

## Oral Health and Lifestyle to Keep Many Teeth in Elderly People

Ryutaro Uchikawa<sup>1</sup>, Sunao Sadaoka<sup>2</sup>, Ichiro Kawahara<sup>3</sup>, Emi Oki<sup>4</sup>, Junichi Otagoto<sup>3</sup>, Akio Yamamoto<sup>3</sup> and Mihoko Tomida<sup>3\*</sup>

<sup>1</sup>Department of Operative Dentistry, Endodontology and Periodontology, Matsumoto Dental University, Shiojiri, Japan.

<sup>2</sup>Department of Public Health, Matsumoto Dental University, Shiojiri, Japan.

<sup>3</sup>Department of Oral Health Promotion, Graduate School of Oral Medicine, Matsumoto Dental University, Shiojiri, Japan.

<sup>4</sup>Department of Oral Science, Matsumoto Dental University Hospital, Shiojiri, Japan.

### \*Correspondence:

Dr. Mihoko Tomida, DDS, ph.D., Department of Oral Health Promotion, Graduate School of Oral Medicine, Matsumoto Dental University. 1780 Hirooka-Gobara, Shiojiri-shi, Nagano, Japan, Tel: +81-263-51-2208.

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### ABSTRACT

**Introduction:** It was proved that an oral cavity function participated in the health of the whole body, and the importance of the tooth was re-perceived. It became clear that a large number of teeth suppressed the degradation of cognitive in the elderly person. Therefore, the preventive method to maintain an oral function with many teeth is demanded.

**Objective:** We investigated a factor for an elderly person to keep a large number of teeth and discussed the guiding principles to maintain them.

**Materials and Methods:** Patients who were 65 years or older in the Matsumoto Dental University Hospital were participated in this study. We investigated the number of the teeth, quantity of stimulation saliva (ml/5min), saliva buffering ability, PCR (Plaque Control Record), seven lifestyles of Breslow and the total of favorable lifestyle, Health Practice Index (HPI). Subjects were divided into two groups, less than 20 teeth and 20 or more than 20 teeth, and were compared with each factor. The correlation of each factor was explored using the correlation coefficient of Spearman and after them the factor in conjunction with the number of the teeth were found out using the multiple regression analysis by the step Wise method.

**Results:** The saliva buffering ability in the subjects with 20 or more than 20 teeth was higher than that of the other group. In addition, HPI in the former group showed a high point compared with the other group, particularly the weight was maintained. There were significant correlation between the number of the teeth and buffering ability, PCR or HPI. And the factors related with the number of the teeth in independently were buffering ability and HPI.

**Conclusion:** These results suggested that it is necessarily for all generations to invoke the saliva buffering ability and let them be aware of a risk, and to instruct the favorable lifestyle.

### Keywords

Elderly person, Saliva buffering ability, Present teeth, Health practice index

### Introduction

In recent years, the society shifts to the aging society by the extension of the average life in many developed countries, which

causes to some problems of medical care and welfare. Elderly person needs to be healthy in such aging society. It became clear that oral health affected the health of the whole body [1]. Then, we need to prevent caries and periodontal disease to protect teeth loss that impairs masticatory ability. To chew with own teeth is considered very important in the elderly, because "pleasure and joy to eat" is able to improve the QOL of the person.

Tooth loss impairs masticatory efficiency even after replacement with dentures, which is also associated with changes in foods preference and nutritional deficiency in older people. A lot of people with less than 10 teeth cannot feel enough chewing [2], which invites the unpleasantness and non-satisfaction in the meal time [3].

Furthermore, many lost teeth induce the high prevalence of heart disease [4], diabetes [5], arteriosclerosis [6], cognitive functional disorder [7] and osteoporosis [8], and the physical balance ability decreases. In the life habit, excessive drinking, a smoking custom, the partial eating habits and the lack of oral health knowledge promote to lose some teeth [9].

On the other hands, person with many teeth can keep the high chewing ability [10], the high function of the brain and the advanced activity of life or mind [11]. As a person holding more than 20 teeth even an elderly person has high bone density, it is necessary to hold at the least 20 teeth [12].

In Japan, since 8020 campaign to maintain 20 teeth until 80 years old established in 1989, the importance of the tooth expanded in the nations. The recognition and effort of the nation made the ratio of people having 20 teeth at 80 years old exceed 51.2%. However, the number of the teeth suddenly decreases to 80s. It is important to strongly prevent some caries and periodontal disease leading to tooth extraction. Therefore, the factor to maintain much more teeth should be made clear and people should recognize their individual risk as soon as possible.

We first examined the number of present teeth, the quantity and buffering ability of saliva and PCR, and assessed the relationship of each factor. Furthermore, we investigated the relations of the number of the teeth and lifestyle of Breslow [13] and discussed guiding principles.

## Subjects and Methods

### Subjects

Fifty-seven patients (31 men, 26 women) who were 65-year-old or over at Matsumoto Dental University Hospital were participated in this study. After they were informed the research contents by mouth and sentences, we obtained an agreement as the participation in this study. The patients with diabetes and osteoporosis were excluded. This study was approved by the ethic committee in Matsumoto Dental University (No. 220) and followed the Declaration of Helsinki on medical protocol and ethics.

### Measurement

The number of the present teeth, quantity of stimulation saliva, saliva buffering ability, PCR were measured and 7 lifestyles of Breslow was asked.

### The number of present teeth

One dentist examined oral cavity under the natural light and artificial light using dental mirror. The pontic of the bridge, implant and only tooth root were not included in the number.

### The Quantity of stimulation saliva

Subjects salivated in the oral cavity with chewing tasteless paraffin wax (Oral care: Oral care, Co.) and discharged it to a measuring cylinder. Then the quantity of saliva collected for 5 minutes was measured.

### The buffering ability

The buffer ability was evaluated with four phases using Dentobuff® Strips (Oral care: orals care) with one drop of saliva. Four phases was determined by the changing color of examination paper. Score 4 means that pH of saliva shows 6.5 or more. Score 3 means the pH is 6.0-6.4, score 2 means the pH is 4.5-5.5, score 1 means the pH is 4.0 or less.

### Plaque Control Record

Plaque Control Record (PCR) was assessed using O'Leary's method. After applying disclosing solution (Merssage PC Pellet) (SHOFU: SHOFU Inc.) to all tooth surfaces, the parts of dying plaque was assayed in the ratio of whole.

### Lifestyle of Breslow

Subjects answered the questionnaire about smoking, exercise, drinking, the sleeping hours, weight, breakfast and snack (Table 1). The number of the favorable lifestyle was calculated and was presented as Health Practice Index (HPI).

Health habit	Yes	No
Never smoking cigarettes	1	0
Regular physical activity	1	0
Moderate or no use of alcohol	1	0
7-8 hours sleep / day regularly	1	0
Maintaining proper weight	1	0
Eating breakfast	1	0
Not eating between meals	1	0
Total : Health Practice Index (HPI)		point

**Table 1:** Questionnaire of physical health status by Breslow.

One point: Favorable lifestyle; Zero point: Non-favorable lifestyle.

### Statistical analysis

All subjects were divided into two groups, with 20 or more than 20 teeth (M group) and with less than 20 teeth (L group). The compare of their age, the number of teeth, the quantity of saliva, buffering ability, PCR and HPI in two groups were used Mann-Whitney U test. In addition, seven lifestyles of Breslow were compared using  $\chi^2$ -test.

The correlation of each factor was demanded using rank correlation of Spearman. Furthermore, an associated factor with the number of the present teeth was analyzed by a multiple regression analysis (step Wise method). All statistical analyses set to 5 percent in a level of significance using SPSSver.23.0.

## Results

### Comparison of the item by the number of the teeth

All subjects were divided into 31 (54.4%) in the M group and 26

(45.6%) in the F group. Median age of the M group was 70 years old and the L group was 75.5 years old. The median of the present teeth in the M group was 27 and the L group was 16. The median of the quantity of stimulation saliva in the M group was 7.0 ml and the L group was 5.2 ml. The median of buffering ability in the M group was score 4 and the L group was score 2. The median of PCR in the M group was 44.0% and the L group was 50.4%. The median of the dentition was 6 points in the lifestyle a lot, and few dentitions was 5 points. The M group significantly showed higher value in the number of the teeth ( $p < 0.0001$ ), buffering ability ( $p < 0.0001$ ) and HPI ( $p < 0.01$ ) than the other group (Table 2).

Factor	More or 20 teeth n=31	Less than 20 teeth n=26	P value
Age (years old)	70 (68.0-76.5)	75.5 (67.0-81.0)	0.32
The number of teeth	27 (24.5-28.0)	16 (12.0-19.0)	<0.0001
Saliva quantity (ml/5min)	7 (4.8-9.3)	5.2 (3.5-7.4)	0.078
Buffering ability (score)	4 (3.0-4.0)	2 (1.0-3.0)	<0.0001
PCR (%)	44 (23.5-60.3)	50.4 (32.5-73.6)	0.089
HPI (point)	6 (5.0-6.5)	5 (4.0-6.0)	<0.01

**Table 2:** Comparison of the subjects divided by the number of teeth. The comparison of age, the number of teeth, saliva quantity, buffering ability, PCR and HPI in two groups. Values are presented median and quartile range. P-value were calculated with Mann-Whitney U test.

In the lifestyle of Breslow, the subjects of M group vs. L group showed 30 and 22 for non-smoking, 21 and 14 for regular exercise, 26 and 17 for moderate alcohol, 21 and 18 for enough sleep, 26 and 14 for proper wright, 31 and 25 for taking breakfast, 23 and 15 for not eating between meals (Table 3). These was a significant difference in the weight maintenance between M group and L group ( $p < 0.05$ ) (Table 3).

Factor	More or 20 teeth n=31 (%)	Less than 20 teeth n=26 (%)	P value
Never smoking cigarettes	30 (97)	22 (85)	0.106
Regular physical activity	21 (68)	14 (54)	0.283
Moderate or no use of alcohol	26 (84)	17 (65)	0.106
7-8 hours sleep / day regularly	21 (68)	18 (69)	0.904
Maintaining proper weight	26 (84)	14 (54)	<0.05
Eating breakfast	31 (100)	25 (96)	0.271
Not eating between meals	23 (74)	15 (58)	0.188

**Table 3:** Comparison of Breslow's factors. The comparison of seven factors in two groups. Values are presented the number of persons with favorable lifestyle. P-value were calculated with  $\chi^2$  test.

### Correlation between each factor

The number of the teeth showed the correlation with buffering ability ( $r = 0.550$ ,  $p < 0.01$ ), PCR ( $r = -0.302$ ,  $p < 0.05$ ) and HPI ( $r = 0.291$ ,  $p < 0.05$ ). There were not the correlations between the number of the teeth and age ( $r = -0.200$ ) or the quantity of saliva ( $r = 0.174$ ) (Table 4).

	No. present teeth	Age	Saliva quantity	Buffer ability	PCR	HPI
The number of teeth		-0.200	0.174	0.550 **	-0.302*	0.291*
Age			-0.230	-0.183	0.399 **	0.168
Saliva quantity				0.508 **	-0.212	-0.258
Buffering ability					-0.374 **	0.069
PCR						-0.073

**Table 4:** Correlation of each parameter. Values are presented Spearman's rank correlation coefficient. \*\*:  $p < 0.01$  \*:  $p < 0.05$

In other factors, there were correlations between age and PCR ( $r = 0.399$ ,  $P < 0.01$ ), the quantity of saliva and buffering ability ( $r = 0.508$ ,  $p < 0.01$ ), and buffering ability and PCR ( $r = -0.374$ ,  $p < 0.01$ ) (Table 4).

### Connection with the number of the present teeth

The factors related to the number of the teeth by step Wise multiple regression analysis independently were buffering ability ( $t = 4.231$ ,  $P < 0.0001$ ) and HPI ( $t = 2.289$ ,  $P < 0.05$ ), they had an influence on the number of the teeth by this order (Table 5).

Independent variable	$\beta$	standard error	Standardizing Coefficient	t value	p value
Buffering ability	3.075	0.727	0.496	4.231	0.000 ***
PCR	-0.030	0.035	-0.098	-0.839	0.405
HPI	1.355	0.592	0.250	2.289	0.026*

**Table 5:** The multiple regression analysis that assumed the number of the teeth a dependent variable. \*\*\*:  $p < 0.0001$  \*:  $p < 0.05$

### Discussion

The oral cavity has various functions such as mastication, deglutition, breathing and pronunciation, etc. Recently, it was certified that to eat with regular mastication might relate with healthy body physically [14]. Therefore, "chewing and eating with own teeth" as one viewpoint of health promotion is emphasized in elderly people. The teeth loss causes malocclusion and dysfunction in the oral cavity, which induces detrimental effects to whole body from hypoalimmentation state. The adequate nutrition is very important for the elderly's health. On the other hand, it was showed that the person holding many teeth could feel satisfaction

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at the meal time and spend active life, therefore, the maintenance of the tooth enable to keep healthy body mentally and physically [15].

The prevention and the earlier treatment of teeth are essential in the dental society. In this study, strong connection was detected between the number of present teeth and saliva buffering ability. The buffering ability of saliva contributes to the activity of bicarbonate ions. The ion maintains intraoral pH constantly, therefore, it is useful to prevent the decalcification of the tooth substance by acid, which defends caries leading to tooth extraction. In our study, although individual differences were recognized in the buffer ability, the buffering ability of the subject in M group was higher than that in other group. Previous study showed that high buffering ability caused the low number of DMF [16]. Our result also was same result. In addition, the root caries by the gingival recession in elderly is one of the process to lead to tooth extraction [17]. It was suggested that the buffering ability of saliva might be a necessary factor for the prevention of all caries.

In previous study, it was reported that the group with more than 20 teeth showed higher saliva quantity than the group with less than 20 teeth [18]. But there was not significant difference between two groups in this study. However, we detected equilateral correlation between saliva buffering ability and the quantity. It is known that the faster the secretion speed of saliva is, the more the ion secretes in oral cavity. Therefore, the increase of salivation quantity was thought to indirectly promote the rise of the buffering ability.

There was a negative correlation between the number of the teeth and PCR. It will be a proper result that decayed teeth and periodontal disease relate with oral hygiene. And there was a positive correlation between age and PCR. Older people often have increasingly poor oral hygiene, higher levels of plaque and calculus together with a higher prevalence of periodontal disease. Some epidemiological studies have shown deterioration in dental health accompanying the ageing process [19]. It was thought that body dysfunction related with age lets them make a plaque control difficult. We have to devise the reinforcement of the dental instruction or the period of medical examination for the elderly person.

People with less than 20 teeth take few intakes of vegetable and fish. They tend to choose softer and more easily chewed foods like carbohydrates, which are often lower in fiber and less nutrient-dense. In our study, M group significantly maintained their weight compared with L group. Loss of teeth also alters older people's selection of foods. The soft sweets easily increases the weight [20] and are easy to be infected with caries. Such a flow becomes the vicious circle and produces high risks. To hold many teeth is important to maintenance of the weight and the metabolic syndrome prevention [21]. The influence of elderly's dental health on nutrition and general health status can contribute to the decision-making process.

In seven lifestyles of Breslow, there was a significant correlation

between the number of the teeth and HPI point. In other words, to keep a favorable lifestyle influences the maintenance of the tooth. When HPI point was 6 or more, average life expanded seven years [22] because of lower stress [23]. The cohort study in the United States showed the strong connection between the loss of teeth and low education level [24], severe drinking [25] and smoking. In this study, there was not significant difference about smoking between M group and L group. The reason was thought that there were few smokers such as one in M group and only four in L group. The connection between the alcohol drinking and the present teeth was not detected in this study. It was thought that subjects were older people who could not drink much more. We didn't investigate the education level in this time, but a highly-educated person was thought to have good lifestyle because they were strict with themselves. The lifestyle of Breslow is contents to be able to protect easy in everyday life. It was revealed that the favorable life affected the health of oral cavity and the whole body conspicuously.

As the average length of life extends every year, promotion aim should be 9020. Then our aim was to find a factor to leave many teeth and to establish the instruction for nation using the result. We used the simple inspection such as saliva test and regular treatment. It is necessary to perform saliva test in the young generations and to let them understand the ability. Specifically, if buffering ability shows low value, medical staff have to recommend the acceleration of the periodic medical examination or the use of fluoride to prevent caries. It will be necessary to be check PCR regularly. In addition, we must instruct not only oral instruction but also living guidance for the lifestyles such as the smoking custom, eating habits and exercise. A saliva test in all generations are expected to introduce in the future dentistry instruction. This study showed that it was important to find the risk factor which caused the loss tooth and to be taught individual and appropriate dentistry instruction. However, this study was cross-sectional and wasn't investigated a change of the number of the teeth. It will be need to follow up a change of the present teeth, an intraoral state or the lifestyle in the future.

## Conclusion

This study showed that high buffering ability of saliva and favorable lifestyle were very important to keep the more teeth in elderly people. Therefore, saliva test and PCR should be performed for young people, and it is necessary to have nation recognize a risk factor. The person with high-risk for oral diseases needs to accept regular examination in the short period. Medical staff should enforces suitable dental instruction and the improvement of life style.

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