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Original Article

Trismus in oral cancer patients undergoing surgery and radiotherapy

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ABSTRACT

Objective: The aim of this study was to determine the incidence of trismus before and after surgery and subsequent radiotherapy for patients of oral cancer and to determine the risk factors for the same.
Methods: 30 patients diagnosed with oral cancer were included. Maximum mouth opening was measured for each patient as the inter incisal distance and was measured on 4 occasions – preoperatively at the time of diagnosis, post-operatively at discharge from the hospital, post-radiotherapy and at 6 months follow-up. The site of cancer, staging and grading of the malignancy, the surgical treatment performed, method of reconstruction, details of radiotherapy and compliance to physiotherapy were recorded, to evaluate the risk factors for developing trismus.
Results: Trismus was observed in 53.3% patients at the time of diagnosis which increased significantly post-surgery (86.7%) and post-radiotherapy (85.7%) and gradually decreased (65.4%) at 6 months. The use of flaps for reconstruction, delay in radiotherapy post-surgery and non-compliance of patients to physiotherapy were the risk factors for developing trismus, showing statistical significance ($p < 0.05$).
Conclusion: Trismus is a significant complication of oral malignancies or its surgical and radiotherapy treatment, or both. Consideration must be given to its early diagnosis, to help in timely intervention and planning of preventive strategies.

1. Introduction

Oral cancer is becoming a global health concern. It accounts for over 30% of all cancers in India with a rate of 20 per 100,000 population.[1] Treatment is aimed at maximizing survival and loco regional control while trying to preserve normal oral function and quality of life.[2] Despite progress in oral oncology a number of patients have diminished or lost oral functions and suffer from complications due to surgery, radiation and/or chemotherapy.[3] These side effects are under recognized, under treated and under reported. It is increasingly realized that aggressive management of early and late oral complications after oral cancer treatment is needed to ensure optimal long-term oral and general health.[4]

Trismus is a symptom related to the treatment of head and neck cancer, which previously has not been paid much attention.[5] Trismus in oral cancer is defined as a tonic contraction of the muscles of mastication resulting from any abnormal condition or disease with mouth opening of $\leq$35 mm.[6] It may be a result of tumour growth, infection, surgery or radiation. Its incidence varies greatly and results in difficulty in activities such as biting, chewing, swallowing and speaking and may further lead to poor oral hygiene, pain, weight loss and even depression.[7] It causes a detrimental impact on quality of life and function and should be a focus in the post-operative management of patients with oral cancer.[8] This study was aimed to note the incidence of trismus in patients of oral cancer before and after surgery and radiotherapy and to determine the risk factors for the same.

2. Methods

This prospective clinical observational study was approved by the institutional ethical committee and review board. Sequential enrolment of 30 patients was done after taking written informed consent. Patients reporting to the Department of Oral and Maxillofacial Surgery, Bapuji Dental College and Hospital, Davangere, Karnataka, diagnosed with oral cancer, willing for surgery and subsequent radiotherapy and follow-up, were included. They were free from other causes of trismus like trauma, TMJ disorders, infection or congenital anomalies.

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Patients treated previously for head and neck cancer, those who would be treated with only radiotherapy and/or chemotherapy, edentulous patients, those suffering from Oral Submucous Fibrosis and those with significant medical co-morbidities not fit for undergoing surgery were excluded.

Site of malignancy, its staging and grading, surgical treatment performed, neck dissection, method of reconstruction used, the histopathological diagnosis, details of radiotherapy and other relevant information were recorded. Patients were advised physiotherapy following surgery in the form of passive exercises, use of tongue blades, Fergusson mouth gag and Hiesters jaw opening devices and their compliance was noted.

Measurement of maximum mouth opening (MMO) was carried out for each patient on 4 occasions – pre-operatively at the time of diagnosis (MMO-0), post-operatively at the time of discharge from the hospital (MMO-1), post-radiotherapy (MMO-2) and finally at 6 months post-operative follow-up (MMO-3). The inter-incisal distance was measured as the maximum mouth opening with the patient sitting in an upright posture. MMO was measured using an LCD Aerospace Digital Vernier Caliper Micrometer Gauge, in mm, by a single observer (PA) to allow for consistent readings and less chance of clinician-related error.[9] Mouth opening of $\leq$35 mm was labelled as trismus.

Statistical analysis was done using IBM SPSS Statistic Software version 16. Mann–Whitney *U* test was used to check the difference in dichotomous data where 2 groups were considered. Kruskal–Wallis ANOVA was used to check the difference in multiple groups. Cochran's *Q* test was performed to test the differences between two or more matched sets which showed statistical significance ($p < 0.05$). McNemar test was performed to assess whether the difference between two matched sets of proportions was significant.

3. Results

Out of 30 patients, 18 were male (60%) and 12 were female (40%). 9 (30%) were of the age group of 25–50 years, 20 (66.7%) between 51 and 75 years and 1 (3.3%) was above 75 years (mean age = 56.8).

7 (23.3%) patients had malignancy involving the mandibular alveolus and gingivobuccal sulcus (GBS), 14 (46.7%) on the buccal mucosa, 4 (13.3%) on tongue, 2 (6.7%) involving the retro molar trigone (RMT) and 3 (10%) involving the maxillary alveolus and GBS. All patients were diagnosed with squamous cell carcinoma out of which 17 (56.7%) were well differentiated, 7 (23.3%) were moderately differentiated, 2 (6.7%) were poorly differentiated and 4 (13.3%) were of the infiltrative type. 26 (86.7%) patients had T_1–T_2 lesions and 4 (13.3%) had T_3–T_4 lesions. No nodal involvement (N_0) was seen in 2 (6.7%) while 28 (93.3%) patients had nodal involvement (N_+). 27 (90%) patients had Grade III tumour, 2 (6.7%) patients had Grade II while 1 (3.3%) patient had Grade I tumour.

Wide resection of tumour was performed for all cases with hemi-mandibulectomy in 40% patients, marginal mandibulectomy in 23.3%, maxillectomy in 10%, segmental mandibulectomy in 3.3% patients and no bony resection was performed in 23.3% patients. 43.3% had supraomohyoid neck dissection performed, 33.3% underwent radical neck dissection (RND), and 6.7% underwent modified RND whereas 16.7% patients did not have their necks addressed. 40% patients underwent reconstruction using regional flaps, 20% using local flaps, 13.3% using split thickness skin grafts, 3.3% using abdominal dermal fat graft whereas 23.3% patients had primary closure performed.

27 (90.0%) patients underwent radiotherapy while 3 (10.0%) patients did not, due to severe debilitation or death. 15 (55.6%) patients underwent RT within 6 weeks of surgery (early) while 12 (44.4%) underwent RT after 6 weeks of surgery (late) due to initial reluctance, delayed wound healing and other personal reasons. 14 (51.8%) patients had their muscles of mastication in the field of radiation whereas 13 (48.2%) did not.

2 patients expired following surgery. Physiotherapy was undertaken by 28 patients, out of which 20 (71.4%) showed compliance and 8 (28.6%) did not. 2 patients expired 3 months post-surgery. Incidence of trismus was 53.3% (16/30) at the time of diagnosis, 86.7% (26/30) post-surgery, 85.7% (24/28) post-radiotherapy and 65.4% (17/26) at 6 months follow-up. Occurrence of trismus was significantly high post-operatively ($p < 0.05$) (Table 1).

Among the factors considered for the development of trismus, the use of flaps for reconstruction, undergoing radiotherapy late post-surgery and the non-compliance of patients to physiotherapy showed statistical significance ($p < 0.05$) whereas other factors did not show significance (Table 2).

4. Discussion

The ability to predict which patients will develop trismus could have a strong bearing on their dental management prior to or at the time of their oncology treatment. They may benefit from radical dental management with extraction of posterior teeth to reduce the cost of their oral maintenance.[10] No relationship between trismus and gender was observed although females have been reported to have more trismus because of a smaller maximal mouth opening than men.[7] No association was found between the patient age and reduction in mouth opening.

No significance was found between the site of cancer and trismus. In contrast, trismus has been shown to result from invasion of the tumour into the muscles of mastication or the TMJ, be a consequence of muscular fibrosis or due to formation of scar tissue post-operatively. Immobilization of the TMJ after surgery for long also has been shown to compound the problem.[5] Our patients with lesions of the buccal mucosa, maxilla and RMT region developed trismus more. Cancers in such regions are known to trigger reflexes in the maxillofacial area, activate the efferent part of the tonic reflex arch of the muscles of mastication resulting is an increased tonus, developing trismus.[11] Lesions involving the lower alveolus, GBS and tongue led to lesser trismus, as in literature, and better results observed with involved floor of mouth or anterior 2/3 tongue.

No statistically significant relationship between the histopathological diagnosis and trismus was found. Neck node status did not seem significant to the development of trismus, but it has been observed that the presence of lymph node metastasis can predict the pre-radiotherapy mouth opening ($p = 0.006$).[12] Although the size of tumour and the development of trismus did not show a significant relationship, most patients with T_{3-4} lesions had

Table 1
Incidence of trismus.

Time of evaluation	Total patients	Trismus present	Trismus absent	
Pre-treatment	30	16	14	Cochran's $Q = 18.09$
Immediate post-surgery	30	26	4	
Immediate post-radiotherapy	28	24	4	
6 months post-operative	26	17	9	