

# Oral care experiences with 181 nasopharyngeal carcinoma patients receiving radiotherapy in a Taiwanese hospital

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## Abstract

**Objective:** The aim of this study is to present our experiences of the oral care of a cohort of nasopharyngeal carcinoma (NPC) patients before receiving radiation therapy in our institution.

**Patients and methods:** A total of 181 (141 males and 40 females) pre-radiation therapy NPC patients who underwent regular recall dental examination and treatment according to a standard protocol of our Dental Department were collected.

**Results:** One hundred and twelve (68.71%) did not have disease recurrence and only 12 patients (7.36%) had metastasis. The rate of expire was 14.92%. The average number of carious tooth was 2.45 (range: 0–16) whereas the mean number extracted tooth was 2.65 (range: 0–14). One hundred and sixty-four patients were recorded to have suffered from oral mucositis. About 7% patients had oral mucositis in the 1st week, but about 50% of patients developed oral mucositis from the 2nd week to the 3rd week after the beginning of radiotherapy. One hundred and thirty-three patients had records of oral infection. About 67% of the patients suffered from candidiasis during radiotherapy. Xerostomia was found in almost 80% of patients during radiation therapy. The mean number of carious tooth of the patient population during/after radiation therapy was significantly higher than the patient population before radiation therapy ( $7.18 \pm 7.10$  vs.  $2.45 \pm 2.85$ ;  $\chi^2 = 46.32$ ,  $p < 0.0001$ ). Eighty-four patients were regularly followed-up and the rate of lost follow-up was about 53.6%. One hundred and eighteen patients had custom-made fluoride trays fabricated. As comparing patients with fluoride trays to those without, the former had a significantly higher rate of dental follow-up compliance ( $\chi^2 = 48.56$ ,  $p < 0.0001$ ).

**Conclusions:** The data and protocol presented in this study would enhance the care and life quality of the NPC patients. Our study showed that a pre-radiotherapy dental care regimen should be conducted simultaneously with the patient's treatment plan to treat the disease. Fluoride tray fabrication is recommended for dentate NPC patients receiving radiation therapy, as it may enhance compliance with dental follow-up.

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**Keywords:** Nasopharyngeal carcinoma; Oral care; Dental compliance; Follow-up

## 1. Introduction

In Western countries, nasopharyngeal carcinoma (NPC) is a rare head and neck malignancy (less than 1 per 100,000 population per year), but it is not an uncommon disease in the Chinese population. Regarding its worldwide distribution, NPC occurs mainly in Southeast Asia, especially in Guangdong, Hong Kong, Singapore and Taiwan [1]. In Taiwan, according to data from the National Health

Administration in 2000, the age-adjusted incidence rate of NPC for every 100,000 people is 11.19 in males and 4.35 in females [2]. Moreover, NPC is one of the 10 major causes of cancer mortality in our country.

Nasopharyngeal carcinoma occurs in the nasopharynx, situated in the upper throat and behind the nasal cavity, close to the base of the skull. Due to this awkward position, a surgical approach to an NPC is complicated. Therefore, since NPC is sensitive to radiation, the main treatment modality is either radiotherapy or combined radiotherapy–chemotherapy. Since the region targeted by radiotherapy includes the nasopharyngeal, retropharyngeal, jugulodigastric, low neck, posterior chain and supraclavicular lymph nodes [3,4], irradiation of the entire oral cavity as well as the

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primary salivary glands is unavoidable. The advent of new technology for radiation therapy, such as Intensity-Modulated Radiation Therapy (IMRT), has successfully reduced the area irradiated as well as the radiation dose, resulting in a prolonged life expectancy for the patient. However, the spectrum of subsequent complications including neuroendocrine dysfunction, serous otitis media, acute oral mucositis, oral candidiasis, trismus, and xerostomia still severely affects the quality of life of surviving patients [4–6]. Particularly, the complication of irreversible salivary gland damage and dysfunction, such as radiation caries, fragile oral mucosa, swallowing difficulties and denture complications, present long-term challenges to both dentists and oncologists. In addition, the motivation and attitude of patients towards dental care will influence their dental follow-up compliance.

The purpose of this retrospective study is to describe the oral condition and the treatment modalities of a population of NPC patients before receiving radiation therapy in a Taiwanese hospital. The relationship between oral care management and radiation treatment is also addressed.

**2. Patients and methods**

A total of 181 NPC patients before receiving radiation therapy, referred chiefly from the departments of ENT and Radiation/Hematological Oncology, visiting the Dental Department of our institution from January 1999 to September 2004 were included in the present retrospective study. The hospital records of pathological diagnosis, disease stage, potential risk factors (cigarette smoking, alcohol drinking, and betel-quid chewing), Epstein-Barr (EB) virus serum test, treatment modality, oral condition and

oral complications were derived from the charts of the patients. The disease stage was categorized as I–IV according to the guidelines of the American Joint Committee on Cancer (AJCC) [7].

The treatment protocol of the Department of Radiation Oncology of our institution using a linear accelerator was as follows: one time a day, 5 days every week, with a radiation dose of 180–225 cGy each time. These patients would undergo a regular recall dental examination and treatment according to a standard protocol of our Dental Department before radiation therapy (Fig. 1). For all dentate patients, a custom fluoride tray would be fabricated. A stone case with patient’s dentition will be duplicated upon alginate impression. Then, a thermo-plastic sheet (0.040, Soft EVA, Keystone, New Jersey, USA) was vacuum-adapted to the stone cast using a heat-suction advice (Erkopress ES2002, Erkodent, Pfalzgrafenweiler, Germany). The margin of the resultant tray was subsequently trimmed with a scissor (Fig. 2A). The patient would be instructed to wear the tray intraorally, filling with fluoride gel (1.23% APF or 2% NaF), for 4 min each day (Fig. 2B).

All the necessary dental treatments will be finished prior to radiation therapy whereas when the patients undergoing radiation therapy, regular dental follow-up will be scheduled for once for every week in order to handle any symptoms occurred immediately. After radiation treatment, the patients will continually be regularly followed, and if condition becomes stable, the patients will be appointed once in every month. Furthermore, we compare the number of carious tooth of those patients having oral care before radiation therapy ( $N = 181$ ) with those patients having oral care during/after radiation therapy ( $N = 42$ ) for the same period (January 1999–September 2004).

**Treatment protocol of oral care for radiotherapy patients**

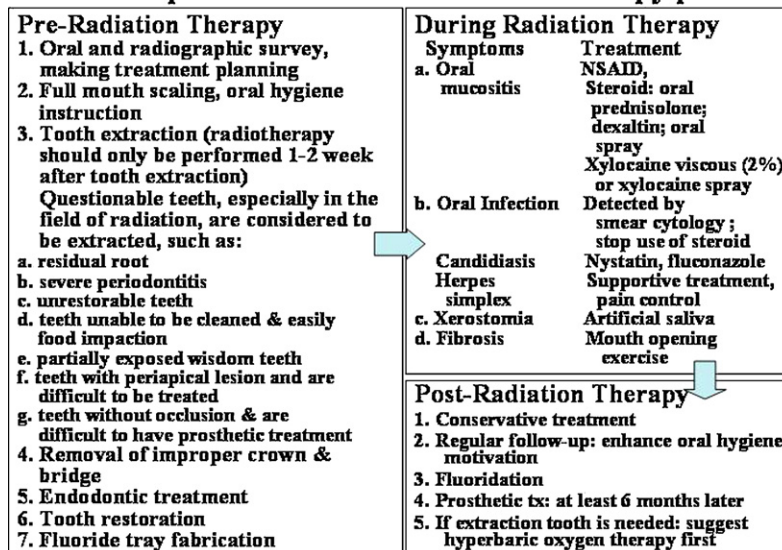


Fig. 1. Protocol for dental examination and treatment of irradiated head and neck cancer patients.

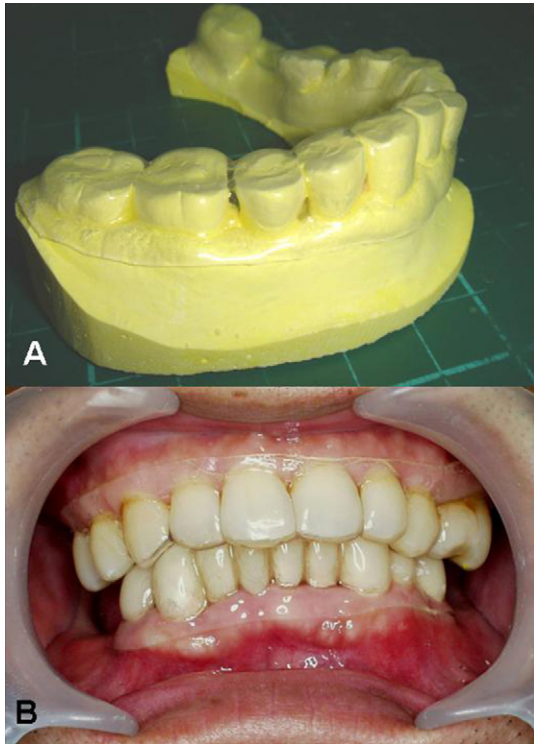


Fig. 2. A thermoplastic sheet is vacuum-adapted to the stone cast with the margin trimmed with a scissor (A). The patient is instructed to wear the tray intraorally for 4 min daily (B).

**3. Results**

The basic data of a cohort of 181 NPC patients before receiving radiation therapy in this study was recorded in Table 1. The majority of the patients ( $N = 111$ ) were 41–60 years old. Approximately 70% of the patients had an advanced stage NPC, i.e. stage III or IV. Approximate 50% of the patients smoked cigarettes and drank alcohol. Nearly 95% of the patients were found to have antibody to EB virus in their serum. One hundred and twelve (68.71%) did not have disease recurrence. Only 12 patients (7.36%) had metastasis. The number and rate of expire was 24 and 14.92%, respectively. The average number of carious tooth was 2.45 with a range of 0–16

Table 2  
Radiotherapy related oral symptoms

Period of occurrence of mucositis ( $N = 164$ )	No.	%	Oral infection ( $N = 133$ )	
			No.	%
1st week	12	7.3	Candidiasis	90 67.6
2nd week	37	22.6	Herpes simplex infection	10 7.5
3rd week	57	34.8	Co-infection	3 2.2
4th week	41	25.0	No infection	30 22.5
5th week	8	4.9		
6th week	3	1.8		
7th week	6	3.7		

whereas the mean number extracted tooth was 2.65 ranging from 0 to 14.

One hundred and sixty-four patients were recorded to have suffered from oral mucositis (Table 2). Only about 7% patients had oral mucositis in the 1st week, but about 60% of patients developed oral mucositis from the 3rd week to the 4th week, after the beginning of radiotherapy. One hundred and thirty-three patients had records of oral infection (Table 2). Candidiasis was the predominant oral infection with about 67% of the patients suffering from this condition during radiotherapy; 7.5% of patients had herpes simplex infection. Xerostomia was found in almost 80% of patients during radiation therapy. Importantly, the mean number of carious tooth of the patient population during/ after radiation therapy was significantly higher than the patient population before radiation therapy ( $7.18 \pm 7.10$  vs.  $2.45 \pm 2.85$ ;  $\chi^2 = 46.32$ ,  $p < 0.0001$ ).

A number of 84 patients were regularly followed-up in the present study (Table 3); the average number of carious tooth was 2.14 (range: 0–4). Patients who failed to return to the Dental Department for more than 1 year were regarded as lost to follow-up, the rate of which was as high as 53.6%. One hundred and eighteen patients had custom-made fluoride trays fabricated. For patients with fluoride tray fabrication, the rate of lost to follow-up was approximately 36% whereas for patients without fluoride tray fabrication was as high as about 87% (Table 3). Therefore, as comparing patients with fluoride trays to those without, the former had a

Table 1  
Basic information on the 181 patients in this study

	Sex		Age (years)*				Stage				Risk factors			EBV antibody	
	M	F	1-20	21-40	41-60	61-80	I	II	III	IV	A	B	C	+	-
No.	141	40	0	36	111	30	19	39	32	75	48	32	54	116	5
%	77.9	22.1	0.5	19.9	63.0	16.6	11.5	23.6	19.4	45.5	34.3	22.9	38.6	94.3	4.1

A: alcohol drinking; B: betel-quid chewing; C: cigarette smoking; M: male; F: female; EBV: Epstein-Barr virus. \*Mean age: 49.23; male, 49.52; female, 48.23.

Table 3  
Fluoride tray fabrication vs. cooperation

	With fluoride tray*	Without fluoride tray
<i>Follow-up duration</i>	118	63
3-6 months	70 (59.3%)	7 (11.1)
6~12 months	6 (5.1%)	1 (1.6%)
Lost to follow-up	42 (35.6%)	55 (87.3%)

\* $\chi^2 = 48.56, p < 0.0001$ .

significantly higher rate of dental follow-up compliance ( $\chi^2 = 48.56, p < 0.0001$ ) (Table 3).

#### 4. Discussion

Since irradiated head and neck cancer patients, including NPC patients, are at high risk of a series of oral complications (mostly rampant caries, oral infection, or xerostomia, as demonstrated in the present study) pre-radiation therapy oral care regimens have been implemented from 1997 in the Dental Department of our institution. In the beginning, we had some difficulties getting patients referred by the departments of ENT and Radiation/Hematological Oncology. However, after almost 2 years of communication with these departments, the referral of irradiated head and neck cancer patients, especially NPC patients, has increased (but could still be improved). Also during this time, a handbook was devised describing the necessity of oral care in irradiated head and neck cancer patients, and stressing the importance of compliance with long-term dental follow-up. Therefore, when a patient is diagnosed with NPC, it would be beneficial to the patient if oral care consultation in the Dental Department were initiated simultaneously with the cancer-focused treatment.

Oral care for NPC patients receiving radiotherapy is a complex issue. Besides alteration of the disease itself, the complications following radiotherapy, as well as the cooperation of the patients, influence the effectiveness of an oral care regimen. The long-term oral complications due to radiation therapy, such as xerostomia and rampant radiation caries, exert a negative effect on the quality of life of patients [8]. In our patients' series, most of the rampant caries were occurred with 1–2 years after completing radiation therapy. In order to minimize the need for extensive treatment in the future, prophylactic preventive measures before radiation therapy, as performed according to our Dental Department's protocol, might be the best approach. The same idea has also been suggested by two other reports [9,10] but our study

presents an up to date and detailed treatment protocol for these patients.

Considering the relationship between oral care management and radiation treatment, the prognosis of these 181 patients is good with a majority ( $N = 112, 68.71\%$ ) did not suffer from recurrence. Furthermore, only a minority ( $N = 12, 7.36\%$ ) had disease metastasis and the rate of expire was only about 15%. On the other hand, as indicated in this study, the rate of occurrence of oral mucositis and oral infection was still fairly high with about 50% of patients developing oral mucositis from the 2nd week to the 3rd week after radiotherapy and nearly 70% suffering from candidiasis during radiotherapy. However, these conditions could be dealt with appropriately providing the patients had regular dental follow-up. Significantly, no osteoradionecrosis was noted in the present patient series.

The mean number of carious tooth of the patient population during/after radiation therapy was significantly higher than the patient population before radiation therapy suggesting that radiation could aggravate the condition of carious tooth of those irradiated NPC patients without proper oral care. Consequently, oral care before radiation treatments could have an important impact to the adverse effect in the oral cavity induced by radiation.

From our experience with NPC patients receiving radiotherapy, the uptake of dental treatment prior to radiotherapy has usually been low and may be influenced by various factors. These patients had a series of dental check-ups and often a number of teeth were removed before radiotherapy. This would be a stress to the patient, especially for those who had not previously visited a dentist regularly, who previously sought help only for specific dental problems. Furthermore, the ability of patients to focus on dental problems, whilst dealing with the more immediate health concerns relating to the malignancy, may be impaired. The rate of loss to follow-up in this study is as high as 53%, which is similar to that in a recent report from Toljanic et al. [11] who reported a 12-year retrospective follow-up study in a dental depart-

ment on 334 irradiated head and neck malignancy patients. They stated that 51% patients lost to follow-up and 22% of them had only attended the initial dental appointment before radiotherapy. The average time until ‘follow-up failure’ was less than 1 year (7.5 months) [11]. Therefore, the dental follow-up compliance may be poor for both Asian and Western irradiated head and neck cancer patients. Pre-radiotherapy dental care regimens should take into consideration the possibility of patients being lost to follow-up.

Interestingly, our data indicated that fluoride tray fabrication had a significant impact on the dental follow-up compliance. This might be attributable to those patients who regularly used the fluoride trays having higher motivation and concern for their oral condition as well as their systemic health. Also, these patients would have a higher demand to improve their life quality. Moreover, these patients had to visit the Dental Department regularly in order to receive the fluoride gel and this could indirectly promote their compliance with dental follow-up. Our finding is compatible with a most recent report of Chambers et al. [12] who documented that intraoral fluoride releasing system could enhance patient compliance with prescribed oral hygiene to prevent caries formation.

## 5. Conclusion

Our data suggest that it would be beneficial to irradiated NPC patients if oral care consultation in the Dental Department were conducted simultaneously with the patients’ management plan to treat the disease. Also, fluoride tray fabrication is suggested for dentate NPC patients receiving radiation therapy, as it appears to have a positive effect on dental follow-up compliance.

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