred and contraction of the TEP wall tissues had

taken place. The TE voice prosthesis was inserted without bleeding and the patient was able to produce voice.

(c) Reflection-on-action

Although medical management of the problem was not necessary in this case, there was an interprofessional discussion about other potential causes of significant bleeding such as esophageal perforation. In such cases, when the TE voice prosthesis tip is projected into the esophagus during the insertion, it could tear the irradiated esophageal mucosa which would explain an increased amount of bleeding. Esophageal perforation can lead to serious secondary infection and requires aggressive management including drainage and antibiotic therapy.

Practice knowledge gained: Knowledge was gained about a rare complication associated with TEP voice restoration. The clinician now pays special attention to the amount of bleeding as it might be indicative of deteriorated tissue in the TE puncture site.

Discussion

This case study provides information emerging from an immersion into clinical events. In doing so, it has drawn on one practitioner's experience to illustrate the use of reflective processes in clinical practice. Schön's work on reflective practice (1983, 1987) has provided a theoretical framework to support the analysis reported herein. Although general conclusions on clinical populations should not be drawn from individual case studies, practitioners and researchers may discern implications for their professional practice and for further research from particular case studies, as some of the findings may parallel their personal experience or research interest(s). In addition, over time a series of case studies may lend themselves to meta-analysis. Systematic and thorough case studies have the potential to make a significant contribution to knowledge and clinical practice.

The purpose of this research was not to compare patient cases, but rather to provide an illustration of the reflective processes involved in professional practice and the implications for professional practice knowledge. Both cases highlight that reflection-in-action gave rise to "on-the-spot" experimentation and informed decision-making, while reflection-on-action provided opportunities for development of practitioner theories of practice and growth of professional practice knowledge (Kinsella, 2000; 2001). "On the spot" experimentation occurred in case A when the practitioner tried out a new action (widening the fenestration), which led to the intended change. In case B, reflection-in-action contributed to the decision to delay insertion of the voice prosthesis. Theories of practice are strategies, insights, and underlying considerations for actions taken in everyday clinical practice. For example, in case A, a change in the clinicians's theory of practice consisted of restructuring counseling based on the practice knowledge gained from this clinical experience. The clinician was able to problem-solve through reflection, observation, and critical evaluation, but also to consider

this outcome in the context of contemporary theory and practice.

Medical and technological advancement, as well as public demand for professionals' accountability, has increased the need for continuing education and specialization for health care practitioners, including S-LPs working with head and neck cancer patients. Reflective practice allows practitioners to thoroughly examine practice questions in order to gain a deeper understanding of the issues they face (Kinsella & Jenkins, 2007). In a similar vein, Benner (2001) asserts that reflective practice allows practitioners to uncover practice knowledge "useful to further develop the scope of practice of professionals who wish to and are capable of achieving excellence" (p. 35). Developing the capacities for reflection in and on practice is to be seen as a significant dimension of professional practice and as important for the development of expertise. The ability to carefully and comprehensively reflect on the nature of the clinical interaction should also be seen as potentially contributing to improved quality of patient care. Indeed, in the context of on-line problem solving, processes of reflection increase the potential that the most appropriate decisions will be made to benefit the patient. While every clinician will make occasional errors, a savvy clinician will seize upon the opportunity of uncommon problems to expand his or her expertise and clinical judgment. In addition, documenting information from challenging cases can, over time, make an important contribution to the S-LP's knowledge and best practices. Comprehensive case documentation can be achieved through an in-depth description of the clinical case complemented with an explicit account of the reflective processes involved in clinical decision making. Doing so may then lead to further reflection and facilitate the clinician's ability to challenge and transcend the frame of day-to-day clinical practice.

There are many ways to develop professional expertise, yet there are no uniform guidelines detailing how clinical experiences can be integrated and shared. Recent conceptualizations have elaborated on the multifaceted and transdisciplinary nature of expertise (King, Currie, Bartlett, Strachan, Tucker, & Willoughby, 2007; King, Bartlett, Currie, Gilpin, Baxter, Willoughby, et al., 2008). Expertise cannot easily be captured in the theoretical, abstract principles, or explicit guidelines (Benner, 2001). Professional expertise is a composite of the practitioner's level of knowledge, personal qualities and characteristics, skills, abilities, outcomes, and professional and public reputation (King et al., 2007). From this point of view, experience should be seen as just one factor that contributes to the development of expertise rather than as an essential constituting characteristic of such expertise. The case studies described herein illustrate how clinical experience may be processed through practitioner reflection and how it may contribute to the development of expertise and consequently to the professional practice of the therapist.

Multiple sources of knowledge inform one's profession and education. Critical reflection allows the practitioner

to gain a deeper understanding of experience so that a challenging clinical situation can be transformed into an opportunity for active learning and practice knowledge development (Kinsella, 2000). Together with scientific evidence and theory, professional practice knowledge generated from reflection in and on practice, by informing the body of knowledge that S-LP's use, has the potential to change and improve best practices in speech-language pathology.

Conclusion

In recent years, evidence-informed practice has become part of the professional lexicon in S-LP, but little research has investigated how reflective practice occurs and how it may contribute to professional practice knowledge in S-LP. The research presented herein contributes to the understanding of the ways in which practitioner reflection is implicated in the development of S-LP expertise in the context of head and neck cancer rehabilitation. Reflecting in and on practice is an important dimension of effective professional practice and the development of expertise. Documenting the intricacies of S-LP practice is essential to make professional practice knowledge available for further practice development, professional education, and research. Further research into the S-LP's use of reflection in clinical practice is required to advance our understanding of the development of professional expertise. Because of the many challenges and complications in this clinical population, head and neck cancer rehabilitation offers an ideal environment in which to study reflective practice and the way in which it informs the development of professional expertise in speech-language pathology.

References

- Beaudin, P., Godes, J., Gowan, A., & Minuk, J. (2003). An education and training survey of speech-language pathologists working with individuals with cancer of the larynx. *Journal of Speech-Language Pathology and Audiology*, 27(3), 144-157.
- Benner, P. (2001). *From Novice to Expert: Excellence and Power in Clinical Nursing Practice*. New Jersey: Prentice Hall.
- Bereiter, C., & Scardamalia, M. (1993). *Surpassing ourselves: An inquiry into the nature and implications of expertise*. Chicago: Open Court.
- Bernstein Ratner, N. (2006). Evidence-based practice: An examination of its ramifications for the practice of speech-language pathology. *Language, Speech & Hearing Services in Schools*, 37(4), 257-267.
- Cutcliffe, J. R. (1997). The nature of expert psychiatric nurse practice: A grounded theory study. *Journal of Clinical Nursing*, 6(4), 325-332.
- Doyle, P. C. (1994). *Foundations of voice rehabilitation following laryngeal cancer*. San Diego, CA: Singular Publishing Group.
- Doyle, P. C. (2005). Rehabilitation in head and neck cancer: Overview. In P. Doyle & R. Keith (Eds.), *Contemporary Considerations in the Treatment and Rehabilitation of Head and Neck Cancer: Voice, Speech and Swallowing* (pp. 3-15). Texas: PRO-ED Incorporated.
- Doyle, P. C., & Keith, R. L. (2005). *Contemporary considerations in the treatment and rehabilitation of head and neck cancer: Voice, speech and swallowing*. Texas: PRO-ED Incorporated.
- Fish, D. (1998). *Developing professional judgment in health care: Learning through the critical appreciation of practice*. Oxford: Butterworth-Heinemann.
- Gress, C. D., & Singer, M. I. (2005). Tracheoesophageal voice restoration. In P. C. Doyle & R. L. Keith (Eds.), *Contemporary considerations in the treatment and rehabilitation of head and neck cancer: Voice, speech and swallowing* (pp. 431-452). Texas: PRO-ED Incorporated.
- Higgs, J., & Titchen, A. (2001). *Practice knowledge and expertise in the health professions*. Oxford: Butterworth-Heinemann.
- Kahmi, A. G. (1995). Research to practice. Defining, developing, and maintaining clinical expertise. *Language, Speech, and Hearing Services in Schools*, 26, 353-356.
- Kasperbauer, J., & Thomas, J. (2004). Voice rehabilitation after near-total laryngectomy. *Otolaryngologic Clinics of North America*, 37(3), 655-677.

- King, G., Bartlett, D. J., Currie, M., Gilpin, M., Baxter, D., Willoughby, C., et al. (2008). Measuring the expertise of paediatric rehabilitation therapists. *International Journal of Disability, Development and Education*, 55(1), 5–26.
- King, G., Currie, M., Bartlett, D. J., Strachan, D., Tucker, M. A., & Willoughby, C. (2007). The development of expertise in paediatric rehabilitation therapists: The roles of motivation, openness to experience, and types of caseload experience. *Australian Occupational Therapy Journal*, 54, 1–15.
- Kinsella, E. A. (2000). *Reflective practice and professional development: Strategies for learning through professional experience*. Ottawa, ON: CAOT Publication ACE.
- Kinsella, E. A. (2001). Reflections on reflective practice. *The Canadian Journal of Occupational Therapy*, 68(3), 195–198.
- Kinsella, E. A. (2007). Embodied reflection and the epistemology of reflective practice. *Journal of Philosophy of Education*, 4(3), 395–405.
- Kinsella, E. A., & Jenkins, K. (2007). Fostering reflective practice. In A. Bossers, et al. *On-line preceptor education program: Preparing partners of learning in the field*. www.preceptor.ca/index.html. University of Western Ontario, Faculty of Health Sciences & The Ontario Ministry of Health and Long Term Care.
- Kinsella, E. A., & Whiteford, G. (2008). Knowledge generation and utilization in occupational therapy: Toward epistemic reflexivity. *Australian Occupational Therapy Journal*, On-line early.
- Lowe, M., Rappolt, S., Jaglal, S., & MacDonald, G. (2007). The role of reflection in implementing learning from continuing education into practice. *Journal of Continuing Education in the Health Professions*, 2(3), 143–148.
- Malik, T., Bruce, I., & Cherry, J. (2007). Surgical complications of tracheo-oesophageal puncture and speech valves. *Current Opinion in Otolaryngology & Head and Neck Surgery*, 15(2), 117.
- McAllister, L. (2005). Issues and innovations in clinical education. *Advances in Speech-Language Pathology*, 7(3), 138–148.
- Melvin, C., Frank, E., & Robinson, S. (2001). Speech-language pathologist preparation for evaluation and treatment of patients with tracheoesophageal puncture. *Journal of Medical Speech-Language Pathology*, 9(2), 129–40.
- Monahan, G. (2005). Clinical troubleshooting with tracheoesophageal puncture voice prostheses. In P.C. Doyle & R.L. Keith (Eds.), *Contemporary considerations in the treatment and rehabilitation of head and neck cancer: Voice, speech and swallowing* (pp. 481–502). Texas: PRO-ED Incorporated.
- Moulton, C. E., Regehr, G., Mylopoulos, M., & MacRae, H. M. (2007). Slowing down when you should: A new model of expert judgement. *Academic Medicine*, 82(10), Supplement, S109–S116.
- Resnik, L., & Jensen, G. M. (2003). Using clinical outcomes to explore the theory of expert practice in physical therapy. *Physical Therapy*, 83(12), 1090–1106.
- Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books.
- Schön, D. A. (1987). *Educating the reflective practitioner*. San Francisco: Jossey-Bass Publisher.
- Singer, S., Merbach, M., Dietz, A., & Schwarz, R. (2007). Psychosocial determinants of successful voice rehabilitation after laryngectomy. *Journal of the Chinese Medical Association*, 70(10), 407–423.
- Stake, R. E. (2003). Case studies. In N. Denzin & Y. Lincoln (Eds.), *Strategies of qualitative inquiry* (2nd ed., pp. 134–164). Thousand Oaks, CA: Sage Publications.
- Yaruss, J., & Quesal, R. (2002). Academic and clinical education in fluency disorders: An update. *Journal of Fluency Disorders*, 27(1), 43–63.
- Yin, R. (2003). *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA: Sage Publications.

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■ Quality of Life in Patients with Hemiglossectomy: Comparison of the EORTC QLQ-H&N35 and a semi-structured interview

■ La qualité de vie chez les patients ayant subi une hémiglossectomie : comparaison des résultats entre le questionnaire QLQ-H&N35 de l'EORTC et une entrevue semi-structurée

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Abstract

Quality of life questionnaires are often used as a measure of outcomes in the head and neck cancer literature. Semi-structured interviews are rarely used and results are not well documented. The current study was designed to compare and contrast quality of life outcomes assessed by a standardized questionnaire and a semi-structured interview. A semi-structured interview and the EORTC QLQ-H&N35 questionnaire were administered to eight patients with hemiglossectomy and reconstruction using an innervated radial forearm free flap. Whereas some of the responses to questions in the semi-structured interviews confirmed EORTC QLQ-H&N35 results, other responses yielded more detail on functional outcomes and quality of life not captured in the standardized instrument. The EORTC QLQ-H&N35 serves as a good screening tool for identifying quality of life issues, but does not adequately assess the breadth or depth of factors related to quality of life outcomes following intervention for head and neck cancer.

Abrégé

Dans les publications sur le cancer de la tête et du cou, les questionnaires sur la qualité de vie servent souvent à mesurer les résultats. On a rarement recours à des entrevues semi-structurées et on ne documente pas les résultats de manière exhaustive. La présente étude compare les résultats obtenus par un questionnaire normalisé et une entrevue semi-structurée sur la qualité de vie. On a fait passer une entrevue semi-structurée et on a administré le questionnaire QLQ-H&N35 de l'Organisation européenne de recherche sur le traitement du cancer (EORTC) à huit patients ayant subi une hémiglossectomie et une reconstruction avec du tissu de l'avant-bras innervé par le nerf radial. Certaines des réponses données en entrevue semi-structurée ont confirmé les résultats du questionnaire, mais d'autres ont fourni davantage de renseignements sur l'évolution fonctionnelle et la qualité de vie que ne l'a fait l'outil normalisé. Le questionnaire constitue un bon outil de dépistage des enjeux touchant à la qualité de vie, mais il n'évalue pas correctement l'ampleur ou la profondeur des indicateurs liés à la qualité de vie après une intervention de lutte contre le cancer de la tête et du cou.

Key words: head and neck cancer, microvascular tongue reconstruction, quality of life

In Canada, 4,600 new cases of head and neck cancer were diagnosed in 2008 (Canadian Cancer Society, 2008). Treatment for head and neck cancer can result in functional complications, which may include difficulty with deglutition, mastication, and speech (Magdycz, 2002). These functional complications can be further exacerbated when the patient enters into a social realm that includes food and the associated social communication as a core focus. The inability to participate in social eating during family dinners and outings with friends and colleagues has the potential to dramatically impact quality of life (Sherman et al., 2000). The changes in quality of life from treatment of head and neck cancer may be apparent especially in patients with cancer of the tongue because of its critical role in producing normal speech and in eating functions. According to the literature, quality of life, as one measure of outcomes for treatment of head and neck cancer, is being applied commonly to assess speech and swallowing function. As such, quality of life measurements are becoming more important when informing medical-surgical interventions that are applied to this population. Although the use of quality of life questionnaires to assess functional outcomes may seem like a readily available and easy solution, these standardized questionnaires provide only cursory information about speech and swallowing function.

An alternative to quality of life questionnaires is the use of semi-structured interviews. A semi-structured interview is a commonly used qualitative research and clinical method for gathering information from a participant or patient. Unlike a structured interview, where the examiner is limited to a set of questions, a semi-structured interview is flexible and provides opportunity for the interviewer to bring up new questions as they relate to what the patient says. In a semi-structured interview, the interviewer will have a general set of pre-established questions or topics they wish to explore with the patient. Follow-up questions are used as probes to gain a more detailed description of salient or related topics. Although this type of assessment has been used to assess pain as it relates to head and neck cancer (Whale et al., 2001), it has been used infrequently to document functional outcomes.

The development of reliable measures of quality of life through disease-specific quality of life questionnaires such as the EORTC-H&N35 has provided researchers with an objective and standardized assessment method. However, because quality of life questionnaires often are used to inform clinical practice regarding functional outcomes, it is important to evaluate their strengths and weaknesses. Can standardized questionnaires capture the essence and multidimensional nature of functional impairments after treatment for head and neck cancer? On the other hand, little is known about the potential added value that semi-structured interviews may provide in the assessment of functional outcomes following surgical intervention in patients with head and neck cancer. Ultimately, it is important to know whether or not the extra time and effort required to conduct a semi-structured interview will

yield significantly more information relevant to treatment outcomes.

Purpose

This study was designed to compare and contrast information obtained on functional outcomes via a disease-specific quality of life measure to information obtained using a semi-structured interview. Specifically, we were interested in understanding how well the quality of life questionnaire reflected what patients who had reconstructive surgery after hemiglossectomy said in a semi-structured interview about general life changes following treatment, specific changes in social/emotional status, and specific changes in function (e.g., eating, speech, sensation).

Methods

Patients

The patients in this study have been described previously (Loewen et al., in press). A total of 68 patients with oral cancer were assessed between May 2000 and December 2004 at the Institute for Reconstructive Sciences in Medicine (iRSM) at the Misericordia Community Hospital in Edmonton, Alberta, Canada. Of these patients, 14 were identified as having resection and reconstruction limited to the oral tongue (i.e., the anterior two-thirds of the tongue) without the involvement of surrounding structures such as the mandible, maxilla, cheek, and base of tongue. Some patients had involvement of the floor of mouth in addition to the tongue. These patients were sent an information letter approved by the Health Research Ethics Board at the University of Alberta requesting their participation in this study. Eight of these patients agreed to participate in this study. Of the six patients that did not participate, five were unable to be contacted and one declined participation. All patients in this study were diagnosed with squamous cell carcinoma and had approximately 50% of the anterior two-thirds of their tongue resected and reconstructed as determined by the operative report, postoperative photos, and clinician assessment at the time of testing. All patients had reconstruction with an innervated radial forearm free flap. Of the eight patients who participated, four received adjuvant radiation therapy (see Table 1).

Procedures

EORTC QLQ-H&N35

The EORTC QLQ-H&N35 survey (EORTC Protocol 15941, 1999; Bjordal et al., 1999) was selected for use in the current study to assess quality of life because of its common use with head and neck cancer patients. EORTC QLQ-H&N35 scores are frequently reported in the literature, making it possible to compare and interpret data across studies and patient groups. Moreover, the EORTC QLQ-H&N35 has established global norms, contains questions related to quality of life specific to this patient population, and has established face validity. The EORTC QLQ-H&N35

was administered to all eight patients. The questionnaires were then scored using standardized procedures. The EORTC QLQ-H&N35 questionnaire results in 18 quality of life summary scores. These 18 areas include: pain, swallowing, difficulties with senses, speech problems, trouble with social eating, trouble with social contact, less sexuality, trouble with teeth, difficulties opening mouth, dry mouth, sticky saliva, coughing, illness, pain killers, nutritional supplements, feeding tube, weight loss, and weight gain.

Semi-Structured Interview

After completion of the quality of life questionnaire, semi-structured interviews were conducted using an interview guide. Questions were designed to elicit information from patients about: (a) general life changes following treatment, (b) specific changes in social/emotional status, and (c) specific changes in function (e.g., eating, speech, sensation) due to surgically induced physical or structural alterations. Follow-up questions were used for seeking clarification or as probes to obtain more detailed information. Follow-up questions varied from patient to patient. The semi-structured interviews were audio recorded and transcribed verbatim. Three investigators independently analyzed each interview. One researcher was a trained clinical psychologist and the others were both trained speech-language pathologists. The interpretation structure involved a modified thematic apperception approach as originally outlined in Bellak (1975). Each patient response to the open-ended questions was identified in terms of the main theme or gist of the response, the main needs and drives of the patient, and the main coping strategies (defence mechanisms) used by the participant. Each investigator further identified specific themes related to psychological impacts, functional impacts (eating, speech, sensation), and coping mechanisms. Relationships between the functional and psychological impacts following treatment were explored. These themes and coping mechanisms were noted in the margins on the

transcripts, and corresponding phrases that were thought to be reflective of these themes and coping mechanisms were underlined. For the purpose of the current study, a three-way concurrence was necessary for a theme or coping mechanism to be identified and counted as a quality of life construct for an individual patient. Once these themes and coping mechanisms were determined, the primary investigator went through the transcripts and tallied the number of patients that were found to have common psychological themes, functional themes, and coping mechanisms.

Comparison of Semi-Structured Interviews and EORTC QLQ-H&N35

The results from the semi-structured interviews were compared with the results from the EORTC QLQ-H&N35. As a first step, common psychosocial themes, functional themes, and coping mechanisms that were identified from the semi-structured interviews were matched to subcategories from the EORTC QLQ-H&N35. For example, descriptions of problems with speech were a common theme in the semi-structured interview; this theme was matched with the "speech problems" subcategory on the EORTC QLQ-H&N35. The primary author then categorized all thematic comments made by each patient during the semi-structured interviews into the corresponding EORTC QLQ-H&N35 subcategory. Each patient's representative comments were listed next to their score on the corresponding EORTC QLQ-H&N35 subcategory. For example, a comment from patient #1's interview that reflected the common theme of "speech" was: "People don't understand me as well." All comments made regarding speech in patient #1's interview were listed next to his score of 44 on the "speech problems" subcategory of the EORTC QLQ-H&N35. These representative comments from the semi-structured interviews were independently judged by two of the study's authors and classified as either "in coherence" or "in conflict" with the standardized subcategory score. To determine coherence or conflict, the

authors first calibrated themselves to the composition of a *good* versus *bad* score on the EORTC QLQ-H&N35. There were no published guidelines to assist in this process, so the authors created fictional scenarios of possible responses on the questionnaire to act as a guide. For example, if a patient were to report having "quite a bit" of a problem on each question that comprised the speech subscale on the EORTC QLQ-H&N35, they would obtain a score of 67; whereas, an individual who only reported a "little bit" of difficulty would have a score of 33 (scores range from 0 to 100, where a higher score indicates a poorer quality of life). Coherence

Table 1
Subject demographics

#	Age	Gender	T-Stage	Reconstructed side	Months postoperative ^a	Radiation therapy
1	59	M	T2	R	54	N
2	69	M	T2	L	26	N
3	44	M	T2	R	63	N
4	62	F	T3	R	20	Y - 5810 cGy (IMRT)
5	58	F	T2	R	38	Y - 5740 cGy (IMRT)
6	45	M	T2	R	29	N
7	61	M	T3	R	30	Y - 6000 cGy
8	45	F	T2	L	32	Y - 6120 cGy

Note: ^aMonths postoperative represents the time between the date of surgery and the assessment date for this study.

M = male; F = female; R = right; L = left; Y = yes; N = no.

or conflict was determined by comparing the nature of the representative comments made by patients in the semi-structured interviews (i.e., this is or is not a problem) and the severity of the comment (i.e., this is a large or small issue) to the EORTC QLQ-H&N35 score for the matching subcategory. If the authors thought that the EORTC QLQ-H&N35 score reflected the comments made by the patients, then a verdict of coherence was applied; if the score on the EORTC QLQ-H&N35 appeared to be in opposition to the comments made in the semi-structured interview, then the two were considered to be in conflict. After scoring each comparison independently, the two authors compared their ratings of coherence and conflict. If the two authors disagreed on whether the representative comments from the interview were in coherence or conflict with the EORTC QLQ-H&N35 results, the specific judgement was discussed, transcripts consulted, and further discussion continued until agreement was reached. Before discussion to reach consensus, the two authors who assessed conflict or coherence were in agreement 100% of the time for speech, 88% of the time for swallowing, 63% for trouble with social eating, and 75% of the time for trouble with social contact. Overall, the two authors were in agreement 81% of the time.

Results

Semi-Structured Interviews

Psychosocial Themes

Three main psychosocial themes were identified across patients. All eight patients identified the need for social acceptance; seven of the eight patients identified generalized feelings of frustration, and six of the eight patients identified some form of anger or resentment related to their treatment. Other less common themes included: depression (3 of 8), physical limitations other than with speech or eating (3 of 8), self-consciousness (3 of 8), and fear of cancer recurrence (2 of 8).

Comments representative of the need for social acceptance include: "Yeah I...I do find it annoying because, uh, you...you feel very self-conscious and uh, other people they have a tendency to watch you. They pick you out of a crowd because you eat different than normal...And uh, you feel everybody is staring at you" and "And then another thing that's maybe changed is, uh, the speaking, and how people look at me, you know...a lot of people that, you know, they probably don't realize it or they can't help it, but as soon as I start to talk then it's almost like, oh, and — you're not what we thought you were."

Comments representative of frustration with outcomes include: "you know you're not going to have a hamburger and be able to eat it with your mouth...to have to cut it with a fork and knife...so it's frustrating that way," and "It's just hard to eat salad, and I can eat a whole salad but then if I go and eat, like for a meal, but if I go the next day to eat a another salad for a meal I'm just just is it's too much work to eat another salad that day."

Comments representative of anger or resentment with their treatment include: "In fact it makes it so you hate the thought of eating," and "Why did it happen to me...you know...why couldn't it have been somebody else or, you know..."

Functional Themes

Two main functional themes were identified across patients. Seven of the eight patients identified eating and five of the eight identified speech as being major issues. Other less common functional themes identified were xerostomia (3 of 8), change in taste (2 of 8), poor saliva control (2 of 8), reduced neck/shoulder range of motion (2 of 8), and change in appearance (2 of 8).

Comments indicating issues with speech include: "People don't understand me as well" and "And also when you're speaking — because normal people do not want to sit and wait for me to try to say things."

Comments indicating concerns about eating include: "...and probably eating bread too...finding that it would get stuck on the top of my mouth was tough," and "Like ground up meat is just, it's too dry even if I put it with um...it makes me choke."

Coping Mechanisms

A number of coping mechanisms were identified from the semi-structured interviews. Of the eight patients, seven displayed evidence of denial, five included self-isolation, and four minimized their disability. Avoidance also was a common coping mechanism, as evidenced by steering clear of: (a) situations requiring oral communication, (b) eating certain foods, and (c) social settings that required eating and engaging in face-to-face conversation.

An example of denial as a method of coping was seen in one patient when he was asked how he felt about having to be more careful when he eats or drinks. His response was, "Well just that...it doesn't bother me at all." This was said even though this patient also discussed how dry foods would elicit a cough and that he no longer eats in public.

Comments indicating self-isolation as a coping mechanism include: "I've ignored basically my family and...and uh, socializing you know. It's not there anymore," and "you know, you can't really go anywhere. Like I don't even like to go to a person's house for a meal." An example of a patient minimizing his or her disability was: "So I've gotta be a little bit more careful, but that's nothing really."

Semi-Structured Interviews and EORTC QLQ-H&N35

The subcategories on the EORTC QLQ-H&N35 that were found to correspond with the common themes in the interviews were speech, swallowing, trouble with social eating, and trouble with social contact. The EORTC QLQ-H&N35 results for these subcategories for each patient are displayed in Figure 1. Conflict between the results on the EORTC QLQ-H&N35 subscales and the semi-structured interview is indicated in Figure 1 by an asterisk above each subscale in which a conflict was noted for each patient.

Conflict between data derived from the semi-structured interviews and the four EORTC QLQ-H&N35 subcategories was observed in five of eight patients for the speech category, in five of eight patients in the swallowing category, in four of eight patients in the social eating category, and in four of eight patients in the social contact category. Within patients, conflict was present in at least one subcategory score for seven of eight patients. Three of the eight patients had conflict in all four subcategories between their EORTC QLQ-H&N35 score and what was reported in the semi-structured interview. One patient had conflict in three of the subcategories, three patients had conflict in one subcategory, and one patient had no conflict.

Of the conflicts found, the EORTC QLQ-H&N35 score suggested a lesser impairment than the responses in the semi-structured interview in 17 of 18 instances. There was only one instance where the conflict was because the EORTC QLQ-H&N35 score suggested a greater impairment than the statements made by the patient in the semi-structured interview.

When the results were compared with the patient demographics (Table 1), it was noted that three of the four patients who had conflict in three or more subcategories were female. In addition, all four of the patients who had conflict in three or more subcategories had radiation therapy as part of their treatment. The one patient with no conflict had very good functional outcomes and did not report any issues in the four subcategories.

Discussion

A study by Mehanna and Morton (2006) reported that 60% of head and neck cancer patients found quality of life questionnaires useful for communicating issues to their doctors and focusing on their problems. The EORTC

QLQ-H&N35 is a standardized quality of life questionnaire that is often used as a measure of functional outcomes in the head and neck cancer population. This study aimed to compare and contrast quality of life outcomes on the EORTC QLQ-H&N35 with semi-structured interview responses in patients with hemiglossectomy and reconstruction with an innervated radial forearm free flap. The current study revealed both coherence and conflicts between the data derived from semi-structured interviews and the scores derived from the EORTC QLQ-H&N35. A conflict between the two measures appeared at least once in approximately 50% of patients in the current study. Interestingly, it was found that conflict or coherence between the semi-structured interviews and the EORTC QLQ-H&N35 appeared to be related more to individual patients rather than to specific subcategories on the EORTC QLQ-H&N35. When there was coherence, one could assume that the EORTC QLQ-H&N35 captured true patient perceptions. When there was conflict between the quality of life measure and the semi-structured interview, it may have been that the standardized questionnaire had not allowed the patients to completely express their feelings. Statements derived during the semi-structured interviews allowed the interviewer to probe deeper for the patient's self-assessment of their situation. Similar findings were reported in the study by Whale et al. (2001). These investigators used the EORTC QLQ-C30 and the EORTC QLQ-H&N35 questionnaires along with a semi-structured interview to assess pain and pain management in head and neck patients following treatment. The authors reported that whereas the questionnaires provided some description of severity and impact, the semi-structured interviews provided more detailed information on the individual aspects and the variety of experiences in terms of pain location and characteristics.

In the current study, two other circumstances may help explain the conflict found between the two forms of measurement. The first may relate to the finding that all four of the patients who had three or more conflicts between their EORTC QLQ-H&N35 score and their semi-structured interview were the same four patients that had undergone radiation therapy in addition to the surgery. The patients who underwent a course of postoperative radiation therapy reported poorer quality of life scores in the EORTC QLQ-H&N35 and identified more issues in the semi-structured interviews when compared to the patients who did not have radiation therapy. The negative influence of radiation therapy on quality of life also was described in a study by Epstein et al. (1999). Oral complications are common after radiation therapy and have a negative effect on quality of life. Specifically,

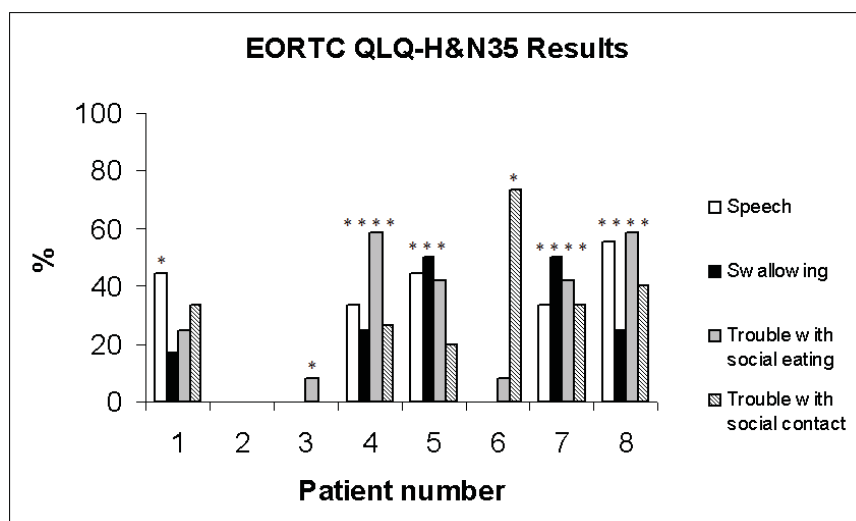


Figure 1. Results for the subcategories of speech, swallowing, trouble with social eating, and trouble with social contact for each of the eight subjects. A higher score on the EORTC QLQ-H&N35 represents a poorer outcome in that area of the quality of life questionnaire. Note: * indicates a conflict between the EORTC subcategory result and the semi-structured interview.

patients report difficulty chewing or eating, dry mouth, change in taste, dysphagia, altered speech, difficulty with dentures, increased tooth decay, and pain. Fang et al. (2005) found that problems with swallowing, dry mouth, and sticky saliva become more serious one year after radiation therapy. In the present study, the conflict found between the responses in the EORTC QLQ-H&N35 and the semi-structured interview in patients with radiation therapy suggest that quality of life measures may not be sensitive enough to capture all of the nuances of functional problems in patients with poorer outcomes.

The second circumstance that may explain conflicts found between the two forms of measurement may relate to gender differences. Three of the four patients with three or more areas of conflict were women. The women and men in the study may have responded to the interviewer in different ways. All patients in this study were interviewed by female interviewers, which also may have influenced patient responses.

Also from this study, it was evident that when there was conflict, the EORTC QLQ-H&N35 tended to underestimate the magnitude of the issues. This may stem from the inherent psychometric properties associated with Likert scales. Patients responding on Likert scales tend to avoid the extreme ends. Since the EORTC QLQ-H&N35 uses a 4-point Likert scale, patients may have been disinclined to choose 4 (*very much*). When the data were examined subsequently, of all the questions evaluated in the four subcategories for all eight patients, only 3 of 128 answers were rated with 4, and 54 of 128 answers were rated with 1 (*not at all*). It is possible that 1 was chosen more often because this indicated no problem at all. In contrast, patients who were experiencing issues may have been hesitant to choose the extreme high end of the scale, and the Likert scales used in the EORTC QLQ-H&N35 may have contributed to an underestimation of the severity of the psychological or functional issues. Since the semi-structured interviews revealed that avoidance and minimization of post-surgical disabilities were common coping mechanisms, this may have contributed to the response patterns observed.

A study by Aarstad, Aarstad, and Olofsson (2008) found that an avoidance-focused coping style is inversely related to health-related quality of life. However, the inverse relationship between coping and quality of life is not always evident. Calman (1984) proposed the theory that quality of life is a representation of the gap between reality and an individual's hopes, dreams, and ambitions. The author suggests that if this gap is reduced, it will lead to an improved quality of life, either by improving the patient's reality (i.e., improved function) or by modifying the individual's expectations and ambitions. For some patients included in this study, the coping skills identified in the semi-structured interview may lead to improved quality of life. For example, an individual with reduced function whose coping style is characterized by avoidance will only be able to improve subjective quality of life by adjusting his or her expectations and ambitions. One patient avoided

using certain difficult words as a way of coping with an articulation disorder. To ensure that his listeners could understand him, he avoided words that had previously lead to a communication breakdown. By lowering his expectations regarding the intelligibility of his own speech, he reduced the gap between his expectations and reality. On the other hand, a different patient in the study had isolated himself from all social contact. Nevertheless, he maintained the expectation towards himself that he should be able to participate fully in social events, thereby widening the gap between his reality and expectations.

The current study highlights some areas that may be overlooked when using a quality of life questionnaire. Even though the EORTC QLQ-H&N35 has been developed as a disease-specific tool, the questionnaire is still designed for use with a wide range of lesion sites in head and neck cancer patients and, consequently, there are a wide range of outcomes. For example, the current study examined a homogeneous group of hemiglossectomy patients, but the subcategory of "speech" on the EORTC QLQ-H&N35 includes a question "Have you been hoarse?" This question relating to voice quality may be applicable to other head and neck cancer lesions such as those of the larynx. However, lesions restricted to the oral tongue rarely result in obvious voice changes. Therefore, relying solely on the speech subcategory score of the EORTC QLQ-H&N35 for lesions restricted to the oral cavity may be misleading relative to the impact a speech disorder has on the patient's quality of life.

Limitations

This study's primary limitation was its small sample size, which is a common problem in studies of patients with head and neck cancer. The patient population was chosen from a convenience sample of patients who were treated at the iRSM and was based on strict criteria which limited the population to patients with partial resection of the oral tongue only and reconstruction with radial forearm free flap. The strict criteria allowed for elimination of other confounding factors and therefore provide a description of quality of life specific to the resection of the oral tongue. The use of a homogeneous group of patients likely outweighs the small sample size. Further research in this topic would benefit from multi-site collaboration to increase patient numbers.

Conclusion

The current study found that although the EORTC-QLQH&N35 is useful as a tool to objectively assess quality of life, a semi-structured interview provides more breadth and depth of patient concerns regarding function. Therefore, questionnaires such as the EORTC QLQ-H&N35 are best used as a screening tool rather than a comprehensive functional outcomes measure. By adding a semi-structured interview and taking the time to evaluate the responses, a clinician will develop a more in-depth appreciation for the issues facing individuals after treatment. This will lead

to more informed therapies and also more extensive data on outcomes, which ultimately can inform medical and surgical procedures. Because of the disparity between what the majority of patients reported regarding speech and swallowing function on the quality of life questionnaire and what they revealed in a semi-structured interview, the EORTC-QLQ-H&N35 should not be used as the sole assessment of functional outcomes for these parameters. The possibility of underestimation of outcome severity should be considered when using the EORTC-QLQ-H&N35. Other factors to be considered include the patient gender, radiation therapy, and the rapport between the clinician and patient.

References

- Aarstad, A. K. H., Aarstad, H. J., & Olofsson, J. (2008). Personality and choice of coping predict quality of life in head and neck cancer patients during follow-up. *Acta Oncologica*, 47, 879–890.
- Bellak, L. (1975). *The T.A.T., C.A.T. and S.A.T. in clinical use: Third Edition*. New York: Grune & Stratton, Inc.
- Bjoridal, K., Hammerlid, E., Ahlner-Elmqvist, M., de Graeff, A., Boysen, M., Even- sen, J. F., et al. (1999). Quality of life in head and neck cancer patients: Validation of the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire – H&N35. *Journal of Clinical Oncology*, 17, 1008–1019.
- Canadian Cancer Society/National Cancer Institute of Canada: *Canadian cancer statistics* (2008). Surveillance and Risk Assessment Division, CCDPC, Health Canada: Toronto, Canada.
- Calman, K. C. (1984). Quality of life in cancer patients – an hypothesis. *Journal of Medical Ethics*, 10, 24–127.
- EORTC Protocol 15941. (1999). Cited in P. Fayers, N. Aaronson, K. Bjoridal, D. Curran, & M. Groenvold. *EORTC QLQ Scoring Manual*. Brussels: Quality of Life Study Group of the European Organisation for Research and Treatment of Cancer.
- Epstein, J. B., Emerton, S., Kolbinson, D. A., Le, N. D., Phillips, N., Stevenson-Moore, P., et al. (1999). Quality of life and oral function following radiotherapy for head and neck cancer. *Head & Neck*, 21, 1–11.
- Fang, F. M., Tsai, W. L., Chien, C. Y., Chiu, H. C., Wang, C. J., Chen, H. C., et al. (2005). Changing quality of life in patients with advanced head and neck cancer after primary radiotherapy or chemoradiation. *Oncology*, 68, 405–413.
- Loewen, I. J., Boliek, C. A., Harris, J., Seikaly, H., & Rieger, J. M. (in press). Oral sensation and function: A comparison of patients with innervated radial forearm free flap reconstruction to healthy matched controls. *Head and Neck*.
- Magdycz, W. P. (2002). Functional tongue reconstruction. *Current Opinion in Otolaryngology & Head and Neck Surgery*, 10, 266–272.
- Mehanna, H. M., & Morton, R. P. (2006). Patients' views on the utility of quality of life questionnaires in head and neck cancer: A randomised trial. *Clinical Otolaryngology*, 31, 310–316.
- Sherman, A. C., Simonton, S., Camp Adams, D., Vural, E., Owens, B., & Hanna, E. (2000). Assessing quality of life in patients with head and neck cancer. *Archives of Otolaryngology – Head & Neck Surgery*, 126, 459–467.
- Whale, Z., Lyne, P. A., & Papanikolaou, P. (2001). Pain experience following radical treatment for head and neck cancer. *European Journal of Oncology Nursing*, 5, 112–120.

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■ Speech After Tongue Reconstruction and Use of a Palatal Augmentation Prosthesis: An acoustic case study

■ La parole après la reconstruction de la langue et l'utilisation d'une prothèse palatine de suppléance : Une étude de cas en acoustique

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Abstract

In this experiment, acoustic properties of speech sounds produced by a 64-year-old Canadian English-speaking female tongue cancer patient were studied. The patient had undergone a tongue resection of the anterior two-thirds of the tongue, a tongue reconstruction with a radial forearm free flap, and treatment with a palatal augmentation prosthesis. The acoustic data included measurements of spectral characteristics analyzed from the vowels /i, I, Λ, u/ and sibilants /s, z, ʃ/ in connected speech samples produced before the tongue resection, taken one year after the resection with a free flap reconstruction and two years after the tongue reconstruction while wearing a palatal augmentation prosthesis. Acoustic changes were observed for formant frequencies ($F1$, $F2$) of the vowels and the spectral moments (mean, skewness) of the sibilants. Treatment with the augmentation prosthesis resulted in an improvement of the sibilants /s/ and /z/. The effect of the augmentation prosthesis on vowel production was less pronounced in this patient.

Abrégé

Pour cette expérience, on a étudié les propriétés acoustiques des sons de la parole produits par une Canadienne anglophone de 64 ans atteinte d'un cancer de la langue. Cette patiente a subi une exérèse des deux tiers antérieurs de la langue, une reconstruction de la langue avec du tissu de l'avant-bras innervé par le nerf radial et un traitement avec une prothèse palatine de suppléance. Les données acoustiques comprennent des mesures des caractéristiques spectrales analysées pour les voyelles /i, I, Λ, u/ et les sifflantes /s, z, ʃ/ dans des échantillons de discours continu produit avant l'exérèse, une année suivant l'exérèse et la reconstruction ainsi que deux années suivant la reconstruction de la langue, au moment où la patiente portait une prothèse palatine de suppléance. On a observé des changements acoustiques pour la fréquence des formants ($F1$, $F2$) des voyelles et des mesures spectrales (moyenne, asymétrie) des sifflantes. Le traitement avec une prothèse palatine de suppléance a eu pour effet d'améliorer les sifflantes /s/ et /z/. L'effet de la prothèse sur la production des voyelles a été moins marqué chez cette patiente.

Key words: acoustics, radial forearm free flap, oral cancer, palatal augmentation prosthesis, sibilants, speech, tongue reconstruction, vowels

Patients with head and neck cancer face many functional challenges (e.g., deficits in their ability to speak) as they progress through their treatment and rehabilitation. While disease control is the primary goal in the treatment of head and neck cancer, maintenance of function also drives treatment interventions. This is particularly pertinent in treatments for oral cancer, which may be associated with functional morbidity because of involvement of structures that are essential for speech production. Surgical reconstruction and prosthetic treatment methods may offer the potential for restoration of patients' speech production. For example, surgical techniques, such as radial forearm free flaps, and prosthetic reconstructive techniques, such as palatal augmentation prostheses, hold the promise of restoring intelligible and acceptable speech in oral cancer patients (de Carvalho-Teles, Sennes, & Gielow, 2008; Matsui, Shiota, Yamashita, & Ohno, 2009).

The objective evaluation of speech articulation following glossectomy is essential for directing treatment aimed at the restoration of speech intelligibility. One of the most common methods for evaluating postoperative speech is the perceptual evaluation of tape-recorded speech samples (e.g., sounds, syllables, sentences, conversational speech) using standardized intelligibility and articulation tests (Furia et al., 2001; Korpjaakko-Huuhka, Söderholm, & Lehtihalmes, 1999; Sun, Weng, Li, Wang, & Zhang, 2007; Terai & Shimahara, 2004). Other objective methods used to evaluate glossectomy speech and tongue function include ultrasound (Rastadmehr, Bressmann, Smyth, & Irish, 2008), videofluoroscopy (Georgian, Logemann, & Fischer, 1982), electropalatography (Imai, Michi, Yamashita, & Suzuki, 1991), and magnetic resonance imaging (Kimata et al., 2003).

Acoustic Outcomes of Tongue Reconstruction

While the effects of oral cancer surgery on speech have been examined in a number of studies, few studies have looked at acoustic outcomes of speech function after microvascular and prosthetic reconstruction. The study of speech acoustics is important because acoustic analysis provides valuable information about the physical properties of the speech output, which carry the phonetic information understood by a listener as a meaningful message. In one acoustic study that used a Fast Fourier Transform method, Knuuttila, Pukander, Määttä, Pakarinen, and Vikman (1999) found just minor effects on formant frequencies of Finnish vowels produced by patients with partial glossectomy and pectoralis major myocutaneous flap reconstruction. The only significant changes were the increase of $F1$ in /i/ and lowering of $F2$ in /a/. Using a Linear Predictive Coding method, Whitehill, Ciocca, Chan, and Samman (2006) observed restricted ranges of $F2$ for Chinese (Cantonese) patients with partial glossectomies after reconstruction. This was interpreted as a sign for reduced tongue mobility for anterior–posterior movements of the tongue. In addition, the vowel space area was found to be smaller (i.e., centralized) than that in the control

group, indicating reduced capacity to produce intelligible speech. Also using linear predictive coding, Kazi et al. (2007) found differences in formant frequency between females and males with partial glossectomy compared to a control group. In that study, only a sustained /i/ vowel was analyzed.

Speech Outcomes with Palatal Augmentation Prosthesis

One of the potential outcomes of tongue resection and reconstruction is limited bulk and movement of the reconstructed tongue, resulting in reduced tongue–palate contact. When this occurs, a palatal augmentation prosthesis (PAP) can be constructed for the patient. The primary benefit of a PAP for oral cancer patients with reduced tongue volume and movement is that the artificial lowering of the palatal vault improves tongue–palate contact.

Only a few studies about the effects of PAPs on the speech of oral cancer patients have been published thus far. Cantor, Curtis, Shipp, Beumer, and Vogel (1969) discovered that patients with severe restriction of tongue movement had the best prognosis for benefiting from a PAP, whereas patients with moderate restrictions had unfavourable outcomes with a PAP. Some investigators have argued that the bulky palatal augmentation may hinder articulatory movements of the residual tongue, decreasing speech intelligibility (Wheeler, Logemann, & Rosen, 1980). Shimodaira, Yoshida, Yusa, and Kanazawa (1998) reported that a PAP provides the patient with effective tongue–palate contact, resulting in increased speech intelligibility and a more effective ability to communicate. In a review of nine published studies, the functional efficacy of PAP was supported for individuals who had severe restrictions in tongue–palate contact after tongue resection (Marunick & Tselios, 2004).

The speech outcomes of rehabilitation with a PAP have been investigated in different acoustic studies. Based on spectrographic analysis, Leonard and Gillis (1990) found a speech improvement of 9% to 23% for oral cancer patients after wearing a PAP. Using speech oscillograms, Ichikawa, Komoda, Horiuchi, and Matsumoto (1995) found that the noise duration of /s/ increased significantly in three out of four palatal augmentation cases. In addition, voice onset time (the time interval between the release of a plosive and the onset of the following vowel) had a tendency to increase with a PAP both in the palatal stop /c/ and the velar stop /k/ produced by Japanese males. De Carvalho-Teles et al. (2008) used spectrography to analyze Brazilian Portuguese vowel sounds in glossectomy patients who had a PAP and who had undergone speech therapy. Female and male patients were grouped together. The prosthesis was reported to bring the formant values ($F1$, $F2$, $F3$) closer to normal in many vowels.

Purpose

The present case study aimed to describe longitudinal changes in speech function related to a PAP. A patient who had undergone primary reconstruction with a radial

forearm free flap and secondary rehabilitation with a PAP was recorded at different times during a 2-year time frame (pre-operative, 1 year postoperative, and 2 years postoperative with a PAP).

The study employed acoustic analyses that had not been used concurrently in previous studies. The main focus was on changes of acoustic characteristics such as vowel formant frequencies and spectral moments of fricatives. Based on the results of previous studies, it was hypothesized that speech would become poorer after primary surgical treatment with a radial forearm free flap (RFFF) at the 1-year post-operative visit and that it would improve at the 2-year assessment time while wearing a PAP. It was expected that the vowel space area would be smaller after the RFFF reconstruction because of reduced tongue function (Whitehill et al., 2006). For sibilants, changes were expected in the spectral moments of sibilant sounds because of changes in the place, degree, and length of constriction. After the PAP, formant values would be higher because of a smaller vocal tract size. As PAPs have been observed to improve the function of the residual tongue and the tongue–palate contact (Shimodaira et al., 1998, de Carvalho-Teles et al., 2008), it was assumed that with the use of a PAP, the acoustic features would return to the pre-operative level or at least approach it.

Methods

The protocol for this study was approved by the Health Research Ethics Board of the University of Alberta in Edmonton. The patient was a 64-year-old English-speaking Canadian female who had undergone resection of a portion of the anterior two-thirds of the tongue and a reconstruction with a RFFF. The resection included the total removal of the right styloglossus, the anterior portion of the inferior and superior longitudinal muscles, the anterior portion of the transverse and vertical muscles, and the right hyoglossus. In addition, a portion of the right genioglossus was removed. The patient underwent adjuvant chemo-radiation therapy. Due to persistent difficulty with swallowing one year after the surgery, she received eight sessions of therapy that included tongue manometry feedback. Little progress was made with conventional therapy; thus, 15 months after surgery, a PAP was custom-made to assist with speech and swallowing. Following delivery of the PAP, the patient underwent two blocks of speech therapy that included 16 sessions each during a four month period. These sessions consisted of articulation therapy with electropalatography biofeedback.

The speech recordings were completed during clinical visits before the tongue resection, both 1 year after the tongue resection and reconstruction and 2 years after the surgery while wearing a PAP. Speech utterances were collected via a head-mounted unidirectional microphone and recorded using a digital audioteape recorder with a sampling rate of 48 kHz. For the acoustic analyses, three different sets of phrases were read by the patient at all assessments. The phrases consisted of a series of “say hVd

again” with four different vowels, six stimulus sentences (Weismer, Jeng, Laures, Kent & Kent, 2001), and the *Zoo Passage* (Fletcher, 1978; see Appendix 1). The stimulus sentences and the *Zoo Passage* were read once at each visit. The hVd phrases were read once at the pre-operative visit, and five times at both the 1-year postoperative visit with RFFF and the 2-year postoperative visit with the PAP.

Acoustic analysis

Vowels

Recordings were digitized at 48 kHz and analyzed using the Computerized Speech Laboratory (CSL; Model 4400, KayPentax, Lincoln Park, NJ). The signal was down-sampled to 16 kHz. Frequencies of the first and second formants (F_1 , F_2) of the vowels /i/, /A/, and /u/ were analyzed from samples of the hVd phrases and the stimulus sentences (see Appendix 1). The vowels /i/, /A/, and /u/ were chosen because they are suitably distinct with regards to their articulatory, acoustical, and perceptual properties. The vowel /I/ was also analyzed because it is qualitatively quite similar to the vowel /i/. These vowels are also used to calculate the vowel space area. The formant frequencies were obtained using linear predictive coding (frame length 20 ms; filter order 12; pre-emphasis 0.9; pitch-synchronicity applied; Blackman window). The linear predictive coding analysis was performed by placing the cursor at the temporal midpoint of the vowel segment taken from the waveform and the broadband spectrogram display (analysis size 100 points; pre-emphasis 0.9; display 0–4,000 Hz, Blackman window). The vowel midpoint was chosen in order to eliminate the contextual effects of adjacent segments and to approximate the point where the articulatory target is presumed to be reached (Lindblom, 1963). The numerical values of the formant frequencies were exported in a table. In doubtful cases when the formant was weak, the measured formant values were double-checked and hand-measured using a spectrogram and/or a 512-point fast Fourier tracking analysis (20 ms Hamming window; low smoothing level).

The averaged F_1 and F_2 values of the four vowels were used to calculate acoustic vowel space areas, using the mathematical formula presented by Liu, Kuhl, and Feng-Ming (2003). The vowel quadrilaterals were divided into two triangles, and the acoustic spaces of these two triangles were calculated (in Hz^2) and summed (Turner, Tjaden, & Weismer, 1995).

Sibilants

Spectral moments of the long-term average spectrum, i.e., the mean (1st moment) and skewness (3rd moment), were analyzed from the speech samples of the stimulus sentences and the *Zoo Passage* using the Computerized Speech Laboratory (CSL; Model 4400, KayPentax, Lincoln Park, NJ). The signal was down-sampled to 24 kHz. The spectrum was computed using the fast Fourier transform (analysis window 512-points, 20-ms Hamming window, analysis range 0–10,000 Hz). The long-term average spectrum was measured over the entire frication by manually

placing the initial cursor at the onset of the frication and the final cursor at the end of the frication. The numerical values of the spectral moments were obtained from the *Long-Term Average Fast Fourier Transform Statistics* table that was generated. The two spectral characteristics were selected because these parameters are suitable for qualifying the overall shape of the spectrum (Flipsen, Shriberg, Weismer, Karlsson, & McSweeney, 1999) and can summarize the concentration (mean) and asymmetry (skewness) of the energy distribution.

Statistical analyses

Statistical comparisons across time were not calculated because of the single-subject experimental design. The results were instead summarized in descriptive statistics.

Results

Vowels

For the hVd phrases (Figure 1, upper diagram), F_1 increased for the high vowels /i/ and /u/ with the PAP, indicating a lower tongue position and a narrower pharyngeal area. Less pronounced increases in F_1 were noted after the RFFF procedure. Decreases in F_2 were observed for all vowels after the RFFF reconstruction. After treatment with the PAP, the F_2 values for all vowels moved closer to the pre-operative level. For the stimulus sentences (Figure 1, lower diagram), a decrease of F_2 was observed after the RFFF. With the PAP, F_2 values approached the pre-operative level, similar to the results for the hVd phrases. The F_1 increased for the high vowel /i/ after the RFFF reconstruction, but returned to the pre-operative level after the PAP.

The area size of the vowel space (Figure 1) decreased systematically over time, in both the hVd phrases and the stimulus sentences (hVd: pre-op = 39,8472 Hz²; post-RFFF = 27,2055 Hz²; post-PAP = 25,4426 Hz². Stimulus sentences: pre-op = 29,5467 Hz²; post-RFFF = 25,7013 Hz²; post-PAP = 24,0456 Hz²). The percentage changes of the vowel space areas were as follows: for the hVd phrases, pre-op vs. 1-year postoperative = decrease of 32%, 1-year post-operative vs. 2-year post-operative with PAP = decrease of 6%, and pre-operative vs. 2-year postoperative with PAP = decrease of 38%; for the stimulus sentences, pre-operative vs. 1-year postoperative = decrease of 13%, 1-year postoperative vs. 2-year postoperative with PAP = decrease of 6%, and pre-operative vs. 2-year postoperative with PAP = decrease of 19%.

Sibilants

Regarding the stimulus sentences, changes were found in the spectral mean (1st spectral moment) for /s/ and /z/ (Figure 2, lower diagram). The spectral mean decreased after reconstruction (pre-operative vs. 1-year postoperative: mean decrease of 2,448 Hz), but increased after treatment with the PAP (1-year postoperative vs. 2-year postoperative with PAP: mean increase of 1,186 Hz). Thus, spectral mean approached the quantitative level of the pre-operative state

(pre-operative vs. 2-year postoperative with PAP: mean decrease of 1,262 Hz). The skewness values returned to the pre-operative level over time (Figure 3, lower diagram). For /j/, effects were found in skewness (3rd moment), which decreased systematically over time (pre-operative 1.54 vs. 2-year postoperative with PAP 0.55, mean decrease 0.99).

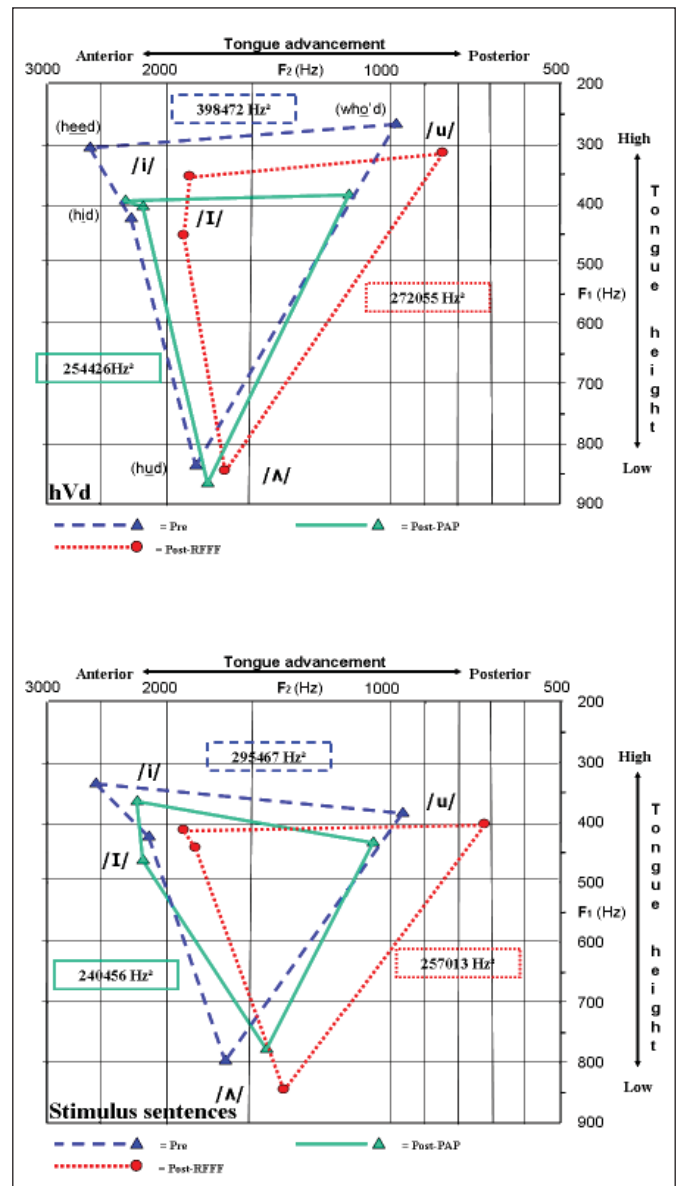


Figure 1. The vowels /i, I, Λ, u/ produced by the subject in hVd phrases (upper diagram) and stimulus sentences (lower diagram) are plotted on an acoustic plane according to the mean values of F_1 and F_2 (in Hz). The vowel sounds produced before the resection (Pre) are marked by triangles connected by dashed lines; the vowels produced 1 year after the resection with RFFF reconstruction (Post-RFFF) are marked by solid circles connected by dotted lines; the vowels produced 2 years after the RFFF reconstruction while wearing a PAP (Post-PAP) are marked by triangles connected by solid lines.

Effects also were found in the spectral mean (pre-operative 4,358 Hz vs. 2-year postoperative with PAP 5,058 Hz, mean increase 700 Hz).

For the *Zoo Passage*, effects were found in the spectral mean (Figure 2, upper diagram) and skewness (Figure 3, upper diagram) for /s/ and /z/. As in the stimulus sentences, the spectral mean decreased after the RFFF (pre-operative vs. 1-year postoperative: mean decrease of 2,240 Hz), and increased after treatment with a PAP (1-year postoperative vs. 2-year postoperative with PAP: mean increase of 814 Hz). The spectral mean approached the qualitative level of the pre-operative state, but did not achieve the pre-operative

quality (pre-operative vs. 2-year postoperative with PAP: mean decrease of 1,426 Hz). Skewness increased at the 1-year postoperative time (mean increase of 0.09), but treatment with the PAP resulted in decrease of skewness (mean decrease of 0.53). The change in skewness between the pre-operative assessment and the 2-year postoperative assessment was notable (mean increase of 0.77). For /j/, the same pattern of decrease followed by increase as observed for /s/ and /z/ was found in the data for the spectral mean (pre-operative 4418 Hz vs. 2-year postoperative with PAP 4,769 Hz, mean increase of 351 Hz). This observation was in agreement with observations from the stimulus sentences.

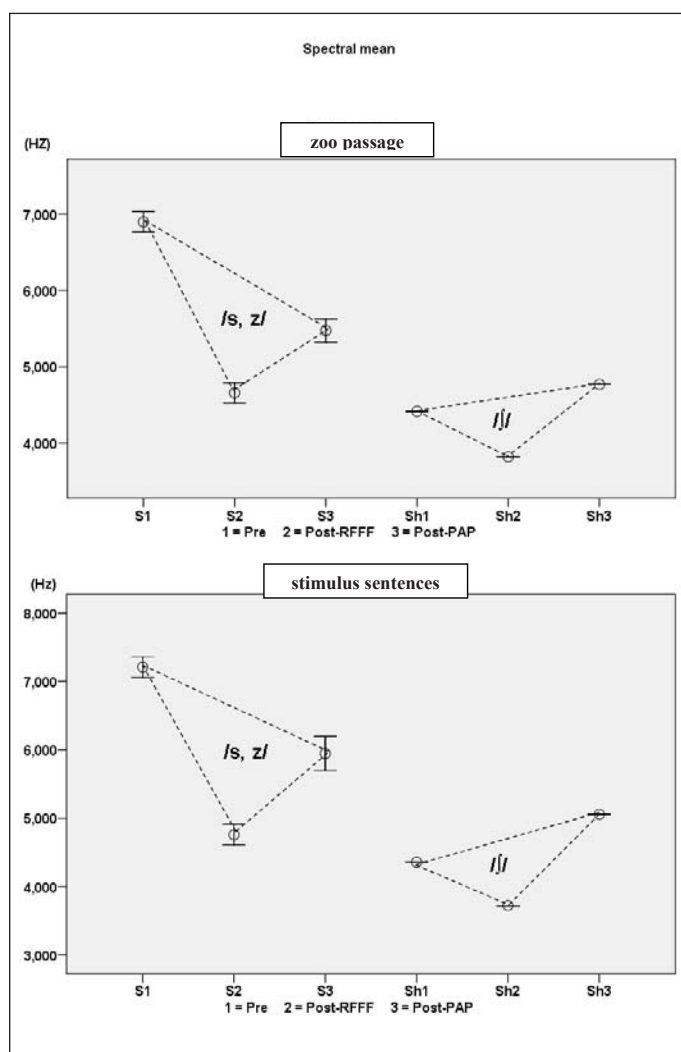


Figure 2. Averaged data of spectral mean of sibilants /s, z/ (= s) and /j/ (= sh) produced in the *Zoo Passage* (upper diagram) and in stimulus sentences (lower diagram) by the subject. The mean and standard error of mean are shown. For both /s, z/ and /j/, data from three sessions are connected by dotted lines (Pre = sounds produced before the resection; Post-RFFF = sounds produced 1 year after the resection with RFFF reconstruction; Post-PAP = sounds produced 2 years after the RFFF reconstruction while wearing a PAP).

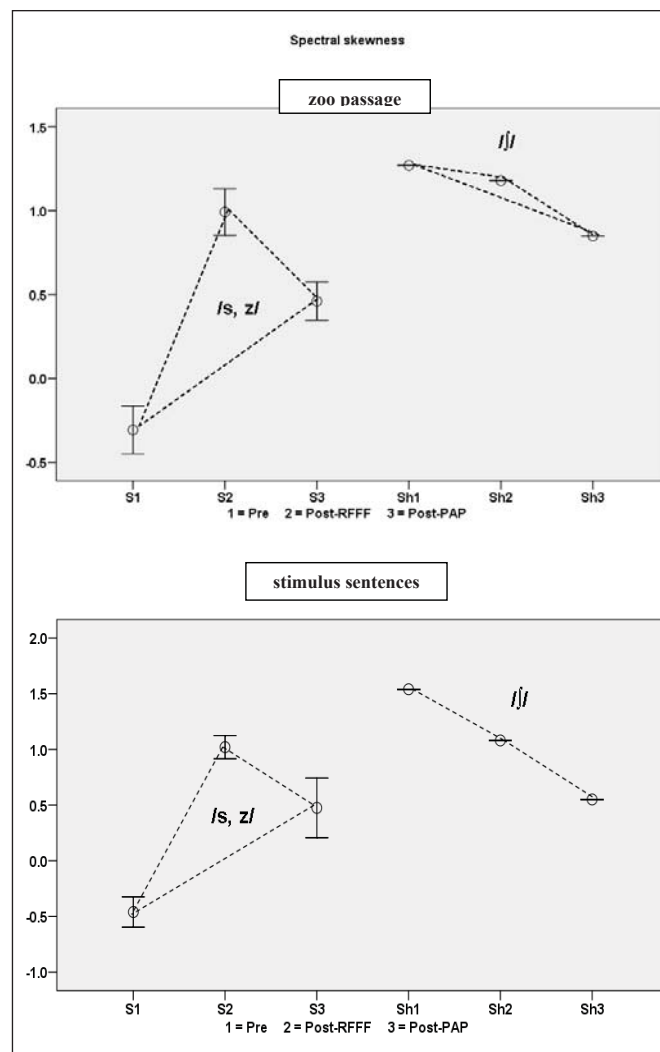


Figure 3. Averaged data of spectral skewness of sibilants /s, z/ (= s) and /j/ (= sh) produced in the *Zoo Passage* (upper diagram) and in stimulus sentences (lower diagram) by the subject. The mean and standard error of mean are shown. For both /s, z/ and /j/, data from three sessions are connected by dotted lines (Pre = sounds produced before the resection; Post-RFFF = sounds produced 1 year after the resection with RFFF reconstruction; Post-PAP = sounds produced 2 years after the RFFF reconstruction while wearing a PAP).

The results for skewness showed the same overall decrease observed in the stimulus sentences (pre-operative 1.54 vs. 2-year postoperative with PAP 0.55, mean decrease 0.99).

Discussion

In this experiment, acoustic properties of speech sounds produced by a female patient with tongue cancer were studied. Acoustic changes were observed for formant frequencies ($F1$, $F2$) and spectral moments (mean, skewness), showing that the tongue resection and reconstruction with the RFFF and the use of the PAP changed the articulatory output. Rehabilitation with the PAP was found to lead to acoustic measures that were moderately similar to the preoperative state.

Vowels

The observed increase of $F1$ after the rehabilitation with the PAP suggests the use of a lower tongue position, resulting in a more open oral cavity and a narrower pharyngeal space. The changes in $F1$ were found only during speech produced with the PAP, suggesting that the prosthesis changed the vocal tract configuration. It may have been the case that the patient used a lower position of the mandible to compensate for the lowered palate. In turn, this may have constrained the tongue and decreased the vocal tract space. Such a change would be most obvious in high vowels. The changes in $F2$ indicated that RFFF had an effect on the forward-backward movement of the tongue. The decreased $F2$ suggests a more posterior tongue position after surgical reconstruction. After treatment with a PAP, the $F2$ s were closer to the pre-operative levels, indicating that the PAP may have been helpful for the patient with regards to restoring pre-operative formant ranges.

In addition to changes in formant frequencies, changes in the size of vowel space area were studied. The vowel space area has been found to correlate both with the precision of articulation and with the clarity of speech (Weismer et al., 2001). In this study, vowel space area was found to decrease over time. After rehabilitation with the PAP, the vowel areas were found to be even smaller than after the resection and RFFF reconstruction (see Figure 1). However, the quantitative change was relatively small and should not be overstated. Therefore, the results may support the view that a PAP does not have a significant effect on vowel production.

Sibilants

Sibilant sounds /s/, /z/, and /ʃ/ are the most complex speech sounds to produce because they require fine motor control of the tongue. Therefore, these sounds are particularly prone to be affected by a glossectomy.

Spectral moments have been found to reflect characteristics of the cavities anterior to constriction and at the constriction itself; however, the precise relationship between the spectral moments and the articulatory function is still unclear. Increasing the length of the cavity anterior to the constriction, increasing of the length of the constriction, or increasing of the degree of the constriction have been

found to lower the energy mean, i.e., 1st spectral moment (Nitttrouer, 1995). Positive skewness (3rd moment) indicates a spectral tilt with an energy concentration in low frequencies, while negative skewness suggests a spectral tilt with an energy concentration in higher frequencies (Jongman, Wayland, & Wong, 2000).

For sibilant sounds in this study, significant changes in spectral moments were found after the RFFF reconstruction and rehabilitation with a PAP, both in the stimulus sentences and in the *Zoo Passage* samples. Changes were observed in both the mean and the skewness values of the energy distributions. For the alveolars /s, z/, the lower energy mean and higher skewness coefficient after the tongue resection and reconstruction with the RFFF indicated that the patient was unable to produce an appropriate constriction. According to the model by Nitttrouer (1995), the causative factors may have been a larger or longer constriction than before the reconstruction. The place of the constriction may have been more posterior than normal. One of the possible reasons for lower energy mean and higher skewness can be lateral emission where the airstream escapes across the lateral part of the tongue. After treatment with the PAP, mean energy increased and skewness decreased, but they were not restored to pre-operative levels. This suggests that the PAP had a moderately positive effect on the production of alveolar sibilants. Palatal augmentation prostheses are designed to improve tongue-palate contact. Tongue-palate contact is important in the production of stop sounds (/t/, /d/, /k/, and /g/). However, sibilants require delicate grooving of the tongue. Previous research has reported negative effects of a PAP. Stops were found to have a longer closure phase and the sibilant /s/ was found to have a longer duration after treatment with a PAP (Ichikawa et al., 1995). The PAP also reduced the tactile feedback from the palate which may interfere with the patient's fine motor control of the tongue. In the present case, the energy distribution for /s/ and /z/ increased to higher frequencies; however, the acoustic distance to /ʃ/ still remained small, indicating that the perceptual distinction of these sounds was not clear.

For the palato-alveolar /ʃ/, the trend of the results was similar to /s/ and /z/. Higher frequency components after treatment with the PAP compared to the pre-operative production suggest that the patient may have used a smaller constriction or a more anterior constriction placement, resulting in higher mean energy and lower skewness. However, the changes were very small and should not be overstated. In the present case, the conservative conclusion has to be that neither the resection and the RFFF reconstruction nor the PAP had an effect on /ʃ/.

Thus, in spite of the fact that the acoustic parameters can qualify spectral shape (Forrest, Weismer, Milenkovic, & Dougall, 1988), they are relatively crude representations of the sibilant spectrum. The acoustic properties of sibilants can be sensitive to small modifications of articulatory movements, but relatively small spectral changes can be associated with significant changes in the perception of these sounds (Stevens, 2000).

Conclusion

The acoustic analyses used in this study documented the effects of a tongue resection and RFFF reconstruction and a PAP. Like other investigations of glossectomy speech, the present study demonstrates the complexity of speech rehabilitation in these patients. The results of the acoustic analysis demonstrated that the patient in the present study benefitted from the PAP, but also that these benefits were moderate. According to the research by Marunick & Tselios (2004), it is currently difficult to demonstrate consistent and systematic benefits of PAPs. A PAP can be a blessing or a curse for the patient. Designing a good PAP is particularly difficult because glossectomy patients may use atypical and asymmetrical compensatory articulation patterns (Bowers, Tobey, & Shaye, 1985). Even normal speakers use distinctive idiosyncratic strategies when trying to compensate for the effects of deteriorated speech function (McFarland, Baum, & Chabot, 1996). The use of the same surgical procedure across patients may produce speaker-specific effects. It is essential to understand the individual variability in speech function, as well as the contributions of underlying anatomical, physiological, and perceptual factors to this variability.

References

- Bowers, J., Tobey, E. A., & Shaye, R. (1985). An acoustic-speech study of patients who received orthognathic surgery. *American Journal of Orthodontics & Dentofacial Orthopedics*, 88, 373–379.
- Cantor, R., Curtis, T. A., Shipp, T., Beumer 3rd, J., & Vogel, B. S. (1969). Maxillary speech prostheses for mandibular surgical defects. *Journal of Prosthetic Dentistry*, 22, 253–260.
- de Carvalho-Teles, V., Sennes, L. U., & Gielow, I. (2008). Speech evaluation after palatal augmentation in patients undergoing glossectomy. *Archives of Otolaryngology - Head and Neck Surgery*, 134, 1066–1070.
- Fletcher, S. (1978). *Diagnosing speech disorders from cleft palate*. New York: Grune & Stratton.
- Flipsen Jr., P., Shriberg, L., Weismer, G., Karlsson, H., & McSweeney, J. (1999). Acoustic characteristics of /s/ in adolescents. *Journal of Speech, Language and Hearing Research*, 42, 663–677.
- Forrest, K., Weismer, G., Milenkovic, P., & Dougall, R. N. (1988). Statistical analysis of word-initial voiceless obstruents: Preliminary data. *Journal of the Acoustical Society of America*, 84, 115–123.
- Furia, C. L. B., Kowalski, L. P., Latorre, M. R. D. O., Angelis, E. C., Martins, N. M. S., Barros, A. P. B., et al. (2001). Speech intelligibility after glossectomy and speech rehabilitation. *Archives of Otolaryngology - Head and Neck Surgery*, 127, 877–883.
- Georgian, D. A., Logemann, J. A., & Fischer, H. B. (1982). Compensatory articulation patterns of a surgically treated oral cancer patient. *Journal of Speech and Hearing Disorders*, 47, 154–159.
- Ichikawa, T., Komoda, J., Horiuchi, M., & Matsumoto, N. (1995). Influence of alterations in the oral environment on speech production. *Journal of Oral Rehabilitation*, 22, 295–299.
- Imai, S., Michi, K., Yamashita, Y., & Suzuki, N. (1991). Electropalatographic characteristics of glossectomies reconstructed with free radial forearm flap. *Japan Journal of Logopedics and Phoniatrics*, 32, 318.
- Jongman, A., Wayland, R., & Wong, S. (2000). Acoustic characteristics of English fricatives. *Journal of the Acoustical Society of America*, 108, 1252–1263.
- Kazi, R., Prasad, V. M. N., Kanagalingam, J., Georgalas, C., Venkitaraman, R., Nutting, C. M., et al. (2007). Analysis of formant frequencies in patients with oral or oropharyngeal cancers treated by glossectomy. *International Journal of Language and Communication Disorders*, 42, 209–224.
- Kimata, Y., Sakuraba, M., Hishinuma, S., Ebihara, S., Hayashi, R., Asakage, T., et al. (2003). Analysis of the relations between the shape of the reconstructed tongue and postoperative functions after subtotal or total glossectomy. *Laryngoscope*, 113, 905–909.
- Korpjaakko-Huuhka, A.-M., Söderholm, A.-L., & Lehtihalmes, M. (1999). Long-lasting speech and oral-motor deficiencies following oral cancer surgery: A retrospective study. *Logopedics, Phoniatrics and Vocology*, 24, 97–106.
- Knuuttila, H., Pukander, J., Määttä, T., Pakarinen, L., & Vilkinen, E. (1999). Speech articulation after subtotal glossectomy and reconstruction with a myocutaneous flap. *Acta Oto-Laryngologica*, 119, 621–626.
- Leonard, R. J., & Gillis, R. (1990). Differential effects of speech prostheses in glossectomized patients. *Journal of Prosthetic Dentistry*, 64, 701–708.
- Lindblom, B. (1963). Spectrographic study of vowel reduction. *Journal of the Acoustical Society of America*, 35, 1773–1781.
- Liu, H.-M., Kuhl, P. K., & Feng-Ming, T. (2003). An association between mothers' speech clarity and infants' speech discrimination skills. *Developmental Sciences*, 6, F1–F10.
- McFarland, D. H., Baum, S. R., & Chabot, C. (1996). Speech compensation to structural modifications of the oral cavity. *Journal of the Acoustical Society of America*, 100, 1093–1104.
- Marunick, M., & Tselios, N. (2004). The efficacy of palatal augmentation prostheses for speech and swallowing in patients undergoing glossectomy: A review of the literature. *Journal of Prosthetic Dentistry*, 91, 67–74.
- Matsui, Y., Shiota, T., Yamashita, Y., & Ohno, K. (2009). Analyses of speech intelligibility in patients after glossectomy and reconstruction with fasciocutaneous/myocutaneous flaps. *International Journal of Oral and Maxillofacial Surgery*, 38, 339–345.
- Nittrouer, S. (1995). Children learn separate aspects of speech production at different rates: Evidence from spectral moments. *Journal of the Acoustical Society of America*, 97, 520–530.
- Rastadmehr, O., Bressman, T., Smyth, R., & Irish, J. C. (2008). Increased midsagittal tongue velocity as indication of articulatory compensation in patients with lateral partial glossectomies. *Head and Neck*, 30, 718–726.
- Shimodaira, K., Yoshida, H., Yusa, H., & Kanazawa, T. (1998). Palatal augmentation prosthesis with alternative palatal vaults for speech and swallowing: A clinical report. *Journal of Prosthetic Dentistry*, 80, 1–3.
- Stevens, K. N. (2000). *Acoustic phonetics*. Cambridge, MA: MIT Press.
- Sun, J., Weng, Y., Li, J., Wang, G., & Zhang, Z. (2007). Analysis of determinants on speech function after glossectomy. *Journal of Oral and Maxillofacial Surgery*, 65, 1944–1950.
- Terai, H., & Shimahara, M. (2004). Evaluation of speech intelligibility after a secondary dehiscence operation using an artificial graft in patients with speech disorders after partial glossectomy. *British Journal of Oral and Maxillofacial Surgery*, 42, 190–194.
- Turner, G. S., Tjaden, K., & Weismer, G. (1995). The influence of speaking rate on vowel space and speech intelligibility for individuals with amyotrophic lateral sclerosis. *Journal of Speech and Hearing Research*, 38, 1001–1013.
- Weismer, G., Jeng, J.-Y., Laues, J. S., Kent, R. D., & Kent, J. F. (2001). Acoustic and intelligibility characteristics of sentence production in neurogenic speech disorders. *Folia Phoniatrica et Logopaedica*, 53, 1–18.
- Wheeler, R. L., Logemann, J. A., & Rosen, M. S. (1980). Maxillary reshaping prestheses: Effectiveness in improving speech and swallowing of postsurgical oral cancer patients. *Journal of Prosthetic Dentistry*, 43, 313–319.
- Whitehill, T. L., Ciocca, V., Chan, J. C., & Samman, N. (2006). Acoustic analysis of vowels following glossectomy. *Clinical Linguistics & Phonetics*, 20, 135–140.

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Appendix 1

hVd phrases (analyzed vowel sounds in brackets):

Say heed again (/i/ in heed)
 Say hid again (/I/ in hid)
 Say who'd again (/u/ in who'd)
 Say hud again (/Λ/ in hud)

Stimulus sentences (analyzed vowel sounds in brackets; analyzed sibilant sounds underlined)

I took a spoon and a dish (/u/ in spoon, /I/ in dish)
 A new seed will grow fast (/i/ in seed)
 A high stack of cards is on the table (no vowels analyzed)
 Buy Bobby a puppy (/i/ in Bobby, /Λ/ in puppy, /i/ in puppy)
 The potato stew is in the pot (no vowels analyzed)
 I saw you hit the cat (/I/ in hit)

Zoo Passage (analyzed sibilant sounds underlined):

Look at this book with us. It's a story about a zoo. That is where bears go. Today it's very cold out of doors, but we see a cloud overhead that's a pretty, white fluffy shape. We hear that straw covers the floor of cages to keep the chill away: yet a deer walks through the trees with her head held high. They feed seeds to birds so they're able to fly.

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ActionACOA!

■ **Speech Outcomes for Partial Glossectomy Surgery: Measures of speech articulation and listener perception**

■ **Indicateurs de la parole pour une glossectomie partielle : Mesures de l'articulation de la parole et de la perception des auditeurs**

Tim Bressmann
Hannah Jacobs
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Abstract

The speech characteristics of speakers with partial tongue resections can be variable and are still not well understood. The present study had the goal of investigating the relationship between speech outcome measures, such as the number of consonant sounds distorted, and the impression of naïve listeners, as expressed with a measure of speech acceptability and ratings of social perception. Twenty-two patients with partial glossectomies underwent a speech acceptability rating, an articulation screening, and a social perception rating by five naïve listeners. The results demonstrated a discrepancy between the number of consonant distortions and the assessment of speech acceptability. Speech acceptability appeared to be the more sensitive measure of the altered nature of the patients' speech. Pre-surgical speech acceptability accounted for 63.3% of the variance of the post-surgical speech acceptability, while the amount of tissue resected predicted 41% of the variance. When both measures were combined, the cumulative predictive value increased to 74.2%. A defect size of more than 20.4% tongue tissue was identified as the critical cut-off for poorer speech acceptability. The research also demonstrated that while listeners rated the patients' speech as less acceptable after the surgery, the rated social perceptions of the speakers did not change.

Abrégé

Les caractéristiques de la parole des locuteurs ayant subi une exérèse partielle de la langue peuvent varier et sont encore mal comprises. La présente étude vise à examiner le lien entre les indicateurs de résultats de la parole, comme le nombre de sons de consonnes distordus, et l'impression d'auditeurs, mesurée en fonction du niveau d'acceptabilité de la parole et de la perception sociale. Cinq auditeurs ont évalué la parole de 22 patients ayant subi une glossectomie partielle au plan de l'acceptabilité de la parole, de l'articulation et de la perception sociale. Les résultats montrent un écart entre le nombre de distorsions de consonnes et l'évaluation de l'acceptabilité de la parole. La mesure de l'acceptabilité de la parole semble plus sensible à la nature altérée de la parole des patients. L'acceptabilité de la parole pré-opératoire compte pour 63,3 % de la variation de l'acceptabilité de la parole post-opératoire, tandis que la quantité de tissu résectée prédisait 41 % de la variation. Une fois les deux mesures combinées, la valeur prédictive cumulative a progressé à 74,2 %. On a déterminé qu'une exérèse représentant plus de 20,4 % du tissu de la langue constituait la limite critique du niveau d'acceptabilité de la parole déficitaire. La recherche montre aussi que, même si les auditeurs ont évalué la parole des patients comme étant moins acceptable après la chirurgie, l'évaluation de leur perception sociale n'a pas changé.

Key words: glossectomy, tongue cancer, speech, speech acceptability, social perception, head and neck cancer

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A partial glossectomy is the main treatment approach for cancer of the tongue or floor of the mouth. The tumour is removed *in toto* and the resulting defect is closed locally or with a flap (Rogers, 2001; Logemann, 1994). Research has shown that speech outcomes can be a major determinant of the patient's postoperative quality of life (Radford, Woods, Lowe, & Rogers, 2004). However, the surgical variables that determine postoperative speech and tongue function are not completely understood and neither are the specific characteristics of glossectomy speech (Matsui, Shirota, Yamashita, & Ohno, 2009; Bressmann, Sader, Whitehill, & Samman, 2004; Beck et al., 1998).

Researchers have argued that the extent of the resection (Rentschler & Mann, 1980; Pauloski et al., 1998), the defect site (Logemann et al., 1993; Michiwaki, Schmelzeisen, Hacki, & Michi, 1993), and the reconstruction method for the defect (Konstantinovic & Dimic, 1998) are the crucial factors determining the postoperative speech outcomes. There also has been discussion whether the residual tongue should be kept flexible, at the price of reducing it in volume (Imai & Michi, 1992), or whether bulky, convex flaps should be used to replace lost tissue (Matsui et al., 2009; Yanai et al., 2008; Kimata et al., 2003).

Pauloski et al. (1998) assessed the speech of 142 partial glossectomy patients and found that the extent of the resection correlated with the decrease in articulatory precision. Flap reconstructions lead to poorer outcomes than local closures but the defects that were closed with flaps were larger than those closed locally. Unfortunately, the patients' speech results were not reported in detail in this study. Rather, the results were presented as a series of correlation analyses, relating summarized speech outcomes to different surgical variables. Nicoletti et al. (2004) used an automated speech-analyzer to assess the production of select fricative sounds, such as /s/, /ʃ/, /f/, and /θ/, in 196 patients. The results from the automatic analyzer were combined with a general measure of speech acceptability ("conversational understandability"). The results demonstrated that larger resections lead to poorer speech results. Local reconstructions lead to better results than flap reconstructions when the group was analyzed as a whole, but comparisons in location subgroups failed to differentiate between reconstructive techniques.

The above review of the literature may serve to demonstrate that research on glossectomy speech tends to focus on the surgical technique, rather than the nature of the speech outcomes. However, for speech pathologists, it is important to gain a better understanding of the patterns of glossectomy speech and the impact that these may have on a listener. Thus, the first goal of the present investigation was to examine the relationship between speech outcome measures, such as the number of consonant sounds distorted, and the general impression of naïve listeners, as expressed with a measure of speech acceptability. The second goal of the study was to investigate the impact of the speech disorder on the social perception of the patients' speech by naïve listeners. While it has been shown that

speech outcomes are an important determinant of the patient's postoperative quality of life (Radford et al., 2004), there has been very little research on the social perception of glossectomy speech. Rieger et al. (2006) used rating scales with different attributes (e.g., intelligent, employable, drunk, weak, etc.) to quantify listeners' social perceptions of oropharyngeal cancer patients with hypernasal resonance disorders. The authors demonstrated that the postoperative social perception of the hypernasal speakers deteriorated. Turcotte, Wilson, Harris, Seikaly, and Rieger (2009) used a similar method to demonstrate that laryngectomy patients treated with radiation therapy had more favourable social perception scores than patients treated with surgery. The third goal of the study was to delineate the critical defect size after which patients can no longer compensate and their speech acceptability deteriorates. The literature on glossectomy speech suggests that a loss of lingual tissue will interfere with the normal movement of the tongue and result in a reduced range of movement (Pauloski et al., 1998; Nicoletti et al., 2004). This reduction in lingual movement is in turn thought to be responsible for the speech distortions (Korpiaakko-Huuhka, Söderholm, & Lehtihalmes, 1999). In a recent study using ultrasound imaging, Rastadmehr, Bressmann, Smyth, and Irish (2008) found that the opposite was the case in a group of 10 patients with small- to medium-sized defects. Contrary to expectations, the glossectomy patients increased the height and the speed of their midsagittal tongue movement in the postoperative speaking condition. This effect was seen in all patients, regardless of the technique of defect reconstruction. It is plausible that glossectomy patients actively compensate for a loss of lingual tissue by making wider and faster movements with the residual tongue. However, such a successful active compensation for a lingual defect will only be possible up to a certain, as of yet unknown, defect size. The present study had the goal of tentatively establishing such a critical defect size based on the speech outcomes.

Methods

Participants

Twenty-two patients with tongue cancer participated in this study. There were 15 men and 7 women. The average age of the male patients was 55 years ($SD = 13.10$) and of the female patients was 45 years ($SD = 13.39$). The patients had lateral or anterolateral carcinomas with defect sizes that varied from small to large. Eleven of the patients, nine males and two females, had smaller defects that were closed using either a primary wound healing or a local closure. The remaining 11 patients, six males and five females, had larger defects that were closed using either a radial forearm flap or an anterolateral thigh flap.

Surgical mapping

The surgeons responsible for the tumour resection and reconstruction documented the location and the extent of the defect on a graphical mapping protocol that was developed by Beck et al. (1998). The defect was drawn in

the horizontal plane. The defect was traced using the NIH ImageJ software and a percentage of the amount of tissue removed was calculated. An overview of the graphical mappings of the patients' lingual defects can be found in Figure 1.

Assessment of consonant production

All speech recordings were made using the Test of Children's Speech software (TOCS+; Hodge & Gotzke, 2007; Gotzke & Hodge, 2005). The TOCS+ was originally designed for children. However, since the focus of the present investigation was not the content but the phonetic form of the patients' speech, the test was deemed appropriate. Before the recordings, it was explained to the patients that they would be working with materials for children. None of the patients voiced any concerns about the form or the content of the test materials. The patients read a list of 80 monosyllabic words in a randomized order. The monosyllabic words formed the basis for a detailed screening of the consonant inventory. All lingual consonants of English were represented in this screening procedure. The patients' speech was recorded to computer hard disk with a sampling rate of 44.1 kHz and a signal resolution of 16 bit, using an AKG C420 headset condenser microphone (AKG Acoustics, 1230 Vienna, Austria) phantom-powered by a Behringer Ultragain Pro pre-amplifier (Behringer USA, Inc., Bothell, WA 98011).

The target sounds in the monosyllabic words were assessed by the second author, who has expertise in transcription and phonetic analysis. Each sound was marked as normal or as distorted, without any further qualification of the nature of the distortion. The second author completed this task twice. Her intra-rater reliability was calculated as a percentage of agreement. The first and third authors reviewed the results from the two assessments and jointly resolved any conflicts between the first and the second perceptual assessment.

Assessment of speech acceptability

Before and after the surgery, the patients also read three 6-word sentences from the TOCS+. The technical aspects of the speech recordings were as described above. The sentences were presented in a randomized order. For the analysis of the patients' speech acceptability (i.e., the perceived "bizarreness" of their speech), five naïve listeners who did not have any training in speech-language pathology were recruited. The order of presentation of the speakers and the sentences during the listening task were randomized. The participants listened to the sound samples using Telex 1210 headphones (Telex Communications, Inc., Burnsville, MN 55337). They did not receive any perceptual training or extensive instructions for the task. The five listeners evaluated the speakers' speech acceptability on the following 4-point scale:

- 0 = *normal*
- 1 = *mildly unacceptable*
- 2 = *moderately unacceptable*
- 3 = *very unacceptable*

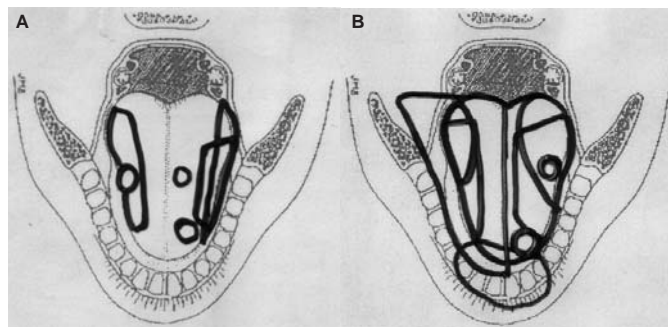


Figure 1. Graphical surgical mapping of the tumour sizes and locations as sketched by the surgeons. (A) Patients with local defect closure. (B) Patients with flap closure.

Assessment of the social perception of glossectomee speech

We also were interested to find out whether the partial tongue resection would impact the patients' social perception by listeners who were not familiar with glossectomee speech. Ten male and 13 female listeners took part in this experiment. The sentences from the speech acceptability assessment were randomized and presented together with eight rating scales. The listeners listened to each sound sample on Telex 1210 headphones and then documented their perceptual reaction using 7-point rating scales. The participants did not receive any perceptual training or specific instructions for the task. The social attributes were taken from Turcotte et al. (2009). The following positive emotional dimensions were rated: attractive, clever, sophisticated, and trustworthy. There were also four negative adjectives rated: boring, scary, annoying, and intimidating. On the 7-point scale, 1 indicated *not at all* and 7 indicated *very much*. For the quantitative analysis, the ratings on the scales for the negatively connotated adjectives were rescaled so that 1 indicated *very much* and 7 indicated *not at all*. A total score was calculated by adding the rating scores for every patient.

Results

Surgical mapping

Patients who received a local closure had on average 6.65% ($SD = 5\%$; range, 2–16%) of their tongue resected. Patients who received a radial forearm flap or an antero-lateral thigh flap reconstruction had on average 23.95% ($SD = 29\%$; range, 5–90%) of their tongue resected. An independent-samples *t*-test was conducted to evaluate whether the percentage of tongue resected differed for patients who received a local closure and for patients who received a flap. The test approached statistical significance, $t(10.72) = 1.97$, $p = .08$ (equal variances not assumed).

Speech acceptability

The speech of all patients was scored for its acceptability pre- and post-surgery. Prior to surgery, patients who received a local closure scored on average 0.65 ($SD = 0.34$; range, 0.33–1.39) for speech acceptability, and patients who

received a flap scored on average 1.16 ($SD = 0.62$; range, 0.64–2.78). Post-surgery, patients who received a local closure scored on average 0.79 ($SD = 0.31$; range, 0.33–0.35) for speech acceptability, and patients who received a flap scored on average 1.60 ($SD = 0.71$; range, 0.78–2.72).

A two-way within-subjects analysis of variance was conducted to evaluate the effect of glossectomy surgery on speech acceptability. The dependent variable was speech acceptability. The within-subjects factors were: time with two levels (pre- and post-surgery) and surgical reconstruction with two levels (local closure and flap). There was a significant main effect for time [$F(1, 18) = 6.83, p = .02$], indicating that speech acceptability became significantly worse after surgery. Two independent-samples t -tests were conducted to evaluate whether speech acceptability differed for patients who received a local closure and patients who received a flap. Prior to surgery, patients who received a local closure were scored significantly better (i.e., lower) on speech acceptability than patients who received a flap [$t(15.65) = 2.39, p = .03$]. Post-surgery, patients who received a local closure were scored significantly better on speech acceptability than patients who received a flap [$t(13.67) = 3.50, p = .00$].

Articulation screening

Prior to surgery, patients who received a local closure distorted on average .36 ($SD = 0.67$; range, 0–2) of the target consonants, and patients who received a flap distorted on average 2.91 ($SD = 5.0$; range, 0–17) of the target consonants. Post-surgery, patients who received a local closure distorted on average .64 ($SD = 1.03$; range, 0–3) of the target consonants, and patients who received a flap distorted on average 5.09 ($SD = 6.09$; range, 0–17) of the target consonants. Since the data were non-continuous (discrete numbers), a non-parametric Mann-Whitney U test was used to compare the total number of distorted target consonants on the articulation test for patients who received a local closure and patients who received a flap. Prior to surgery, the difference between the total number of distorted consonants for patients who received a local closure and patients who received a flap approached statistical significance ($z = -1.70, p = .09$). Post-surgery, the difference again approached significance ($z = -1.65, p = .10$).

Sounds most frequently distorted

An overview of the frequencies and the distribution of the consonant errors can be found in Table 1. Prior to surgery, the total number of articulatory distortions was 36. The most frequently distorted target consonant was /g/ ($n = 5$), followed by /s/ ($n = 4$). After surgery, the total number of articulatory distortions observed was 59. The most frequently distorted target consonant was /d/ ($n = 11$), followed by /k/ ($n = 6$), /r/ ($n = 6$), /s/ ($n = 6$), and /tʃ/ ($n = 5$). Because the data were non-continuous, a non-parametric Mann-Whitney U test was conducted to compare the patients' error numbers for the articulation screening before and after surgery. The results of the test approached significance ($z = -1.70, p = .09$).

Table 1

Frequency of consonant distortions for all patients before and after the surgery

Phoneme	Pre-surgery number of distortions	Post-surgery number of distortions
/d/	2	11
/k/	3	6
/r/	2	6
/s/	4	6
/tʃ/	1	5
/g/	5	4
/ʃ/	3	4
/dʒ/	2	3
/n/	3	3
/ŋ/	3	3
/t/	3	2
/θ/	1	2
/z/	2	2
/l/	0	1
/v/	1	1
/b/	0	0
/f/	0	0
/h/	0	0
/m/	0	0
/p/	0	0
/w/	1	0

Social perception of glossectomy speech

Means and standard deviations of listener responses for each emotional dimension pre- and post-surgery for patients who received a local closure and patients who received a flap are reported in Table 2. A total score was calculated for each patient by summing up the ratings.

Independent-samples t -tests were conducted to evaluate whether the male and female listeners rated the social attributes differently. Sixteen independent-samples t -tests were conducted for each emotional dimension pre- and post-surgery. No Bonferroni adjustment was made in keeping with the recommendations by Perneger (1998). The results for the positive attributes demonstrated that the female listeners rated the patients as being significantly more attractive, clever, sophisticated, and trustworthy than the male listeners did ($p < .05$ for all tests). For two of the four negative emotional dimensions (rescaled), significant differences were found between the scores of male and female listeners. Female listeners rated the

speech of patients as being significantly scarier and more intimidating than male listeners did ($p < .05$ for both tests). For the other two emotional dimensions, boring and annoying, there were no significant differences between male and female listeners' ratings.

A two-way within-subjects analysis of variance was conducted to evaluate the effect of the glossectomy surgery on total score (with rescaled negative attributes). The within-subjects factors were: time with two levels (pre- and post-surgery) and surgical reconstruction with two levels (local closure and flap). The time main effect and the Surgical Reconstruction x Time interaction effect were not significant. Since we had found a difference in the rating behaviour of the female and the male listeners, the analysis was repeated for only the female and only the male listeners. The results were not significant.

A series of independent-samples *t*-tests was conducted to evaluate whether listeners perceived the speech of patients who received a local closure and the speech of patients who received a flap differently with regards to the different social attributes. Sixteen independent-samples *t*-tests were conducted for the dimensions pre- and post-surgery. The test was only significant for the attribute scary (rescaled) prior to surgery [$t(20) = 2.57$, $p = .019$]. Patients in the flap group were rated as scarier than the local closure group.

Predicting post-surgery speech acceptability from pre-surgery speech acceptability and amount of tissue resected

A linear regression analysis was conducted to predict post-surgery from pre-surgery speech acceptability. The two variables were linearly related such that the more unacceptable a patient's speech was prior to surgery, the more unacceptable that patient's speech was post-surgery. The resulting regression equation for predicting the post-surgery speech acceptability was: *Post-surgery speech acceptability* = .97 *Pre-surgery speech acceptability* + .315

The correlation between the pre- and post-surgery speech acceptability was $r = .795$ ($p = .00$), and 63.30% of the variance of post-surgery speech acceptability was accounted for by pre-surgery speech acceptability.

A second linear regression analysis was conducted to predict post-surgery speech acceptability from the defect size, as calculated from the surgical mapping protocols. The two variables were linearly related such that the larger the lingual defect, the poorer the patient's speech post-surgery. The resulting regression equation for predicting the post-surgery speech acceptability was: *Post-surgery speech acceptability* = .02 *Percentage of tongue resected* + .875

Table 2

Results for the social perception ratings of the glossectomees' speech

Attribute	Group	Before surgery	After surgery
Boring (rescaled)	Local	4.10 (SD .64)	4.38 (SD .41)
	Flap	4.44 (SD .58)	4.18 (SD .49)
Attractive	Local	2.73 (SD .57)	2.76 (SD .42)
	Flap	2.71 (SD .43)	2.80 (SD .46)
Clever	Local	3.05 (SD .41)	3.19 (SD .35)
	Flap	3.10 (SD .58)	3.05 (SD .47)
Scary (rescaled)	Local	6.38 (SD .19)	6.28 (SD .29)
	Flap	6.15 (SD .22)	6.32 (SD .25)
Annoying (rescaled)	Local	5.20 (SD .59)	5.46 (SD .32)
	Flap	5.37 (SD .56)	5.30 (SD .40)
Sophisticated	Local	3.10 (SD .47)	3.19 (SD .51)
	Flap	3.11 (SD .47)	3.04 (SD .53)
Intimidating (rescaled)	Local	6.16 (SD .21)	6.09 (SD .25)
	Flap	6.04 (SD .29)	6.15 (SD .21)
Trustworthy	Local	3.55 (SD .33)	3.71 (SD .31)
	Flap	3.55 (SD .38)	3.49 (SD .32)
Total Score	Local	34.27 (SD 2.72)	35.06 (SD 2.01)
	Flap	34.48 (SD 2.72)	34.33 (SD 2.29)

Notes: The ratings were made on a 7-point scale with the endpoints 1 (*not at all*) and 7 (*very much*). For the negatively connotated adjectives, the rating values were inverted to ensure comparability of all rating values.

SD = standard deviation

The correlation between the pre- and post-surgery speech acceptability was $r = .640$ ($p = .002$), and 41.0% of the variance of the post-surgery speech acceptability was accounted for by the defect size.

Finally, a multiple linear regression analysis was conducted to predict post-surgery speech acceptability from the combination of the pre-surgery speech acceptability and the defect size. The resulting regression equation for predicting the post-surgery speech acceptability was: *Post-surgery speech acceptability* = .011 *Percentage of tongue resected* + .8 *Pre-surgery speech acceptability* + .309

The correlation between the two variables and the post-surgery speech acceptability was $r = .861$ ($p < .001$), and 74.2% of the variance of the post-surgery speech acceptability was accounted for by the regression equation.

In order to identify a tentative cut-off point for the surgical defect size after which postoperative speech acceptability deteriorated markedly, a Receiver Operating Characteristic (ROC) curve was plotted. The state variable was defined as a speech acceptability rating of 1.5 or higher (i.e., more than *mild*). The ROC identified a cut-off of 20.4% tongue surface removed (sensitivity 75% and specificity 94%).

Discussion

This study evaluated the speech characteristics of a small, convenience-sampled group of partial glossectomy patients. The graphical surgical mapping demonstrated that the patients with the local closure had smaller defects than the patients with the flap reconstructions. This finding was expected because the surgeons use flaps for the larger defects. The method of defect reconstruction was used as a sorting variable between the patients with smaller defect sizes and the patients with more extensive defect sizes.

Speech acceptability is a relatively crude outcome measure. Nevertheless, it differentiated well between patients with different degrees of articulation disorders, and it had the advantage that untrained naïve listeners could be recruited to complete the assessments. Both groups' speech acceptability worsened significantly after the surgery, which was an expected finding. It also was found that the patients with larger defects and flap reconstructions had poorer speech acceptability than the patients with smaller defects and local reconstructions. This difference was noted before and after the surgery. The observation that even before the surgery patients may have reduced speech acceptability is of importance for rehabilitation as well as for research. We should not assume that the pre-surgical speech of the patient will always be error-free. However, it is unclear what may cause the reduced speech acceptability. Some patients may have pre-existing speech errors and, in other patients, the presence of the tumour may impact on the normal tongue movement.

While the speech acceptability assessment showed clear effects of the tumour and the surgery, the results of the articulation screening were less pronounced. It was found that the patients with the larger defects and flap reconstructions had poorer results before as well as after the surgery. However, relatively few consonants were noted to be distorted, even in patients with markedly reduced speech acceptability. The articulation screening that was used in the present study was not formally set up for this purpose. The fact that the target sounds were mostly in single syllable words may have allowed the patients to enunciate with more clarity than they may have shown in connected speech. Vowels were not assessed in this screening, so it was not possible to determine whether vowel distortions would have influenced the listeners' acceptability assessments more than the consonant distortions.

Since there were relatively few consonant distortions observed, the hierarchy of consonant distortions may be of limited transferability to other groups of glossectomy patients. As reported by Bloomer and Hawk (1973), Kalfuss (1968) evaluated the speech of 22 glossectomy patients and noted distortions of the vowel /i/ and of the consonants /l/, /v/, /k/, /g/, /θ/, /ð/, /s/, /z/, /ʃ/, /tʃ/, and /dʒ/. Beck et al. (1998) noted distortions of /r/, /l/, /s/, /z/, /ʃ/, /tʃ/, and /dʒ/ in five patients with floor of mouth resections and /r/, /j/, /l/, /s/, /k/, and /ʃ/ in five patients with resections of the dorsum of the tongue. The rank order found in our study differs slightly from these previous studies. The

differences are probably explained by differences in the defect sizes and locations as well as the reconstructive techniques employed by the surgeons.

Reduced speech acceptability may be associated with social stigmatization, which could be detrimental to the patient's emotional well-being and quality of life (Radford et al., 2004). However, the results of the ratings of the social attributes did not demonstrate systematic changes in the social attributes that were ascribed to the patients' voice and speech. While there was a single significant *t*-test indicating that patients in the flap group were rated as scarier than the local closure group, this finding should not be overstated in the face of the non-significant analyses of variance. Overall, the findings indicated that the post-surgical deterioration in speech acceptability and articulation was not inevitably associated with negative social perceptions. In future research, it would be interesting to juxtapose the assessment of social perceptions of naïve listeners with the patients' self-assessments.

It was also an interesting observation that the female listeners in the group tended to be more positive in their ratings of positive attributes and more negative in their ratings of negative attributes than were the male listeners. This finding was observed in six out of the eight perceptual dimensions. Previous research by Turcotte et al. (2009) and Rieger et al. (2006) had not found any gender effects for their listeners.

Since speech acceptability appeared to be the outcome measure that differentiated most clearly between the different speakers, regression analyses were calculated to predict post-surgical speech acceptability from preoperative acceptability and from the defect size. The results showed that the pre-surgical speech acceptability accounted for 63.3% of the variance of the post-surgical speech acceptability, while the amount of tissue predicted 41% of the variance. When both measures were combined, the cumulative predictive value increased to 74.2%. If these findings could be replicated with a larger and more diverse group of patients, they might have direct consequences for the pre-surgical assessment and counselling process.

The ROC method identified a defect size of more than 20.4% tongue tissue as the critical cut-off for poorer speech acceptability. The resulting sensitivity of 75% and the specificity of 94% were satisfactory. A cut-off of 20% tissue loss appears plausible from a clinical perspective. Obviously, these results need to be treated with caution. The cut-off only considers the defect size and neglects the defect location. The sample size in the present study was small and may not have adequately represented the whole variety of possible tongue defects.

Glossectomy surgery and its speech outcomes are notoriously difficult and still not completely predictable in their outcomes. The present study demonstrated a disconnect between the number of consonant distortions and the resulting assessment of speech acceptability. Speech acceptability appeared to be the more sensitive measure of the "differentness" of the patients' speech. On

the other hand, the research also demonstrated that while listeners rated the patients' speech as less acceptable after the surgery, the rated social perceptions of the speakers did not change.

References

- Beck, J. M., Wrench, A., Jackson, M., Soutar, D., Robertson, A. G., & Laver, J. (1998). Surgical mapping and phonetic analysis in intra-oral cancer. In W. Ziegler & K. Deger (Eds.), *Clinical Phonetics and Linguistics* (pp. 481–492). London: Whurr.
- Bloomer, H. H., & Hawk, A. M. (1973). Speech considerations: Speech disorders associated with ablative surgery of the face, mouth, and pharynx – ablative approaches to learning. *ASHA Reports*, 8, 42–61.
- Bressmann, T., Sader, R., Whitehill, T. L., & Samman, N. (2004). Consonant intelligibility and tongue motility in patients with partial glossectomy. *Journal of Oral and Maxillofacial Surgery*, 62, 298–303.
- Gotzke, C. L., & Hodge, M. M. (2005). Relationship between measures of intelligibility and phonetic accuracy in children with and without cleft palate. *Canadian Acoustics*, 33, 80–81.
- Hodge, M., & Gotzke, C. L. (2007). Preliminary results of an intelligibility measure for English-speaking children with cleft palate. *Cleft Palate-Craniofacial Journal*, 44, 163–174.
- Imai, S., & Michi, K. (1992). Articulatory function after resection of the tongue and floor of the mouth: Palatometric and perceptual evaluation. *Journal of Speech and Hearing Research*, 35, 68–78.
- Kalfuss, A. H. (1968). Analysis of the speech of the glossectomee. Doctoral dissertation, Wayne State University.
- Kimata, Y., Sakuraba, M., Hishinuma, S., Ebihara, S., Hayashi, R., Asakage, T., et al. (2003). Analysis of the relations between the shape of the reconstructed tongue and postoperative functions after subtotal or total glossectomy. *Laryngoscope*, 113, 905–909.
- Konstantinovic, V. S., & Dimic, N. D. (1998). Articulatory function and tongue mobility after surgery followed by radiotherapy for tongue and floor of the mouth cancer patients. *British Journal of Plastic Surgery*, 51, 589–593.
- Korpiaakko-Huuhka, A. M., Söderholm, A. L., & Lehtihalmes, M. (1999). Long-lasting speech and oral-motor deficiencies following oral cancer surgery: A retrospective study. *Logopaedics, Phoniatrics and Vocology*, 24, 97–106.
- Logemann, J. A., Pauloski, B. R., Rademaker, A. W., McConnel, F. M. S., Heiser, M. A., Cardinale, S., et al. (1993). Speech and swallow function after tonsil/base of tongue resection with primary closure. *Journal of Speech and Hearing Research*, 36, 918–926.
- Logemann, J. A. (1994). Rehabilitation of the head and neck cancer patient. *Seminars in Oncology*, 21, 359–365.
- Matsui, Y., Shirota, T., Yamashita, Y., & Ohno, K. (2009). Analyses of speech intelligibility in patients after glossectomy and reconstruction with fasciocutaneous/myocutaneous flaps. *International Journal of Oral and Maxillofacial Surgery*, 38, 339–345.
- Michiwaki, Y., Schmelzeisen, R., Hacki, T., & Michi, K. (1993). Functional effects of a free jejunum flap used for reconstruction in the oropharyngeal region. *Journal of Cranio-Maxillo-Facial Surgery*, 21, 153–156.
- Nicoletti, G., Soutar, D. S., Jackson, M. S., Wrench, A. A., Robertson, G., & Robertson, C. (2004). Objective assessment of speech after surgical treatment for oral cancer: Experience from 196 selected cases. *Plastic and Reconstructive Surgery*, 113, 114–125.
- Pauloski, B. R., Logemann, J. A., Colangelo, L. A., Rademaker, A. W., McConnel, F. M., Heiser, M. A., et al. (1998). Surgical variables affecting speech in treated patients with oral and oropharyngeal cancer. *Laryngoscope*, 108, 908–916.
- Perneger, T. V. (1998). What's wrong with Bonferroni adjustments. *British Medical Journal*, 316, 1236–1238.
- Radford, K., Woods, H., Lowe, D., & Rogers, S. N. (2004). A UK multi-centre pilot study of speech and swallowing outcomes following head and neck cancer. *Clinical Otolaryngology and Allied Sciences*, 29, 376–381.
- Rastadmehr, O., Bressmann, T., Smyth, R., & Irish, J. C. (2008). Increased tongue velocity indicates articulatory compensation in speakers with partial glossectomies. *Head & Neck*, 30, 718–726.
- Rentschler, G. J., & Mann, M. B. (1980). The effects of glossectomy on intelligibility of speech and oral perceptual discrimination. *Journal of Oral Surgery*, 38, 348–354.
- Rieger, J., Dickson, N., Lemire, R., Bloom, K., Wolfaardt, J., Wolfaardt, U., et al. (2006). Social perception of speech in individuals with oropharyngeal reconstruction. *Journal of Psychosocial Oncology*, 24, 33–51.
- Rogers, S. N. (2001). Surgical principles and techniques for functional rehabilitation after oral cavity and oropharyngeal oncologic surgery. *Current Opinion in Otolaryngology & Head and Neck Surgery*, 9, 114–119.
- Turcotte, A., Wilson, A., Harris, J., Seikaly, H., & Rieger, J. M. (2009). Listeners' social perception of speakers after treatment for laryngeal cancer. *Canadian Journal of Speech-Language Pathology and Audiology*, 33, 24–33.
- Yanai, C., Kikutani, T., Adachi, M., Thoren, H., Suzuki, M., & Iizuka, T. (2008). Functional outcome after total and subtotal glossectomy with free flap reconstruction. *Head & Neck*, 30, 909–918.

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Book Reviews/ Évaluation des livres

Velo-Cardio-Facial Syndrome. Volume 1

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Karen J. Golding-Kushner

Publisher: Plural Publishing, 2008
Cost: \$100.92 CAD
Reviewers: Cheryl Cytrynbaum, Paula Klaiman,
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V*elo-Cardio-Facial Syndrome, Volume 1* is the fourth book in the "Genetic Syndromes and Communication Disorder Series." The authors, Dr. Shprintzen and Dr. Golding-Kushner, have extensive experience in the diagnosis, treatment and study of VCFS. It was Dr. Shprintzen who first coined the term "Velo-Cardio-Facial syndrome," and he has since contributed much to our understanding of the condition. This volume is the first of two and presents a comprehensive look at the history, phenotype, genetics, growth/feeding issues, and medical management guidelines pertaining to VCFS. The intended audience is defined as "anyone interested in VCFS."

The book is divided into five chapters. The first chapter provides a detailed summary of the history of VCFS from the first suspected published case report in 1955 to the identification of microdeletion 22q11.2 as the etiology to the ongoing current debate about what to call the syndrome. This is a comprehensive and insightful overview. It also provides an understanding into the reasoning behind the many different labels applied to the same disorder and the resultant "nosologic confusion" that continues to puzzle both professionals and the public.

The second chapter provides an exhaustive description of the phenotypic features of VCFS. Much of the book is dedicated to providing an overview of all possible complications or associations related to VCFS. While it is helpful to the clinician to be aware of the variability and extent of the phenotype, little perspective is given regarding the actual prevalence of various phenotypic findings. Equal attention is given to findings that have been reported in one (e.g. cerebellar ataxia) individual with VCFS as to findings that are reported to occur in a high percentage of individuals with VCFS (e.g. chronic leg pains). The reader may develop a skewed perception of what to typically expect, and thus could have benefited by a classification of common versus less common phenotypic features. More focus on the typical VCFS phenotype and its most commonly associated complications/associations, would have helped the reader to develop a clearer gestalt of the syndrome. This would

lead to more sensitive recognition and ultimately a better diagnostic rate amongst speech and language pathologists and other health care providers. Special attention is given to the presentation of speech and language disorders. Many of the statements about the speech and language profiles are based on the authors' extensive experiences in treating this patient population in a communication disorders clinical setting and leaves the reader with the impression that nearly all affected individuals have gross VPI and resultant severe speech issues. The widely variable heterogeneity in this population with regards to speech/resonance disorders, and the resulting wide range of management options are not well outlined which may contribute to under-diagnosis of the condition. We have seen children with VCFS with normal resonance or slight/mild hypernasality. In addition, alternative, non-surgical management options need to be considered for carefully selected young children who may benefit from speech/resonance therapy alone. Some young children with VCFS and compensatory articulation substitutions (glottal stops) are able to achieve correct articulatory placement and avoid the need for surgical management for VPI. While the authors encourage advocating for speech therapy as soon as a need is identified, in this patient population, a more preventative approach should be recommended; specifically to avoid the development of compensatory articulation substitutions and to facilitate expressive language development.

The third chapter reviews the genetic basis of VCFS. The diagrams in this chapter provide a helpful adjunct to the written explanations. The explanatory text appears to be directed toward the lay public and is thus oversimplified for the health professional reader. Some of the analogies used to explain complex genetic mechanisms may be more confusing than clarifying. The advice provided regarding genetic counseling relies on the authors' anecdotal experiences, rather than on evidence-based practice published in the genetic counselling literature. This is highlighted in part by a failure to address the principles of counseling individuals with intellectual disabilities.

The fourth chapter provides general recommendations regarding medical management of the various phenotypic features in VCFS. This chapter is the most useful as it provides the reader with a thorough overview of the various investigations that should be considered in the overall care of a child with VCFS. The authors, however, draw upon their extensive anecdotal experience, at the expense of evidence-based medical references to support their recommendations.

The fifth chapter focuses specifically on issues regarding growth and feeding. A valuable contribution to this chapter is the longitudinal information on height and weight which the authors have used to generate VCFS specific growth curves. This may prove to be a helpful tool once validated independently. As in the previous chapter, the use of evidence-based medical references would have served to strengthen the authors' recommendations regarding medical management.

Overall, this publication has many strengths, including clear visual aids and photographs. The variety of images of patients with VCFS helps the clinician recognize the variability of the syndrome dysmorphology. The enclosed CD ROM serves as a good teaching tool, for speech-language pathologists in particular, as the majority of samples are nasopharyngoscopy or multiview videofluoroscopy studies. Preceding titles and the use of labels superimposed on images provide additional clarification. The synopses of the relevant video clips at the end of Chapters 1 and 2 are helpful as well. The book is clearly organized and simply written, which may make it useful for families who want more detailed information. Visually clear information boxes attempt to define concepts and terms. Overall, readers, health professionals, and caregivers will benefit from the extensive clinical experience and information that the authors have collated into this comprehensive resource.



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All copies should be typed, double-spaced, with a standard typeface (12 point, noncompressed font) on an 8 ½ X 11 page. All margins should be at least one (1) inch. For paper submissions, an original and four (copies) of the manuscript should be submitted directly to the Editor. Author identification for the review process is optional; if blind-review is desired, three (3) of the copies should be prepared accordingly (cover page and acknowledgments blinded). Responsibility for removing all potential identifying information rests solely with the author(s). All manuscripts should be prepared according to APA guidelines. This manual is available from most university bookstores or is accessible via commercial bookstores. Generally, the following sections should be submitted in the order specified.

Title Page: This page should include the full title of the manuscript, the full names of the author(s) with academic degrees and affiliations, and a complete mailing address and email address for the contact author.

Abstract: On a separate sheet of paper, a brief yet informative abstract that does not exceed one page is required. The abstract should include the purpose of the work along with pertinent information relative to the specific manuscript category for which it was submitted.

Key Words: Following the abstract and on the same page, the author(s) should supply a list of key words for indexing purposes.

Tables: Each table included in the manuscript must be typewritten and double-spaced on a separate sheet of paper. Tables should be numbered consecutively beginning with Table 1. Each table must have a descriptive caption. Tables should serve to expand the information provided in the text of the manuscript, not to duplicate information.

Illustrations: All illustrations for the manuscript must be appended to each copy of the manuscript. All manuscripts must have clear copies of all illustrations for the review process. High resolution (at least 300 dpi) files in any of the following formats must be submitted for each graphic and image: JPEG, TIFF, AI, PSD, GIF, EPS or PDF. For other types of computerized illustrations, it is recommended that CJSIPA production staff be consulted prior to preparation and submission of the manuscript and associated figures/illustrations.

Legends for Illustrations: Legends for all figures and illustrations should be typewritten (double-spaced) on a separate sheet of paper with numbers corresponding to the order in which figures/illustrations appear in the manuscript.

Page Numbering and Running Head: The text of the manuscript should be prepared with each page numbered, including tables, figures/illustrations, references, and appendices. A short (30 characters or less) descriptive running title should appear at the top right hand margin of each page of the manuscript.

Acknowledgments: Acknowledgments should be typewritten (double-spaced) on a separate page. Appropriate acknowledgment for any type of sponsorship, donations, grants, technical assistance, and to professional colleagues who contributed to the work but are not listed as authors, should be noted.

References: References are to be listed consecutively in alphabetical order, then chronologically for each author. Authors should consult the APA publication manual (6th Edition) for methods of citing varied sources of information. Journal names and appropriate volume number should be spelled out and italicized. All literature, tests and assessment tools, and standards (ANSI and ISO) must be listed in the references. All references should be double-spaced.

Potential Conflicts of Interest and Dual Commitment

As part of the submission process, the author(s) must explicitly identify if any potential conflict of interest or dual commitment exists relative to the manuscript and its author(s). Such disclosure is requested so as to inform CJSIPA that the author or authors have the potential to benefit from publication of the manuscript. Such benefits may be either direct or indirect and may involve financial and/or other nonfinancial benefit(s) to the author(s). Disclosure of potential conflicts of interest or dual commitment may be provided to editorial consultants if it is believed that such a conflict of interest or dual commitment may have had the potential to influence the information provided in the submission or compromise the design, conduct, data collection or analysis, and/or interpretation of the data obtained and reported in the manuscript submitted for review. If the manuscript is accepted for publication, editorial acknowledgement of such potential conflict of interest or dual commitment may occur within the publication.

Participants in Research Humans and Animals

Each manuscript submitted to CJSIPA for peer-review that is based on work conducted with humans or animals must acknowledge appropriate ethical approval. In instances where humans or animals have been used for research, a statement indicating that the research was approved by an institutional review board or other appropriate ethical evaluation body or agency must clearly appear along with the name and affiliation of the research ethics and the ethical approval number. The review process will not begin until this information is formally provided to the Editor.

Similar to research involving human participants, CJSIPA requires that work conducted with animals state that such work has met with ethical evaluation and approval. This includes identification of the name and affiliation of the research ethics evaluation body or agency and the ethical approval number. A statement that all research animals were used and cared for in an established and ethically approved manner is also required. The review process will not begin until this information is formally provided to the Editor.

Renseignements à l'intention des collaborateurs

La Revue canadienne d'orthophonie et d'audiologie (RCOA) est heureuse de se voir soumettre des manuscrits de recherche portant sur la communication humaine et sur les troubles qui s'y rapportent, dans leur sens large. Cela comprend les manuscrits portant sur les processus normaux et désordonnés de la parole, du langage et de l'audition. Nous recherchons des manuscrits qui n'ont jamais été publiés, en français ou en anglais. Les manuscrits peuvent être tutoriels, théoriques, synthétiques, pratiques, pédagogiques ou empiriques. Tous les manuscrits seront évalués en fonction de leur signification, de leur opportunité et de leur applicabilité aux intérêts de l'orthophonie et de l'audiologie comme professions, et aux sciences et aux troubles de la communication en tant que disciplines. Par conséquent, tous les manuscrits sont évalués en fonction de leur incidence possible sur l'amélioration de notre compréhension de la communication humaine et des troubles qui s'y rapportent. Peu importe la catégorie, tous les manuscrits présentés seront soumis à une révision par des collègues afin de déterminer s'ils peuvent être publiés dans la RCOA. La Revue a établi plusieurs catégories de manuscrits afin de permettre la meilleure diffusion possible de l'information portant sur la communication humaine et les troubles s'y rapportant. Les catégories de manuscrits comprennent :

Tutoriels : Rapports de synthèse, traités ou exposés de position portant sur un sujet particulier dans un cadre théorique ou clinique.

Articles : Manuscrits conventionnels traitant de recherche appliquée ou expérimentale de base sur les questions se rapportant à la parole, au langage ou à l'audition et faisant intervenir des participants humains ou animaux.

Comptes rendus cliniques : Comptes rendus de nouvelles procédures ou méthodes ou de nouveaux protocoles cliniques

portant particulièrement sur une application directe par rapport aux questions d'identification, d'évaluation et de traitement relativement à la parole, au langage et à l'audition.

Comptes rendus sommaires : Semblables aux notes de recherche, brèves communications portant sur des conclusions préliminaires, soit cliniques soit expérimentales (appliquées ou fondamentales), pouvant mener à une étude plus poussée dans l'avenir. Ces comptes rendus se fondent typiquement sur des études à petit « *n* » ou pilotes et doivent traiter de populations désordonnées.

Notes de recherche : Brèves communications traitant spécifiquement de travaux expérimentaux menés en laboratoire. Ces comptes rendus portent typiquement sur des questions de méthodologie ou des modifications apportées à des outils existants utilisés auprès de populations normales ou désordonnées.

Comptes rendus d'expérience : Comptes rendus décrivant sommairement la prestation de services offerts en situations uniques, atypiques ou particulières; les manuscrits de cette catégorie peuvent comprendre des comptes rendus de dépistage, d'évaluation ou de traitement.

Courrier des lecteurs : Forum de présentation de divergences de vues scientifiques ou cliniques concernant des ouvrages déjà publiés dans la Revue. Le courrier des lecteurs peut avoir un effet sur notre façon de penser par rapport aux facteurs de conception, aux confusions méthodologiques, à l'analyse ou à l'interprétation des données, etc. Comme c'est le cas pour d'autres catégories de présentation, ce forum de communication est soumis à une révision par des collègues. Cependant, contrairement aux autres catégories, on recherchera la réaction des auteurs sur acceptation d'une lettre.

Présentation de manuscrits

Pour soumettre un article, les auteurs doivent utiliser le système de soumission électronique de l'ACOA à l'adresse <http://cjslpa.coverpage.ca>. Si vous ne pouvez pas utiliser le système électronique, veuillez envoyer par courriel un fichier Word ou WordPerfect contenant le manuscrit, y compris tous les tableaux, les figures ou illustrations et la bibliographie. Adressez le courriel au rédacteur en chef à l'adresse tim.bressmann@utoronto.ca. Vous pouvez aussi soumettre cinq (5) exemplaires sur papier à :

Tim Bressmann, PhD
Rédacteur en chef
Revue canadienne d'orthophonie et d'audiologie
Department of Speech-Language Pathology
University of Toronto
160 - 500 University Avenue
Toronto, Ontario M5G 1V7

On doit joindre aux exemplaires du manuscrit une lettre d'envoi qui indiquera que le manuscrit est présenté en vue de sa publication. La lettre d'envoi doit préciser que le manuscrit est une œuvre originale, qu'il n'a pas déjà été publié et qu'il ne fait pas actuellement l'objet d'un autre examen en vue d'être publié. Les manuscrits sont reçus et examinés sur acceptation de ces conditions. L'auteur (les auteurs) doit (doivent) aussi fournir une attestation en bonne et due forme que toute recherche impliquant des êtres humains ou des animaux a fait

l'objet de l'agrément d'un comité de révision déontologique. L'absence d'un tel agrément retardera le processus de révision. Enfin, la lettre d'envoi doit également préciser la catégorie de la présentation (i.e. tutoriel, rapport clinique, etc.). Si l'équipe d'examen juge que le manuscrit devrait passer sous une autre catégorie, l'auteur-contact en sera avisé.

Toutes les présentations doivent se conformer aux lignes de conduite présentées dans la publication *Manual of the American Psychological Association (APA)*, 6^e Édition. Un accusé de réception de chaque manuscrit sera envoyé à l'auteur-contact avant la distribution des exemplaires en vue de la révision. La RCOA cherche à effectuer cette révision et à informer les auteurs des résultats de cette révision dans les 90 jours de la réception. Lorsqu'on juge que le manuscrit convient à la RCOA, on donnera 30 jours aux auteurs pour effectuer les changements nécessaires avant l'examen secondaire.

L'auteur est responsable de toutes les affirmations formulées dans son manuscrit, y compris toutes les modifications effectuées par les rédacteurs et réviseurs. Sur acceptation définitive du manuscrit et immédiatement avant sa publication, on donnera l'occasion à l'auteur-contact de revoir les épreuves et il devra signifier la vérification du contenu dans les 72 heures suivant réception de ces épreuves.

Organisation du manuscrit

Tous les textes doivent être dactylographiés à double interligne, en caractère standard (police de caractères 12 points, non comprimée) et sur papier 8 ½" X 11" de qualité. Toutes les marges doivent être d'au moins un (1) pouce. L'original et quatre (4) copies du manuscrit doivent être présentés directement au rédacteur en chef. L'identification de l'auteur est facultative pour le processus d'examen : si l'auteur souhaite ne pas être identifié à ce stade, il devra préparer trois (3) copies d'un manuscrit dont la page couverture et les remerciements seront voilés. Seuls les auteurs sont responsables de retirer toute information identificatrice éventuelle. Tous les manuscrits doivent être rédigés en conformité aux lignes de conduite de l'APA. Ce manuel est disponible dans la plupart des librairies universitaires et peut être commandé chez les libraires commerciaux. En général, les sections qui suivent doivent être présentées dans l'ordre chronologique précisé.

Page titre : Cette page doit contenir le titre complet du manuscrit, les noms complets des auteurs, y compris les diplômes et affiliations, l'adresse complète de l'auteur-contact et l'adresse de courriel de l'auteur contact.

Abrégé : Sur une page distincte, produire un abrégé bref mais informateur ne dépassant pas une page. L'abrégé doit indiquer l'objet du travail ainsi que toute information pertinente portant sur la catégorie du manuscrit.

Mots clés : Immédiatement suivant l'abrégé et sur la même page, les auteurs doivent présenter une liste de mots clés aux fins de constitution d'un index.

Tableaux : Tous les tableaux compris dans un même manuscrit doivent être dactylographiés à double interligne sur une page distincte. Les tableaux doivent être numérotés consécutivement, en commençant par le Tableau 1. Chaque tableau doit être accompagné d'une légende et doit servir à compléter les renseignements fournis dans le texte du manuscrit plutôt qu'à reprendre l'information contenue dans le texte ou dans les tableaux.

Conflits d'intérêts possibles et engagement double

Dans le processus de présentation, les auteurs doivent déclarer clairement l'existence de tout conflit d'intérêts possibles ou engagement double relativement au manuscrit et des auteurs. Cette déclaration est nécessaire afin d'informer la RCOA que l'auteur ou les auteurs peuvent tirer avantage de la publication du manuscrit. Ces avantages pour les auteurs, directs ou indirects, peuvent être de nature financière ou non financière. La déclaration de conflit d'intérêts possibles ou d'engagement double peut être transmise à des conseillers en matière de publication lorsqu'on estime qu'un tel conflit d'intérêts ou engagement double aurait pu influencer l'information fournie dans la présentation ou compromettre la conception, la conduite, la collecte ou l'analyse des données, ou l'interprétation des données recueillies et présentées dans le manuscrit soumis à l'examen. Si le manuscrit est accepté en vue de sa publication, la rédaction se réserve le droit de reconnaître l'existence possible d'un tel conflit d'intérêts ou engagement double.

Illustrations : Toutes les illustrations faisant partie du manuscrit doivent être incluses avec chaque exemplaire du manuscrit. Chaque manuscrit doit contenir des copies claires de toutes les illustrations pour le processus de révision. Il faut envoyer un fichier électronique pour chaque image et graphique en format JPEG, TIFF, AI, PSD, GIF, EPS ou PDF, compression minimale 300 ppp. Pour les autres types d'illustrations informatisées, il est recommandé de consulter le personnel de production de la RCOA avant la préparation et la présentation du manuscrit et des figures et illustrations s'y rattachant.

Légendes des illustrations : Les légendes accompagnant chaque figure et illustration doivent être dactylographiées à double interligne sur une feuille distincte et identifiées à l'aide d'un numéro qui correspond à la séquence de parution des figures et illustrations dans le manuscrit.

Numérotation des pages et titre courant : Chaque page du manuscrit doit être numérotée, y compris les tableaux, figures, illustrations, références et, le cas échéant, les annexes. Un bref (30 caractères ou moins) titre courant descriptif doit apparaître dans la marge supérieure droite de chaque page du manuscrit.

Remerciements : Les remerciements doivent être dactylographiés à double interligne sur une feuille distincte. L'auteur doit reconnaître toute forme de parrainage, don, bourse ou d'aide technique, ainsi que tout collègue professionnel qui ont contribué à l'ouvrage mais qui n'est pas cité à titre d'auteur.

Références : Les références sont énumérées les unes après les autres, en ordre alphabétique, suivi de l'ordre chronologique sous le nom de chaque auteur. Les auteurs doivent consulter le manuel de l'APA (6^e Édition) pour obtenir la façon exacte de rédiger une citation. Les noms de revues scientifiques et autres doivent être rédigés au long et imprimés en italiques. Tous les ouvrages, outils d'essais et d'évaluation ainsi que les normes (ANSI et ISO) doivent figurer dans la liste de références. Les références doivent être dactylographiées à double interligne.

Participants à la recherche – êtres humains et animaux

Chaque manuscrit présenté à la RCOA en vue d'un examen par des pairs et qui se fonde sur une recherche effectuée avec la participation d'êtres humains ou d'animaux doit faire état d'un agrément déontologique approprié. Dans les cas où des êtres humains ou des animaux ont servi à des fins de recherche, on doit joindre une attestation indiquant que la recherche a été approuvée par un comité d'examen reconnu ou par tout autre organisme d'évaluation déontologique, comportant le nom et l'affiliation de l'éthique de recherche ainsi que le numéro de l'approbation. Le processus d'examen ne sera pas amorcé avant que cette information ne soit formellement fournie au rédacteur en chef.

Tout comme pour la recherche effectuée avec la participation d'êtres humains, la RCOA exige que toute recherche effectuée avec des animaux soit accompagnée d'une attestation à l'effet que cette recherche a été évaluée et approuvée par les autorités déontologiques compétentes. Cela comporte le nom et l'affiliation de l'organisme d'évaluation de l'éthique en recherche ainsi que le numéro de l'approbation correspondante. On exige également une attestation à l'effet que tous les animaux de recherche ont été utilisés et soignés d'une manière reconnue et éthique. Le processus d'examen ne sera pas amorcé avant que cette information ne soit formellement fournie au rédacteur en chef.

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