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Dysphagia after Nonsurgical Head and Neck Cancer Treatment: Patients' Perspectives

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Abstract

Objective. Assess patients' perspectives on the severity, time course, and relative importance of swallowing deficit before and after (chemo)radiotherapy for head and neck cancer.

Study Design. Before-and-after cohort study.

Setting. Head and neck cancer UK multidisciplinary clinic.

Subjects and Methods. A total of 167 patients with a primary cancer, mostly laryngopharyngeal, completed the MD Anderson Dysphagia Index (MDADI) and the University of Washington Quality of Life Questionnaire (UWQOL) before treatment and at 3, 6, and 12 months. Pretreatment swallowing, age, gender, and tumor site and stage were assessed. Statistical methods used were Mann-Whitney, analysis of variance, and logistic regression.

Results. There was a sharp deterioration in swallowing on average by 18%, from before treatment to 3 months post treatment (mean difference in MDADI score = 14.5; $P < .001$). Treatment schedule, pretreatment score, and age accounted for 37% of the variance in 3-month posttreatment MDADI scores. There was then little improvement from 3 to 12 months. Patients treated with only 50-Gy radiotherapy reported significantly less dysphagia at 1 year than patients receiving higher doses or combined chemoradiation ($P < .001$). Swallowing was the most commonly prioritized of the 12 UWQOL domains both before and after therapy. The MDADI and UWQOL scores were strongly correlated: $\rho > 0.69$.

Conclusion. Swallowing is a top priority before and after treatment for the vast majority of patients with head and neck cancer. Swallowing deteriorates significantly posttreatment ($P < .001$). Treatment intensity, younger age, and lower pretreatment scores predict long-term dysphagia. After chemoradiation, there is little improvement from 3 to 12 months.

Keywords

deglutition disorders, head and neck cancer, dysphagia, radiotherapy, chemotherapy

Acute and chronic dysphagias are common side effects of chemoradiotherapy for head and neck cancer.[1,2] Swallowing is a finely tuned event that is negatively affected by the development of postradiotherapy neuromuscular fibrosis and, in some cases, stenosis.[3] This causes an uncoordinated, inefficient swallow that can result in long-term and persistent aspiration of material into the airway. Dysphagia is a major medical concern because patients may be at risk of malnutrition, dehydration, or complications from aspiration. Much of the current body of literature describes the pathophysiologic process of swallowing using instrumental assessments such as videofluoroscopy. However, it appears that swallowing disorders observed on instrumental assessments may not have a strong relationship with how patients perceive their dysphagia.[4,5] Furthermore, patients are more likely to rate their swallowing symptoms more severely than do clinicians,[6] and so the impact of this side effect can be underestimated.

Health-related quality of life (QOL) questionnaires provide insights into how the individual perceives the impact of treatment and any adjustments to his or her lifestyle. Dysphagia has been found to be strongly associated with a poorer QOL.[7,8] Research has shown that patients with head and neck cancer report a decrease in QOL in the immediate posttreatment phase, with a slow recovery over time.[9-11] Less is understood about the trajectory of patient-reported, posttreatment swallowing difficulties. More recently, work has been published that captures more detailed information on patients' perspectives on swallowing issues, using specific head and neck cancer questionnaires such as the MD Anderson Dysphagia Inventory (MDADI). This questionnaire has been used to

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record treatment outcomes in cross-sectional studies.[12-16] Results have shown some surprising findings; for example, patients having conservative laryngeal surgery had similar scores to those having more radical resections.[17] As yet, there are very few published longitudinal MDADI data that examine how patient swallowing self-report changes over time and which treatment factors or patient characteristics might influence outcomes. Therefore, the aim of this article is to assess patients' perspectives on the trajectory and relative importance of swallowing deficit before and after (chemo)radiotherapy for head and neck cancer.

Methods

Patients

Patients were eligible if they had been diagnosed with cancer of the larynx, hypopharynx, oropharynx, nasopharynx, or unknown primary. Patients were referred for either radiotherapy or chemoradiotherapy (CRT) with curative intent and were excluded if they had recurrent or residual disease or had preexisting swallowing difficulties. They were recruited prospectively over a 25-month period from the head and neck oncology combined clinics in 2 university teaching hospitals in northeast England. We approached 204 consecutive patients who met the inclusion criteria. Treatment schedules included (1) chemoradiotherapy (cisplatin 40 mg/m^2 in 6 cycles) combined with 63/30 Gy (2.1 Gy per fraction) over a 6-week period, (2) 63/30 Gy over a 6-week period, or (3) 50/16 Gy over a 22-day period (3.1 Gy per fraction). All patients had 3-dimensional conformal treatment—none received intensity-modulated radiation therapy.

Assessments

Patients were asked to complete 2 questionnaires: the MDADI and the University of Washington Quality of Life Questionnaire (UWQOL). The MDADI has 20 questions that patients are asked to rate using a 5-point scale. There is 1 global question, the remaining 19 scores are summed, and a total mean score is calculated. Scores range from 20 to 100, with higher scores indicating a better outcome. The UWQOL (version 4) has 12 domains including physical symptoms, social functions, and emotions. Each domain is scored, and a mean composite score is calculated. At the end of the questionnaire, patients are asked which (up to 3) of the 12 domains have been priorities for them over the previous 7 days. Questionnaires were collected before treatment and at 3, 6 and 12 months posttreatment. The MDADI data were analyzed for (1) any changes over time and (2) whether the independent variables of pretreatment swallowing status, type of treatment, age, gender, and tumor site and stage were predictors of swallowing self-report at 12 months.

Analysis

Data were analyzed using SPSS version 15 (Chicago, Illinois). Pre- to posttreatment data were analyzed, using repeated-measures analysis of variance, for patients who completed the questionnaires at all time points. Pretreatment scores were entered into the model as a covariate, to measure whether there was any change over time, accounting for baseline measures. Multiple stepwise regression was used to analyze whether the identified independent variables were important predictors of outcomes at 12 months. The top 3 domains selected as a priority, as rated on the UWQOL, were descriptively evaluated. The relationship between the 2 questionnaires was tested using Pearson product moment correlation test.

The study was approved by the Sunderland (UK) local Research Ethics Committee. All patients gave written informed consent to participate.

Table 1. Treatment Details and Patient and Disease Characteristics for the Recruited Group

Treatment schedule, n (%)	
50 Gy in 16 fractions	33 (20)
63 Gy in 30 fractions	30 (18)
Chemoradiotherapy	104 (62)
Tumor site, n (%)	
Oropharynx	66 (39)
Hypopharynx	21 (13)
Larynx	63 (38)
Nasopharynx	5 (3)
Unknown primary	12 (7)
Tumor stage, n (%)	
T1	37 (22)
T2	37 (22)
T3	37 (22)
T4	44 (27)
Age, y	
Range	42-89
Mean	63
Gender	
Male	136 (81)
Female	31 (19)

Results

Patient Characteristics

One hundred and sixty-seven patients returned both questionnaires before treatment, with 107 patients completing both measures at all 4 time points. A summary of the data is given in **Table 1**.

Over the course of the study, 41 (24%) patients died, 23 of these deaths being disease-related. Thirteen patients were diagnosed with residual disease and were excluded. Six patients dropped out of the study across the follow-up period.

Time Course

There was a sharp deterioration in MDADI scores on average by 18%, from before treatment to 3 months posttreatment (mean difference in MDADI score 14.5; $P < .001$). Only 15% of patients scored themselves as having no swallowing problems at 3 months. There was no significant change in MDADI scores across the posttreatment time line for the total group. A summary of the MDADI data across the 4 time points is presented in **Table 2**.

Table 2. MD Anderson Dysphagia Index Score for the Total Group (Range, 20-100)

	Before Treatment	3 Mo After Treatment	6 Mo After Treatment	12 Mo After Treatment
Mean (standard deviation)	77.6 (16.1)	65.0 (17.6)	67.1 (19.0)	68.2 (18.7)

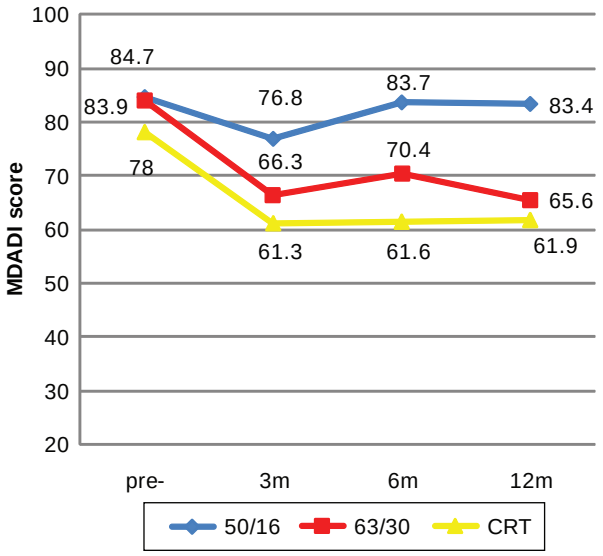

Figure 1. Changes in MD Anderson Dysphagia Inventory (MDADI) score over time in 3 treatment cohorts. CRT, chemoradiotherapy.

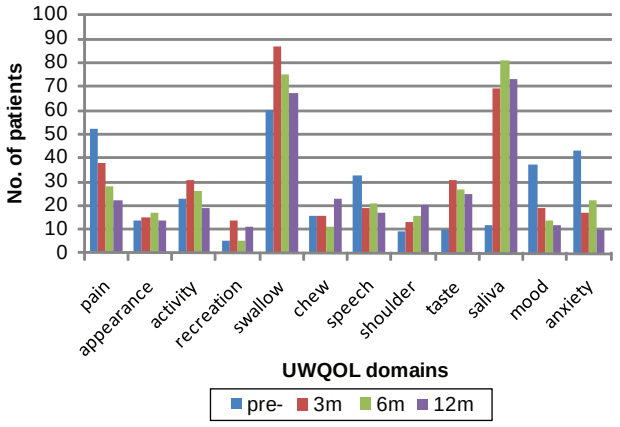

Figure 2. Patients' selected priorities from University of Washington Quality of Life Questionnaire(UWQOL) domains at 4 time points.

Predictors of MDADI Scores at 1 Year

The data were analyzed to test whether any of the selected variables (pretreatment swallowing status, treatment schedule, age, gender, tumor site, and stage) were predictive of MDADI scores at 1 year. One hundred and eleven patients were entered into this model. The stepwise regression model retained 3 of the variables: treatment schedule, pretreatment score, age.

These 3 accounted for 37% of the variance (R^2 = 0.37, F = 21.1, P < .001). The strongest predictor was treatment schedule (R^2 = 0.20). Patients treated with only 50-Gy radiotherapy reported significantly less dysphagia than did patients receiving a higher dose or combined chemoradiation (P < .001). **Figure 1** illustrates mean MDADI scores for each time point, grouped by treatment schedule. Pretreatment scores accounted for 13% of the variance in data at 12 months, followed by age (R^2 = 0.04). Patients with advanced disease (P < .001) and those with pharyngeal cancers (P = .001) had poorer pretreatment MDADI scores. Younger patients were more likely to report poorer swallowing outcomes (r = 0.35).

Priority Rating

The UWQOL asks patients to select their 3 most important issues out of 12 domains covered in the questionnaire, as represented by the bars in **Figure 2**. Swallowing was the most commonly prioritized domain, with 36% of patients selecting this domain before treatment, increasing to 48% after treatment (**Figure 2**). The MDADI and UWQOL scores were strongly correlated across all time points (r range, 0.69-0.83).

Discussion

This study aimed to investigate patients' perspectives on swallowing outcomes following nonsurgical treatment for head and neck cancer. The current literature provides only a small body of MDADI evidence, and the present data set is larger than any previous study. Furthermore, no previous study has recorded patients' perspectives on swallowing outcomes up to 1 year after (chemo)radiotherapy. MDADI scores were significantly lower at 3 months, regardless of treatment schedule. Beyond this point, there was little improvement for the group as a whole. In contrast to these findings, an improvement in results of another swallowing-specific questionnaire was noted in patients with nasopharyngeal cancer.[8] However, the sample was cross-sectional and patients' treatment had taken place at least 3 years previously. It is possible therefore that adjustment to dysphagia occurs over a much longer time than 12 months.

These findings suggest that there is little change in the way patients receiving the highest total radiotherapy dose lived with their dysphagia. This new evidence on the lack of change supports outcomes from another longitudinal study, which monitored swallowing impairment in the first year after (chemo)radiotherapy.[1] A marked deterioration was seen in swallowing function from before treatment to 3 months after, without significant recovery. The results from this cohort suggest that patients do not experience a "response shift," that is, changes in their perceptions of their swallowing or adaptation

to their dysphagia. It has also been suggested that swallowing may deteriorate further, beyond 1 year, because of postradiotherapy fibrotic changes affecting swallowing biomechanics.[18] Although improvements to overall health-related QOL appear to occur in the posttreatment period, little change is observed in swallowing-specific QOL.

Little information has been published on swallowing in patients receiving the lowest total dose of radiotherapy (50 Gy), as this regime is less popular worldwide. Results from this study showed that these patients report problems in the early posttreatment period, but over time, their scores returned to baseline levels. Despite having the lowest dose, patients still report short-term changes, which will need to be considered when giving information prior to treatment. Their superior swallow performance accords with the findings of a Dutch study of early laryngeal cancer, which indicated that the addition of cervical (nodal) irradiation—total dose 70 Gy—was the best predictor of malnutrition during radiotherapy.[19] Because the majority of the cohort had the higher total dose of 63 Gy with or without chemotherapy, the improvement in the 50-Gy group was masked on statistical tests by the lack of change observed in the other 2 groups. Given these results, it is therefore perhaps not surprising that treatment schedule was the strongest predictor of swallowing self-reported outcomes at 1 year. The findings warrant replication in other centers where doses may be as high as 70 Gy, because the implication is that these greater doses can cause additional dysfunction.

The finding that pretreatment MDADI score was a predictor of posttreatment outcomes is an important addition to the literature base. A pretreatment swallowing assessment is recommended for patients who are likely to experience dysphagia as a side effect of head and neck cancer treatment. Swallowing impairment, as measured by videofluoroscopy, has also been found to predict post(chemo)radiotherapy outcomes.[2] Therefore, swallowing assessment is important not only for identifying dysphagia before treatment commences but also for identifying patients at risk of developing long-term, chronic problems.

Age also made a small but significant contribution as a predictor of MDADI scores at 1 year, with older patients reporting better swallowing outcomes. This is a new finding, given that other smaller, cross-sectional HNC studies have not identified age as an significant determinant of swallowing.[8,16] Equally, no differences according to age were found in an older healthy sample's swallowing self-report.[20] However, a large longitudinal QOL study has found that older patients with head and neck cancer had better emotional functioning than a younger group.[21] This suggests that older people may be better able to adjust to problems such as dysphagia. Health expectations may lower with age, making it easier to accept changes to function. Indeed, Chen et al[20] reported that one-fifth of healthy people older than 65 years considered swallowing changes to be a natural part of aging.

An excellent relationship was found between the MDADI total score and the UWQOL composite score. Correlation coefficients in this study were higher than those reported elsewhere ($r = 0.61$),[22] probably because patients were assessed at the same set time points and all had received nonsurgical treatment. Evaluating the relative importance of functional outcomes is key to understanding the patient's perspective. Swallowing was the most commonly selected important issue across all time points. This evidence supports that eating and drinking are major concerns for head and neck cancer patients.

Conclusion

Swallowing performance is increasingly recognized as the key functional outcome following head and neck cancer therapy. The present study shows that swallowing self-report tools are easy to administer and are repeatable and sensitive to change in patients with head and neck cancer who are treated nonsurgically. The consistent use of a single measure readily allows intertreatment group comparison over time. The findings are of value to clinicians and patients when weighing up the pros and cons of different treatment schedules, which appear to have a direct bearing on swallow outcome.

Author Contributions

Janet A. Wilson, funding application, design, trial supervision, data analysis, manuscript preparation; **Paul N. Carding**, funding application, trial supervision, design, data analysis, manuscript preparation; **Joanne M. Patterson**, funding application, ethical approval, design, recruitment, data collection, day to day running of the study, data analysis, manuscript preparation.

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References

1. Logemann JA, Pauloski BR, Rademaker AW, et al. Swallowing disorders in the first year after radiation and chemoradiation. *Head Neck*. 2008;30:148-158.
2. Frowen J, Cotton S, Corry J, Perry A. Impact of demographics, tumor characteristics, and treatment factors on swallowing after (chemo)radiotherapy for head and neck cancer. *Head Neck*. 2009;32:513-528.
3. Mittal BB, Pauloski BR, Haraf DJ, et al. Swallowing dysfunction—preventative and rehabilitation strategies in patients with head-and-neck cancers treated with surgery, radiotherapy, and chemotherapy: a critical review. *Int J Rad Oncol Biol Phys*. 2003;57:1219-1230.
4. van der Molen L, van Rossum MA, Ackerstaff AH, Smeele LE, Rasch CRN, Hilgers FJM. Pretreatment organ function in patients with advanced head and neck cancer: clinical outcome measures and patients' views. *BMC Ear Nose Throat Disord*. 2009;9:10.
5. Peretti G, Piazza C, Cattaneo A, De Benedetto L, Martin E, Nicolai P. Comparison of functional outcomes after endoscopic versus open-neck supraglottic laryngectomies. *Ann Otol Rhinol Laryngol*. 2006;115:827-832.
6. Gluck I, Feng FY, Lyden T, et al. Evaluating and reporting dysphagia in trails of chemoradiation for head and neck cancer. *Int J Rad Oncol Biol Phys*. 2010;77:727-733.

7. Nguyen NP, Frank C, Moltz CC, et al. Impact of dysphagia on quality of life after treatment of head and neck cancer. *Int J Rad Oncol Biol Phys*. 2005;61:772-778.
8. Lovell SJ, Wong HB, Loh KS, Ngo RY, Wilson JA. Impact of dysphagia on quality-of-life in nasopharyngeal carcinoma. *Head Neck*. 2005;27:864-872.
9. Epstein JB, Robertson M, Emerton S, Phillips N, Stevenson-Moore P. Quality of life and oral function in patients treated with radiation therapy for head and neck cancer. *Head Neck*. 2001;23:389-398.
10. Deleyiannis FW, Weymuller EA Jr, Coltrera MD. Quality of life of disease-free survivors of advanced (stage III or IV) oropharyngeal cancer. *Head Neck*. 1997;19:466-473.
11. Allal AS, Dulguerov P, Bieri S, Lehmann W, Kurtz JM. Assessment of quality of life in patients treated with accelerated radiotherapy for laryngeal and hypopharyngeal carcinomas. *Head Neck*. 2000;22:288-293.
12. Levendag PC, Teguh DN, Voet P, et al. Dysphagia disorders in patients with cancer of the oropharynx are significantly affected by the radiation therapy dose to the superior and middle constrictor muscle: a dose-effect relationship. *Radiother Oncol*. 2007;85:64-73.
13. Teguh DN, Levendag PC, Sewnaik A, et al. Results of fiberoptic endoscopic evaluation of swallowing vs. radiation dose in the swallowing muscles after radiotherapy of cancer in the oropharynx. *Radiother Oncol*. 2008;89:57-63.
14. Barringer DA, Hutcheson KA, Sturgis EM, Kies MS, Lewin JS. Effect of induction chemotherapy on speech and swallowing function in patients with oral tongue cancer. *Head Neck*. 2009;31:611-617.
15. Kulbersh BD, Rosenthal EL, McGrew BM, et al. Pretreatment, preoperative swallowing exercises may improve dysphagia quality of life. *Laryngoscope*. 2006;116:883-886.
16. Gillespie MB, Brodsky MB, Day TA, Lee FS, Martin-Harris B. Swallowing-related quality of life after head and neck cancer treatment. *Laryngoscope*. 2004;114:1362-1367.
17. Schindler A, Favero E, Nudo S, Albera R, Schindler O, Cavalot AL. Long-term voice and swallowing modifications after supracricoid laryngectomy: objective, subjective, and self-assessment data. *Am J Otolaryngol*. 2006;27:378-383.
18. Chang YC, Chen SY, Lui LT, et al. Dysphagia in patients with nasopharyngeal cancer after radiation therapy: a videofluoroscopic swallowing study. *Dysphagia*. 2003;18:135-143.
19. Langius JAE, Doornaert P, Spreeuwenberg MD, Langendijk JA, Leemans CR, van Bokhorst-de van der Schueren MAE. Radiotherapy on the neck nodes predicts severe weight loss in patients with early stage laryngeal cancer. *Radiother Oncol*. 2010;97:80-85.
20. Chen P, Golub J, Hapner E, Johns MM. Prevalence of perceived dysphagia and quality of life impairment in a geriatric population. *J Am Geriatr Soc*. 2007;55:S29.
21. Hammerlid E, Silander E, Hornestam L, et al. Health-related quality of life three years after diagnosis of head and neck cancer—a longitudinal study. *Head Neck*. 2001;23:113-125.
22. Thomas L, Jones TM, Tandon S, Katre C, Lowe D, Rogers SN. An evaluation of the University of Washington Quality of Life swallowing domain following oropharyngeal cancer. *Eur Arch Otorhinolaryngol*. 2008;265:S29-S37.