

FUNCTIONAL OUTCOMES AFTER RADIOTHERAPY FOR EARLY GLOTTIC CANCER

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Abstract

This paper discusses the current evidence for functional outcomes following radiotherapy treatment for early glottic cancer and the role of speech pathology intervention. Limited data exists for either voice or swallowing outcomes for these patients and even less evidence was found detailing speech therapy treatment outcomes after radiotherapy. The limited research reports improvement in voice quality over time to at least two years. It has been shown that it is possible to collect both subjective and objective voice quality data along with quality of life information, and this can be applied pre treatment and at post treatment intervals. We also report on our local clinical experience with this patient group, including unpublished swallowing outcome data. Ongoing standardised collection of voice and swallowing data will continue to add to the body of knowledge in this area and may define the role, if any, of active voice therapy for this population.

Variable incidence rates are reported for head and neck cancers across the world. In Australia, most recent statistics show two per cent of new cancer diagnoses are of head and neck origin each year. Mortality rates are reducing across developed countries. The major head and neck cancer sites are oral cavity, nasopharynx, oropharynx, larynx and hypopharynx.^{1,2}

Treatment options may include surgical management, radiotherapy, chemotherapy or a combination. With better survival and control rates, organ function is now of prime importance when evaluating therapeutic interventions. Improved surgical and reconstruction techniques and more effective chemoradiotherapy protocols are helping to preserve function, however ongoing research regarding functional outcomes is required to determine extent and impact of loss, long-term nature of losses and benefits of prevention and rehabilitation strategies.³ Functional outcomes are commonly reported to depend upon multiple factors, including the site of origin and stage of the cancer, treatment modality, extent of resection and type of reconstruction, as well as the age and well being of the patient. The quality of support provided by the managing team is also highly valued by the patient.³

Radiotherapy for head and neck cancer commonly affects speech, swallowing and/or voice function and can result in overall changes to patients' quality of life. Radiotherapy treatment may result in xerostomia (dryness of the mouth), pain, inflammation, fatigue, fibrosis, muscle atrophy and joint fixation.³

Rehabilitation that prevents and/or alleviates the loss of function and increases the patients' quality of life would seem necessary. Further studies are required to determine whether rehabilitation conclusively improves function, whether there are preventative effects or whether gains, if any, are maintained long-term. Speech pathologists offer pre and post-assessment and management of changes to speech, voice and swallowing brought about by the presence of and treatment for head and neck cancer.

This paper discusses the current functional outcome data and speech pathology involvement with patients following primary radiotherapy treatment for early laryngeal cancer.

Current evidence

Literature supports that early laryngeal cancer can be managed by radiotherapy or transoral laser microsurgery with similar control and survival.⁴⁻⁸ It is therefore the functional outcomes (voice quality and swallowing) and quality of life outcomes that guide patient decision-making between the two treatment options for this disease. Current functional outcome data is limited, however demonstrates comparable outcomes for voice and quality of life for both treatment options.⁴

Waghmare and colleagues state that early glottic cancers treated with radiotherapy result in voice changes associated with geometric asymmetry, fibrosis, inelasticity and oedema of the vocal folds.⁶ This presents as vocal fold vibratory slowness (lower than normal fundamental frequency), dysrhythmic vibratory pattern (increased noise component) and poor glottic closure (increased breathiness and weak vocal intensity). This is confirmed by acoustic analysis, which demonstrates changes to fundamental frequency, jitter and shimmer measures and harmonic to noise ratio. Perceptually, voice quality is characterised by breathiness, strain, roughness and glottal fry. Glottal fry is the term used to describe a particular vocal quality brought about by a thick flaccid vibrating vocal fold edge. There are also aerodynamic changes of reduced mean phonation time.^{9,10}

Current literature regarding the functional outcomes after radiotherapy for early glottic cancers, indicates both subjective and objective improvement in voice quality over time, without specific functional therapy intervention (ie. speech therapy).^{6,10} Waghmare and colleagues state that voice quality after radiotherapy improves but does not reach the standard of normal controls.⁶ Similar studies have also shown an improvement in quality of life scores

after treatment.^{9,10} Positive changes in voice quality and quality of life measures have been shown to last for at least two years post radiotherapy treatment.³

As a consequence of limitations in the published data, the value of voice therapy in preventing or reducing dysphonia following radiotherapy has not been established. Van Gogh and colleagues reported 44% of patients had evidence of voice impairment after radiotherapy treatment.⁵ They concluded that voice therapy was effective in patients after treatment for early glottic cancer. The study grouped patients treated with either radiotherapy or laser surgery and did not provide voice outcome data specific to each treatment. Although voice improvement was measured by both patient subjective feedback – Voice Handicap Index scores – and some objective analysis of acoustic measures and perceptions of glottal fry,¹¹ no conclusions could be made with specific reference to outcomes after radiotherapy treatment alone. The authors noted that nearly 67% of eligible patients with voice complaints were not willing to participate in the study or withdrew. The high level of non-participation was thought to be due to therapy time requirements and acceptance that voice change was a logical consequence of treatment for a potentially life-threatening disease. Investigators concluded that regular assessment of voice after treatment was helpful for selecting patients that might benefit from voice therapy. Several other authors comment that appropriate voice therapy may be of benefit to this patient group, without supporting data.⁶⁻⁸ Voice rehabilitation exercises post radiotherapy are reported to include vocal hygiene, reduction of abuses, deconstriction and breathing exercises.⁶

Royal Adelaide Hospital experience

Change in voice is frequently the initial symptom for patients with early glottic cancer, with subsequent general practitioner referral to an otorhinolaryngologist for further investigation. At the Royal Adelaide Hospital, a combined speech pathology and otorhinolaryngology consultant clinic captures data for patients pre-microlaryngoscopy and biopsy of laryngeal pathology. Voice and swallowing function are recorded via flexible nasendoscopic examination. A quality of life measure – the Voice Handicap Index score – is also collected. These assessments provide objective pre-treatment information for baseline comparison. Patient education regarding voice changes associated with laryngeal pathology is provided at this time. Once diagnosed with an early glottic cancer, patients are seen by both the otorhinolaryngology surgeons and radiation oncologists in order to discuss treatment options and possible outcomes. Patients then make an informed decision regarding their treatment of choice.

For those patients undertaking radiotherapy, it has been our clinical experience that during active treatment, patients are not concerned with voice quality, but rather the day-to-day experience of radiotherapy. It is also our experience that functional swallowing difficulties are minimal in this population both before and during therapy. Therefore speech pathology input for this

population has predominantly focused on vocal hygiene and general education around voice changes associated with radiotherapy.

In a recent publication, we have shown that it is possible to utilise a standardised battery of assessment to measure voice and quality of life pre-treatment and at intervals post-treatment to monitor functional outcomes and change over time.¹⁰ Our small cohort of patients demonstrated statistically significant improvements in both self rated and objective assessments of voice quality over a two year period. Pre-treatment assessments also allow for speech pathology input and education as required for voice and swallowing disorders at this time, and to provide education regarding expectations throughout and after treatment. Swallowing dysfunction in early glottic cancers is minimal and the need for ongoing speech pathology swallowing intervention during or after treatment is rare. Unpublished swallowing and endoscopic data collected on the same patient cohort and at the same time as the voice data described by Adams and colleagues,⁹ confirms minimal swallowing difficulties for patients with T1 or T2, NO laryngeal cancer treated with radiotherapy. All patients continued their nutrition orally during and after treatment.

The endoscopic data also provided information about laryngeal function for voice production. Although unpublished, the data revealed improvement over time in laryngeal oedema, vocal fold edge irregularity, glottic closure and mucosal wave. Supraglottic constriction was demonstrated by half of all patients pre-treatment. Two thirds of these patients demonstrated persistent supraglottic constriction during the post-treatment assessment phase.

Overall, this data demonstrated that supraglottic constriction was the only feature apparent pre-treatment that was consistently present post-treatment. This feature was identified simply as present or not present. The improvements observed in other glottic features were made without specific therapy tasks beyond basic vocal hygiene information.

In our setting, patients who present with poor perceptual voice ratings and/or are assessed to have persistent supraglottic constriction on endoscopic assessment are offered individually tailored voice therapy tasks. These aim to achieve voluntary retraction of the ventricular folds to optimise true vocal fold function. In our experience the majority of patients with early glottic cancers choose not to engage in voice therapy as voice quality is not of prime concern.

There is a paucity of data in relation to functional outcomes for patients treated for early glottic cancer. In our experience, these patients present with poor voice quality due to their disease, but swallowing difficulties are rare. Despite experiencing poor voice quality during treatment, there is gradual improvement over time such that patients are happy with their voices without active voice therapy. Our patients report acceptance of a degree of disorder subsequent to treatment for cancer. These patients are relieved to have a good response to cancer treatment with any residual voice issues accepted as a natural consequence.

Pre-treatment assessment in a formal clinic using a standardised format, provides the opportunity for baseline voice and swallowing data collection and provision of pre-treatment vocal hygiene education both verbal and written. It also establishes a clinical relationship with the patient so that if patients are concerned about functional outcomes, they are able to contact the speech pathology department for input. Ongoing standardised collection of voice and swallowing data will continue to add to the body of knowledge in this area and may define the role if any, of active voice therapy for this population.

Conclusion

There are documented subjective and objective improvements in voice quality following radiotherapy treatment for early glottic cancer. Swallowing function appears minimally affected by this treatment, but this is not well documented in the literature. Speech pathology input consists of pre-treatment assessment for baseline data collection and education for vocal hygiene. Discussions around general radiotherapy side-effects and the impact on speech, voice and swallowing are also presented. The benefit of additional speech pathology involvement requires further investigation. Ongoing standardised collection of voice and swallowing data will continue to add to the body of knowledge in this area and may define the role, if any, of active voice therapy for this population.

References

1. Cancer Australia. Head and Neck Cancers Factsheet [Internet] Sydney: Cancer Australia, October, 2010. Available from: http://www.canceraustralia.gov.au/sites/default/files/images/Factsheets/Head_and_Neck_Cancers_Factsheet.pdf Accessed May 2012.
2. Cancer Council Australia. Head and Neck Cancers. [Internet] Sydney: Cancer Council Australia, September 2011. Available from: <http://www.cancer.org.au/aboutcancer/cancertypes/headandneckcancers.htm> Accessed May 2012.
3. Van der Molen L, van Rossum MA, Burkhead LM, Smeele LE, Hilgers FJM. Functional outcomes and rehabilitation strategies in patients treated with chemoradiotherapy for advanced head and neck cancer: a systematic review. *Eur Arch Otorhinolaryngol.* 2009;266:889-900.
4. Spielmann PM, Majumdar S, Morton RP. Quality of life and functional outcomes in the management of early glottic carcinoma: a systematic review of studies comparing radiotherapy and transoral laser microsurgery. *Clin Otolaryngol.* 2010;35:373-382.
5. Van Gogh CDL, Verdonck-de Leeuw IM, Boon-Kamma BA, Rinkel RNPM, de Bruin MD, Langendijk JA, Kuik DJ, Mahieu HF. The efficacy of voice therapy in patients after treatment for early glottic carcinoma. *Cancer.* 2006;106:95-105.
6. Waghmare CM, Agarwal J, Bachher GK. Quality of voice after radiotherapy in early vocal cord cancer. *Expert Rev Anticancer Ther.* 2010;10:1381-1388.
7. Hocevar-Boltezar I, Zargi M, Strojanc P. Risk factors for voice quality after radiotherapy for early glottic cancer. *Radiother Oncol.* 2009;93:524-529.
8. Honocodeevar-Boltezar I, Zargi M. Voice quality after radiation therapy for early glottic cancer. *Arch Otolaryngol Head and Neck Surg.* 2000;126:1097-1100.
9. Adams G, Burnett R, Mills E. Objective and subjective changes in voice quality after radiotherapy for early (T1 or T2,N0) laryngeal cancer: A pilot prospective cohort study. *Head Neck.* Published online in Wiley Online Library (wileyonlinelibrary.com). DOI 10.1002/hed.22969.
10. Bibby JRL, Cotton SM, Perry A, Corry JF. Voice outcomes after radiotherapy treatment for early glottic cancer: assessment using multidimensional tools. *Head Neck.* 2008;30:600-610.
11. Jacobson BH, Jonson A, Grywalski C. The Voice Handicap Index (VHI): development and validation. *Am J Speech Lang Pathol.* 1997;6:66-70.