



Relationship between dental status and development of osteoradionecrosis of the jaw: a multicenter retrospective study

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Objective. Osteoradionecrosis of the jaw is a serious late adverse event in patients with head and neck cancer undergoing radiotherapy. The aim of this study is to investigate the relationship between dental status and development of osteoradionecrosis.

Study Design. Multicenter, retrospective observational study. A total of 392 patients with head and neck cancer who underwent radiotherapy were investigated for correlations between the development of osteoradionecrosis and various factors. The cumulative occurrence rate of osteoradionecrosis was calculated by the Kaplan-Meier method and analyzed by Cox regression and log-rank test.

Results. Osteoradionecrosis developed in 30 of 392 patients. In 23 patients, osteoradionecrosis occurred in the mandibular molar region. A univariate analysis showed that oral or oropharyngeal cancer, jaw radiotherapy dose exceeding 50 Gy, periapical periodontitis, and tooth extraction after radiotherapy were significantly correlated with the occurrence of osteoradionecrosis. Among these, oral and oropharyngeal cancer, periapical periodontitis, and tooth extraction after radiotherapy were significant independent risk factors by multivariate analysis. Further, caries that occurred after radiotherapy and progressed rapidly, resulting in periapical periodontitis, carious stump, or extraction, was a major cause of osteoradionecrosis.

Conclusion. Extraction of mandibular molars with periapical periodontitis before radiotherapy and strict dental management after radiotherapy may reduce the risk of osteoradionecrosis. (Oral Surg Oral Med Oral Pathol Oral Radiol 2017;124:139-145)

Radiotherapy (RT) is commonly performed in patients with head and neck cancer, but it causes various acute and late adverse effects, such as oral mucositis, xerostomia, tasting disturbance, leukocytopenia, dermatitis, and osteoradionecrosis (ORN). ORN of the jaws is a serious late complication. ORN is defined as exposed irradiated bone that fails to heal over a period of 3 months without any evidence of persisting or recurrent tumor.¹ The mandible is the most frequently

affected bone because it is inevitably exposed to a high dose of irradiation in most patients. Although the incidence of ORN is low, when it occurs it rarely cures spontaneously, and in patients with advanced stages of ORN, surgical resection of the jaw becomes necessary. This may be associated with an alteration in the shape and function of the oral cavity and the pharynx, leading to substantial deterioration of a patient's quality of life.²

Various treatment-related, tumor-related, and patient-related risk factors of ORN have been reported, including total RT dose,^{3,4} biologically effective dose,⁵ combination of external beam irradiation and interstitial brachytherapy,⁶ field size,³ dose per fraction,^{3,5} short interval between fractions,^{4,5} bone surgery in cases of post-operative irradiation,⁵ alcohol and tobacco abuse,⁷ tumor size or stage,^{8,9} association of the tumor with

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Statement of Clinical Relevance

This retrospective study suggests that extraction of mandibular molars with periapical periodontitis before radiotherapy and strict dental management after radiotherapy may reduce the risk of osteoradionecrosis in patients with head and neck cancer who undergo radiotherapy.

Table I. Demographic factors and oral condition of patients by development of ORN

Factor	Category	Number of patients	
		ORN (+)	ORN (-)
Age	<65 years	10	158
	≥65 years	20	204
Gender	Male	21	275
	Female	9	87
Weight	<55 kg	18	178
	≥55 kg	12	184
Tumor site	Oral cavity/oropharynx	26	193
	Other	4	169
	Unknown	2	12
Stage	I-II	6	65
	III-IV	22	285
	Unknown	2	12
RT method	3-D CRT	29	337
	IMRT	1	25
Combination chemotherapy	RT alone	12	125
	CRT/BRT	18	237
Total RT dose	50-59 Gy	3	48
	≥60 Gy	27	314
RT dose against jaw	<50 Gy	2	90
	≥50 Gy	28	272
Diabetes	Present	6	88
	Absent	24	274
Serum creatinine	Within normal range	26	334
	Higher than normal range	4	28
Serum albumin	≥3.0 mg/dL	28	321
	<3.0 mg/dL	2	41
Minimum white blood cell count during RT	≥3000/μL	17	179
	<3000/μL	13	183
Minimum lymphocyte count during RT	≥800/μL	12	87
	<800/μL	18	275
Dental status	Dentulous	30	331
	Edentulous	0	31
Periapical periodontitis at first visit	(-)	12	253
	(+)	18	109
Periapical periodontitis pre-RT	(-)	13	294
	(+)	17	68
Pericoronitis at first visit	(-)	29	357
	(+)	1	5
Pericoronitis pre-RT	(-)	29	360
	(+)	1	2
Carious stump at first visit	(-)	24	276
	(+)	6	86
Carious stump pre-RT	(-)	26	327
	(+)	4	35
Severe marginal periodontitis at first visit	(-)	20	246
	(+)	10	116
Severe marginal periodontitis pre-RT	(-)	22	311
	(+)	8	51
Tooth extraction before RT	(-)	23	237
	(+)	7	125
Tooth extraction after RT	(-)	19	335
	(+)	11	27

ORN, osteoradionecrosis; RT, radiotherapy; CRT, conformal radiotherapy; 3-D CRT, 3-dimensional conformal radiotherapy; IMRT, intensity-modulated radiation therapy; BRT, brachytherapy.

bone,³ anatomic tumor site,⁸ and dental hygiene.^{2,10} With regard to dental status, some investigators have reported risk factors relating to the incidence of ORN. Morrish et al.¹¹ reported that the incidence of ORN was 22 of 100 (22%) and that the risk was significantly greater for patients who had teeth extracted after RT

than for those with extractions before radiation or with no extractions at all. Thorn et al.⁹ found that in 80 patients with ORN, more than half of the cases were initiated by tooth removal and recommended a more aggressive pre-irradiation approach to dental pathology located within the field of radiation. Raguse

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