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Oral Health Management of Three Head and Neck Cancer Patients Performed by Dental Hygienists

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Abstract

Introduction: Oral health management is often difficult in patients after surgical tumor resection and/or radiotherapy due to defects, bulky flaps, limitation of tongue movement, and trismus. In addition, patients who have undergone radiotherapy have serious disabilities such as oral mucositis, mucosal weakening, soft tissue fibrosis, salivary gland disorder, and osteoradionecrosis. Dental hygienists must understand the characteristics of patients after surgical tumor resection and/or radiotherapy. In this report, the oral health management of three patients after maxillectomy, mandibulectomy, and radiotherapy was shown. **Case Description:** Case 1: A 53-year-old male patient visited our clinic after chemotherapy, radiotherapy, and partial maxillectomy for cancer of the right maxillary gingiva. Case 2: A 65-year-old male patient visited our clinic after radiotherapy for a right-sided tongue cancer, partial mandibulectomy of the right tongue to the oropharynx, a right-sided segmental mandibulectomy and a speech aid and a mandibular prosthesis were provided. Case 3: A 36-year-old female visited our clinic for radiotherapy for left-sided tongue cancer. Dental hygienists provided oral health management to the patients. In oral health management, it was suggested that intervention before cancer treatment, oral hygiene instructions tailored to patients' symptoms, and frequent professional care are important. **Conclusion:** Oral health management by dental hygienists is extremely important for patients under-

going maxillofacial cancer treatment to maintain their quality of life in the long term.

Keywords

Head and Neck Cancer, Dental Hygienist, Oral Health Management, Maxillectomy, Mandibulectomy, Interstitial Radiotherapy

1. Introduction

Preoperative oral health management reduces postoperative complications and is useful for preventing wound infections and aspiration pneumonia [1] [2] [3] [4] [5]. Perioperative oral hygiene management, maintenance, and improvement of oral functions are important issues that require a multidisciplinary approach. Oral health management is often difficult in patients after surgical cancer resection and/or radiotherapy due to defects, bulky flaps, limitation of tongue movement, and trismus. In addition, patients who have undergone radiotherapy have serious disabilities, such as oral mucositis, mucosal weakening, soft tissue fibrosis, salivary gland disorder, and osteoradionecrosis [6] [7] [8] [9]. Therefore, oral health management should consider these factors. Surgical reconstruction and prosthetic rehabilitation are provided to these patients to improve treatment-related dysfunctions [10] [11] [12] [13] [14]. Dental hygienists must understand the characteristics of patients after surgical resection and/or radiotherapy. Maxillectomy patients have difficulty of mastication, dysarthria, dysphagia, unacceptable aesthetics, and xerostomia due to perforation between their nasal and oral cavity. Mandibulectomy patients have difficulty of mastication, dysphagia, mandibular deviation and salivation due to mandibular bone loss. Glossectomy patients have difficulty of mastication, dysarthria, dyskinesia, dysphagia. Radiotherapy patients have oral mucositis at an early stage, mucosal weakening, soft tissue fibrosis, salivary gland disorder, and osteoradionecrosis at late effects [15]. Prostheses applied to improve these functions and morphology, such as obturator prostheses, speech aids, palatal augmentation prostheses, and palatal lift prostheses, have complex structures and are easy to accumulate denture plaque, so that the prostheses become reservoirs for oral microorganisms, which can lead to aspiration pneumonia. For this reason, plaque control and cleaning the prosthesis are extremely important in perioperative oral health management. However, knowledge and techniques related to perioperative oral health management are not sufficiently provided in educational institutions for dental hygienists. At the Maxillofacial Prosthetic Clinic, Tokyo Medical and Dental University (TMDU) Hospital, Tokyo, Japan, dental hygienists and other medical professionals collaborated to manage oral health and improve the patient's quality of life. In this report, the oral health management of three patients after maxillectomy, mandibulectomy, and radiotherapy was shown.

To conduct this study, we explained to the research participants both in writ-

ing and orally that their participation was voluntary, that there would be no disadvantages if they refused to participate, that we would protect their personal information, and that we obtained their consent in writing.

2. Case Description

2.1. Case 1: A Case of Maxillectomy Patient

A 53-year-old male patient visited our clinic after chemotherapy, radiotherapy, and partial maxillectomy for cancer of the right maxillary gingiva. A maxillary obturator prosthesis was fabricated to close the palatal defect and offer functional and aesthetic rehabilitation. Subsequently, a dental hygienist provided oral hygiene instructions for oral health management (Figure 1).

2.1.1. The Content of Instruction

• Maxillary defect: The use of a mucous membrane brush was recommended to clean the maxillary defect effectively without leaving any residues. The patient was shown how to use and adjust the pressure applied on the brush.

• Residual maxillary teeth: The patient was informed that multiple abutment devices could be placed on the denture and that they could be easily stained. The patient was instructed on how to apply the toothbrush to the residual tooth near the maxillary defect.

• Residual mandibular teeth: The patient had an impaired self-cleaning effect of saliva on the right molars of the contralateral teeth of the defect, and lip tension caused by the scar was observed. The patient was informed that the right molars of the contralateral teeth of the defect were difficult to brush. We recommended the use of a partially brushed toothbrush and provided instructions on how to use it.

Figure 1. Case 1: Intraoral views at the start of oral hygiene instructions and the maxillary obturator prosthesis.

• A Maxillary obturator prosthesis: The patient was taught that food debris tended to accumulate on the inner surface of the maxillary obturator prosthesis, and was instructed on how to clean the denture with a denture brush and denture cleaner.

2.1.2. Course of Oral Health Management

The presence or absence of supragingival dental plaque was recorded using the O'Leary Plaque Control Record (PCR). The PCR score improved gradually over six months after the initial visit (Figure 2). Because maxillectomy patients are not able to brush their teeth on the right molars of the contralateral teeth of the defect and the residual tooth near the defect, supragingival dental plaque may remain attached to the teeth. Therefore, the patient visited our clinic regularly and underwent oral health management. Cleaning the maxillary defect was a challenge for patients in oral health management. A solution was found by using a mirror to confirm that the mucous membrane brush was hitting the maxillary defect. After 3 years and 4 months of oral health management, no inflammation of the defect, gingiva, or mucosa was observed. Furthermore, the maxillary obturator prosthesis was maintained clean (Figure 3). After this visit, the patient was instructed to continue to visit the clinic every six months to check the status of the maxillary defect, residual maxillary teeth, residual mandibular teeth, and a maxillary obturator prosthesis.

2.2. Case 2: A Case of Mandibulectomy Patient

A 65-year-old male patient visited our clinic after radiotherapy for right-sided tongue cancer, partial mandibulectomy of the right tongue to the oropharynx,

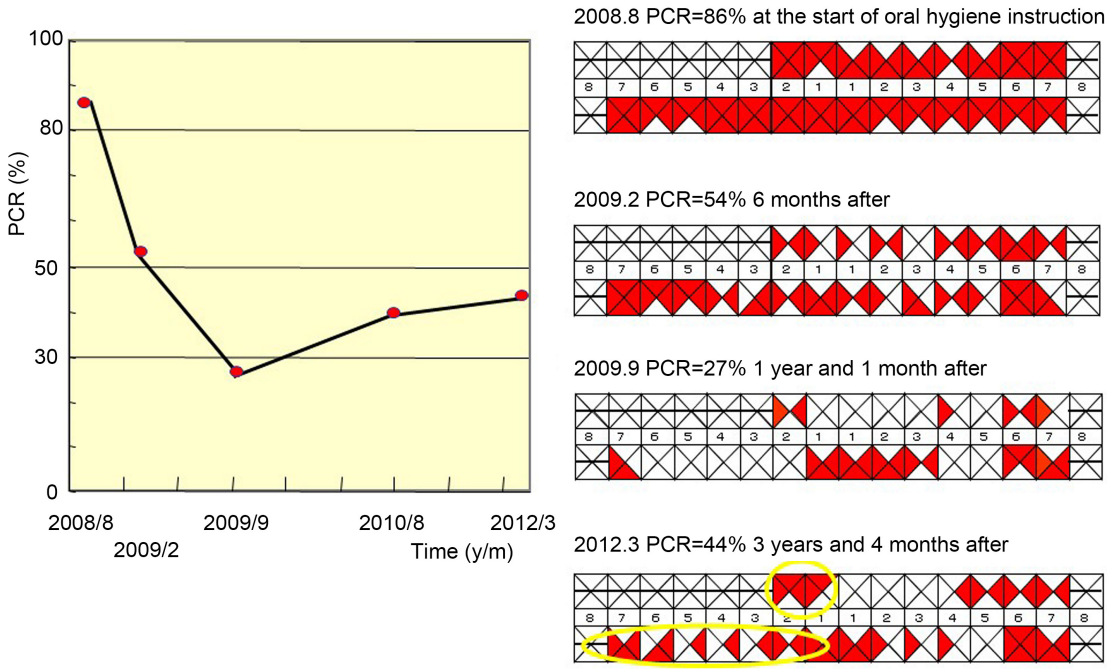

Figure 2. Case 1: Plaque control records.

Figure 3. Case 1: Intraoral views at 3 years and 4 months after oral hygiene instructions.

and right-sided segmental mandibulectomy. A speech aid and a mandibular prosthesis were delivered to the patient. Subsequently, oral hygiene instructions were provided for oral health management by the dental hygienist at the same time the mandibular prosthesis was made (**Figure 4**).

2.2.1. The Content of Instruction

- Tongue, reconstructed flap, and oral mucosa: Mandibulectomy patients tended to accumulate food debris due to xerostomia, dyskinesia, and dysphagia. Therefore, we recommend the use of sponge and mucous membrane brushes.
- Residual maxillary teeth: Mandibulectomy patients were observed for xerostomia, dyskinesia, and mandibular deviation and wore the speech aid all of the time, so that many supragingival dental plaque remained attached to the teeth.
- Speech aid and mandibular prosthesis: The patient was taught that denture plaque tended to accumulate on the speech aid and the mandibular prosthesis due to xerostomia, dyskinesia, and mandibular deviation. The patient was instructed how to clean the speech aid and the mandibular prosthesis using a denture brush and denture cleaner.

2.2.2. Course of Oral Health Management

Due to the patient's circumstances, a period of approximately one year goes on from the start of oral health management, and thus plaque control was poor. However, the patient began repeat oral health management every month thereafter and improved his plaque control (**Figure 5**). Periodontal disease was severe at the patient's first visit in 1998, 6 of the 11 teeth had lost, and the periodontal pocket depths ranged from 3 to 10 mm. By September 1997, the patient had lost three mandibular teeth, the mandible had become edentulous. By July 2007, the patient had lost 6 maxillary teeth. Because the patient wore a specially constructed prosthesis, it was thought that there would be a great deal of stress

on the residual teeth. While undergoing oral health management by a dental hygienist, patients understood that their oral cavity presented complex problems, including mandibular deviation, restriction of tongue movement, reconstructed flaps, and mandibular prostheses. The patient also wanted to visit our clinic every month to check their oral hygiene skills. As a result, the residual teeth were maintained through oral health management by a dental hygienist every month and daily self-care. After 12 years of oral health management, the maxillary mucosa was slightly erythematous but did not bleed easily. The speech aid and the mandibular prosthesis were kept clean despite repeated repairs (Figure 6).

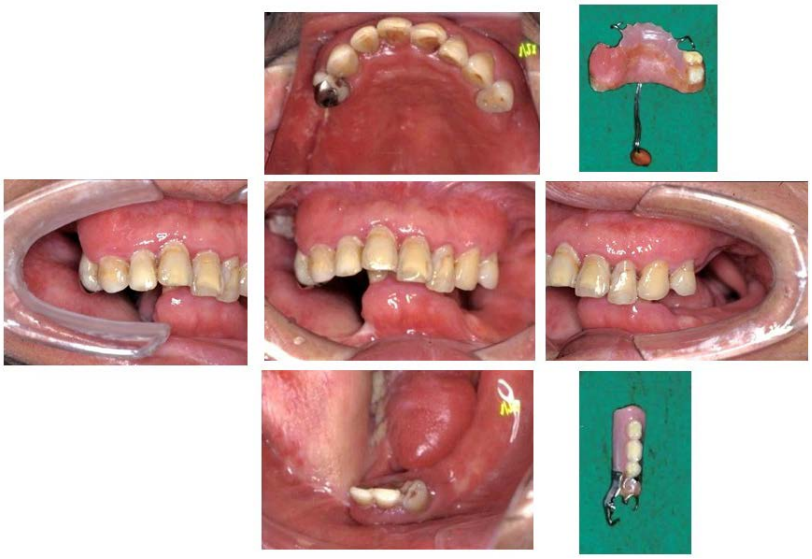

Figure 4. Case 2: Intraoral views at the start of oral hygiene instructions, the speech aid, and the mandibular prosthesis.

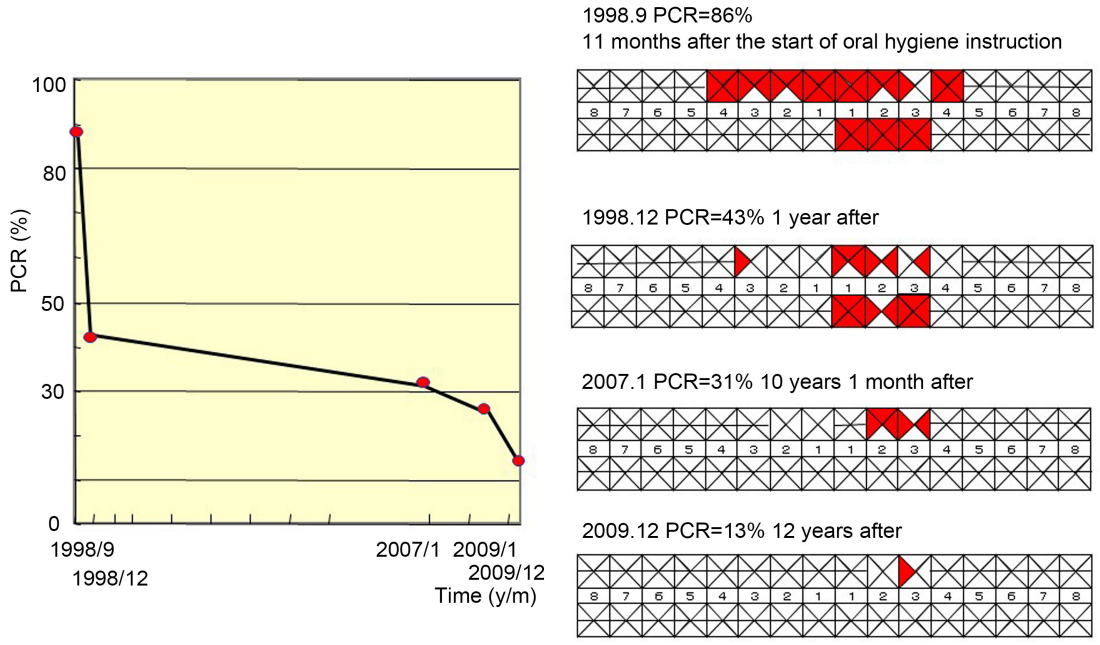

Figure 5. Case 2: Plaque control records.

Figure 6. Case 2: Intraoral views at 12 years after oral hygiene instructions, the speech aid, and the mandibular prosthesis.

2.3. Case 3: A Case of Interstitial Radiotherapy Patient

A 36-year-old female visited our clinic in February 2001 for radiotherapy of left-sided tongue cancer. Oral hygiene instructions were provided for oral health management by the dental hygienist at the same time the radiotherapy appliance was fabricated (**Figure 7**) [16] [17]. After that, the interstitial radiotherapy, 137Cesium (Cs) needle implant, was performed (total 70 Gy). One year and nine months after irradiation, neck dissection was performed because of metastasis to the lymph nodes.

2.3.1. The Content of Instruction

• Before interstitial radiotherapy: To maintain oral hygiene until the start of interstitial radiotherapy, the patient was instructed to floss and brush with a toothbrush and fluoridated toothpaste. Since dental hygienists were unable to intervene during interstitial radiotherapy, the patient was instructed to follow the radiologist's instructions regarding the use of mouthwash and toothbrushes. The patient was also instructed to brush the irradiated side so that she could resume brushing after the radiologist had allowed it.

• Immediately after interstitial radiotherapy: Plaque removal procedure using an exploration of a toothbrush and application of fluoride gel was performed approximately every week, considering the patient's pain level and oral conditions. A soft-bristled toothbrush was used depending on the condition of the oral mucosa and instructions for proper self-care were provided. The patient was also educated on the contraindications to dental treatment after interstitial radiotherapy, such as tooth extraction and the limitations of denture fabrication.

• After interstitial radiotherapy: The dental hygienist listened to the patient's concerns and the joy that the patient's oral condition had recovered. The dental hygienist also provided instructions on efficient self-care according to patients' oral conditions.

Figure 7. Case 3: Intraoral views at the start of oral hygiene instructions and the radiotherapy appliance.

2.3.2. Course of Oral Health Management

Although the dental hygienist was unable to record the plaque scores using a staining solution because of the patient's pain level at the first visit, plaque control was satisfactory, except during interstitial radiotherapy and during the onset of oral mucositis (**Figure 8**). Plaque was easy to accumulate around the misaligned teeth, but this improved with oral health management from a dental hygienist. During oral health management prior to interstitial radiotherapy, the patient was concerned about the onset of oral mucositis, dyskinesia, and dysarthria that would develop after interstitial radiotherapy. The dental hygienist was able to build a trusting relationship with the patient by carefully listening to the patient's concerns. This, in turn, led to increased motivation for the patient's oral health. After 8 years and 4 months of oral health management, oral hygiene conditions remained stable (**Figure 9**). There was also no evidence of functional impairment, such as tongue dysmotility or dysphagia.

3. Discussion

In this study, we reported perioperative oral health management of three head and neck cancer patients performed by dental hygienists. Dental hygienists should understand various functional and morphology disorders of patients with head and neck cancer to instruct oral health management. Because postoperative oral conditions and tongue movement would be extremely changed [10]-[15], plaque accumulation is often occurred and caused aspiration pneumonia. Prostheses applied to these patients have complex structures and patients could not keep clean their prostheses without appropriate instructions [18] [19]. Therefore, perioperative oral health management is very important to maintain oral health and prevent aspiration pneumonia [1] [2] [3] [4] [5].

3.1. Main Points of Oral Health Management in the Case of Maxillectomy Patient

The maxillectomy patient leaves a connection between the oral and nasal cavity

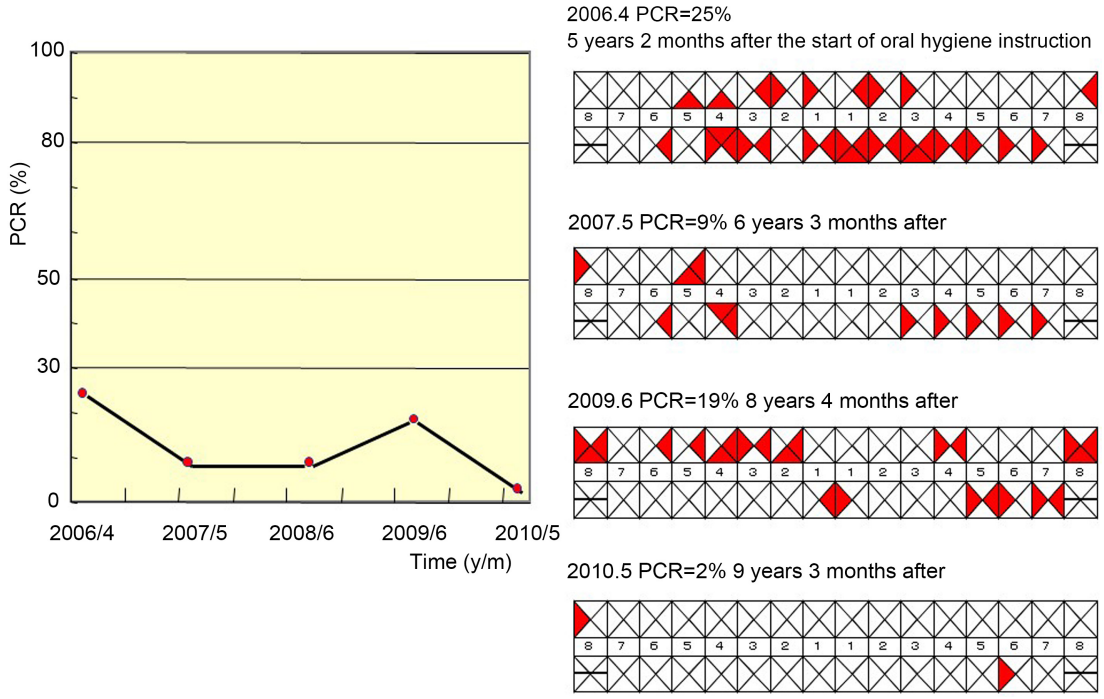

Figure 8. Case 3: Plaque control records.

Figure 9. Case 3: Intraoral views at 8 years and 4 months after oral hygiene instructions.

with maxillary and palatal resection. As a result, patients with maxillary defects have various functional disorders, affecting chewing, speech and swallowing especially [12]. In the case of our maxillectomy patient, functional impairment also occurred, with various effects on the oral cavity. The main points of oral health management were maxillary defect, self-cleaning effect of saliva, lip tension, the maxillary obturator prosthesis, and abutment teeth. The maxillary defect was

difficult to clean because of its position and size. The selection and use of cleaning tools needed to be explained to maxillectomy patients according to their brushing proficiency. It is also important to explain the characteristics of the maxillectomy patient's oral environment, such as limitations on the direction of toothbrush insertion for lip tension and impairment of the self-cleaning effect of saliva on the contralateral teeth of the maxillary defect. Since the oral cavity is closely connected to the nasal cavity, nasal discharge and food debris can easily accumulate in the maxillary obturator prosthesis. Therefore, the cleaning status of the maxillary obturator prosthesis and condition of the mucosa around the maxillary defect must be carefully evaluated. The maxillary obturator prosthesis was directly supported by the residual tooth near the maxillary defect. Therefore, it is important to care for residual maxillary and abutment teeth.

3.2. Main Points of Oral Health Management in the Case of Mandibulectomy Patient

Mandibulectomy patients have difficulty of speech, mastication, and swallowing [20]. Mandibulectomy patients wear a mandibular prosthesis to restore these dysfunctions. In the case of our mandibulectomy patient, the mandibular prosthesis also improved the patient's quality of life. The main aspects of oral health management were mandibular deviation, restriction of tongue movement, reconstructed flaps, the mandibular prosthesis. Because mandibular deviation and restricted tongue movement impair the self-cleaning effect of saliva, it is necessary for dental hygienists and patients to focus on the characteristics of mandibulectomy patients. In addition, it is important to select and use cleaning tools depending on the location and extent of the reconstructed flap. The structure of the mandibular prosthesis is complex, and denture plaques tend to accumulate. Mandibulectomy patients need to wear a mandibular prosthesis in their daily lives to restore lost function. If the mandibular prosthesis is not removed from the oral cavity, denture stomatitis and mucous membrane inflammation are likely to occur, so the denture must be removed as appropriate and cleaned every day. Denture cleaning should involve mechanical cleaning with denture cleaning brushes and water and scientific cleaning with denture cleanser. Denture cleanser should be used at least once every two days. Therefore, it was necessary to explain how to use and clean the prostheses and check the condition of the oral mucosa.

3.3. Main Points of Oral Health Management in the Case of Interstitial Radiotherapy Patient

Radiotherapy patients have salivary gland disorder at late effects, and xerostomia continues for a long time [6]. However, xerostomia was not observed in our case of radiotherapy patients. To avoid osteoradionecrosis is also important. We considered that a radiotherapy appliance was effective to protect the salivary glands and bone from radiation during interstitial radiotherapy. Furthermore, oral mucositis occurs almost always in patients who have undergone interstitial radi-

otherapy [7] [8]. It is important for dental hygienists to teach patients the significance of observing and cleaning their own mouths during interstitial radiotherapy.

The important points of oral health management are the timing of the intervention, oral mucositis, and post-radiotherapy disorders. Dental hygienists carefully explained the importance of oral health management before interstitial radiotherapy. Therefore, the patient's oral hygiene was kept clean until pre-interstitial radiotherapy, and the patient maintained her motivation for oral hygiene management after interstitial radiotherapy. Oral moisturizers are also effective to improve dry mouth [21]. When oral mucositis reached its peak, the patient's pain was at its maximum and oral hygiene status deteriorated; however, brushing was resumed once the oral mucositis recovered. During the period between the onset and resolution of oral mucositis, it is necessary for dental hygienists to be related to the patient as often as possible and practice oral care tailored to the patient's oral symptoms. In this case, the use of a radiotherapy appliance minimized the incidence of post-radiotherapy disorders, especially osteoradionecrosis. Therefore, the patient was able to undergo the same dental treatment as the general patient, except that aggressive scaling and root planning were avoided because of the risk of osteoradionecrosis. Additionally, the patient maintained a satisfactory oral environment after long-term oral health management.

Oral health management of patients with maxillectomy, mandibulectomy, and interstitial radiotherapy was considered generalizable by utilizing an assessment sheet for each case. However, no generalized assessment sheet exists. In addition, as discussed in this report, patients who have undergone maxillectomy, mandibulectomy, and interstitial radiotherapy have a variety of issues that need to be addressed according to their individual challenges. A future task is to develop an assessment sheet that can be used for oral health management of patients who have undergone maxillectomy, mandibulectomy, and interstitial radiotherapy.

4. Conclusion

Oral health management by a dental hygienist is extremely important for patients undergoing maxillofacial cancer treatment to maintain their quality of life in the long term. In oral health management by dental hygienists, it is necessary to intervene before cancer treatment, provide oral hygiene instructions tailored to patients' symptoms, and provide frequent professional care.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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