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# Prediction of post-treatment trismus in head and neck cancer patients

R. Lee [a], N. Slevin [a,*], B. Musgrove [a], R. Swindell [a], A. Molassiotis [a,b]

[a] *Christie Hospital NHS Trust, Manchester M20 4BX, UK*
[b] *School of Nursing, University of Manchester, Manchester, UK*

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**Abstract**

Our aim was to establish the incidence of trismus over time, together with risk factors (including quality of life (QoL)) for the prediction of trismus after treatment in patients with cancer of the head and neck. It was a longitudinal study of 152 patients accepted for primary operation who attended the head and neck cancer clinic of a tertiary referral cancer centre in the United Kingdom. A total of 87 patients was studied prospectively. Our results showed that 41/87 (47%) of patients presented with trismus, 57/80 (71%) had postoperative trismus, and 41/52 (79%) had trismus 6 months after operation or radiotherapy (trismus defined as a maximum mouth opening of ≤35 mm). Men and those who drank a lot of alcohol were less likely to have trismus after treatment. QoL variables showed that pain, eating, chewing, taste, saliva, social functioning, social contact, and dry mouth were significantly more impaired in the trismus group than among those without trismus. Postoperative differences in QoL between the two groups highlighted problems with social function and role-playing, fatigue, activity, recreation, and overall reduction in QoL. Women, and those who do not drink alcohol, are at particularly high risk of developing trismus, and, to prevent it and treat it, patients may benefit from multidisciplinary management at an early stage during treatment.


*Keywords:* Trismus; Quality of life; Head and neck cancer; Risk factors

## Introduction

Restricted mouth opening (trismus) in patients with cancer of the head and neck may result in difficulties with daily activities such as eating, chewing, swallowing, breathing, and speaking. It can lead to further problems such as severe pain, weight loss, and poor oral hygiene.[1] In the light of these problems it is not surprising that 30–40% of these patients develop depression after treatment,[2] and their rehabilitation may require treatment from a multidisciplinary team including speech and language therapists, dietitians, physiotherapists, counsellors, dentists, and orthodontic specialists.

Risk factors for trismus after treatment of cancer of the head and neck include tumours in the region of mouth-closing muscles, and disruption of the temporomandibular joint (TMJ) or the muscles of mastication, particularly the medial pterygoid muscle. The primary factor that limits movement of the jaw is rapid formation of collagen caused by radiation,[3] or operation, or both, leading to fibrosis and contraction in the muscles used for closing the mouth and mastication.[4]

The variations in the reports of trismus[5,6] have largely been caused by differences in sites of treatment, types of treatment, stage of tumour at the time of presentation, and a lack of a uniform definition of trismus. Dijkstra et al.[7] defined it as mouth opening of ≤35 mm (either the interincisal distance or the distance between the upper and lower alveolus), and they were supported by Scott et al.[8] Before these reports trismus was defined as mouth opening of less than 20 mm,[9] or less than 40 mm.[10]

Some patients may be able to open their mouths by only about 5 mm, which restricts them to a liquid diet using a

* Corresponding author.
*E-mail addresses:* nick.slevin@christie.nhs.uk, rana.lee@christie.nhs.uk (N. Slevin).

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straw. Publications about trismus have largely focused on patients being given radiotherapy (RT) as their primary treatment, or as an adjunct to resection.[11] There is no consensus on the incidence of trismus. In one study, it was reported that 45% of 40 patients who had been given curative doses of RT developed trismus,[12] with no differences in the incidence between RT and chemoradiotherapy or between conventional RT and intensity-modulated RT. However, a recent systematic review of trismus induced by cancer treatments concluded that the weighted prevalence for patients given conventional RT was 25.4% compared with 5% for those patients given intensity-modulated RT. There is no mention in this review, however, of the prevalence of trismus after primary surgical treatment.[13] The published data on trismus is essentially cross-sectional in design, often with small numbers of patients.

The purpose of the study was to assess the incidence of trismus over time, to pinpoint the associated risk factors in patients treated by primary surgery with or without postoperative RT, and to assess its impact on the quality of life (QoL).

## Patients and methods

We designed a prospective, observational study of patients with cancer of the head and neck referred to the oromaxillofacial and ENT clinics of a major cancer centre in the northwest of England.

### *Inclusion and exclusion criteria*

Patients who presented with cancer of the head and neck and were treated by primary radical surgery alone, or primary radical surgery plus RT, or chemoradiotherapy (no distinction was made between these latter two groups), were included. Patients who had laser treatment of cancers of the tongue or larynx were excluded as were those with cancers of the thyroid or skin. Patients who were edentulous or whose incisors were partly missing were also excluded.

### *Participants and procedures*

Patients who consented to participate in the study provided maximum readings of mouth opening and QoL measures at their preoperative assessment, 6 weeks after their primary operation, and again more than 6 months after treatment (including those given adjuvant RT or chemoradiotherapy).

### *Assessments*

Maximum mouth opening was measured using a Platon motion scale (manufactured by Atos Medical[14]), which was inserted between the maxillary and mandibular incisors while the patient was sitting upright. A threshold of $\leq$35 mm (incisor to incisor) was used to define trismus.[7]

Initially two independent readings of maximum mouth opening were taken by the research worker and the specialist nurse from 20 patients, and these showed no significant inter-observer differences. We concluded that the research worker alone could take all future readings. Additional readings from the bottom of the nose to the chin with the mouth closed and open were taken using Willis bite calipers.

QoL was assessed using the University of Washington Quality of Life Questionnaire version 4 (UWQoL v4),[15,16] the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30), and its head and neck module (EORTC QLQ H&N C35).[17] Because of the many problems faced by patients with cancer of the head and neck we thought that a combination of these scales was appropriate.

Data were collected using a touch screen. The raw data from the QoL scales were converted to scores ranging from 0 to 100 using linear transformation according to the standard scoring procedures outlined by Fayers et al.[18]

### *Analysis of data*

Descriptive statistics were used, and variables reported as number (%). The following were used to assess comparisons between groups: continuous variables – Student's *t* test or the non-parametric Mann–Whitney *U* test as appropriate; ordinal variables – the Wilcoxon rank-sum test; and dichotomous variables – Fisher's exact test, which was used to assess the significance of differences between subgroups of patients. The Mann–Whitney test was used to assess the significance of differences in the QoL variables between the groups with and without trismus before treatment, postoperatively, and more than 6 months after RT. Logistic regression was used to identify any independent predictors of trismus. All analyses were made with the help of the Statistical Package for the Social Sciences (SPSS) version 16.0 (SPSS Inc., Chicago, IL, USA).

## Results

### *Details of patients and treatments in the larger sample*

A total of 152 patients (none of whom had had any intervention or treatment for limited mouth opening within the study period) were available for assessment; this is the number of patients who had had trismus measured postoperatively and had completed either the 6-week or the 6-month assessment. Eighty-seven subjects were followed prospectively to assess the incidence of trismus, whereas the data from all 152 patients were used for the predictive analysis. Two thirds were men, and primary sites were oral cavity 70 (46%), pharynx 41 (27%), and larynx 21 (14%). Sixty-two patients (41%) presented with stage 2, 46 with stage 4 (30%), 31 with stage 1 (20%), and 14 with stage 3 disease (9%). Seventy-three (48%) were current smokers, 47 were ex-smokers (31%), and