

Limited mouth opening after primary therapy of head and neck cancer

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Abstract

Objectives Patients after surgery and radiation/chemoradiation for treatment of head and neck cancer often suffer from oral complications. These problems may be caused by surgery and radiation. Patients complain, for example, of swallowing problems and limited mouth opening (trismus).

Methods The maximal interincisal mouth opening (MIO) was measured in patients treated with surgery and radiation/chemoradiation for head and neck cancer at the Department of Otorhinolaryngology at the University of Rostock. These patients also completed a 20-item questionnaire concerning nutritional, sensual, and speech disorders and pain.

Results One hundred one patients (16 female and 85 male) returned the questionnaire and were included in the study. About 50% of the patients had a limited mouth opening (<36 mm); patients with oropharyngeal cancer had a significant higher risk for trismus ($p=.024$) than patients with other head and neck cancers, especially compared to patients with laryngeal cancer ($p=.013$). The questionnaire showed that especially patients with oral cancer report about problems with opening the mouth (73%), eating (65%), drinking (73%), xerostomia (92%), speech disorders

(68%), and voice (62%). Patients with laryngeal cancer only reported about problems with xerostomia (62%), speech (83%), and voice (90%), similar to patients with pharyngeal cancer.

Conclusions About half of the patients who underwent primary treatment for oral and oropharyngeal cancer developed trismus and reported about problems with opening the mouth, eating, drinking, dry mouth, voice, and speech. Trismus has a negative impact on quality of life and should be a focus in the postoperative management of patients with oral and oropharyngeal cancer, and, if diagnosed, special treatment should be initialized.

Keywords Head and neck cancer · Primary therapy · Quality of life · Trismus

Introduction

Patients with head and neck cancer often suffer from various complications after surgery and radiation/chemoradiation. While patients with laryngeal or pharyngeal cancer report about problems with speech and voice due to surgical techniques such as laryngectomy [1], patients with oral cancer complain about oral complications caused by radiation, such as dry mouth (xerostomia), swallowing problems, or limited mouth opening (trismus), as well as candidiasis and mucositis [2]. Radiotherapy (RT) is especially a main reason for oral complications like trismus. There are different opinions on the definition of trismus; some authors define trismus as a mouth opening less than 30 mm, other authors 40 mm [3]. Trismus is related to the dose of radiation [4]. Radiation-induced trismus appears in a high percentage of patients independent of other treatment modalities and has a proven negative impact on quality of

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life (QOL) [5]. The loss of function and range of mandibular motion appear to be related to damage and fibrosis to the muscles of mastication [6]. Different studies showed in up to 50% of patients with RT to the temporomandibular joint and the masseter muscle limitations in mouth opening [7]. Trismus is the main reason for other complications; it causes, for example, chewing and swallowing problems, which in turn cause weight loss with other resulting complications.

The aim of our study was to investigate the incidence of trismus in head and neck cancer patients after primary surgical therapy including (chemo)radiation and the impact on QOL. The results should be considered in preventive and postoperative management in head and neck cancer patients.

Methods

One hundred twenty-one patients were recruited from the head and neck cancer aftercare consultations at the Department of Head and Neck Surgery “Otto Körner”, University Hospital Rostock. All patients had biopsy-proven head and neck cancer and were treated with surgery and/or RT or radiochemotherapy (RCT). The patients completed a standardized 20-item questionnaire concerning QOL according to the EORTC QOL questionnaire (H&N35) [8]. They were asked nine questions about food intake, four questions about sensual alterations, three questions about speech disorders, and four questions about pain. Then the maximal interincisal opening (MIO) was measured using the Therabite® range of motion scale; a MIO less than 36 mm was considered to be limited. The patient data such as diagnosis, location, TNM status, and specific therapy were taken from the medical records. All data were entered in an SPSS database and statistical analyses consisted of χ^2 tests using SPSS for Windows 12.0.

Results

One hundred one patients, 16 female and 85 male, who had received primary therapy for head and neck cancer returned a modified EORTC QOL questionnaire for head and neck cancer patients; the clinical and sociodemographic data for these patients are shown in Table 1, the MIO measurement results are shown in Table 2, and the outcomes for the QOL questionnaire are shown in Table 3.

There were significant differences in limitations of mouth opening between oral/oropharyngeal and laryngeal cancer patients ($p=.013$), as well as between oral/oropharyngeal and other head and neck cancer patients ($p=.024$).

Table 1 Patients' baseline characteristics

Variable	Category	Number	Percentage
Age	Range	37–80	
	Mean	62	
Gender	Male	85	84.2
	Female	16	15.8
Tumor site	Oropharynx	37	36.6
	Larynx	29	28.7
	Hypopharynx	16	15.8
	Other	19	18.8
UICC stage	I	2	2.0
	II	13	12.9
	III	25	24.8
	IV	59	58.4
	0	1	1.0
	Not classifiable	1	1.0
Histology	Squamous cell carcinoma	93	92.1
	Others	8	7.9
Therapy	Surgery/R(C)T	82	81.2
	Only R(C)T	19	18.8

A more advanced international union against cancer (UICC) stage was also associated with reduced mouth opening. Patients who received a higher radiation dose also showed higher incidence of limited mouth opening.

Discussion

Limited mouth opening (MIO)

This clinical trial showed that almost 50% of the 101 head and neck cancer patients who were evaluated presented with a limited mouth opening less than 36 mm; eight patients had a mouth opening less than 20 mm. Normal mouth opening should be 46 ± 7 mm; for our study, we chose a MIO less than 36 mm as trismus in analogy with O'Leary [9]. The average MIO in this study was 37.2 mm, which is similar to the results (36.7 mm) of Kent et al. [5], who researched on 40 head and neck cancer patients and identified trismus in 45%; their results showed that the trismus group reported more QOL deficits. Other trials showed a wide range (6–86%) in the incidence of trismus in head and neck cancer patients [10, 11]. These wide differences appear to be related to varying definitions and measurements of trismus in other trials, as well as the tumor localizations. In this trial, 65% of oral/oropharyngeal cancer patients showed a limited mouth opening, compared to 44% of hypopharyngeal cancer patients ($p=.013$) and 31% of laryngeal cancer patients;

Table 2 Results of the measurements of mouth opening

Variable	MIO <36mm	Percentage	MIO >36mm	Percentage	<i>p</i> value
All patients	50	49.5	51	50.5	
Gender					
Male	39	45.9	46	54.1	>.05
Female	11	68.8	5	31.2	
Tumor site					.024
Oropharynx	24	64.9	13	35.1	
Larynx	9	31	20	69	
Hypopharynx	7	43.8	9	56.3	
Others	10	52.6	9	47.4	
UICC stage					>.05
IV	32	54.2	27	45.8	
III	11	44	14	56	
Others	7	41.2	10	58.8	
Surgery					>.05
Yes	41	50	41	50	
No	9	47.4	10	52.6	
RT dose					>.05
<60 Gy	3	33.3	6	66.7	
60–69 Gy	30	52.6	27	47.4	
>70 Gy	11	68.8	5	31.2	
RCT					>.05
Yes	27	57.4	20	42.6	
No	23	42.6	31	57.4	

these differences were significant ($p=.024$). This may lead to the conclusion that the location of the tumor affects the mouth opening, as well as the field of radiation. The incidence of radiation-induced trismus depends on

factors such as the total dose of radiation, fractionation, overall treatment time, and treatment technique. Teguh et al. [4] showed a relationship between mean radiation dose in masseter and pterygoid muscles and the probab-

Table 3 Results of the modified EORTC QOL questionnaire for head and neck cancer patients

Variable	All patients (<i>n</i> =101)	Oropharynx (<i>n</i> =37)	Larynx (<i>n</i> =29)	Hypopharynx (<i>n</i> =16)	Others (<i>n</i> =19)
Problems with					
Xerostomia	81	34	18	11	18
Alteration of voice	70	23	26	14	7
Speech	68	25	24	9	10
Impairment of taste	55	22	15	8	10
Swallowing	53	22	13	9	9
Eating	53	24	12	8	9
Limited mouth opening	51	27	6	5	13
Drinking	48	26	8	5	9
Coughing	44	19	14	6	5
Choking	40	20	9	6	5
Chewing	37	22	4	5	6
Reflux to nose	32	16	7	5	4
Constriction	31	14	9	4	4
Paresthesia	31	14	9	5	3
Pain while swallowing	27	16	4	3	4
Drinking	25	13	4	6	2
Pain at mouth opening	20	13	1	2	4
Pain while chewing	16	10	1	1	4
Alteration of sound	12	5	6	1	0
Pain (analgetic needed)	4	4	0	0	0

ity of having trismus. Graff et al. [12] showed that intensity-modulated RT (IMRT) produces less oral complications than conventional RT. Radiation causes a loss of function by inducing fibrosis in the muscles of mastication, as well as necrosis of bone and soft tissue [6]. This fibrosis limits the mouth opening, with major effects on nutrition, dental hygiene, swallowing, and phonation. There is a proven relationship between trismus in head and neck cancer patients and QOL deficits [5]; these deficits result even in social exclusion and depression [10]. Duke et al. [13] demonstrated that oral complications and a poor dental status in irradiated head and neck cancer patients have a persistent impact on QOL, longer than other effects of cancer treatment. All this leads to the conclusion that head and neck cancer and especially oral/oropharyngeal cancer patients should be examined for oral complications in the aftercare management, and supportive treatment should be initialized. There are a few options for trismus therapy, such as tongue spatulas, Therabite Jaw Motion Rehabilitation System™, physical and thermal therapy, electrotherapy, and drugs (i.e., pentoxifylline, diazepam) [14].

Quality of life questionnaire

The QOL questionnaire showed that head and neck cancer patients report a lot of complications after primary therapy, such as xerostomia (80%), alteration of voice (69%), speech problems (67%), impairment of taste (54%), swallowing problems (52%), ingestion of food (50%), and limited opening the mouth (50%).

Especially patients with *oral and oropharyngeal cancer* complained about oral complications such as problems opening the mouth (73%), these results were significant compared to *laryngeal cancer* patients, of whom only 21% complained about trismus ($p < .001$), and to *hypopharyngeal cancer* patients, of whom 31% reported limited mouth opening ($p = .011$). These questionnaire results were similar to the measurements of limited mouth opening, as well as to the results of Bjordal et al. [15] (Table 4). They also report about more problems with mouth opening in patients with *oral and oropharyngeal cancer* and less problems in patients with *pharyngeal and laryngeal cancer*.

Patients with *oral and oropharyngeal cancer* reported about problems with eating (65%) and drinking (70%) that are related to the reduced mouth opening; intake or ingestion is restricted by limited jaw opening. The secondary effects are weight loss and dental hygiene with a negative impact on QOL and contribution to depression [10].

Radiation therapy for oropharyngeal cancer affects the salivary glands causing xerostomia. This was reported by 92% of the patients with *oral and oropharyngeal cancer*. Sixty-two percent of laryngeal cancer patients complained about xerostomia and 69% of the patients with *hypopharyngeal cancer*. Dirix et al. [16] showed similar results (93% of oral cancer patients) in their research on xerostomia, with a proven impact on QOL.

Another negative impact on QOL reported by *oral and oropharyngeal cancer* patients in this questionnaire is the impairment of speech (68%). Talmi [17] reported about speech disorders following RT and surgery for oral cancer. This may be related to hypomobility of the tongue after treatment, but limited mouth opening may also play a role. *Laryngeal cancer* patients complained in 83% of speech disorders, due to surgery or RT to the larynx [18].

Other disorders or problems reported by more than 50% of patients with *oral and oropharyngeal cancer* were alteration of voice (62%), change of sense of taste (60%), chewing problems (60%), impaired swallowing (60%), choking on food (54%), and coughing while eating (52%). Surprisingly, only 11% of these patients needed analgesic drugs, while other authors reported chronic pain in 42% of oral cancer patients [19].

Head and neck cancer patients suffer from a lot of complications, disorders, and problems affecting QOL. The main problems for patients with oral and oropharyngeal cancer in this trial were xerostomia, limited mouth opening, drinking and eating disorders, as well as speech problems. Concerning limited mouth opening or trismus, patients often suffer from secondary effects such as weight loss, malnutrition, and poor dental hygiene. To avoid these complications and to improve QOL, we should consider these problems during posttreatment management of these patients. If limited mouth opening is diagnosed, supportive therapy should be initialized.

Table 4 Measurement of mouth opening versus questionnaire results

Tumor site	MIO <36mm (%)	Questionnaire reported problems with mouth opening (%)
Oropharynx	65	73
Larynx	31	21
Hypopharynx	44	31
Others	53	68

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