

Vertical Partial Laryngectomy With Temporoparietal Free Flap Reconstruction for Recurrent Laryngeal Squamous Cell Carcinoma

Technique and Long-term Outcomes

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Objectives: To present a technique for reconstruction of the vertical partial laryngectomy defect using a vascularized carrier consisting of a temporoparietal free flap, cartilage graft, and buccal mucosal graft; to evaluate the oncologic outcomes with respect to locoregional control and overall survival; and to provide an assessment of patient quality of life and functional outcomes.

Design: Retrospective medical record review and prospective cross-sectional analysis of functional outcomes.

Setting: Princess Margaret Hospital–University Health Network and the Odette Cancer Centre–Sunnybrook Health Sciences Centre.

Methods: We collected data on patient demographic characteristics, tumor staging, initial treatment, recurrence, management, and follow-up. Prospectively, a cross-sectional study was performed using the European Organization for Research and Treatment of Cancer Quality of Life of Cancer Patients Questionnaire C30 and HN35 module and voice and swallowing results using the Voice Handicap Index and Swallowing Quality of Life index.

Main Outcome Measures: Local recurrence-free survival, cause-specific survival, and overall survival.

Results: Forty men met inclusion criteria (median age, 65.0 years). Local recurrence-free survival was 84% at 3 years and 75% at 5 years. Cause-specific survival was 88% at 3 years and 78% at 5 years. Thirty-eight patients were successfully decannulated; all patients tolerated oral intake after the surgical procedure. The C30 and HN35 symptomatic results were comparable with patients with standardized stages I and II head and neck tumors. The Voice Handicap Index results were comparable with patients with functional dysphonia. Patients' swallowing was in the normal range.

Conclusions: Patients receiving vertical partial laryngectomy with temporoparietal free flap reconstruction for recurrent glottic carcinoma following radiation treatment failure have high rates of locoregional control. The use of the temporoparietal free flap in this patient population produces high-quality voice results and normal swallowing and has no major effect on quality of life.

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CURRENT OPTIONS FOR THE management of early glottic carcinoma (T1 and T2) include surgical excision (transoral endoscopic or open partial laryngectomy) or radiotherapy (RT). Surgical and nonsurgical approaches provide comparable overall survival rates.¹ The optimal treatment for early glottic carcinoma balances functional preservation (ie, airway, speech, and swallowing) against the probability of locoregional disease control. In the past decade, an increasing number of patients have been treated with transoral laser excision; however, primary radiation is still offered to patients with more advanced tumors (T2) and patients in whom anatomic extent of early disease or concern with regard to their ul-

timate voice is an issue. Although the local control rates with primary RT are quite high, treatment failure does occur, with literature reviews suggesting that the rate for T1 disease is from 9% to 21% and for T2 from 15% to 30%.¹⁻⁴ Current approaches to RT failure include transoral laser procedures, partial laryngeal procedures, and the traditional approach of total laryngectomy. Laser procedures tend to be performed on small-volume T1 recurrences, with open procedures offered to more advanced disease. Partial laryngeal procedures with laryngeal preservation are often not offered to this group of patients because of concern about wound healing after radiation and poor voice and airway results.

The senior author (R.W.G.) has previously reported a technique of vertical par-

tial laryngectomy (VPL)⁵—for appropriately selected patients—with defect reconstruction using a vascularized carrier based on the concepts of Delaere and colleagues.^{6,7} This reconstruction consists of a temporoparietal free flap (TPFF), cartilage graft, and buccal mucosal graft. The rationale for the use of a free tissue transfer is to provide a vascularized carrier to support local wound healing and incorporation of the associated mucosal and cartilage grafts in an attempt to optimize the functional outcomes in terms of airway diameter, speech, and swallowing.

This article reviews the results with this technique in a consecutive series of patients treated with partial vertical laryngectomy and TPFF reconstruction. The technique of reconstruction and the primary outcome measures of local relapse-free survival, cause-specific survival, and overall survival are presented. The article also reviews the voice, swallowing, and quality of life (QOL) implications for patients treated with this surgical approach.

METHODS

STUDY SETTING AND PATIENTS

Approval was granted from the research ethics board at both Princess Margaret Hospital–University Health Network and the Sunnybrook Health Sciences Centre. All patients meeting the following inclusion criteria were included in this study: laryngeal squamous cell carcinoma recurrence following failed RT and treatment with VPL and TPFF reconstruction.

DEFINITIONS AND VARIABLES

The patient's age was noted at the time of the VPL surgery with TPFF reconstruction. The primary tumor subsite was classified according to the International Union Against Cancer.⁸ Recurrence was documented as the date of first manifestation of recurrent disease and further subclassified as local (at the primary tumor site), regional (at the site of cervical metastases), both (locoregional), or distant (to distant organs or lymph nodes), within 5 years after surgical resection. Time to disease recurrence was documented as the number of months between the patient's completion of RT and the first noted evidence of disease recurrence. Time to oral intake was recorded as the number of days postoperatively until the patient was safely tolerating oral consumption of any consistency, whereas time to oral diet was recorded as the number of days postoperatively until the patient was safely tolerating an oral diet sufficient to meet nutrition requirements.

TREATMENT

Members of the multidisciplinary head and neck oncology teams at each site managed all patients treated for recurrent laryngeal squamous cell carcinoma after failure of primary RT. Clinical staging of the recurrence was based on the clinical examination and computed tomography findings. Following failure of RT, patients with recurrent disease staged rT1 or rT2 or small-volume rT3 were considered for organ preservation approaches. Contraindication to partial surgery included laryngeal framework or cricoid involvement, disease extension outside the larynx, or pulmonary comorbidity that would preclude open surgery. All patients meeting the selection criteria for recurrent disease were offered surgical salvage with tracheotomy, stan-

dard VPL, or extended VPL with TPFF reconstruction. After the surgical procedure, patients were monitored for disease recurrence at either multidisciplinary head and neck oncology center, which included routine clinical examination with flexible nasolaryngoscopy and periodic imaging by computed tomography. Disease recurrence was confirmed by either biopsy or fine-needle aspiration cytology.

SURGICAL TECHNIQUE

The reconstructive technique we have developed is illustrated in **Figure 1A** and **Figure 1B**. The TPFF is used as a vascular carrier for a buccal mucosa graft and a nonvascularized cartilage graft (usually a cartilaginous strut harvested from the contralateral thyroid ala). A TPFF of a size slightly larger than the partial laryngectomy defect is harvested (usually 10 cm long × 5 cm wide), with a vascular pedicle based on the superficial temporal artery and venae comitantes. The mucosal graft is thinned and sutured to the luminal surface of the TPFF (**Figure 2**). The flap is insetted and the cartilage graft is attached on the lateral aspect of the TPFF with fixation to the posterior remnant of the thyroid ala and TPFF at the level of the contralateral vocal fold. The vascular pedicle is then rotated between the ipsilateral sternohyoid and sternothyroid muscles and approximated to the carotid sheath for microvascular anastomosis. By inserting the pedicle between these muscles, the anteroposterior position of the flap is maintained. Microvascular anastomosis is then performed to the superior thyroid artery or facial artery. The venous anastomosis is usually performed to the facial vein or one of its tributaries. A prefabricated Montgomery laryngeal luminal stent is inserted and held in position with transcutaneous sutures. The stent serves to maintain the position of the reconstructed elements and is removed 10 to 14 days after the surgical procedure via direct laryngoscopy (**Figure 3**). Following stent removal, the patient is decannulated as tolerated and an oral diet is initiated. The operative time for this procedure (ablation and reconstruction) is usually 5 to 7 hours, depending on the complexity of the flap harvest. In this series, most patients did not undergo neck dissection unless either they had presented with nodal disease or there was suspicion of nodal disease on preoperative imaging.

Comprehensive clinicopathologic data were collected into a computerized database, which included patient demography, tumor subsite, and clinical tumor staging. Treatment details included radiation treatment (dose and fractionation), recurrence details, surgical treatment, postoperative course, oncologic follow-up (local, regional, or distant recurrence), and subsequent management and disease status at last clinical review.

OUTCOME MEASURES AND STATISTICAL ANALYSIS

Primary outcome measures were local recurrence-free survival, cause-specific survival, and overall survival as determined by Kaplan-Meier survival analysis. The clinicopathologic factors examined with respect to these outcomes included patient's age, rT stage, RT dose, time to disease recurrence, tumor subsite, and the presence of anterior commissure involvement, arytenoid involvement, and contralateral cord involvement. Univariate Cox proportional hazards regression analysis was used to test the association of these clinical factors with disease-control and survival outcomes. Kaplan-Meier survival analysis was performed with the log-rank test to compare survival curves. Confidence intervals were set at 95%, and significance level was set at $P < .05$.

To assess a patient's QOL and functional outcomes, a paper survey was developed that included the following 3 validated pa-

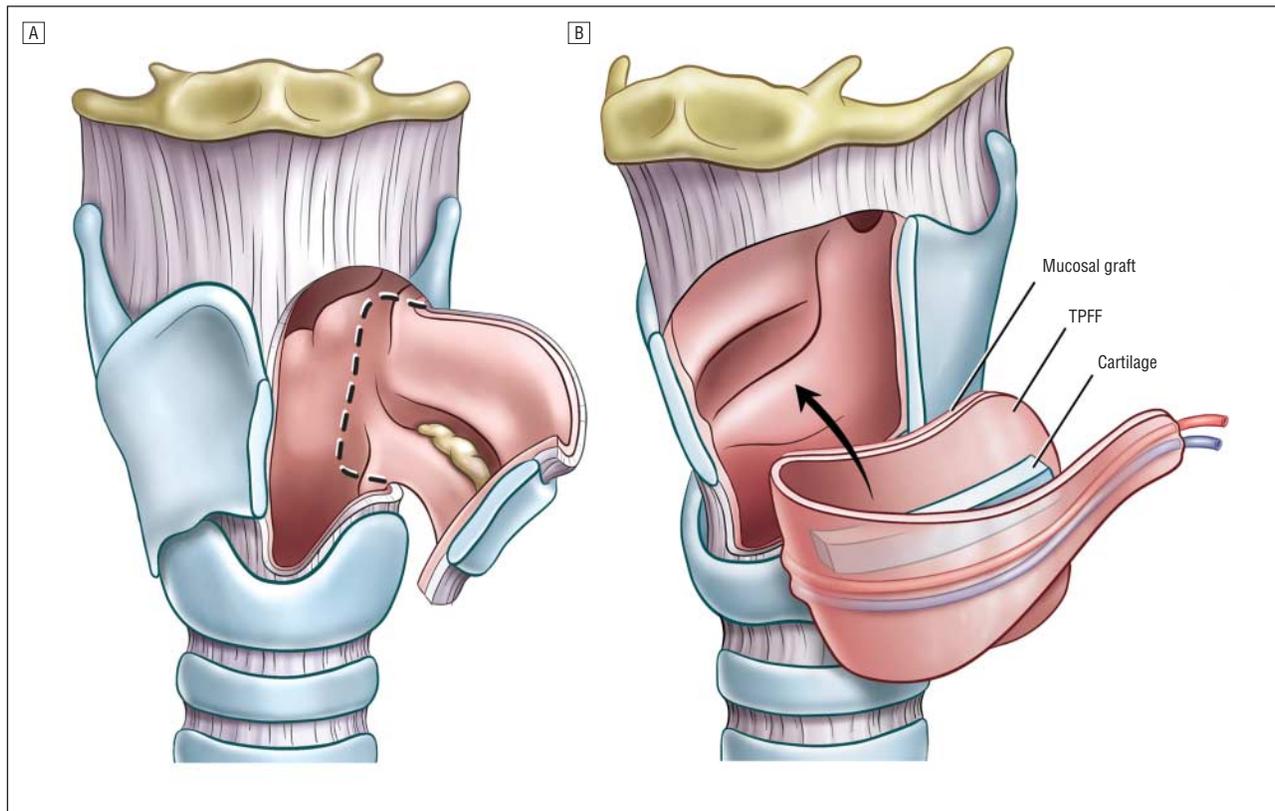


Figure 1. Illustrations of standard frontolateral partial laryngectomy (A) and reconstructive concept including temporoparietal free flap (TPFF), cartilage graft, and mucosal graft (B).



Figure 2. Temporoparietal flap with mucosal graft.

tient questionnaires: the Voice Handicap Index (VHI),⁹ which measures the influence of voice problems on a patient's QOL; the European Organization for Research and Treatment of Cancer Quality of Life of Cancer Patients questionnaire (EORTC QLQ-C30), with the supplemental head and neck cancer questions (HN35),¹⁰ which address patient QOL, function, and symptoms; and the Swallowing Quality of Life index (SWAL-QOL),¹¹ used to assess patients' swallowing impairment and effect on their QOL.

Patients identified in the retrospective study were eligible for enrollment in this functional outcomes study, except for those who had undergone total laryngectomy, if the following additional inclusion criteria were met: ability to provide informed voluntary consent and ability to complete the questionnaires in English.

Surveys were disseminated between June and September 2008 using a modified Dillman method,¹² which emphasizes personally addressed communication, reminders, and repeat mailings. By this protocol, each patient was mailed a survey pack-

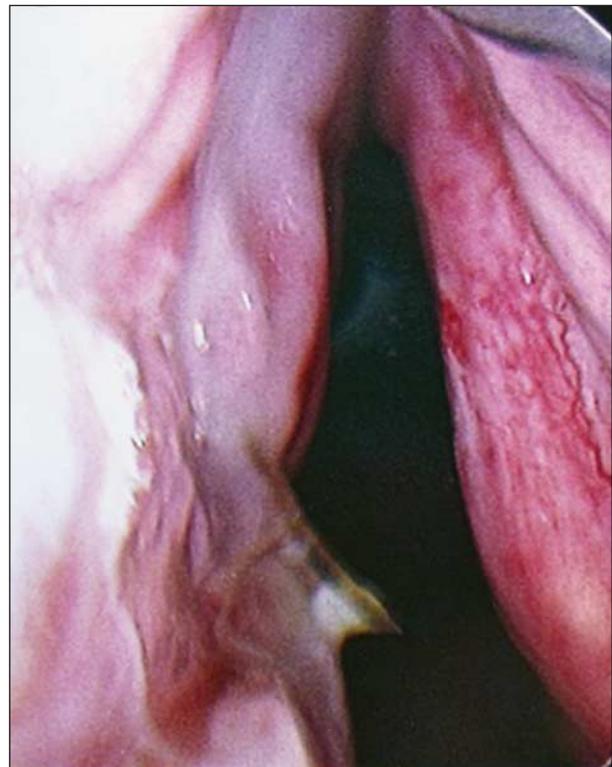


Figure 3. Direct laryngoscopy after stent removal, with left cord reconstructed.

age with a personally addressed letter of information and consent and a preaddressed, postage-paid return envelope. A reminder

Table 1. Perioperative Complications

Complication	No. of Patients
Postoperative infection	2
Hematoma	2
Partial flap loss	2
Subcutaneous emphysema	1
Pulmonary embolus	1
Stent dislodged	1

postcard was sent to all patients 1 week afterward. A second survey package was mailed to nonrespondents after 6 weeks. One week after the second survey package was mailed, each participant who had yet to respond was reminded once more with a telephone call by one of the research team members (J.P.G.). At any time, participants had the option of withdrawing from the study.

RESULTS

RETROSPECTIVE ONCOLOGIC OUTCOMES

Forty patients treated from June 1, 1995, through April 30, 2010, at the Princess Margaret Hospital and the Odette Cancer Centre met the inclusion criteria for our study. All patients were men, with a mean (range) age of 64.1 (38.0-80.0) years at the time of surgery. All patients had been treated with primary RT, with the most common treatment regimen consisting of 50 Gy in 20 fractions over 4 weeks (mean [range], 55 [50-70] Gy). Patients presented with recurrence a mean (range) of 18 (3-51) months after completing primary therapy. Patients were equally distributed in terms of recurrent stage with 20 rT1, 19 rT2, and 1 rT3 undergoing salvage VPL. Most patients had disease limited to a single vocal cord (83%) vs bilateral cord involvement (17%).

Patients returned to the operating room for stent removal at a mean (range) of 12 (10-21) days after the surgical procedure. Nine patients experienced early postoperative complications (**Table 1**). After stent removal, 38 of the 40 patients were successfully decannulated; 2 patients with extended resections in the posterior glottis required permanent tracheotomies. The mean (range) time to decannulation was 16 (12-126) days. All patients resumed oral intake, starting fluids at a mean (range) of 12 (3-39) days after the surgical procedure. The time to an oral dietary intake adequate to meet nutritional needs was a mean (range) of 19 (12-98) days. Five patients experienced delayed complications (3 had granulation tissue requiring debridement, 1 had glottic stenosis requiring dilation, and 1 had cartilage graft resorption treated with revision thyroplasty).

Patients were followed up for a mean (range) of 52 (0-170) months, with 32 controlled locoregionally. Of the remaining 8 patients, 7 had a local or locoregional recurrence and 1 developed disease distally. Of the 8 patients with recurrence, only 6 were amenable to salvage laryngopharyngectomy, and only 2 of the 6 patients underwent procedures for salvage.

The Kaplan-Meier local relapse-free survival was 84% at 3 years and 75% at 5 years (**Figure 4**). Cause-

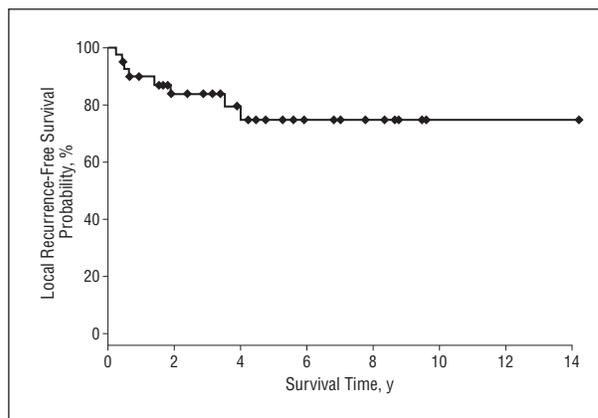


Figure 4. Kaplan-Meier local recurrence-free survival. The 3-year overall survival rate is estimated to be 84% (95% CI, 67%-92%), and the 5-year overall survival rate is estimated to be 75% (55%-87%).

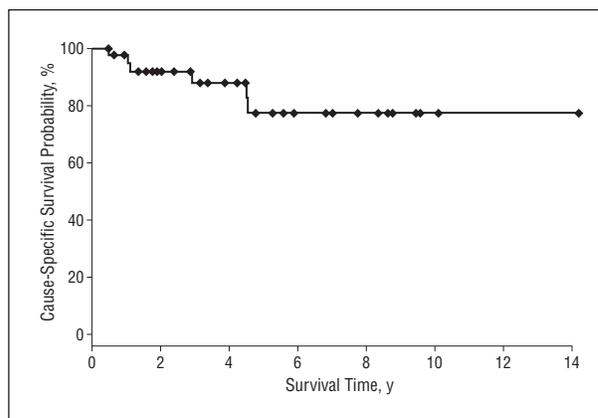


Figure 5. Kaplan-Meier cause-specific survival. The 3-year overall survival rate is estimated to be 88% (95% CI, 70%-95%), and the 5-year overall survival rate is estimated to be 78% (55%-90%).

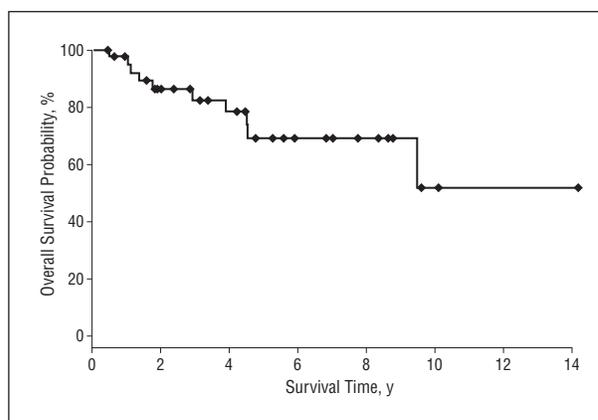


Figure 6. Kaplan-Meier estimated overall survival. The 3-year overall survival rate is estimated to be 83% (95% CI, 65%-92%), and the 5-year overall survival rate is estimated to be 69% (48%-83%).

specific survival (death from laryngeal carcinoma) was 88% at 3 years and 78% at 5 years (**Figure 5**). Overall survival was 83% at 3 years and 69% at 5 years (**Figure 6**). Kaplan-Meier analysis to assess outcome measures by patient group, using the log-rank test to compare survival curves, showed no statistically significant differences in

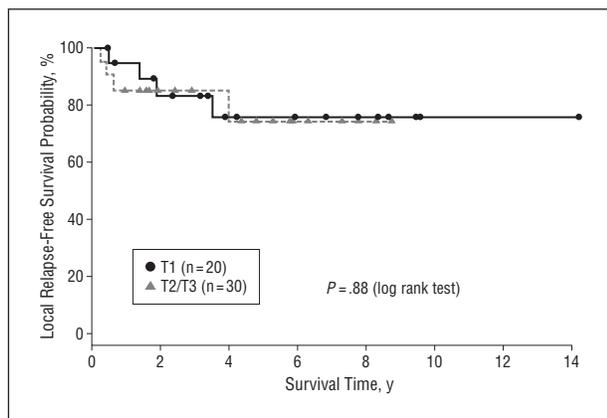


Figure 7. Kaplan-Meier estimated local relapse-free survival by T stage.

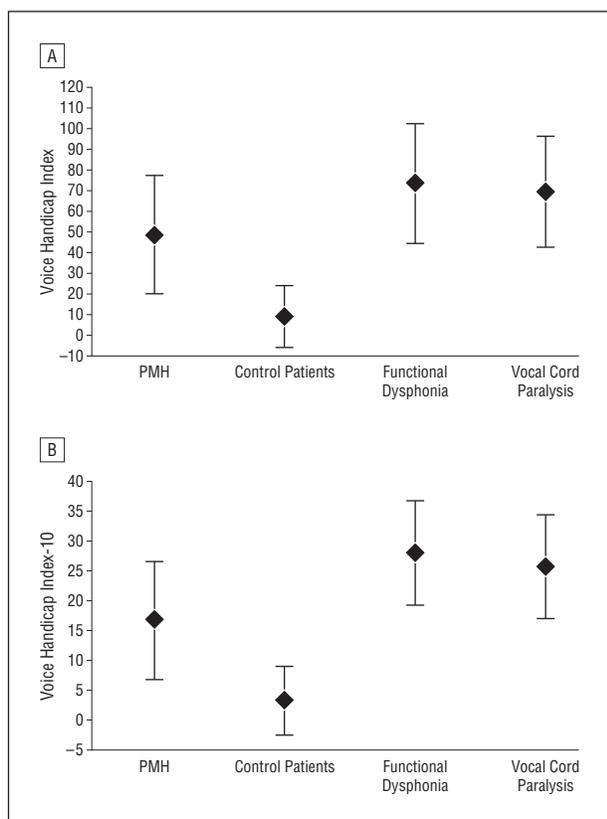


Figure 8. Voice Handicap Index (VHI) (A) and VHI-10 (B), with reference data from control patients for normal function, dysphonia, and vocal cord paralysis, from Rosen et al.¹³ PMH indicates Princess Margaret Hospital. Error bars indicate 95% CIs.

local disease control for patients grouped by involvement of anterior commissure, arytenoid involvement, RT dose, patient age, or time to recurrence following primary treatment. Surprisingly, there was no statistically significant difference in local disease control for patients grouped by rT stage (**Figure 7**).

PROSPECTIVE CROSS-SECTIONAL FUNCTIONAL OUTCOMES

The cross-sectional analysis had a good response rate, with 24 of the 33 eligible participants (73%) returning sur-

Table 2. SWAL-QOL Least Symptomatic Quartile Pharyngeal Dysphagia From McHorney et al¹¹

SWAL-QOL Scale	PMH Study	Least Symptomatic Quartile Pharyngeal Dysphagia
Food selection	86.4	75.8
Burden	83.5	67.0
Mental health	85.8	72.3
Social functioning	80.4	75.7
Fear	83.9	81.2
Eating duration	84.2	61.3
Eating desire	93.1	79.6
Communication	72.2	67.2
Sleep	67.9	67.9
Fatigue	71.0	59.7

Abbreviations: PMH, Princess Margaret Hospital; SWAL-QOL, Swallowing Quality of Life index.

veys. Of those responding, the stage distribution was as follows: T1a (9 respondents), T1b (5 respondents), and T2 (10 respondents), and 15 had the body of the ipsilateral arytenoid preserved.

VOICE HANDICAP INDEX

The VHI and VHI-10 are illustrated in **Figure 8** and contrasted with literature reports for control patients and for patients with functional dysphonia and vocal paralysis.¹³

SWALLOWING QUALITY OF LIFE

The SWAL-QOL results for this series are represented in **Table 2**. This table represents a comparison between the patients in this study and the best quartile for SWAL-QOL of patients from the original validation study. Patients selected for the aforementioned study had stable oropharyngeal dysphagia, evaluated with a video fluoroscopic swallowing study interpreted by an experienced speech pathologist. In the SWAL-QOL, higher scores imply higher levels of function.¹¹

RESULTS OF THE EORTC QLQ-C30

The EORTC QLQ-C30 results for functional outcomes and symptoms scales are depicted in **Table 3** and **Table 4**. For the functional scales, higher scores imply better function; for the symptoms scale, lower scores imply fewer symptoms. The results are contrasted with the EORTC QLQ-C30 cross-sectional data for patients with stage I and stage II head and neck primary tumors.¹⁰

RESULTS OF THE EORTC QLQ-HN35 MODULE

The HN35 module results are presented in **Table 5**. In this QOL measure, lower scores imply fewer symptoms. The results are contrasted to the EORTC-QLQ HN35 cross-sectional data for patients with stage I and stage II head and neck primary tumors.

Table 3. EORTC QLQ-C30 Functional Scales Reference Values

Item	PMH Study	EORTC QLQ-C30 H&N Stages I-II Reference, Mean ¹⁰
Global health	74.6	66.8
Cognitive function	81.8	85.9
Emotional function	81.5	74.2
Physical function	83.7	81.5
Role function	89.1	80.7
Social function	78.2	85.3

Abbreviations: EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life of Cancer Patients questionnaire; H&N, head and neck; PMH, Princess Margaret Hospital.

Table 4. EORTC QLQ-C30 Reference Values for Head and Neck Stages I and II

Item	PMH Study	EORTC QLQ-C30 H&N Stages I-II Reference, Mean ¹⁰
Appetite loss	5.7	13.2
Dyspnea	23.1	18.3
Fatigue	22.7	24.0
Financial	17.3	14.7
Insomnia	23.1	24.7
Nausea	3.6	4.1
Pain	16.6	19.0

Abbreviations: EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life of Cancer Patients questionnaire; H&N, head and neck; PMH, Princess Margaret Hospital.

COMMENT

The salvage of patients with recurrence following RT for early glottic carcinoma (T1 and T2) remains controversial. The primary issues in selecting a treatment approach are locoregional control, the probability of preservation of speech and swallowing, and ultimately the patient's QOL. Secondary issues for most patients and physicians are the quality of the voice after treatment, swallowing efficiency, and the cost and duration of treatment and rehabilitation. This study has demonstrated that for selected patients who have failed RT, excellent locoregional control can be achieved following VPL with a local recurrence-free survival of 84% at 3 years and 75% at 5 years. The high probability of local control in this series is almost certainly related to strict selection criteria for patients undergoing vertical partial procedures for salvage. Disease extension to involve the cricoid and disease extension through the cricothyroid space via the paraglottic space is, in our opinion, a contraindication to partial surgery and likely will be associated with local failure. It is disappointing that for patients in this series for whom partial salvage surgery failed, so few could be salvaged with laryngopharyngectomy. The reasons for this are likely multifactorial and include fundamental tumor biology (lymphatic and vascular invasion) and the fact that previous surgery disrupts the natural barriers to tumor growth and spread in the recurrent setting. Recurrent tumor stage

Table 5. EORTC QLQ-HN35 Symptom Scale Reference Values for Head and Neck Stages I and II

Item	PMH Study, Mean	EORTC QLQ-HN35 Module Stages I-II Reference, Mean ¹⁰
Social eating	3.6	15.0
Swallowing	8.3	16.8
Speech problem	34.7	28.8
Social contact	9.5	11.9
Nutritional supplement	30.4	24.1
Saliva	27.5	26.5
Teeth	21.7	20.7
Dry mouth	21.7	29.7
Cough	34.7	31.1
Felt ill	13.0	20.2
Feeding tube	0	20.3
Open mouth	3.0	13.7
Weight gain	17.3	28.6
Weight loss	4.3	33.1
Senses	12.3	16.2
Pain	4.3	21.6
Pain killers	39.1	41.8
Sexuality	31.1	28.4

Abbreviations: EORTC QLQ-HN35, European Organization for Research and Treatment of Cancer Quality of Life of Cancer Patients questionnaire supplemental head and neck cancer questions; PMH, Princess Margaret Hospital.

surprisingly did not predict probability of local relapse; the reasons for this are not clear but likely are related to the fact that the vertical partial procedure in appropriately selected patients completely clears the sites at risk in patients with rT1 and rT2.

During the past decade, there has been an increased interest in the use of transoral laser approaches for early glottic carcinoma that has recurred following RT. The current literature is limited with small numbers of patients. The series reported to date have demonstrated control rates ranging from 68% to 76% at the primary site, with 19% to 50% of patients ultimately undergoing salvage laryngectomy.¹⁴⁻¹⁸ The literature regarding partial laryngectomy in the recurrent setting is also limited by small numbers, with local control rates ranging from 76% to 96% and with salvage laryngectomy rates ranging from 4% to 27%.¹⁹⁻²² Small-volume T1 recurrences are likely amenable to transoral laser approaches; however, tumors that extend to involve the paraglottic space or extend to the supraglottis and anterior commissure are likely best managed by open partial procedures, either VPL or supracricoid procedures.

Supracricoid partial laryngectomy is an option for salvage of RT failures. The advantage of this technique is complete removal of the paraglottic space bilaterally; it is ideally suited for advanced recurrent disease with bilateral anterior laryngeal involvement or bilateral paraglottic space involvement. Whether supracricoid partial laryngectomy should be performed instead of VPL in recurrent disease remains controversial. Although the supracricoid procedure is more radical in extent than VPL, it is associated with significant rates of perioperative complications, particularly in the radiation failure setting.²³⁻²⁵ Pellini et al²³ have reviewed a retrospective multi-

institutional experience reporting a 27% early complication rate and an 18% late complication rate. In their series, the median time to decannulation was 40 days, with 33% of patients suffering prolonged swallowing impairment with an overall gastrostomy tube rate of 8%. In addition, a number of studies of both radiated and non-radiated patients support the concept that the voice quality in most patients is problematic, with 60% of patients being described as grossly hoarse and 10% nearly aphonic.²³ Little prospective QOL data are available for patients undergoing this procedure. Makeieff et al²⁶ described a series of patients undergoing primary supracricoid partial laryngectomy who were evaluated with the VHI as in this study. The mean score for their series of patients was 51.2; however, nearly 50% of the patients with professional careers did not return to their professions because of the severity of their voice impairment, likely reflecting the severity of the voice impairment associated with supracricoid partial procedures.

This study describes a novel technique for laryngeal reconstruction based on the concept of vascularized carriers described by Delaere et al.⁶ The technique described requires microvascular expertise, making the procedure technically complicated and more time consuming than the standard approaches to reconstruction of the VPL defect or closure of the supracricoid partial laryngectomy. Early in our experience we were frustrated with the local wound-healing complications, airway problems, and poor voice results associated with the vertical partial procedure in the radiation failure setting. Our concerns and frustration have been supported by a number of authors^{20,27} who have reported high rates of airway stenosis and wound-healing complications (up to 50%), including laryngocutaneous fistula and chondronecrosis in patients undergoing VPL laryngectomy in the radiation failure setting.

Although the technique we have described in this article is more complex than the classic techniques, the opportunity to bring well-vascularized tissues to reconstruct the larynx improves local wound healing and provides the opportunity for high-quality functional results. In the follow-up of these patients, the voice results are particularly good in patients for whom the ipsilateral arytenoid can be preserved and remains functional. The reasons for this are unclear but are likely related to tissue remodeling associated with movement of the reconstructed vocal fold promoting the development of a neovocal fold.

The VHI and VHI-10 results reported in this study suggest that patients undergoing VPL with TPFf reconstruction have voice results comparable with those reported in the literature with functional dysphonia.¹³ As indicated, the best voice results are seen in patients with functioning arytenoid cartilages, and there is a wide range of voice results in this series. The limitation of the VHI data in this study is that they exclude those undergoing laryngectomy, and with a response rate of 72%, it has the potential bias that the patients responding may have the best functional and disease-related outcomes.

The SWAL-QOL data presented in this study suggest that the swallowing QOL in this group of patients is within the normal range. This result is not surprising in pa-

tients who retain a high level of laryngeal function and is consistent with our observations of individual patients. The limitation of this QOL measure in this patient population is similar to that of the VHI data because none of the patients requiring laryngectomy salvage completed the questionnaire. In addition, the fact that no other studies of partial laryngectomy in the salvage setting have used this QOL instrument to assess swallowing makes it difficult to compare the observations in this study with outcomes in other reported studies of partial laryngeal surgery.

The EORTC QLQ-C30 and EORTC QLQ-HN35 modules evaluate both patient function and symptoms. To establish a comparative group of patients, we elected to compare data for the patients in this series with the cross-sectional EORTC data for patients treated with identically staged head and neck tumors. The results suggest that the patients in our series have function comparable with this group of patients with early stage head and neck tumors, and they function at a near-normal level. In reviewing the symptom scales of both the QLQ-C30 and QLQ-HN35, the patients in this series have limited symptom issues other than those anticipated for patients who have undergone radiation and surgical treatment.

This article describes the outcomes for a selected group of patients undergoing VPL for salvage of radiation failure for rT1 and rT2 glottic carcinoma. In addition, we describe a novel reconstructive technique using the TPFf combined with a mucosal and cartilage graft to reconstruct the hemilaryngeal defect. The results suggest that the local control achieved with this approach to recurrent disease can retain the function of the larynx in 83% of patients at 3 years. The QOL measures, including VHI, VHI-10, SWAL-QOL, and EORTC QLQ-C30 and QLQ-HN35, demonstrate that these patients have functional voices with high levels of daily function and few problems with symptom management.

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Author Contributions: Drs Gilbert, Guillemaud, Higgins, and Enepekides had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Gilbert and Patel. *Acquisition of data:* Gilbert, Goldstein, Guillemaud, Patel, Higgins, and Enepekides. *Analysis and interpretation of data:* Gilbert and Guillemaud. *Drafting of the manuscript:* Gilbert, Goldstein, Guillemaud, and Patel. *Critical revision of the manuscript for important intellectual content:* Gilbert, Higgins, and Enepekides. *Statistical analysis:* Higgins. *Administrative, technical, and material support:* Gilbert and Guillemaud. *Study supervision:* Gilbert, Goldstein, Patel, Higgins, and Enepekides. **Financial Disclosure:** None reported.

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