

Effects of oral care on perioperative pediatric cancer patients

Toshiro Yamamoto^{1,2*}, Shigeta Takizawa^{1,2}, Makiko Otsubo², Yuki Miyagaki², Daisuke Matsui³, Tomoko Ichara⁴ and Narisato Kanamura^{1,2}

¹Department of Dental Medicine, Kyoto Prefectural University of Medicine, Graduate School of Medical Science, Kyoto, Japan

²Department of Dentistry, University Hospital Kyoto Prefectural University of Medicine, Kyoto, Japan

³Department of Epidemiology, Kyoto Prefectural University of Medicine, Graduate School of Medical Science, Kyoto, Japan

⁴Department of Pediatrics, Kyoto Prefectural University of Medicine, Graduate School of Medical Science, Kyoto, Japan

Abstract

Objective: Problems faced by pediatric and adult cancer patients differ, as the former include late-stage complications and development/educational issues derived from a longer course of disease after treatment. Oral care, aiming to enhance patients' QOL, is likely to be effective to address problems specific to pediatric cancer patients. This study examined the effects of specialized oral care to improve such patients' oral environments and QOL.

Methods: Pediatric cancer in patients receiving chemotherapy and radiotherapy in our University Hospital Medical Center for Children, for whom specialized oral care had been requested, were studied. The contents of the specialized oral care for them included: brushing guidance, dental tartar removal, and oral moistening, gargling guidance, and/or dental treatment in accordance with the type of oncological treatment. Before and after care, oral environments were assessed using an original sheet, while measuring oral moisture and bacterial levels, and conducting a questionnaire survey on patient satisfaction. The assessment sheet consisted of Revised Oral Assessment Guide (ROAG) items, in addition to those regarding halitosis, the mouth-opening degree, dental condition, changes in the gustatory sense, and oral mucositis. For the questionnaire survey, the Child Perceptions Questionnaire (CPQ) 8-10 sheet was used to comprehensively evaluate the pediatric patients' oral health-related QOL.

Results: The mean oral assessment score decreased after care, while there were no changes in the oral moisture or bacterial level. Regarding the questionnaire, the mean overall score decreased after care. Decreases were also observed in the score for each question with increases in the number of intervention sessions.

Conclusion: The maintenance and improvement of oral hygiene through specialized oral care are important to appropriately treat late-stage complications and provide health management education for pediatric cancer patients. In this study, specialized oral care was effective to improve such patients' QOL.

Introduction

Cancer is the leading cause of clinical death among children. Pediatric cancer is difficult to prevent than adult cancer because it is not associated with lifestyle-related diseases. In addition, the development of treatment and medicine for pediatric cancer is delayed due to the small number of cases. Pediatric cancer treatment at the growth and developmental stages is at risk for late-stage complications such as developmental disorders, endocrine disorders, organ disorders, gonadal disorders, brain dysfunction, the development of secondary cancers and the increase in economic and psychosocial burdens after treatment. Furthermore, issues such as returning to school, working, marriage and childbirth require long-term support for patient education and independence as well as for families. As mentioned above, QOL is impaired in pediatric cancer patients.

Oral care, aiming to enhance patients' QOL by preventing and reducing adverse events or complications related to cancer treatment, is likely to be effective to address problems specific to pediatric cancer patients [1-3]. Therefore, the initiation of oral care-based intervention when a cancer diagnosis is established may also be useful in pediatrics. In pediatric cancer treatment, objective and subjective assessment indices differ, and they are under the marked influences of environmental factors. Studying adolescents' and young adults' QOL has been reported to be key to accurately predicting their health conditions as part of

pediatric cancer treatment [4]. In order to provide high-quality oral care services, it is also important to promote active liaison between dentistry and medicine, and feed the results of subjective evaluation of the effects of dental approaches on pediatric patients' QOL back to medical professionals [3].

Therefore, a study was conducted to clarify the effects of oral care on pediatric cancer patients by assessing their oral environments.

Subjects and methods

Subjects

Pediatric cancer in patients receiving chemotherapy and radiotherapy in the Medical Center for Children of the university hospital, for whom specialized oral care had been requested, were studied (Table 1).

***Correspondence to:** Toshiro Yamamoto, Department of Dental Medicine, Kyoto Prefectural University of Medicine, Graduate School of Medical Science, 465, Kajii-cho, Kawaramachi-Hirokoji, Kamigyo-ku, Kyoto, 602-8566, Japan, Tel: 81752515641; Fax: 81752515641; E-mail: yamamoto@koto.kpu-m.ac.jp

Key words: oral care, pediatric cancer, perioperative period

Received: June 17, 2019; **Accepted:** July 08, 2019; **Published:** July 12, 2019

Specialized oral care

The contents of the specialized oral care performed by dentists or dental hygienists for them included: brushing guidance, dental tartar removal, and oral moistening, gargling guidance, and/or dental treatment in accordance with the type of oncological treatment using behavioral modification (TSD method, operant conditioning

with reinforcement, systematic desensitization method, 10 count method). Furthermore, in order to educate not only patients but also parents about the necessity of oral care, we visited frequently and gave lectures using media (picture-story show, model). Before and after the specialized oral care, oral environments were assessed using an original sheet (Table 2) based on the Revised Oral Assessment Guide (ROAG) developed by Andersson [5] and Common Toxicity Criteria for Adverse

Table 1. Details of cases

Case	Age	Sex	Diagnosis	Chemotherapy	Duration of hospital stays (Day)	Radiation (Gy)
1	8	Male	Leukaemia	Cytarabine, methotrexate	173	0
2	6	Male	Leukaemia	Methotrexate	249	0
3	6	Female	Neuroblastoma	Carboplatin, etoposide	644	100.8
4	9	Male	Leukaemia	Methotrexate	221	50
5	12	Female	Neuroblastoma	Cyclophosphamide, dacarbazine	3072	100.8
6	6	Male	Leukaemia	Mitoxantrone	356	0
7	11	Male	Medulloblastoma	Carboplatin, etoposide	667	55.8
8	6	Female	Neuroblastoma	Ifosfamide	533	60.6
9	6	Female	Osteosarcoma	Pirarubicin	486	0

Table 2. Oral assessment using an original sheet

ID	Perioperative Cancer Assessment Sheet						Note	
Name	Sex		1. Male 2. Female	Age (yrs.)	1. 0-20 2. 21-30 3. 31-40 4. 41-50 5. 51-60 6. 61-70 7. 71-80 8. 81-90			
Anticancer drugs	1. Yes 2. No		Drug name (product name)					
			Please indicate the name in the space to the right.					
Carcinoma	Type	Select the type from the following, and indicate it in the space to the right (multiple answers allowed)						
		1. Alkylating drugs 2. Antimetabolic drugs 3. Plant alkaloids 4. Molecular-target drugs 5. Hormone drugs 6. Anticancer antibiotics 7. Biological response modifiers 8. Others						
Classification	Name of the diagnosis							
	Please indicate the name in the space to the right.							
Radiotherapy	1. Yes 2. No			Radiation site				
	Radiation dose			Radiation frequency				
Vocalization	1: Normal		2: Low or hoarse voice			3: Difficult to speak		
Swallowing	1: Normal swallowing		2: Painful			3: Unable to swallow		
Lips	1: Smooth and pink		2: Dry or cracked and/or angular cheilitis			3: Ulcers or bleeding		
Tongue	1: Pink and moist with the papillae visible 2: Dry with the papillae invisible or red/white 3: Very thick white coating, vesicles, or ulcers							
Saliva	1: No resistance between the mirror and mucosa 2: Resistance slightly increases, but the mirror does not touch the mucosa 3: Resistance clearly increases, and the mirror touches or nearly touches the mucosa							

Mucosa	1: Pink and moist 2: Dry and/or red, purple, or white 3: Marked redness or thick white coating		
Gingiva	1: Pink and firm 2: Swollen and/or red 3: Easily bleeding when pressed by hand		
Tooth/denture cleanliness	1: Clean 2: 1) Plaque and/or food residue in some parts; 2) Caries and/or denture damage 3: Plaque and/or food residue throughout the oral cavity		
Halitosis	1: Not perceivable 2: Perceivable at a distance of less than 30 cm from the mouth 3: Perceivable even at a distance of more than 30 cm from the mouth		
Mouth-opening degree	1: Able to open the mouth independently without limitations 2: Able to open the mouth independently with limitations (a breadth of 2 horizontal fingers); Unable to open the mouth independently due to consciousness disturbance, but it is passively and manually openable 3: Mouth-opening is limited to a breadth of 1 horizontal finger or less due to bruxism or mandibular contracture		
Dental condition	1: There is no tooth requiring dental treatment 2: There is a tooth/teeth that may interfere with care or be a source of infection 3: There is a tooth/teeth requiring early dental treatment such as tooth extraction and grinding		
Changes in the gustatory sense	1: Unchanged 2: There are changes in the gustatory sense, but they do not influence diet 3: There are changes in the gustatory sense, influencing diet (e.g., oral intake of dietary supplements); an uncomfortable or unpleasant taste; a loss of taste sensation		
Oral mucositis	1: Absent 2: Painless ulcer or erythema, or mild pain derived from unidentified lesions 3: Painful erythema, edema, or ulcer, but able to eat and swallow 4: Painful erythema, edema, or ulcer, and intravenous fluid injection is required 5: Severe ulcer, and tube or intravenous feeding or preventive intubation is required		
Site	Lateral Vertical	1. Left 1. Maxilla	2. Right 2. Mandible
Lesion	Ulceration Erythema Edema Dysphagia/painful swallowing Skin erosion Pseudomembrane Bleeding	1. Painless 1. Present 1. Present 1. Present 1. Present 1. Present 1. Bleeding due to mild external injury	2. Painful 2. Absent 2. Absent 2. Absent 2. Absent 2. Absent 2. Tissue necrosis (major spontaneous bleeding)
Graphical representation			
Please indicate any figures as a reference, if possible.			

Events Ver. 3.0 (CTCAE) established by the National Cancer Institute (NCI) [6]. The sheet comprised questions regarding halitosis, the mouth-opening degree, dental condition, changes in the gustatory sense, and oral mucositis, in addition to the ROAG items. Subsequently, the oral moisture level in the central part of the dorsum of the tongue was measured using an oral moisture meter (Mucus®, LIFE, Co., Ltd., Saitama), while bacterial counting was performed using a bacterial counter (Bacterial Counter®, Panasonic Healthcare Co., Ltd., Tokyo).

Patient satisfaction questionnaire survey and totaling

A patient satisfaction questionnaire survey was conducted before and after the specialized oral care. The Child Perceptions Questionnaire (CPQ) 8-10 sheet (Table 3) was used to comprehensively evaluate the pediatric patients' oral health related QOL [7]. Responses were scored as follows: 0: Never, 1: Once or twice, 2: Sometimes, 3: Often, 4: Almost every day/always.

The study was approved by the medical ethics committee of our university (EMB-C-323).

Results

Changes in oral environments

The mean ROAG score, as well as those related to halitosis, the mouth-opening degree, dental condition, changes in the gustatory

sense, and oral mucositis, decreased after the specialized oral care (Figure 1).

Oral moisture and bacterial levels

There were no intervention-related changes in the oral moisture or bacterial level (Figures 2 and 3).

Patient satisfaction questionnaire survey

The mean CPQ8-10 score, representing patient satisfaction, decreased after the specialized oral care (Figure 4). Decreases were also observed in the score for each question (regarding oral symptoms, functional limitations, or mental or social stability) with increases in the number of intervention sessions (Figure 5).

Discussion

Time-dependent decreases in assessment scores were observed after the specialized oral care, indicating improved oral environments. On the other hand, there were no marked changes in the oral moisture or bacterial level, possibly due to the subjects' young age and the consequent absence of a history of oral diseases. In fact, the oral moisture level was appropriate, and the bacterial level was 3 (1,000,000 cfu/mL) in the majority of patients before the intervention. As a result, specialized oral care may not have markedly influenced these items.

Table 3. The child perceptions questionnaire (CPQ) 8-10 sheet

Child Perceptions Questionnaire

1. Question matters

Today's date:

Are you a boy or a girl?

Boy 1 Girl 1

How old are you? _____

NOW A FEW QUESTIONS ABOUT YOUR TEETH AND MOUTH

How often have you had:

1. Troubles with your mouth and teeth?

Never 1

Once or twice 1

Sometimes 1

Often 1

Everyday or almost every day 1

2. How long are you troubled with the pain of a tooth and the mouth?

3. Pain in your teeth or mouth in the past 4 weeks?

4. Sore spots in your mouth in the past 4 weeks?

5. Pain in your teeth when you drink cold drinks or eat foods in the past 4 weeks?

6. Food stuck in your teeth in the past 4 weeks?

7. Bad breath in the past 4 weeks?

In the past 4 weeks, how often have you:

8. Needed longer time than others to eat your meal because of your teeth or mouth?

9. Had a hard time biting or chewing food like apples, corn on the cob or steak because of your teeth or mouth?"

10. Had trouble eating foods you would like to eat because of your teeth or mouth?

11. Had trouble saying some words because of your teeth or mouth?

12. Had a problem sleeping at night because of your teeth or mouth?

SOME QUESTIONS ABOUT YOUR FEELINGS

In the past 4 weeks, how often have you:

13. Been upset because of your teeth or mouth?

14. Felt frustrated because of your teeth or mouth?

15. Been shy because of your teeth or mouth?

16. Been concerned what other people think about your teeth or mouth?

17. Worried that you are not as good-looking as others because of your teeth or mouth?

QUESTIONS ABOUT YOUR SCHOOL

In the past 4 weeks, how often have you:

18. Missed school because of your teeth or mouth?
19. Had a hard time doing your homework because of your teeth or mouth?
20. Had a hard time paying attention in school because of your teeth or mouth?
21. Not wanted to speak or read out loud in class because of your teeth or mouth?

QUESTIONS ABOUT YOU BEING WITH OTHER PEOPLE

In the past 4 weeks, how often have you:

22. Tried not to smile or laugh when with other children because of your teeth or mouth?
23. Not wanted to talk to other children because of your teeth or mouth?
24. Not wanted to be with other children because of your teeth or mouth?
25. Stayed away from activities like sports and clubs because of your teeth or mouth?
26. Other children teased you or called you names because of your teeth or mouth?
27. Other children asked you questions about your teeth or mouth?

CPQ8-10 modified the English version of the questionnaire was used.

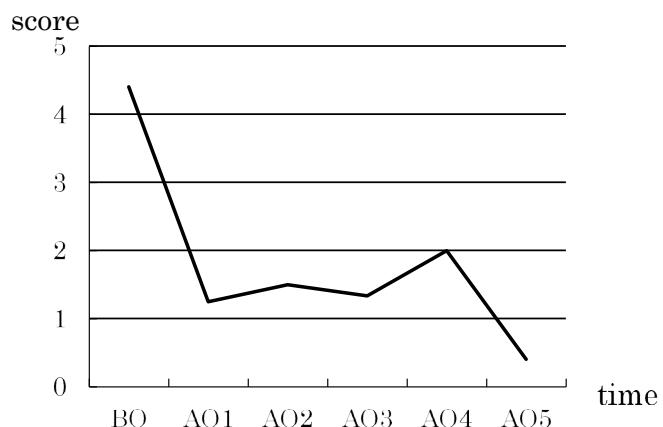


Figure 1. Changes in the mean assessment score

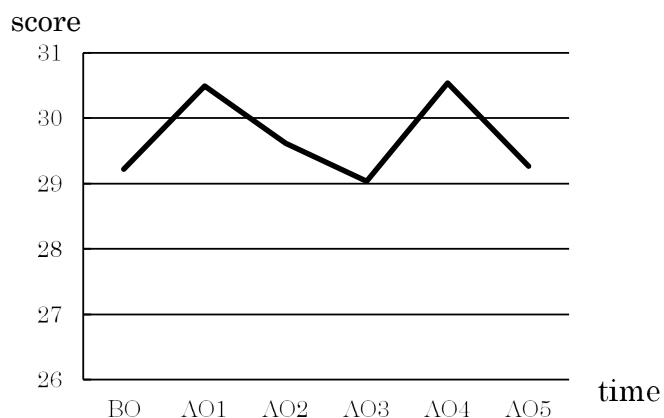


Figure 2. Changes in oral moisture

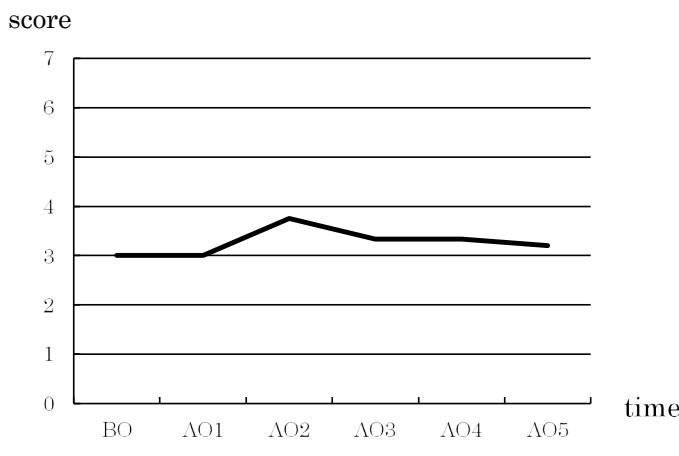


Figure 3. Change in bacterial count

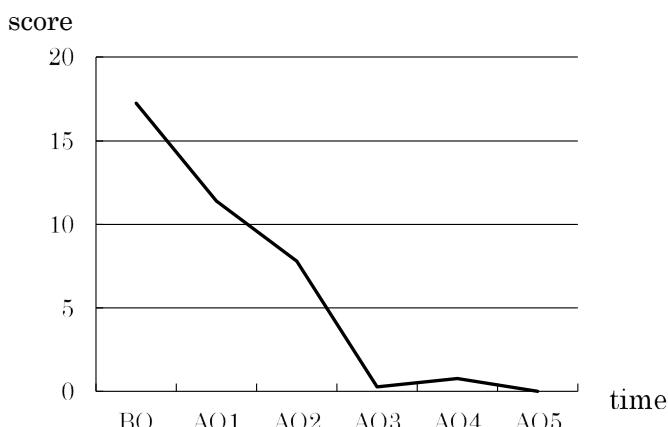


Figure 4. Changes in the mean CPQ8-10 score

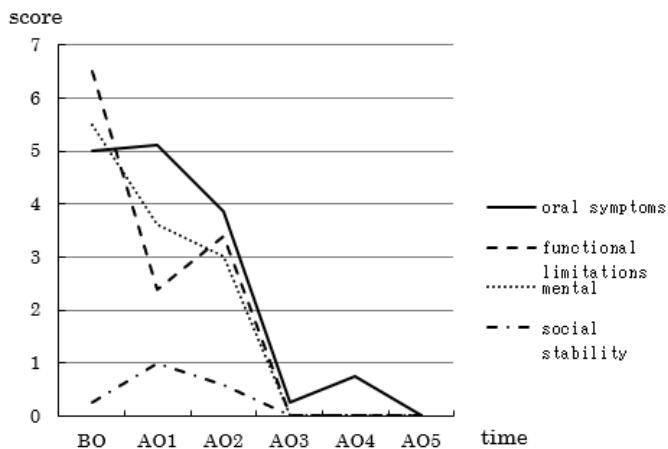


Figure 5. Changes in the mean score for each question

In the questionnaire survey, the CPQ score decreased after each intervention session, indicating an increase in the patient satisfaction level. After the fifth intervention session (Month 5), all of the scores related to oral symptoms, functional limitations, and mental/social stability decreased to 0, with the lowest assessment scores, confirming that the endpoints of specialized oral care had been achieved. In short, the oral hygiene status of patients with pediatric cancer

requiring long-term inpatient treatment was improved or maintained at 5 months after the initiation of intervention. The results also highlighted the necessity of further promoting support, which is not unilaterally provided by medical/dental professionals, but also covers psychological considerations for children and their parents, when performing specialized oral care. In this respect, the study confirmed the feasibility of unilateral, subjective assessment, involving medical professionals and pediatric patients, in addition to quantifying the outcomes of specialized oral care. Considering that studies on the effects of such care or patient satisfaction with it have rarely been conducted to the present, the study may have been of marked significance by examining its effects on pediatric cancer.

As future perspectives, oral hygiene improvement and maintenance may be important to appropriately manage late-stage complications in pediatric cancer patients, while providing health management education for them, and these approaches are likely to contribute to such patients' QOL.

Conclusion

On objectively evaluating specialized oral care for pediatric cancer patients, it was shown to improve their oral environments and satisfaction levels. Oral hygiene improvement and maintenance may be important to appropriately manage late-stage complications in pediatric cancer patients, while providing health management education for them, and these approaches are likely to contribute to QOL-oriented specialized oral care.

Acknowledgment

The progress of the research was advised and instructed by emeritus professor Yoshiyuki Watanabe. This research was conducted with research support for the 8020-research project.

References

1. Chiyadu PK, Yellamma B (2014) Oral and dental considerations in pediatric leukemic patient. *ISRN Hematology Article* 11.
2. Stephan TS, Edward GF (2002) Oral complications of cancer therapy. *Oncology* 16: 680. [\[Crossref\]](#)
3. da Fonseca MA (2004) Dental care of the pediatric cancer patient. *Pediatr Dent* 26: 53. [\[Crossref\]](#)
4. Matsuda T, Noguchi M, Umeno Y, Kato N (2006) QOL research in child health present state and issues. *Jpn J Public Health* 53: 805. [\[Crossref\]](#)
5. Pia A, Ingall RH, Stefan R (2002) Inter-rater reliability of an oral assessment guide for elderly patients residing in a rehabilitation ward. *Spec Care Dentist* 22: 181. [\[Crossref\]](#)
6. Common terminology criteria for adverse events v3.0 (CTCAE) National cancer institute (NCI): August 9, 2006. https://ctep.cancer.gov/protocoldevelopment/electronic_applications/docs/ctcaev3.pdf
7. Yamada H, Miura H, Usui Y, Sato T (2013) Development of the Japanese version of the child perceptions questionnaire (CPQ8-10_JP). *Pediatr Dental J* 23: 86.

Copyright: ©2019 Yamamoto T. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.