

Voice Outcomes after Radiotherapy Treatment for Early Glottic Cancer: Long-Term Follow-Up

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Summary: Objectives. The aim of this study was to investigate long-term voice outcomes and voice-related quality of life (QOL) for early glottic cancer treated with radiotherapy.

Study Design. Long-term exploratory follow-up study of a prospective patient cohort comparing outcomes at a mean of 11 years postradiotherapy with the original 1-year posttreatment results.

Method. Eight patients completed voice tasks for auditory perception and acoustic and aerodynamic measures. Patient-reported voice-related QOL (VR-QOL) and voice quality were measured. Changes in outcomes over time were analysed using repeated-measures linear mixed models.

Results. Acoustic and aerodynamic outcomes remained stable from 1 year postradiotherapy to long-term follow-up, with only jitter mildly increasing from 1.9% at 1 year posttreatment to 2.8% (difference = 1.0%, 95% confidence interval [CI] = 0.1–1.9). Perceptually, voice remained relatively stable with only phonation breaks slightly increasing within the normal range, from 1.1 to 1.7 (difference = 0.6, 95% CI = 0.3–0.9) and breathy quality increasing from normal to slight impairment, with scores increasing from 1.8 to 2.4 (difference = 0.6, 95% CI = 0.3–1.1). QOL scores indicate a good level of VR-QOL that were unchanged at long-term follow-up when compared with 1 year posttreatment.

Conclusions. Improvement in voice outcomes found at 1 year postradiotherapy were largely maintained long term, with only minor changes observed. QOL scores indicate that a high level of VR-QOL was maintained many years after curative radiotherapy.

Key Words: Glottic cancer–Radiotherapy–Dysphonia–Voice–Outcomes.

INTRODUCTION

Single-modality radiotherapy (RT) or laser surgery (LS) are well-established treatment options for the management of early glottic cancer, with both treatments providing high cure rates.¹ With comparable cure rates for oncologic control and survival, decisions regarding optimal treatment may therefore be based on the functional outcomes achieved from either treatment.

The comparison of voice quality following RT or LS for early glottic cancer has been widely researched. While two earlier systematic reviews found no evidence to support superior outcomes for one treatment over the other,^{2,3} a recent RCT study found better voice outcomes following RT with decreased breathiness.⁴ This was supported by another recent study which found better overall voice quality, emotional functioning and social contact for those treated with RT.⁵ One meta-analysis⁶ reported some advantages of voice outcomes for LS over RT. However, the number of studies analysed was small and with no RCT analysed with the selected studies. Currently the research indicates that RT has provided better voice outcomes following treatment, which

is important knowledge given the known impact voice quality can have on quality of life (QOL).^{4,5,7}

Although studies have reported on voice outcomes for early glottic cancer treated with RT, comparative research remains scarce due to the lack of agreed consensus of measurable functional outcomes and use of objective standardised measures.^{2,8} In addition, there are only limited studies investigating voice as a multidimensional construct, exploring multiple aspects of voice such as vocal fold vibration, respiratory support (which may include vital capacity, pressure generation and abdominal/thoracic excursion), auditory-perceptual voice changes, as well as voice-related QOL (VR-QOL).^{8–12}

Currently, there is also a lack of studies reporting patients' long-term quality of voice following curative treatment, with very few prospective studies exploring voice outcomes for early glottic cancer beyond 5 years. There is encouraging evidence for improved voice outcomes following RT. However, the research is largely limited to only 12 months^{8,13,14} and a 2-year follow-up.^{4,11} Due to favourable cure rates and subsequent long-term survivorship, more research is needed beyond 2 years to ascertain voice quality over a prolonged period of time following RT treatment.

In summary, to date there are limited published data reporting long-term follow-up beyond 5 years, as well as limited research using multiple objective and standardised assessments. This study aims to address these gaps by investigating long-term voice outcomes with the use of objective and standardised assessments in a long-term exploratory follow-up on the same group of participants at 10–12 years posttreatment who were reported in an original study by Bibby et al.⁸ This original study used both instrumental and perceptual measures to assess voice quality changes and VR-QOL outcomes pretreatment and at 12 months posttreatment.

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MATERIALS AND METHODS

Original study

Between 2002 and 2004, 41 participants with newly diagnosed squamous cell cancer of the glottis (AJCC stage I or II) were recruited from the Peter MacCallum Cancer Centre for a study of voice outcomes. At 12 months posttreatment, 30 patients remained enrolled in the study. Explanations for patient dropout at 12 months posttreatment are outlined in Figure 1.

All participants received RT alone. Those with T1 lesions received 63 Gy radiation in 28 fractions over 5 weeks. Those with T2 lesions received 66 Gy, in 35 fractions over 5 weeks, using an infield boost regime of 50 Gy in 2-Gy fractions over 5 weeks, with the second 1.6 Gy fraction 6 hours later, in the last 10 days of treatment.

Long-term follow-up (current study)

In 2014 institutional ethics approval was obtained to review medical records and establish which patients remained alive and well with no evidence of loco-regional or metastatic disease. Participants from the original study who met these criteria were initially contacted via telephone and provided information about the follow-up study. Additional information was posted to interested participants, and a follow-up phone call was made. Thirteen of the original 30 patients were identified as eligible, and nine participants consented to be involved. Informed written consent was obtained prior to participation. Of the four original participants who did not consent, reasons included the following: one participant was overseas at the time of data

collection, one was too unwell to participate, one lived too far away to travel, and one declined due to personal reasons. One participant who consented was excluded due to a recent cerebral vascular accident resulting in voice changes; this resulted in eight participants being included in the current long-term follow-up study. Details of participant recruitment are shown in Figure 1.

Data collection

Participants were invited to attend the Peter MacCallum Cancer Centre for a recording of voice assessment tasks. For those participants with restricted mobility affecting their ability to travel, the voice assessment took place in their home.

Data collection procedures were replicated from the original study, which included participants completing three voice tasks involving recitation of the days of the week, three sustained phonations of “ah,” and a 1-minute monologue. Voice tasks were recorded on a Marantz compact flash recorder (model PMD671, Eindhoven, Netherlands). Attempts were made to use the TASCAM Digital AudioTape recorder (TEAC Corp., Tokyo, Japan) used in the original study; however, it has been superseded by newer technologies, and it was no longer possible to use. Participants were placed in a quiet carpeted room and positioned with their mouths 40 cm from the microphone.

In replication of the original study, participants completed a self-report rating of their voice quality (visual analogue scale [VAS]) and a VR-QOL measure prior to their voice being recorded. This was done prior to the voice recordings to reduce

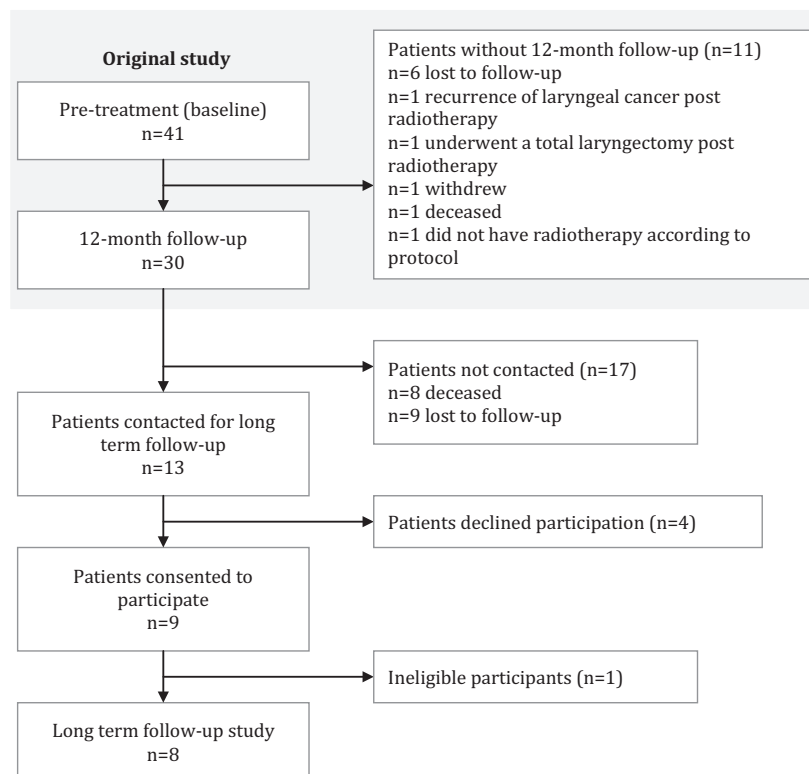


FIGURE 1. Participant flow diagram.

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