Oral Health of Korean Patients With Head and Neck Cancer

ORIGINAL ARTICLE

Young-Seok Kim[1], Yun-Sook Jung[2], Bo-Kyoung Kim[3], Eun-Kyong Kim[1]

[1]Department of Dental Hygiene, College of Science & Technology, Kyungpook National University, Sangju, [2]Department of Preventive Dentistry, School of Dentistry, Kyungpook National University, Daegu, [3]Department of Dental Science, Yonsei University Graduate School, Seoul, Korea

Background: Association between periodontitis and of head and neck carcinoma was suggested. In the present study, we evaluated the oral health status of patients with head and neck carcinoma and analyzed the relationship between cancer characteristics and oral health.
Methods: Oral health of 40 patients with head and neck carcinoma was examined. Decayed teeth, missing teeth, plaque index, gingival index, and probing depth were measured. Cancer type and site were recorded based on the patients' medical records.
Results: The average age of participants was 60.10 ± 8.99 years, and 35 of participants were male. The decay or missing teeth index was 5.43 ± 5.57, and the plaque index, gingival index, and probing depth were 1.37 ± 1.03, 1.57 ± 0.84, and 4.13 ± 1.45, respectively. These indexes showed no significant difference according to the type or site of cancer ($P > 0.05$).
Conclusions: This study showed that there was no correlation between oral health parameters and characteristics of head and neck carcinoma. **(J Cancer Prev 2018;23:77-81)**

Key Words: Oral health, Head and neck cancer, Periodontal diseases

INTRODUCTION

Cancers of the head and neck (HNC) constitute a heterogenous group of malignancies of varied sites above the clavicle, such as lips, tongue, tonsil, oral cavity, salivary gland, pharynx, and larynx.[1] Although the frequency of HNC is about 2% of all types of cancers, the incidence of HNC has steadily increased for both men and women in Korea since 1998.[2] HNC is of great interest because of its potentially destructive consequences with regard to the patients' quality of life.[3] Alcohol consumption and cigarette smoking are established risk factors for HNC originating from the oral cavity, pharynx, and larynx.[4,5]

In general, most patients with HNC are habitual users of tobacco and alcohol. Recently, human papillomaviruses have been shown to play an important role in carcinogenesis, especially in HNC, including cancers of the tonsils, base of the tongue, and other parts of the pharynx.[6,7] In addition, Tezal et al.[8]

reported that severity of periodontitis was associated with increased risk of head and neck squamous cell carcinoma (HNSCC).

Periodontal disease is a chronic and destructive disease associated with dental plaque that progresses slowly and is the major cause of tooth loss in adults.[9,10] Many recent studies have reported a relationship between periodontal disease and risk of systemic disease, such as cardiovascular disease, diabetes mellitus, and premature birth. In addition, several studies have reported that periodontal disease shows the strongest degree of association with oral cancer.[11,12] However, the reciprocal effects of periodontal disease and cancer are unclear. Abnet et al.[13] reported that carcinogenic metabolic by-products of periodontal disease are possibly involved in the relationship between periodontal disease and cancer. Under the assumption that biomarkers of inflammation, such as myeloperoxidase and superoxide, are elevated in periodontitis, polymorphisms of related genes were

reported to be associated with elevated cancer risk.[14]

However, the association between HNC characteristics and oral health status among patients with HNC has not been evaluated in Korea. Therefore, the purpose of the present study was to evaluate the oral health status of patients with HNC and analyze the relationship between cancer characteristics and oral health status parameters such as tooth decay and periodontal health.

MATERIALS AND METHODS

1. Subjects

Patients who were referred to a dental clinic for oral examination and management before radiation therapy among those diagnosed with HNC at the Yeungnam University Medical Centers' Otolaryngology Department Clinic were screened. Among these, patients with no previous diagnosis of HNC and radiotherapy, without infectious disease, and with good cooperation for oral examination and management were included. Those who were edentulous or refused to participate after receiving information on the purpose and examination procedure of the study were excluded. Finally, 40 patients who were in agreement with the purpose and methods of the present study, and provided informed consent, were selected. Before initiation, the study was approved by the Institutional Review Board of Yeungnam University Hospital (YUH-13-0396-O41).

2. Methods

1) Oral examination

In all patients, oral examinations were performed before radiotherapy on the dental chair. Oral examination procedures were performed by one examiner, and questionnaire survey was conducted by one dental hygienist. Evaluation for decayed teeth (DT) and missing teeth (MT) included all teeth except the third molar. Plaque index (PI), gingival index (GI), and probing depth (PD) were measured on six representative teeth i.e., the maxillary right first molar and central incisor, maxillary left first molar, mandibular left central incisor and left first molar, and mandibular right first molar. PI and GI were measured according to the Löe and Silness criteria, with a higher number indicating more accumulation of plaque or poorer gingival health as follows: PI - 0 (no plaque), 1 (a film of plaque adhering to the free gingival margin and adjacent area of the tooth, which cannot be visualized with the naked eye, but only with use of a disclosing solution or probe), 2 (moderate accumulation of deposits within the gingival pocket, on the gingival margin and/or adjacent tooth surface,

which can be visualized with the naked eye), 3 (abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin); and GI-0 (no inflammation), 1 (mild inflammation, slight change in color, slight edema, and no bleeding on probing), 2 (moderate inflammation, moderate glazing, redness, and bleeding on probing), 3 (severe inflammation, marked redness and hypertrophy, ulceration, and tendency to spontaneous bleeding).[15] The highest value of PI, GI, or PD was considered to be the representative value of each participant, respectively.

2) Systemic health

Sex, age, general health status, smoking, and drinking status were surveyed using a questionnaire. Characteristics of cancer (site, type) were examined from the patients' medical records. Type of cancer was classified as squamous cell carcinoma (SCC), adenoid cystic carcinoma, pleomorphic adenoma, or others based on the medical records.

3. Statistical analysis

Statistical analysis was performed using IBM SPSS for Windows ver. 20.0 (IBM Co., Armonk, NY, USA). Kruskal-Wallis test and Mann-Whitney U-test were performed to compare characteristics of cancer between the dental status groups. P-value of < 0.05 was considered as significant.

RESULTS

1. General and cancer characteristics in the participants

The average age of participants was 60.10 ± 8.99 years, and 35 of participants were male. Of the total participants, 47.5% had a history of systemic disease such as hypertension and diabetes; 52.5% were smokers; and 57.5% drank alcohol. Among the participants with HNC, the rate of SCC was 75.0%, rate of adenoid cystic carcinoma was 7.5%, and rate of pleomorphic adenoma was 5.0%. Of the total cancer rate, rate of cancer of the larynx was 27.5%, and rates of other cancers of the nasopharynx, floor of mouth, tonsil, and salivary gland were with lower, in decreasing order (Table 1).

2. Oral status of participants with head and neck according to general and cancer characteristics

The decay or missing teeth (DMT) median (range, min-max) value were 3.5 (0-18), and those of the PI, GI, and PD were 1 (0-3), 2 (0-3), and 4 (2-8), respectively. The DMT, PI, and PD of male

Table 1. General and cancer characteristics in the participants

Characteristic	Value
Total	40 (100.0)
Sex	
Male	35 (87.5)
Female	5 (12.5)
Age (yr)	60.10 ± 8.99
≤ 59	18 (45.0)
≥ 60	22 (55.0)
General disease	
No	21 (52.5)
Yes	19 (47.5)
Smoking	
None	19 (47.5)
Current	21 (52.2)
Drinking	
None	17 (42.5)
Current	23 (57.5)
Cancer type	
Squamous cell carcinoma	30 (75.0)
Adenoid cystic carcinoma	3 (7.5)
Pleomorphic adenoma	2 (5.0)
Other	5 (12.5)
Cancer site	
Larynx	11 (27.5)
Nasopharynx	5 (12.5)
Floor of mouth	3 (7.5)
Tonsil	3 (7.5)
Salivary gland	3 (7.5)
Other	10 (25.0)

Values are presented as number (%) or mean ± standard deviation.

participants were 4 (0-18), 1 (0-3), and 4 (2-8), respectively, which was higher than the corresponding values of female participants, without significance. In addition, there were no statistical differences in oral status according general disease or smoking. MT of participants over 60 years old was 4 (0-17) and of those under 59 years old was 2.5 (0-9), with significant difference ($P <$ 0.05). DT and PD of the current drinker group were statistically higher than those of the non-drinker group ($P < 0.05$). DMT of SCC patients was 5 (0-18) and that of other cancer participants was 2 (0-9). PI 1.5 (0-3) and PD 4.5 (3-6) of patients with other cancers were slightly higher than those of patients with SCC, without significance. DMT of patients with cancer of the larynx was 12 (0-17) and those of patients with cancer of the nasopharynx, floor of mouth, tonsil, salivary gland, etc., were of lower value, in order. However, DMT and periodontal status showed no significant difference according to the site of cancer (Table 2).

DISCUSSION

The aim of the present study was to evaluate the association of the oral status with the HNC characteristics. DT and PD were significantly increased according to the presence of alcohol consumption. Other variables were not significant, but showed a trend toward increase with alcohol consumption, as well as with smoking. Many studies have shown that drinking and smoking are the main causes of development of periodontal disease, which are considered to be confounding variables in the assessment of periodontal status in cancer patients.[16,17]

To our knowledge, no study has focused on the differences in oral status according to the type and location of cancer in Korea. In our study, there was no significant difference between periodontal disease and tooth disease according to cancer site or cancer type. Many previous studies have reported that most patients with HNC have more MT than those of the general population, even after adjusting for smoking or drinking status.[16,18,19] Proinflammatory proteins and bacterial toxins are related to the development of periodontal disease; hence, it is postulated that these mediators play a role in the etiology of HNC in patients with periodontal disease.[20] In our study, the results are attributed to the fact that chemical mediators (proinflammatory proteins or bacterial toxins) act on periodontal tissue, irrespective of the type and location of cancer, and cause periodontal disease. Taken together, these results indicate that the periodontal status depends on the inflammatory action of the cancer itself rather than the location or type of cancer.

In addition, there was no significant difference in DT or DMT (tooth disease parameters) according to location or type of cancer. A previous study reported the potential mechanisms by which cariogenic bacteria such as Mutans streptococci may protect the host from cancer[21]; however, no conclusion could be made with regard to the anti-cancer effect of cariogenic bacteria due to limitations of the study design and suggestion of a putative mechanism without bacterial examination.[22] Therefore, further research on the relationship between mechanism of cancer and dental caries is required.

Our study has some limitations. First, analysis was without adjusting for confounding variables of drinking and smoking. In addition, the subjects were few and the oral status was not compared to that of a healthy control group. In future studies, it is expected that improvement to overcome these limitations will provide more meaningful results. Nevertheless, this was the first study to explore the association between oral health status and characteristics of HNC in patients in Korea. Collaboration

Table 2. Oral status of participants with head and neck according to general and cancer characteristics

Variable	DT	MT	DMT	PI	GI	PD
Total (n = 40)	0 (0-7)	3 (0-17)	3.5 (0-18)	1 (0-3)	2 (0-3)	4 (2-8)
Sex						
Male (n = 35)	0 (0-7)	3 (0-17)	4 (0-18)	1 (0-3)	2 (0-3)	4 (2-8)
Female (n = 5)	0 (0-2)	2 (0-8)	2 (0-8)	1 (0-3)	2 (0-3)	4 (3-6)
Age (yr)						
≤59 (n = 18)	0 (0-7)	2.5 (0-9)[a]	3 (0-9)	1 (0-3)	2 (0-2)	3.5 (2-7)
≥60 (n = 22)	0 (0-5)	4 (0-17)[a]	4.5 (0-18)	2 (0-3)	2 (0-3)	4 (2-8)
General disease						
No (n = 21)	0 (0-7)	2 (0-15)	4 (0-18)	1 (0-3)	2 (0-2)	33 (2-8)
Yes (n = 19)	0 (0-5)	3 (0-17)	3 (0-17)	2 (0-3)	2 (0-3)	4 (2-7)
Smoking						
None (n = 19)	0 (0-3)	1 (0-17)	1 (0-18)	1 (0-3)	2 (0-3)	3 (3-6)
Current (n = 21)	0 (0-7)	3 (0-17)	5 (0-17)	1 (0-3)	2 (0-3)	4 (2-8)
Drinking						
None (n = 17)	0 (0-2)[a]	1 (0-17)	1 (0-17)	1 (0-3)	2 (0-3)	3 (2-6)[a]
Current (n = 23)	1 (0-7)[a]	3 (0-17)	5 (0-18)	2 (0-3)	2 (0-2)	4 (3-8)[a]
Cancer type						
SCC (n = 30)	0 (0-6)	3 (0-17)	5 (0-18)	1 (0-3)	2 (0-3)	4 (2-8)
Others (n = 10)	0 (0-7)	1.5 (0-8)	2 (0-9)	1.5 (0-3)	1.5 (0-3)	4.5 (3-6)
Cancer site						
Larynx (n = 11)	0 (0-6)	7 (0-17)	12 (0-17)	2 (0-3)	2 (0-3)	4 (3-7)
Nasopharynx (n = 5)	0 (0-3)	8 (0-15)	8 (0-18)	1 (0-3)	2 (0-3)	3 (2-6)
Floor of mouth (n = 3)	0 (0-0)	5 (2-9)	5 (2-9)	0 (0-3)	2 (2-2)	3 (2-7)
Tonsil (n = 3)	2 (0-5)	2 (1-3)	5 (1-7)	1 (0-3)	0 (0-2)	3 (3-7)
Saliva gland (n = 3)	0 (0-7)	0 (0-2)	0 (0-9)	1 (0-2)	1 (0-2)	4 (3-5)
Etc. (n = 10)	0 (0-1)	2.5 (0-7)	2.5 (0-8)	1 (0-3)	5 (0-2)	4 (3-8)

Values are presented as median (range). Total results for each variable may be different due to missing values. DT, decayed teeth; MT, missing teeth; DMT, decay or missing teeth; PI, plaque index; GI, gingival index; PD, probing depth; SCC, squamous cell carcinoma. [a]Data indicates statistical significance shown by Mann-Whitney U-test or Kruskal-Wallis test ($P < 0.05$).

between dental and medical teams may promote patients' general and oral health.

There was no correlation between oral health parameters and HNC characteristics. Regardless of the site or type of cancer, effective prevention and management of dental caries and periodontal disease should be implemented.

CONFLICTS OF INTEREST

No potential conflicts of interest were disclosed.

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