QUALITY OF LIFE AND VOICE IN PATIENTS WITH LARYNGEAL CARCINOMA
- A POST-TREATMENT COMPARISON OF LARYNGECTOMY VS RADIOTHERAPY.

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ABSTRACT
Two groups of laryngeal cancer patients were studied. Fourteen laryngectomized patients speaking with tracheoesophageal prosthesis (TEP) were matched with fourteen irradiated laryngeal speakers with preserved larynx. To measure patients’ QL we used; the European Organisation for Research and Treatment of Cancer Quality of Life Core Questionnaire (EORTC QLQ-C30), the EORTC Head and Neck module (EORTC QLQ - H&N 35), the Hospital Anxiety and Depression scale (HAD) and a study-specific questionnaire. For the perceptual speech evaluation we used visual analog scales.

The perceptual ratings of speech intelligibility, voice quality and speech acceptability showed a significant difference between the treatment groups. Both the patients treated with radiotherapy and the listeners rated the irradiated laryngeal voices higher than the tracheoesophageal speech. The laryngectomized patients scored significantly better than the patients treated with radical radiotherapy on the question about hoarseness. No other significant difference was found for the QL functions and symptoms.

We conclude that, when patients treated with laryngectomy as salvage surgery were compared to patients treated with radiotherapy, only small differences were found in QL and in patients’ perceptual voice- and speech self-evaluation.

1. INTRODUCTION
The larynx is the most common subsite of head and neck cancer. The different treatment modalities for advanced laryngeal cancer, i.e. laryngectomy and radical radiotherapy, have quantitatively similar results (1-3), provided that radiotherapy is not used as a single modality treatment in Stage IV disease (4). Survival is the primary outcome of interest for laryngeal cancer patients but the risk of losing one’s voice and thereby perhaps also the possibility to communicate is frightening. Since different treatment modalities for laryngeal cancer give comparable results, other end-points than survival are necessary. A major criterion for choosing between therapies may be quality of voice and the quality of life (QL) after treatment. Earlier studies of laryngectomized patients have focused on rehabilitation in terms of speech proficiency and voice characteristics (5-6), while only a small number have examined psychosocial adjustment and coping abilities. A few studies of laryngeal cancer are available comparing radiotherapy vs laryngectomy (7-8) in a broader aspect than survival and voice results. These studies show quite heterogeneous QL results when comparing the two treatments, laryngectomy and radical radiotherapy. The voice results are believed to be superior after radical radiotherapy compared to laryngectomy, and therefore radiotherapy is often the first choice of treatment for laryngeal carcinoma (9). In Sweden patients with advanced laryngeal carcinoma are either treated with radiotherapy (with or without chemotherapy) or laryngectomy with a tracheoesophageal prosthesis (TEP).

The main aim of the present study was to examine whether radical radiotherapy with preservation of the larynx was a better alternative than laryngectomy according to perceptual speech evaluation and the patients’ reported quality of life. Furthermore we explored any differences between the perception of patients and a group of listeners in the perceptual speech evaluation.

2. MATERIALS AND METHODS
2.1. Patients
Fourteen patients with tracheoesophageal speech as their primary mode of communication participated in the study, two women and twelve men. The primary treatment for all fourteen patients was radical radiotherapy but they were later laryngectomized as salvage surgery. To get comparable groups of patients, fourteen patients treated with radical radiotherapy and with preserved larynx were identified from the clinical records and chosen when they matched the laryngectomized patients as far as possible according to sex, tumor site, TNM and age. All patients contacted agreed to participate and were included in the study. The patients answered the QL questionnaires on the same occasion as a voice recording was performed at the hospital.

2.2. Voice recordings
Voice recordings were made in a soundproof booth on a Revox B77 Stereo tape recorder connected to a Sennheiser HME 25-1 headset microphone, with a microphone-to-mouth distance of 7 cm and angle to the mouth of 45 degrees. The listeners’ panel for the investigation included ten inexperienced listeners (unfamiliar with tracheoesophageal or irradiated laryngeal speech) and five experienced listeners (practicing speech-language pathologists).

2.3. Voice perceptual ratings
The patients and the judges rated the voices on three different perceptual items: speech intelligibility, voice quality and speech acceptability. The ratings were made by placing a vertical line on a 100 mm visual analog scale. The scale was anchored at each end by opposite extremes of the attribute. A mean per cent score for speech intelligibility, voice quality and speech acceptability was determined for each speaker and specified for the listeners’ and the patients’ own evaluations (10).
2.4. QL Questionnaires
Four questionnaires were used in the study: 1) EORTC QLQ-C30, a comprehensive QL instrument developed for cancer patients and consists of 30 questions to which disease specific modules should be added. 2) The EORTC H&N35-module is a supplement to the QLQ-C30 and consists of questions which are especially relevant to head and neck cancer. 3) The Hospital Anxiety and Depression scale is a self-assessment scale found to be valid and reliable for detecting depression and anxiety disorder. 4) A study-specific questionnaire which contained seven questions we considered to be of specific interest to laryngeal carcinoma patients and not previously included in the EORTC QLQ-C30 or QLQ-H&N35.

2.5. Statistical methods
For descriptive purposes, we used means and 95% confidence interval for the mean. For comparison between groups, Fisher's nonparametric permutation test was used. For comparison within patients, Fisher's nonparametric permutation test for matched pairs was used (11). Due to the large number of tests we only discuss differences with a significance level of less than $p < 0.01$.

3. RESULTS
3.1. Questionnaires
The results from the EORTC QLQ-C30 and the QLQ-H&N35 for the two groups showed only small differences between the two groups of patients, for most of the scales and single items. The largest difference between the groups was found for "hoarseness" (38 points), "trouble with smell" (31 points), "trouble eating in front of other people" (21 points), "trouble having social contact with friends" (19 points), "bothered by appearance" (17 points) and "mucus production" (16 points). The question about "hoarseness" differed significantly between the two treatment groups *** $p<0.001$.

The study specific questionnaire designed for this study containing questions especially relevant to this group of patients did not reveal any significant difference between the groups.

According to the HAD scale, there were three patients with probable depression among the laryngectomized patients compared to one among the irradiated patients, and one patient in each treatment group showed possible depression and possible anxiety. The scores of one laryngectomized patient indicated a probable case of anxiety disorder.

3.2. Visual analog scale; voice-perceptual ratings
The laryngectomized patients judged their voices to be significantly better than the listeners according to voice quality ($p<0.001$) and speech acceptability ($p<0.01$). The patients treated with radiotherapy judged the voice result "speech intelligibility" to be significantly better than the laryngectomized patients ($p<0.01$). The listeners judged the voices of the patients treated with radiotherapy to be significantly better than those of the laryngectomized patients on the three perceptual items ($p<0.001$).

4. DISCUSSION
The main findings of this study were few significant differences, when QL was compared between the two groups of patients. There was, however, a significant difference between the patients' and the listeners' judgements on the perceptual ratings of the patients' voices as well as a significant difference in the listeners' judgements between the two treatment groups.

An interesting finding was that laryngectomized patients scored significantly lower on hoarseness than patients treated with radiotherapy. Obviously the patients speaking with a TEP do not see themselves as having a hoarse voice. The majority of patients, 71% (10 of 14 patients) of the TEP-patients (64% of the irradiated patients), considered that their voices were better after treatment. Even though the laryngectomized patients scored lower on 18 out of 24 symptoms/problems in the QLQ-H&N35, the difference was mostly small and not significant between the different treatment groups. The laryngectomized patients coped better with work after treatment than reported in earlier studies (12-13) and they scored as high as the irradiated patients on the global quality of life (70 and 67 respectively). These findings are consistent with other QL studies (8, 14).

One possible explanation for these findings could be the relatively small number of patients in this study, as a larger number of patients might have shown statistical significance for more QL functions and questions when comparing the different treatment groups.

In our study the patients treated with radiotherapy showed, significantly higher results than the laryngectomized patients when their voices were judged by themselves and by 15 listeners. Previous results (10) have shown that irradiated laryngeal voices are rated as high as TEP speech according to intelligibility by transcription (for bisyllabic words and sentences). In this study the patients treated with radiotherapy felt more hoarse, reported more voice fatigue and did not perceive that their voice was better after treatment to the same extent as the laryngectomized patients. Other studies confirm that patients treated with radiotherapy have quite a few problems with their voices and that irradiated laryngeal voices are distinguishable from the voices of normal controls (10, 15). These findings indicate the need of voice rehabilitation also for patients treated with radiotherapy (15). In the absence of patient preference data, one cannot make the assumption that patients prefer irradiation with voice preservation to laryngectomy (16). The laryngectomized patients scored much higher on perceptual voice items than did the listeners, were rarely ashamed of their new voices, and appeared to be satisfied with the voices they managed to achieve (17), which contradicts the findings of some other authors (9, 13). This difference may in fact be due to modern techniques of speech rehabilitation following laryngectomy (TEP) and to the human ability to cope with the circumstances given (18-19).

5. CONCLUSION
In conclusion we report only small differences in perceptual speech evaluation and quality of life between patients treated with laryngectomy versus radiotherapy.

For TEP patients, we conclude that the quality of the post-treatment voice is acceptable for social and vocational functioning. The successful laryngeal speakers typically feel a strong sense of accomplishment and take pride in their voice.

These findings are important to consider when choosing the optimal treatment for laryngeal cancer patients. The treatment residuals are what patients have to live with for the rest of their lives. An understanding of the changes in the lives of patients after treatment is both necessary and valuable. Further studies comparing the
different treatment modalities prospectively are needed to increase this understanding.

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