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ORIGINAL ARTICLE

## Patient assessed symptoms are poor predictors of objective findings. Results from a cross sectional study in patients treated with radiotherapy for pharyngeal cancer

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### Abstract

**Introduction.** The aim of the study was to assess the value of the EORTC questionnaires C30 and H&N35, as an instrument for the study of side effects. **Patients and methods.** We invited all recurrence free patients, treated with radical radiotherapy for pharyngeal cancer between 1998 and 2002 at our institution, to participate in the study. Data was retrieved using questionnaires, functional endoscopic evaluation of swallowing, dental examination with orthopantomography and saliva flow measurements. Thirty-five (55% of invited) participated. **Results.** Side effects were omnipresent and often severe. The value of patient assessed symptom scores to predict equivalent objective changes was varied: We found a sensitivity of 0.59–0.93, specificity of 0.40–0.81, positive predictive value of 0.28–0.81 and a negative predictive value of 0.46–0.94. **Conclusion.** The questionnaire should be used to retrieve information on subjective side effects and objective examination should be used for objective changes. One cannot conclude from one to the other.

Radiotherapy in the head and neck region is challenging because of the abundance of normal tissues that can be harmed by ionising radiation. Each structure has its own unique features of dose and volume sensitivity and resulting symptoms [1–3]. Often symptoms from different organs interplay and result in serious handicaps that have detrimental consequences for the quality of life of the patients [4,5].

Hyperfractionation with dose escalation and acceleration, radio-chemotherapy, and surgery with post-operative radiotherapy results in altered quality and intensity of side effects and subsequent consequences for quality of life in a broader context. Therefore, knowledge of the frequency and intensity of side effects is of paramount importance in order to be able to compare different modalities. Xerostomia, dental problems and dysphagia are some of the most common side effects after radiotherapy. Xerostomia has been found to be the most serious side effect after radiotherapy [6]. It often leads to problems with teeth, swallowing, sleeping and talking, and this

lead further to related problems of social interaction. Dental problems are less well described [7,8]. It is caused, at least partially, by xerostomia, and is often mentioned by the patients as a serious problem. Late swallowing problems, although more rarely reported by the patients, have substantial effect on quality of life and health [9], and have been found to be dose limiting for chemoradiation [9,10]. However, evidence is mounting that it is common among all head and neck cancer patients treated with radiotherapy [11–13].

The knowledge of late side effects have traditionally been retrieved from physician based scoring of both subjective and objective endpoints scored on arbitrary scales. Data on subjective endpoints collected in this way have repeatedly been shown to be inferior to patient based scoring with respect to sensitivity, specificity and predictive value [14–18]. Instead patient assessed symptom severity scores such as those from the site-specific quality of life questionnaires (QLQ) have been suggested as a

proper tool for research on symptoms and side effects. The EORTC head and neck specific questionnaire H&N35 contains questions on e.g. social interaction and pain – data that can probably not be retrieved better with any other method. The questionnaire also contains very specific items such as the ability to swallow different substances, dental problem and dry mouth. It is not known if these items provide us with trustworthy knowledge in relation to pathophysiologic changes.

A study, using data on the same patients, analysing the effect of radiotherapy doses on swallowing function has been accepted for publication [19].

The aim of this cross sectional study was to obtain a quantitative assessment of common side effects in head and neck cancer patients treated with radiotherapy and to evaluate the value of patient assessed symptoms to predict objective side effects.

## Patients and methods

### Patients

Medical records were reviewed for 216 patients with pharynx cancer treated at our institution from 1998–2002 with radical radiotherapy with curative intent. Pharynx cancer survivors were selected

because of a high prevalence of significant side effects. Sixty-four patients were alive and free from disease and were invited to participate in the study by letter. Thirty-five patients (55%) agreed to participate. Characteristics of eligible patients are presented in Table I.

Non-participants differed only from the participating patients by having had a significantly higher T-stage (38% versus 17% T3 and T4 respectively), but neither overall stage, N-stage nor other clinical parameters were different (Table I). Likewise, there were no differences in standard morbidity scoring at the last follow up visit before the study period between participants and eligible non-participants.

The patients did not receive any fee for participation, but were compensated for travel expenses. The regional ethics committee approved the study (May 30, 2005, study no. 20050044) and written informed consent was collected from all patients.

### Saliva flow measurements

Patients were instructed to abstain from eating, drinking anything but water, tooth brushing and smoking 1½ hours before the examination. Whole mouth saliva flow was measured by having the patient spitting in a pre-weighted cup. Parotid flow

Table I. Characteristic of eligible patients.

	Participants (n = 35)	Non participants (n = 29)	p-value*
Age, mean (years (range))	61 (44–82)	60 (38–91)	N.S.
Gender (Male/Female (%))	25/10 (71/29)	16/13 (55/45)	N.S.
Site			N.S.
Nasopharynx	2	1	
Oropharynx	30	27	
Hypopharynx	3	1	
Stage			
T <sub>3-4</sub>	6 (17%)	11 (38%)	<b>0.02</b>
N+	21 (60%)	20 (69%)	N.S.
Stage I-II/III-IV	22 (63%)	23 (79%)	N.S.
Radiotherapy			
Years after treatment, mean (range)	5.0 (2.6–7.6)	4.5 (3.0–7.7)	N.S.
66–68 Gy in 33–34 fx	33 (94%)	28 (97%)	
Weekly fractions (5/6/10)	5/29/1	4/25/0	N.S.
Nimorazole	31 (89%)	25 (86%)	N.S.
Recurrence after radiotherapy <sup>§</sup>	3 (9%)	2 (7%)	N.S.
Last recorded morbidity <sup>#</sup>			
Dysphagia (any)	57%	31%	N.S.
Dysphagia gr. III–IV	6%	3%	N.S.
Dryness (moderate/severe)	57%	37%	N.S.
Hoarseness (any)	38%	23%	N.S.
Oedema (any)	29%	21%	N.S.
Atrophy (any)	86%	90%	N.S.
Fibrosis (any)	86%	72%	N.S.

\*T-test,  $\chi^2$ , Fishers Exact Test or Kruskal Wallis test as appropriate.

§Successfully treated with surgery.

#DAHANCA score.

N.S.: Not significantly different.

was measured by placing a modified Lashley cusp over the orifice of Stensen's duct. Saliva flowed freely into 2 ml pre-weighted syringes. The examinations were repeated with stimulation with 2% citric acid placed with a cotton bud on the antero-lateral aspect of the tongue, starting 2 minutes before the examination and repeated every 30 seconds. Flow was expressed as ml/min under the assumption that 1 ml weighed 1 gram. Saliva was collected for approximately 5 minutes for each measurement.

Because swallowing examination was sometimes carried out before saliva flow measurements, some degree of stimulation might be present for some patients. One patient was not able to carry out the examination because of the unpleasant taste of the citric acid. All other patients experienced only minor discomfort.

#### *Swallowing assessment*

The swallowing function of the patients was examined using Functional Endoscopic Evaluation of swallowing (FEES), a standardized test using pre-defined endpoints [20]. This examination was chosen since it provided information on the sensitivity of the throat – a common problem after radiotherapy [13]. In brief, the movements of the tongue base, pharynx and larynx were assessed during speech, spontaneous movements and during swallowing of coloured water, milk, mash and bread. Sensitivity of the pharynx was assessed by light touch with the tip of the endoscope. Residual saliva, liquid or food in the vallecula epiglottica, ary-epiglottic region and pyriform sinus were assessed together with laryngeal penetration and aspiration. The examination was recorded on DVD recorder for later review.

Most patients experienced mild discomfort from the endoscopic procedure. One patient could not cooperate with the examination at all. Nosebleed or other side effects lasting beyond the duration of the examination were not observed. The patients were instructed in relevant compensatory swallowing techniques and dietary changes or restrictions in case of severe dysphagia, penetration or aspiration. A follow-up visit was planned as required. The results were scored using a modified Berliner Dysphagia Index [21].

#### *Dental examination with orthopantomography*

An examination of teeth and oral cavity was performed including orthopantomography. Side effects were scored by the examiner according to CTCAE 3.0. Dental status, distance between incisors or gums, caries, periodontitis and osteoradionecrosis

were examined. The subjective problems with dentures and trismus were recorded. The patients were referred to their own dentist or the department of oral and maxillofacial surgery in case the findings required treatment. Data from the examination prior to radiotherapy were available except for data on objective trismus.

#### *Quality of life questionnaires, socio-economic information and co-morbidity*

EORTC C30 and H&N35 QLQ were used as they contain relevant items on teeth, swallowing and xerostomia. The H&N35 questionnaire has previously been translated into Danish by our group [22]. No significant problems were experienced with the questionnaire. One patient had missed a whole page of the questionnaire. This was the main reason for a frequency of unanswered questions of 1.4%.

To acquire socioeconomic information, a questionnaire used by Vedsted et al. [23] was slightly adapted to fit the present population of high age and frequent socio-economic problems. The patients filled out the QLQ and the questionnaire concerning socio-economic questions the day before the examination, and brought the questionnaires with them in order to avoid influence from the objective examinations and interaction with the study group. The presence of co-morbidity was scored according to Charlson's co-morbidity index [24].

#### *Statistics*

The scale scores of the EORTC quality of life scores was converted, as described in the scoring manual, to a normalized mean of 0–100. The single items of the swallowing scale were considered of interest and were analyzed using the “raw scores” of 1–4 (“Not at all” – “Very much”).

The majority of endpoints were categorical and their distributions were skewed. We therefore used non-parametric test when considering QoL, swallowing and dental examination (Mann Whitney, Kruskal Wallis, Spearman's rho,  $\chi^2$ , Fishers exact test). A significance level of 0.05 was used if nothing else is stated. No formal correction was made for multiple testing, since non-parametric tests were applied, but a p-value  $\leq 0.01$  for significance was used in these circumstances. All tests were two-sided. SPSS 11.0 and STATA 8.0 for Windows were used for the statistical analysis.

#### **Results**

Quality of life data are shown in Table II. Subjective complaints were very common. Of note is that, even

Table II. Selected scale scores and selected item scores from EORTC QLQ H&amp;N35.

	Mean	Median	Percentile 25	Percentile 75
HN Pain	29	25	8	50
HN Swallowing	25	25	8	33
HN Social eating	30	17	0	58
HN Teeth	42	33	0	100
HN Opening mouth	51	67	0	75
HN Dry mouth	71	67	33	100
HN Sticky saliva	56	67	25	100
HN Coughed	39	33	0	67
HN Feeding tube	11	0	0	0

The QoL scores are normalized to a number between 0 and 100. Higher numbers means worse symptoms.

though swallowing did not have a high mean score, this endpoint had better correlation with overall quality of life, physical function and social eating scale than all other head and neck specific symptoms, e.g. xerostomia (Figure 1). The four items, which constitute the swallowing scale, consists of questions on problems swallowing liquids, pureed

food, solid food and choking. The mean score of the items were 1.5, 1.3, 2.3 and 1.9 respectively. One patient had a PEG tube and was only able to drink water per mouth. Nevertheless four patients stated in the EORTC H&N35 questionnaire that they had a feeding tube, probably referring to previous tube feeding. Co-morbidity and socio-economic data are presented in Table III. Sixty-two percent were without jobs, 37% lived alone and 39% were sometimes alone against their wish. Results of the FEES are presented in Table IV. Decreased sensitivity, reduced range of motion, residues, penetration and aspiration was found in 94%, 79%, 88%, 59% and 18% of the patients respectively. Saliva flow measurements are presented in Table V. CTC AE 3.0 grade 2–3 objective xerostomia was found in 80% of patients. Results of the dental examination are presented in Table VI. Changes in dental status with respect to dental loss could not be analysed with respect to cause, primarily because dental extraction prior to radiotherapy was counted as dental loss. The proportion of patients with caries and periodontitis before versus after radiotherapy was not increased (27% versus 35% and 58% versus 42% respectively).

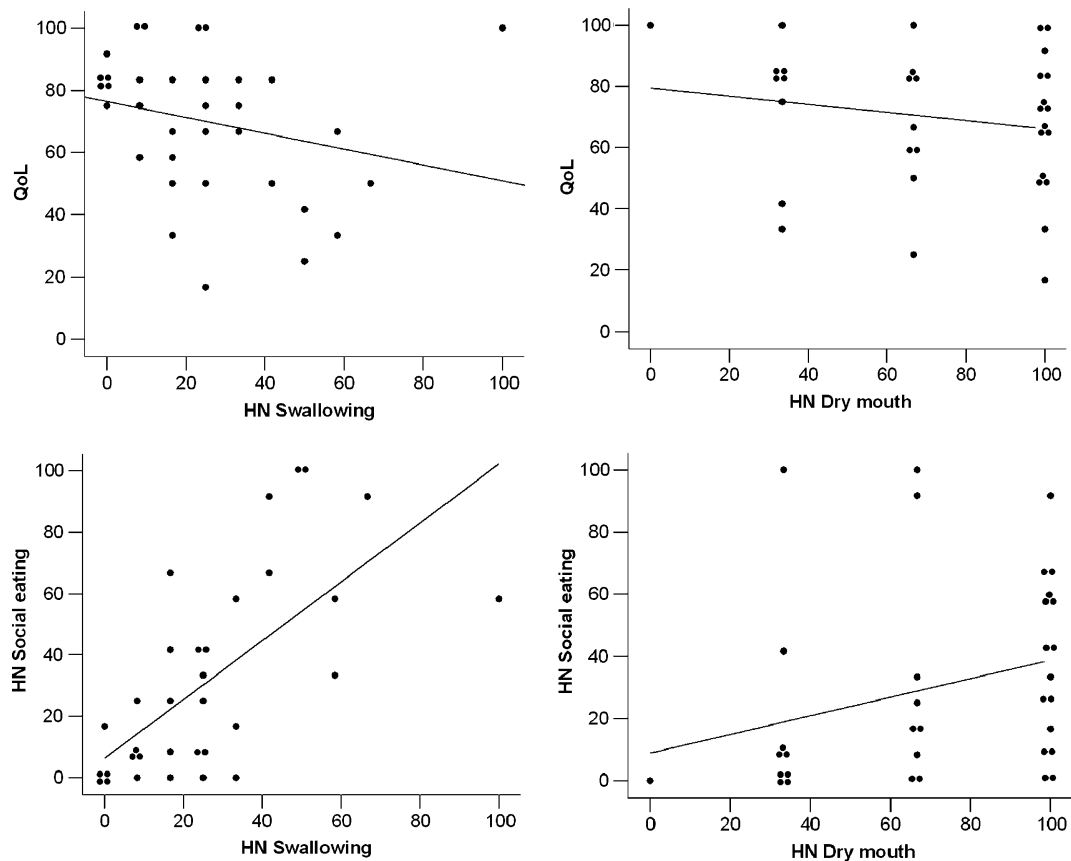


Figure 1. Scatterplot illustrating the correlation between the quality of life endpoints dry mouth and swallowing versus QoL and social eating in 35 recurrence free pharynx cancer patients. The dots each represent one observation. In case of multiple identical observations the dots are slightly displaced. The lines, based on linear regression, should only guide the eye. Spearmans correlation was used for the analysis. The endpoints are normalized to a 0–100 scale. One-hundred represent the best QoL or the worst symptoms.

Table IIIA. The distribution of comorbidity and socioeconomic status.

		Frequency	%
Charlsons Comorbidity Score	0	19	54
	1	8	23
	2	4	11
	3	3	9
	4	1	3
Education	None	4	11
	Vocational	14	40
	Higher	17	49
Profession	Employed/ self employed	13	37
	Retired/ education	11	31
	Unemployed	11	31
Marital Status	Married/ cohabiting	22	63
	Single	13	37
If you became ill, and had practical problems, can you count on other to help you?	Yes, definitely	29	85
	Yes, perhaps	3	9
	No	2	6
Does it ever happen that you are alone, even though you would like to be with others?	No	21	62
	Yes, rarely	6	18
	Yes, sometimes	5	15
	Yes, often	2	6
Do you have someone to confine in if you have problems?	Yes, many	14	41
	Yes, 2-4	10	29
	Yes, one	9	26
	No, none	1	3

#### Correlation between QoL and objective findings

The correlation between the QoL questions regarding swallowing (scales and items), social eating, coughing and the objective measures of the FEES

was not straightforward. Both the swallowing scale of the questionnaire and the FEES examines whether the patients has problems swallowing material of

Table IIIB. The correlation between comorbidity and socioeconomic status and answers to quality of life questionnaire EORTC C30 and H&N 35, objective findings and patient related factors.

Endpoint	Significant correlations (Spearman's test (p-value))	
	EORTC quality of life questionnaire	Patient related and objective endpoints
Charlson co-morbidity Index	HN Swallowing (0.04) Feeding Tube (0.01) "Have you had problems swallowing solid food" (0.05)	Smoking (0.05) Swallowing function (0.03) Objective Aspiration (0.04)
Education		Smoking (0.02)
Profession		Age (0.04) Smoking (0.03) Best parotid flow (0.02) Total parotid flow (0.04) Objective Aspiration (0.02)
Marital Status		Protection of airways index (0.02)
Help*	HN Social Eating (0.03)	
Alone*	HN Dry Mouth (0.02) "Have you had problems swallowing liquids" (0.002)	
Confine*	HN Swallowing (0.001) HN Social Eating (0.004) HN Teeth (0.03) HN Coughed (0.04) "Have you had problems swallowing liquids" (0.0006) "Have you had problems swallowing solid food" (0.02) "Have you choked when swallowing" (0.008)	Trismus (0.006)

Bold characters:  $p \leq 0.01$ . All correlations are in the expected directions: Worse socio-economic/comorbidity status more symptoms/ worse quality of life.

\*Refers to the questions of Table IIIA.

Table IV. Functional Endoscopic Evaluation of Swallowing (FEES) in recurrence free pharyngeal cancer patients (n = 34).

Endpoint	%
Reduced sensitivity	97
Reduced mobility	76
Asymmetry (atrophy/oedema)	9
Leakage	9
Residues	88
Penetration	59
Aspiration	18
Silent aspiration	6
Overall assessment of swallowing§	
Normal/Slight reduction	53
Moderate	18
Severely restricted	29
Overall assessment of protection of airways§	
Normal	0
Moderate	56
Severely, therapy recommended	41
Enteral nutrition recommended	3

\*: 81% needed water to clear residues of solid food.

§: Composite score of leakage, residues and laryngeal dysfunction.

@: One patient could not swallow solid food at all.

\$: Composite score of coughing reflex and completeness of swallowing.

different viscosity and chokes. Nevertheless, the correlation between the question regarding e.g. swallowing of pureed food and the examination with the corresponding material (mash) did not correlate better than examination with any other viscosities. The swallowing symptom scale did not correlate with any objective finding with a p-value <0.01. Aspiration was correlated with patient reported problems swallowing solid food, the swallowing scales, social eating scale and coughing (p<0.05), but not with choking (Figure 2). The correlation between the findings of the dental examination and the scales of pain, teeth and opening mouth were somewhat better compared to swallowing. There was a significant correlation (p<0.01) between the opening mouth scale and

the CTC scoring of trismus and the inter-incisional/gum distance. There was also a significant correlation (p<0.01) between the teeth scale of the questionnaire and caries but not with periodontitis. The HN pain scale only correlated with problems with prosthesis (p=0.017). There was no single question from the quality of life questionnaire that could identify patients that were referred to their own dentist for further treatment. Of note is that the edentulous patients (n=7) used all possible answers for the question "Do you have problems with your teeth?" – only one abstained from answering the question.

All measures of saliva flow in Table V correlated significantly (p<0.01) with the answers to the question "Do you have a dry mouth?" and "Do you have sticky saliva?". The most consistent finding was, however, that patients with the highest degree of symptoms had a low flow rate. Other combinations of symptoms and measurements were common (patients with low flow often scored low degree of dry mouth etc.). Socio-economic factors and co-morbidity were significant predictors for several QoL, clinical- and some morbidity endpoints (Table III B). Significant correlations were in the expected direction, e.g. poor socio-economic factors – poor QoL or more side effects.

#### *Quality of life scores as predictor of objective side effects*

The sensitivity, specificity, positive and negative predictive value of the questionnaire to predict objective findings is shown in VII. These simple measures of concordance are presented since a non-parametric correlation coefficient or its p-value is difficult to relate to a clinical or scientific question. The table shows a limited value of the scores of the questionnaire to predict objective changes. For example, if the patient has caries or periodontitis there is a 67% chance that the patient will report having dental problems (sensitivity) and if the patient has no caries or periodontitis there is 58% chance that he/ she has no dental problems (specificity). If a

Table V. Mean saliva flow (ml/min) and HN Dry Mouth score in 35 recurrence free pharynx cancer patients treated with radiotherapy.

	Overall	HN Dry Mouth				Spearman's correlation coefficient*
		Not at all (n = 1)	A little (n = 9)	Quite a bit (n = 9)	Very much (n = 16)	
Whole mouth unstimulated	0.18	0.56	0.21	0.35	0.05	−0.59
Best parotid unstimulated	0.02	0.05	0.04	0.03	0.00	−0.48
Total parotid unstimulated	0.03	0.06	0.05	0.05	0.00	−0.47
Whole mouth stimulated	0.39	0.66	0.58	0.65	0.12	−0.58
Best parotid stimulated	0.04	0.04	0.07	0.05	0.02	−0.50
Total parotid stimulated	0.05	0.04	0.09	0.07	0.02	−0.52

\*p <0.01 in all cases.

Table VI. Results of the dental examination.

	At risk	CTCAE 3.0 Scale	Observed (%)
Edentulous	33		7 (22%)
Prosthesis	14	0 No Problems 1 Discomfort 2 Discomfort and problems 3 Unable to wear	4 (29%) 4 (29%) 4 (29%) 2 (14%)
Trismus	33	0 None 1 Some 2 Problems eating 3 Leading to insufficient oral intake	9 (27%) 14 (42%) 7 (21%) 3 (9%)
Caries	27	0 None 1 Superficial 2 Extractions needed	18 (67%) 7 (26%) 2 (7%)
Periodontitis	27	0 None 1 Slight bleeding and recesses 3 Spontaneous bleeding, loose teeth	14 (54%) 11 (42%) 1 (4%)
Osteoradionecrosis	32	None Asymptomatic, only on x-ray	30 (94%) 2 (6%)
Conclusion	33	No further treatment needed Referred to own dentist	15 (47%) 17 (53%)

patients states having problems with his/ her teeth there is a 67% chance of the patient having caries or periodontitis (positive predictive value). If the patient states having no problems there is only a 58% chance that the dentist found no objective problems (negative predictive value). If the objective assessment is regarded as the test for the patient assessed symptom, the same parameters can be read from Table VII. Sensitivity is the read of at the column of positive predictive value, the specificity of the column of negative predictive value and vice versa.

#### Interplay between objective measures

Several significant correlations were found regarding swallowing and saliva flow but none with a p-value

less than 0.01. The correlation coefficients were both positive and negative and therefore no support of a causal connection could be identified.

No significant association was found between the dental examination and the measured saliva flow.

#### The effect of smoking

In this population there were 16 smokers and 19 self-reported non-smokers. Smoking was associated with co-morbidity, short education and low professional status (Table IIIB) as well as low score on several quality of life endpoints. However, none reached a significant level of 0.01. Smokers experienced significantly more periodontitis ( $p=0.007$ ), penetration/ aspiration of fluid ( $p=0.046$ ) and overall

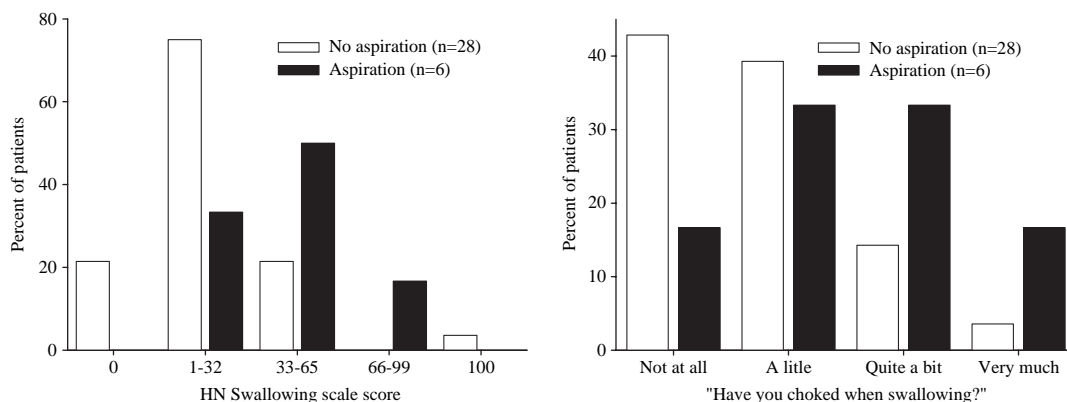


Figure 2. Self reported choking (EORTC H&N35) depending on objective aspiration (endoscopic evaluation). Results from 34 pharynx cancer survivors. Percent of patients refers to percent within a group.



Table VII. The value of the quality of life question to predict objective side effects.

Patient reported side effect	Objective finding	Sensitivity (95% C.I.)	Specificity (95% C.I.)	Positive predictive value (95% C.I.)	Negative predictive value (95% C.I.)
HN Teeth > <0	Periodontitis or caries	0.67 (0.38; 0.88)	0.58 (0.28; 0.85)	0.67 (0.38; 0.88)	0.58 (0.28; 0.85)
HN Teeth > <0	In need of further treatment	0.59 (0.33; 0.82)	0.40 (0.16; 0.68)	0.53 (0.29; 0.76)	0.46 (0.19; 0.75)
HN Opening mouth >0	Inter-incisor distance = <35 mm <sup>§</sup>	0.93 (0.66; 1.0)	0.47 (0.23; 0.72)	0.59 (0.36; 0.79)	0.89 (0.52; 1.0)
HN Swallowing > < Median (17)*	Aspiration	0.83 (0.36; 1.0)	0.54 (0.34; 0.72)	0.28 (0.10; 0.53)	0.94 (0.70; 1.0)
HN Swallowing > < Median (17)*	Penetration	0.60 (0.36; 0.81)	0.57 (0.29; 0.82)	0.67 (0.41; 0.87)	0.50 (0.25; 0.75)
"Have you choked when swallowing?" >0	Penetration	0.65 (0.41; 0.85)	0.43 (0.18; 0.71)	0.62 (0.38; 0.82)	0.46 (0.19; 0.75)
"Have you choked when swallowing?" >0	Aspiration	0.83 (0.36; 1.0)	0.43 (0.24; 0.63)	0.24 (0.08; 0.47)	0.92 (0.64; 1.0)
HN Dry mouth > < median (67)*	CTC AE 3.0 Xerostomia = 3	0.68 (0.43; 0.87)	0.81 (0.54; 0.96)	0.81 (0.54; 0.96)	0.68 (0.43; 0.87)
HN Sticky Saliva > < median (33)*	CTC AE 3.0 Xerostomia = 3	0.78 (0.52; 0.94)	0.75 (0.48; 0.93)	0.78 (0.52; 0.94)	0.75 (0.48; 0.93)

\*Groups divided by median score since to few patients had score =0 to make a meaningful test.

<sup>§</sup>35 mm was determined by Dijkstra [28] as the best objective criteria for trismus compared with a questionnaire.

#Numbers of observations too low to make meaningful approximations of C.I.

aspiration ( $p=0.004$ ). All six patients with aspiration were smokers.

## Discussion

This study presents results on swallowing function, dental status, saliva flow, quality of life, co-morbidity and socio-economic factors in a patient cohort examined more than 2½ years after radical radiotherapy for pharyngeal cancer. We identified several important objective side effects, but found a limited value of patient assessed symptoms to predict these objective changes and vice versa. More than 50% of the invited patients participated. We had a unique opportunity to control for selection bias since morbidity data, as well patient-, disease- and treatment related data was present for both participants and non-participants. The influence and direction of any bias, in this moderate-sized cross sectional study, cannot be estimated.

The patients were examined with Functional Endoscopic Examination of Swallowing. This method potentially offers a detailed objective recording of swallowing problems compared to videofluoroscopy, including an examination of sensitivity and aspiration of saliva. No patients in our cohort had a normal examination of swallowing, as residuals, decreased range of motion, penetration, aspiration and decreased sensitivity were common. Nevertheless, the correlations with other findings, including patient

assessed swallowing function, were not straightforward. FEES is a sensitive, patient-friendly and efficient tool in the investigation of deglutition disorders [25], but it remains to be proven that it is a relevant tool for research. In contrast to VF it only provides semi-quantitative measures of swallowing function.

We found no correlations between swallowing problems and dysfunction of the salivary glands. This is in line with the study by Logemann [4] showing that xerostomia affected only the perception but not the dynamics of swallowing. Nevertheless, residual solid food had to be flushed down with water by 81% of our patients. This could suggest that symptoms often related to xerostomia could also be symptom of a deglutition disorder.

Patients and therapists often grades dental problems as important, but tooth decay and problems with dentures are described by only a few studies. Subjective and objective endpoints have not previously been compared. We found a correlation between patient and dentist reported trismus, and between the teeth scale of the EORTC questionnaire and caries. The seven edentulous patients used all possible categories of answers to the question "Have you had problems with your teeth?" stressing that the questions have to be inclusive and exhaustive to produce reliable answers. These findings could call for a critical review of the quality of life questionnaire concerning the validity in populations with many

edentulous patients. Objective need of dental care was identified in 53% of patients irrespective of our recommendation of meticulous dental care and frequent visits to their own dentist.

As previously reported we found a negative impact of smoking on several QoL endpoints [26]. In this study smokers also had more objective and subjective swallowing problems. All six patients with aspiration were smokers.

The results have shown a complex and probably individual interaction between side effects, quality of life, smoking and socioeconomic factors. Knowledge on pathophysiology could not be obtained from the patient assessed symptom scores in any reliable way. A simple analytical endpoint as saliva flow correlated nicely with the question "Have you had a dry mouth?" Nevertheless, there was a high probability that a patient answering "A little" or "quite a bit" had a very low flow rate. The question "Have you had problems with your teeth?" was answered in a completely unpredictable way by edentulous patients, and answers were not significantly different between patients in need for further therapy and patients with healthy teeth. Objective evaluation of swallowing correlated with some of the patients assessed symptoms. This has been described previously: Pauloski et al. [27] made repetitive VF measurements in 132 patients and asked, "Do you experience problems with swallowing?" at the same time points. Several objective findings were significantly different among those who had complaints or not. E.g. among pharynx cancer patients, aspiration of liquid were significantly different among patients without (1–5%) or with (6–28%) swallowing complaints. We experienced similar frequencies; 0 and 21% respectively, but as can be seen from Table VII and Figure 2, correlation is by no means equality and the items/scales of the questionnaire have a very low sensitivity and specificity of detecting objective changes.

The lack of significant correlations between objective and subjective symptoms could be attributed to the moderate number of patients. Nevertheless, the moderate degree of concordance expressed as sensitivity, specificity, positive and negative predictive value will probably not change drastically with more observations. A specific weakness in the EORTC questionnaire were found as four patients answered positively to the question "Have you used a feeding tube?", even though only one patient turned out to have a tube in the more thorough interview in relation with the FEES. This despite the fact that it is clearly stated next to the question that the period of interest is the last week. This may indicate that

factual data retrieved from a QoL questionnaire might not be too trustworthy.

## Conclusion and recommendations

The study has shown that swallowing disorders, dry mouth and dental problems are frequent and severe in pharynx cancer survivors. The EORTC quality of life questionnaire provides valuable data on subjective complaints, but these complaints are not closely correlated with specific objective changes. In order to fully characterize morbidity after radiotherapy for pharyngeal cancer, the data on subjective symptoms retrieved from questionnaires are complementary to data on objective changes retrieved using analytical methods. One cannot conclude from subjective patient assessed symptoms to pathophysiologic changes and vice versa.

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