Abstract: The purpose of this pilot study was to develop a new oral care system based on a new classification of oral care needs. An electrical oral brush combined with an automatic liquid supply/suction system (Dent. ERAC 910, LION DENTAL PRODUCTS) was used on four dentate dependent elderly in a general hospital by nurses. The effectiveness of oral cleaning was evaluated microbiologically. The mean value of the anaerobe count in gargling water was at the level of $10^8\sim10^{10}$ at the baseline. This value decreased in $1/10\sim1/100$ at 2 weeks after the start of oral care using the new brush system, and maintained the level of $10^6\sim10^7$ with continuous care until the end of this study.

No aspiration symptoms (choking or coughing) were observed in any subject during the test period. Other findings showed an improvement in oral malodor, activity of daily life and facial expression. On the other hand nurses complained at the increase in care work.

Keywords: Category of oral care needs, Dentate dependent elderly, Oral microbes, Liquid supply/Suction brush

Introduction

In our present aging society, the influences of oral microbes on various systemic diseases have been clarified, suggesting the importance of oral care. Dependent elderly people are at risk of aspiration during tooth cleaning using conventional tooth brushes. As a result, rubbing by gauze has been commonly performed for such people. However the effect of the gauze method is still questionable. The degree of independence and the oral condition of the elderly are markedly different from those of younger adults. It is therefore necessary to develop effective oral care methods appropriate to the individual situation.

A new classification with 9 categories (Fig. 1) of oral care needs for the elderly was proposed according to the degree of independence (independent, partially dependent, dependent) and the oral con...
dition (number of present teeth, denture wearing, no dentures). The degree of independence was classified according to the Assessment of Independence for Brushing, Denture Wearing and Mouth Rinsing (BDR index, approved by the Ministry of Health and Welfare)⁶. "Order-made" oral care methods for each category were designed.

In order to ensure safe and effective oral care of the dependent elderly even by carers or patients' family, rather than medical care professionals, an electrical oral brush combined with an automatic liquid supply/suction system (Dent. ERAC 910, LION DENTAL PRODUCTS, Fig. 2) was developed⁷.

This clinical research was performed as a pilot study to develop a new oral care system based on the new classification of oral care needs. The new brush system was used by nurses on the dentate dependent elderly, selected to represent all the categories of care needs, and its effects were evaluated microbiologically.

**Subjects and Methods**
The subjects were 4 dentate dependent inpatients

![Fig. 2 Electrical Oral Brush Combined with Automatic Liquid Supply / Suction System (Dent. ERAC 910 : LION DENTAL PRODUCTS)](image)

<table>
<thead>
<tr>
<th>Table 1 Volunteer Description</th>
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<tr>
<td><strong>Gender</strong></td>
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<td>Male</td>
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<tr>
<td><strong>Age</strong></td>
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<td><strong>ADL</strong></td>
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<tr>
<td><strong>BDR-index</strong></td>
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<tr>
<td><strong>No. of Present Teeth</strong></td>
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<td><strong>DMFT</strong></td>
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<td><strong>CPI</strong></td>
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<td><strong>Denture</strong></td>
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<td><strong>Trismus</strong></td>
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<td><strong>Masticatory disorder</strong></td>
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<td><strong>Eating functional disorder</strong></td>
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<td><strong>Communication problem</strong></td>
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<td><strong>Nutrition method</strong></td>
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<td><strong>Family visit</strong></td>
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ADL : activity of daily living (B : chair-bound elderly, C : bed-ridden elderly)
BDR-index : the degree of independence was classified according to the Assessment of Independence for Brushing, Denture Wearing, Mouth Rinsing
(a : no support, b : partially support, c : completely support)
(aged 65~82 years) at a general hospital in Niigata. After consultation with their physicians in charge, informed consent to this study was obtained from the subjects and their families. Before starting this study, oral examination was carried out, and the oral cleaning condition and the degree of independence in oral cleaning were classified (Table 1).

The oral care of subjects had been routinely performed by gauze rubbing only once a day before starting this study. The new oral care was performed by nurses once daily, approximately 2 hours after lunch. The subjects adopted a sitting posture to prevent aspiration of water from the water supply of the new brush system during oral cleaning. 20 ml of liquid toothpaste (Dent. ERAC, LION DENTAL PRODUCTS) was used during cleaning for 5 minutes. Microbiological examination was performed 3 times to measure the number of anaerobes, that is a large majority of oral microbes, at 2-week intervals from immediately after oral cleaning on the first day. The subjects gargled with 20 ml of sterile physiological saline for 20 seconds. Samples were carried in an aerobic globe box. Each sample (1 ml) was homogenized for 15~20 minutes, and 0.1 ml of each sample was diluted 1/10 with 0.9 ml of 40 mM sterile phosphate buffer. The 10⁶~10¹² diluted sample was anaerobically incubated at 37°C for 7 days. Colonies were counted. and the Colony Forming Units (CFUs) /ml were calculated. ANOVA was used for statistical analysis.

The nurses observed the breathing of each subject and the symptoms of aspiration, such as coughing during oral cleaning. They also observed oral malodor, activity of daily life and facial expression during the study period. Finally, we asked nurses' opinion about this care system.

**Results**

Fig. 3 shows the changes in the number of anaerobes in the gargle water at 2-week intervals. The mean number of anaerobes in the 4 subjects was at the level of 10⁹~10¹⁰ at the baseline. This number decreased in 1/10~1/100 after the initiation of oral care using the new brush system, and maintained the level of 10⁶~10⁷ with the continuation of oral care. However, there was no statistically significant difference. The findings of subjects' (B and D) condition observed by nurses showed the improvement of activity of daily life, and oral malodor. Nurses complained that the new oral cleaning was a burden on their routine work.

No aspiration symptom (choking or coughing) was observed in any subject during the oral care period using a liquid supply/suction brush.

**Discussion**

The physical and mental situations of the elderly are quite varied, but there is no standardized oral care method for these elderly individuals. The rubbing method by gauze is commonly used by nurses for the cleaning of the oral cavity of inpatients. But this method is not likely to remove the plaque on the tooth surface sufficiently. More effective, safer and easier oral care methods than conventional ones are needed to ensure the overall well-being of the elderly. Starting from this concept, we tried to create a classification of oral care needs on which to base a new oral care system. Tooth brushing by liquid supply/suction brush system was one component of this system.

In this study, the mean number of anaerobes decreased after the implementation of a new brush sys-
system, but no statistical difference was observed during the study period. 2 subjects (A and C) sometimes showed emotional instability and refused the oral cleaning by nurses. This might be a reason for the variation of microbiological test results during the study. Therefore, the degree of dementia seems to be an important factor to consider when devising the care plan and evaluating the effect of oral cleaning methods for the elderly.

The systemic condition of two subjects (B and D) seemed to be slightly improved by the oral care. However, nurses complained that the introduction of a new oral care system disturbed their busy routine work. Therefore, we recommend the use of this brush system by hospital attendants or patients’ families rather than by medical care professionals. In future, every one is likely to become a carer in the aging society.

In another pilot study, dental hygienists tried to use the new brush system for three dentate dependent elderly at a hospital in Tokyo. The mean number of anaerobes in gargling water decreased in 1/10 as a result of the new brush system, with a statistical difference. The reason why that the result was statistically meaningful seemed to be that there were fewer anaerobes and that the 3 subjects were different of the baseline compared with the subjects of this study.

In addition, no symptom of aspiration was observed during oral care. However, it is said that elderly people sometimes do not show any symptoms of aspiration due to the decrease of the reflex function, even if slight aspiration occurs. More studies related to aspiration will be needed.

The difference of the physical and mental conditions of the dependent elderly is associated with the quality of daily care. From this point of view, the oral care appropriate to the dependent elderly might contribute to the improvement of their quality of life.

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高齢者の自立度と口腔状態に対応したオーダーメードの口腔ケア
——第1報　多数歯を有する要介護高齢者に対する
新しい口腔清掃システムの効果——

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。しかし、要介護者では、一般の歯ブラシによる清掃は誤嚥のリスクが高いため、通常、ガーゼによる清拭などが行われており、その効果は充分とは言い難い。そこで、日常の介護者が安全かつ容易に行える効果的な口腔ケア法の開発が急務である。特に、高齢者では、一般成人と比較して自立度や口腔状態が大きく異なるために、その状況に応じた口腔ケア法の確立が必要とされている。

そこで、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）と口腔状態（歯数と義歯の有無）から9つのカテゴリに分類した「高齢者口腔ケア分類表」の作成を試み、それぞれに対応したオーダーメードの口腔ケア法を考案すべく細菌学的手法を中心検討を進めている。

本研究は、予備実験として、要介護者の口腔ケアを安全かつ効果的に、しかも歯科医療従事者以外でも容易に行えることを目的に開発したシステム（デント・エラック給吸ブラシ910）を多数歯を有する要介護高齢者に試みて、一般的に使用される使用前に、その安全性と効果の詳細な情報を得るために、今回は、看護師により行われ、合歯水中的細菌数の平均値が1/10〜1/100に減少した。さらに、口腔ケアを通して歯垢とみられる明らかな症状は認められなかったが、一般的に高齢者では、わずかな誤嚥ではなく症状を示さない場合もあり、今後一層のシミュレーション研究が必要である。

キーワード：口腔ケア分類表、多数歯を有する要介護高齢者、口腔細菌、給吸ブラシ

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