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Order-made Oral Care for the elderly based on an Assessment of their Independence and Oral Condition
—(Ⅲ)Efficacy of Oral Mucosa and Denture Cleaning for the Edentate Dependent Elderly—

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Abstract: Recently, the influences of oral micro-organisms on various systemic diseases have been clarified, suggesting the importance of oral care. In our previous study, we proposed a new classification with 9 categories of oral care needs for the elderly according to the degree of independence and the oral condition. In order to ensure safe and effective oral care of the dependent elderly even by carers or patients' family, we presented a new electrical oral brush with an automatic liquid supply/suction system (Dent. ERAC 910: LION DENTAL PRODUCTS). In addition, order-made oral care methods for each category were designed, and these methods were matched to the various categories. The effects of the care methods were microbiologically evaluated.

The purpose of this study was twofold: firstly to evaluate the effect of a newly developed electrical oral mucosa brush with automatic liquid supply/suction system, and secondly to evaluate a chemical and physical denture cleaning technique. The purpose of the brush and the cleaning technique was to establish an effective oral care method for the edentate dependent elderly with dentures. The number of Candida, as a parameter of oral hygiene, detected from the tongue, alveolar crest and dentures decreased with cleaning during a period of 5 days, with a statistical difference by ANOVA, suggesting the importance of daily cleaning of oral mucosa and dentures.

Key words: Category of oral care needs, Dependent edentate elderly, Micro-organisms, Mucosa brush with liquid supply/suction brush, denture cleaning

Introduction

It is well known that oral micro-organisms control on oral mucosa and dentures of the edentate elderly with care needs are very important in order to prevent oral candidiasis and systemic diseases such as aspiration pneumonia¹ ⁵). However, routine oral care consists mainly of denture cleaning for such elderly due to the risk of aspiration during tooth brushing and mouth rinsing.

In our previous study, we proposed a new classification with 9 categories of oral care needs for the elderly according to the degree of independence and the oral condition⁶). In order to ensure safe and effective oral care of the dependent elderly even by carers or patients' family, we presented a new electrical oral brush combined with automatic liquid supply/suction system (Dent. ERAC 910: LION DENTAL PRODUCTS)⁸ ⁹). In addition, order-made oral care methods for each category were designed, and an attempt was made to match the oral care methods to the categories. The effects of those care methods were microbiologically evaluated⁶ ⁷).

The purpose of this study was to evaluate the effect of the combination of our newly designed electrical oral mucosa brush with automatic liquid supply/suction system. This study aimed to evaluate the efficacy of oral mucosa and denture cleaning for the edentate dependent elderly.
supply/suction system and a chemical and physical denture cleaning technique. The purpose of the brush and the cleaning technique was to establish an effective oral care method on the edentate dependent elderly with dentures.

**Subjects and Methods**

The subjects were 4 edentate dependent elderly residents with dentures (aged 74~93 years) at a special nursing home for the elderly (100 beds) in Tokyo. We selected those volunteer subjects who had Candida above $10^3$ levels in their tongue, alveolar crest and dentures by preliminary examination. Informed consent was obtained from the subjects and their families before starting this study (Table 1).

Before this study was undertaken, the oral care of subjects had been routinely performed by rubbing the oral mucosa with gauze by washing dentures with a denture brush only once a day by carers. In the trial of the new oral care system, a newly developed mucosa brush (Fig. 1) attached to a liquid supply/suction system was used for mucosa cleaning. This brush is made of nylon (5 mil) to prevent injuring the oral soft tissue and the brush size is 24.5mm in length, 14.4mm in width and 10.0mm in height. The surface of the tongue and the alveolar crest were brushed with this system during oral cleaning, using 20ml of liquid tooth paste (Dent.ERAC : LION DENTAL PRODUCTS) applying about 100g weight for 3 minutes with a rubbing motion. For the denture cleaning, the denture surface was rubbed with the denture brush (Dent.ERAC 710M : LION DENTAL PRODUCTS, Fig. 2) applying about 200g weight for 1 minute, immediately after removing the denture from the subject’s mouth, and then immersed in the denture cleanser solution (Dent.ERAC : LION DENTAL PRODUCTS) for 15 minutes. Finally, the denture surface was again rubbed as in the first step.

The cleaning of oral mucosa and dentures was performed daily for 5 days (from Monday to Friday). The samples were taken before and after cleaning on 4 days : Thursday was excluded because of a routine medical check-up in the special nursing home. The effect of oral mucosa and denture cleaning was evaluated based on changes of the number of Candida.

Samples of oral micro-organisms were collected from the tongue on the right and left sides of the
midline, alveolar crest and denture by swabbing 10 times with a single stroke in the direction from posterior to anterior of about 20 mm in length with sterile cotton sticks before and after cleaning. The sample was smeared onto the culture medium of the BBL CHROMagarTM Candida (BD Biosciences) and incubated at 37°C for 48 hours, and then the Candida species were identified based on the color and morphology of colonies. Colonies were counted according to species.

Results

Fig. 3, 4 and 5 show the changes of mean number of Candida of 4 subjects detected on the tongue, alveolar crest and dentures over a period of 5 days of cleaning. On the first day, no change of the mean number of Candida was observed in any location before and after cleaning. However, with continuous cleaning for 5 days the mean number of Candida decreased to 1/10 on the tongue and alveolar crest, and to 1/100 on the dentures of baseline level at the final day, with a statistical difference by ANOVA (p<0.05).

Discussion

It was confirmed that the combination of cleaning with the newly developed electrical oral mucosa brush with automatic liquid supply/suction system and the chemical and physical denture cleaning decreased the number of Candida effectively in this study. Accordingly this oral care method is recommended for the edentate dependent elderly with dentures (Category: C III). With regard to the tongue cleansing, the number of Candida detected from the tongue did not change before and after cleaning on the first day after starting this study. The possible reasons were the difficulty of removal of tongue plaque due to the rugged surface of tongue and the variation of subject’s condition at the initial stage. Moreover, the rubbing time in this study seems to be too short to remove the Candida completely in some cases. In another study by the same authors, many projections with the plaque were...
observed on the tongue. Further study will be needed to make clear the most suitable time for completely cleaning the tongue, by checking the relationship between the structure of the tongue surface and the cleansing ability of the mucosa brush. In addition, daily tongue cleaning is also necessary for effective oral care.

With regard to the denture cleaning, the number of Candida detected from denture surfaces did not change before and after cleaning on the first day of this study. The reason of this phenomenon may be associated with the presence of numerous fine irregularities on the denture surface, microorganism invasion into them, a biofilm covering the irregular surface, the size of the bristle tip and the reaching ability of the toothbrush. Our study using SEM11) showed that numerous microorganisms invaded into the irregularities of an old denture plate used for a long time in the patient's mouth. This finding suggests that the removal of both the microorganisms inside the dentures and the biofilm formed in the defects is not easy. Further studies are necessary to evaluate completely methods for removing such microbes.

The reason why Candida detected from the dentures after 5 days cleaning was one tenth less than that detected from the tongue and alveolar crest seems to be due to the different cleansing methods.

However, it is clear that the daily cleaning of oral mucosa and denture is invariably effective for the oral care of the edentate elderly with care needs.

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References

抄録：近年、口腔細菌が高齢者の各種全身疾患に影響を及ぼすことが明らかとなり、口腔ケアの重要性が指摘されている。筆者らは、高齢者の口腔ケアを自立度（自立、一部介助、全介助）と歯磨け状態（歯数と義歯の有無）から9つのカテゴリーに分類した「高齢者口腔ケア分類表」を作成し、それぞれに対応したオーダーメードの口腔ケア方法を考案してその効果を細菌学的手法を中心に検討を進めている。

前報では、多数歯を有する要介護者の口腔ケアを安全かつ効果的に行なうために、清掃のための給水と誤嚥を防ぐための2段階の方法を用意し、その効果を細菌学的に明らかにした。さらに、有料老人ホームに入所者の自立度と要介護者に対して、現行行なっている口腔清掃法による口腔状態を細菌学的に評価し、その結果に基づいた個別の口腔ケア法を自立者およびヘルパーに提案し、その効果を明らかにした。

今回は、無歯頸で総義歯を有する要介護者の効果的な口腔ケア法を確立するために、特別養護老人ホーム入所者を対象に、粘膜と義歯の使用の組み合わせを変えて口腔ケアの方法とそれを用いる場合の効果を比較検討した。その結果、粘膜および義歯清掃によって、無歯頸で総義歯を有する要介護者にとって効果的な口腔ケア法であることが明らかとなった。

キーワード：口腔ケア分類表、要介護高齢者、口腔内微生態、給水吸引システム用粘膜ブラシ、義歯清掃

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