



The Effect of Smoking During Radiotherapy on Development of Osteoradionecrosis and Subsequent Treatment Outcomes



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OBJECTIVE

To report on the development and treatment outcomes of osteoradionecrosis in patients that smoke while undergoing radiotherapy treatment for oral cavity and oropharyngeal cancer.

BACKGROUND

Despite advances in surgical reconstructive techniques, treatment of oral cavity/oropharyngeal cancers remains a challenge. Many patients require adjuvant therapy in the form of radiation or chemoradiation. While radiation therapy (RT) increases the cure rate of oropharyngeal cancers, complications attributable to this form of therapy are not negligible. These include mucositis, loss of taste, xerostomia, and osteoradionecrosis (ORN).¹ ORN, while rare, is a condition with significant morbidity and impact on quality of life.

The degree of radionecrosis varies widely – ranging from loss of soft tissue to exposed bone. The definition of ORN is largely accepted as the presence of exposed bone in an irradiated field, which fails to heal over a period of at least 3 months.¹ The prevalence also varies widely. While most reports suggest a prevalence rate of 10-15%, some suggest rates as low as 1% and as high as 30%.²

A subset of ORN cases can be managed with conservative treatment. However, depending on the degree, invasion, and size of the necrotized bone lesion, hyperbaric oxygen therapy and/or surgical intervention is often required.

The development of ORN appears to be multifactorial.² Smoking, consumption of alcohol, tumor characteristics, oral hygiene, and dose of radiation therapy have all been implicated as risk factors for the development of ORN. However, these risk factors are not well studied; there is a paucity of literature describing the effect of these factors on the development and treatment outcomes of ORN. The purpose of this study was to evaluate the impact of smoking on these end points.

METHODS

A retrospective chart review of all patients with oral cavity and oropharyngeal cancer was conducted to identify cases of ORN at a tertiary medical center between 2013 and 2015. Demographic information, including patient reported smoking habits, was retrieved.

FIGURES

	Sex	Age (years)	Primary cancer diagnosis - pathology	Site of primary	Stage (T, N, M)	Site of ORN	RT dose (Gy)	RT completion to ORN diagnosis (months)	# of Debridements	Resolution of ORN (Y/N)
Current Smokers	M	63	SCC in situ	Floor of mouth	I (1, 0, 0)	Mandible	Unknown	22.6	2	Y
	F	46	Undifferentiated SCC	Nasopharynx	II (2, 0, 0)	Mandible	69.96	61.9	5	N
	F	61	Recurrent SCC	Floor of mouth	III (1, 1, 0)	Mandible	Unknown	44.1	1	N
Former Smokers	M	61	Moderately undifferentiated SCC	Tongue	II (2, 0, 0)	Mandible	Unknown	20.0	2	N
	M	70	Well differentiated	Floor of mouth	II (2, 0, 0)	Mandible	68	139.6	1	N
	M	44	SCC	Base of tongue	IV (2, 2b, 0)	Mandible	70	6.3	1	N
Never Smokers	F	57	SCC in situ	Retromolar trigone	II (2, 0, 0)	Posterior FOM	60.80	12.1	1	N
	M	58	Moderately differentiated SCC	Tonsil	III (2, 1, 0)	Mandible	Unknown	Unknown	2	Y
	M	53	Well differentiated	Base of tongue	IV (1, 2b, 0)	Mandible	70	7.3	Refused	N

Figure 1. Patient demographics. Results are shown for average follow-up period of 1 year following the initiation of ORN treatment.

RESULTS

Of the 189 patients with oral cavity and oropharyngeal cancer reviewed in this study, 10 cases of ORN were documented (5.3% prevalence). Only 9 were included in the study due to 1 incomplete record.

All but 1 patient underwent primary surgical treatment of squamous cell carcinoma with adjuvant RT; one patient received primary chemoradiation treatment. All but one patient was treated with debridement and adjuvant hyperbaric oxygen therapy; one patient refused this recommended treatment.

The 9 ORN patients included in this study were considered in one of three groups: never smokers, former smokers, and those who smoked during RT and ORN treatment ('current smokers'). There were 3 patients in each group (Fig. 1). Demographic characteristics were similar between these 3 groups.

Current smokers, on average, required 1.7 more debridements than never-smokers (1 vs 2.7, range 0-5). The average duration between completion of RT and diagnosis of ORN was 39.2 months (6.3-139.6 months). In current smokers, the mean duration was 42.9 months, in former smokers it was 55.3 months, and never smokers it was 9.7 months (p=0.61).

RESULTS (CONTINUED)

The dosage of RT is unknown for 4 patients. For the 5 patients for whom we have data, the average radiation dosage was 67.75 Gy (60.80-70 Gy). There is no correlation between radiation dosage and number of debridements. Similarly, there is no correlation between initial SCC staging and ORN development, number of debridements, or ORN resolution.

At average follow-up period of 1 year from the initiation of ORN treatment, 2 cases were resolved. Of the resolved cases, one was a current smoker treated initially for stage I SCC. The other patient with resolved ORN was a never smoker with an initial diagnosis of stage III SCC.

CONCLUSIONS

The incidence of ORN is low in patients treated with RT for oral cavity and oropharyngeal cancer; however, it is a condition with significant morbidity and impact on quality of life. There is no correlation between smoking while undergoing RT and the subsequent duration of time to the diagnosis of ORN. However, patients who smoked through RT required a greater number of debridements, on average, than former smokers and never smoker; which may suggest a delay in healing. The dose of RT received did not impact the treatment outcomes of ORN.

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REFERENCES

1. Rayatt SS, Mureau MA, Hofer SO. Osteoradionecrosis of the mandible: Etiology, prevention, diagnosis and treatment. Indian J Plast Surg 2007;40, Suppl S1:65-71
2. Lee IJ, Koom WS, Lee CG, et al. Risk factors and dose-effect relationship for mandibular osteoradionecrosis in oral and oropharyngeal cancer patients. Int J Radiat Oncol 2009; 15, 1084-1091



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