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**研究題目：**Changes in the number of bacteria in saliva after tooth brushing  
—Effects of oral wiping and gargling—

**目的：**

Aspiration pneumonia often occurs in the elderly because of the deterioration of general condition and swallowing function due to aging, which causes pathogenic microorganisms present in the oral cavity and pharynx to enter the respiratory tract together with saliva<sup>1)</sup>. It is known that aspiration occurs not only during meals but also during nighttime sleep. Aspiration pneumonia poses a serious problem even in perioperative patients undergoing highly invasive surgery<sup>2)</sup>. In patients with ventilator intubation, one of the causes of ventilator-associated pneumonia (VAP) is the accumulation of oral saliva and nasal discharge in the upper part of the cuff and into the lower respiratory tract<sup>3)</sup>. Furthermore, even after extubation, the risk of aspiration pneumonia is considered to increase due to temporary dysphagia and deterioration of general condition due to surgical invasion.

Prevention of aspiration pneumonia includes improvement of swallowing function as well as general condition, but it is thought to be most important to reduce the number of bacteria in saliva containing pathogenic microorganisms. In recent years, there have been some studies on oral cleaning methods focusing on the number of bacteria in the oral cavity<sup>4)</sup>. Many of these show the results of brushing, wiping, and gargling. However, not all procedures can be performed as planned depending on the patient's general condition and planned treatment. Therefore, when planning oral hygiene management, changes in the number of bacteria after each oral cleaning procedure are also included. The purposes of this study are to investigate the effects of tooth brushing, wiping, and gargling on the number of bacteria in saliva.

**対象および方法：**

**【Participants】**

The subjects were 40 patients who visited the outpatient department of Kyushu Dental University Hospital for dental treatment such as periodontal disease, prosthetic treatment, or regular maintenance. They all can take regular meals, can perform oral self-care, and can gargle. Participants were randomly assigned to 30 patients in group A and 10 patients in group B.

**【Intervention】**

Group A performed toothbrush, wiping and gargling, and Group B only gargled. Before tooth brushing, interviews and oral examinations, oral wetness, salivary bacterial count, and dorsal bacterial count were measured. All brushing was done by the same dental hygienist.

First, the toothbrush was moistened with water, and the maxillary buccal anterior teeth to the molars were brushed by the scrubbing method, and then the maxillary palate and mandible were also brushed in the same order for about 5 minutes. It was instructed to leave the saliva accumulated in the oral cavity during brushing or to discharge it and not to gargle. Immediately after tooth brushing, the number of bacteria in saliva was measured. Next, the oral cavity was wiped using a sponge brush. The dentition and the left and right buccal and lingual (palatal) mucosal surfaces were wiped for about 2 minutes. At that time, two paper cups containing water were used, and the procedure of cleaning the contaminated sponge brush with one and re-cleaning with the other was repeated. After wiping, the number of bacteria in saliva was measured, and then participants were instructed to gargle. For gargling, about 200 ml of tap water was divided into 3 times, and the whole amount was used. The participants were instructed to gargle for 5 seconds each time so that the water would spread to the entire oral cavity and the left and right buccal sides. The number of bacteria in saliva after gargling was also measured.

#### 【Data examined】

Interviews were conducted regarding gender, age, body mass index (BMI), smoking, drinking, hypertension and diabetes. The number of remaining teeth, mouth breathing, oral hygiene index (OHI), community periodontal index (CPI), oral cavity wetness, and the number of bacteria in saliva were measured.

Oral cavity wetness was measured three times using Mucus® (Life Co., Ltd., Saitama), and the median value was adopted. The number of bacteria in saliva was measured by the Rapid Oral Bacteria Quantification System (Panasonic Healthcare Co. Ltd., Osaka, Japan) which is based on dielectrophoretic and impedance measurements, by placing a sterile cotton swab for sample collection in the posterior part of the floor of the mouth for 10 seconds to absorb saliva in the oral cavity.

#### 結果および考察：

Demographic factors and data examined in Group A and Group B were summarized in Table 1. The gender was 6 males and 24 females, and the age ranged from 54 to 97 years (average  $73.05 \pm 10.92$  years). There was no apparent difference in background factors between Group A and Group B.

Figure 1 shows changes in the number of bacteria due to tooth brushing, oral wiping, and gargling. In Group A, salivary bacterial counts increased significantly after brushing in all patients. Compared with the number of bacteria in saliva after tooth brushing, it was significantly lower after wiping ( $p < 0.01$ ) and after gargling ( $p < 0.01$ ). There was no significant difference between bacterial count in saliva before tooth brushing and after oral wiping, and it was significantly lower after gargling than before tooth brushing ( $p < 0.01$ ). In Group B, bacteria count after gargling was significantly lower than that of baseline ( $p < 0.05$ ).

Table. 1. Patient characteristics of Group A and Group B.

Variable		GroupA	GroupB
Sex	male	6	3
	female	24	7
Age		72.8 ± 9.92	73.8 ± 14.14
Smokinghabit	(-)	2	1
	(+) 28	9	
Drinkinghabit	(-)	8	4
	(+)	22	6
Hypertenshou	(-)	136	
	(+)	17	4
Diabetes	(-)	5	1
	(+)	25	9
BMI		22.10 ± 3.54	22.21 ± 3.15
Numberofremainingteeth		21.9 ± 3.89	21.7 ± 4.40
OHIscore		1.62 ± 0.92	2.01 ± 1.67
CPIScore		3.23 ± 0.94	3.40 ± 0.97
Oralwetness		28.9 ± 2.92	29.0 ± 1.54

The subjects of this study were patients with dental diseases who had no problem with swallowing function, but the number of bacteria in saliva immediately after tooth brushing increased significantly. The number of bacteria in saliva is always kept constant by the self-cleaning action consisting of many mechanisms such as saliva secretion and swallowing, and plaque is firmly attached to teeth as a biofilm and is not released into saliva. However, it was thought that when tooth brushing was performed, plaque that originally did not fall into saliva peeled off and mixed with saliva, causing a temporary increase in the number of bacteria in saliva. Since indigenous bacteria in the oral cavity are listed as bacteria detected in aspiration pneumonia<sup>5, 6)</sup>, it is possible that aspiration of saliva after tooth brushing, in which the number of bacteria temporarily increased, is the cause of pneumonia. It was suggested that it is important to remove the bacteria in the plaque scattered during brushing.

When performing oral care for patients who cannot gargle, wiping is generally performed as a procedure for removing bacteria in saliva after tooth brushing, so in this study, the effect of wiping on the number of bacteria in saliva was first examined. As a result, the number of bacteria was significantly reduced by wiping with a sponge brush compared to after tooth brushing, but it was higher than before brushing. Therefore, it was thought that wiping could not completely remove the bacteria in the scattered plaque after tooth brushing.

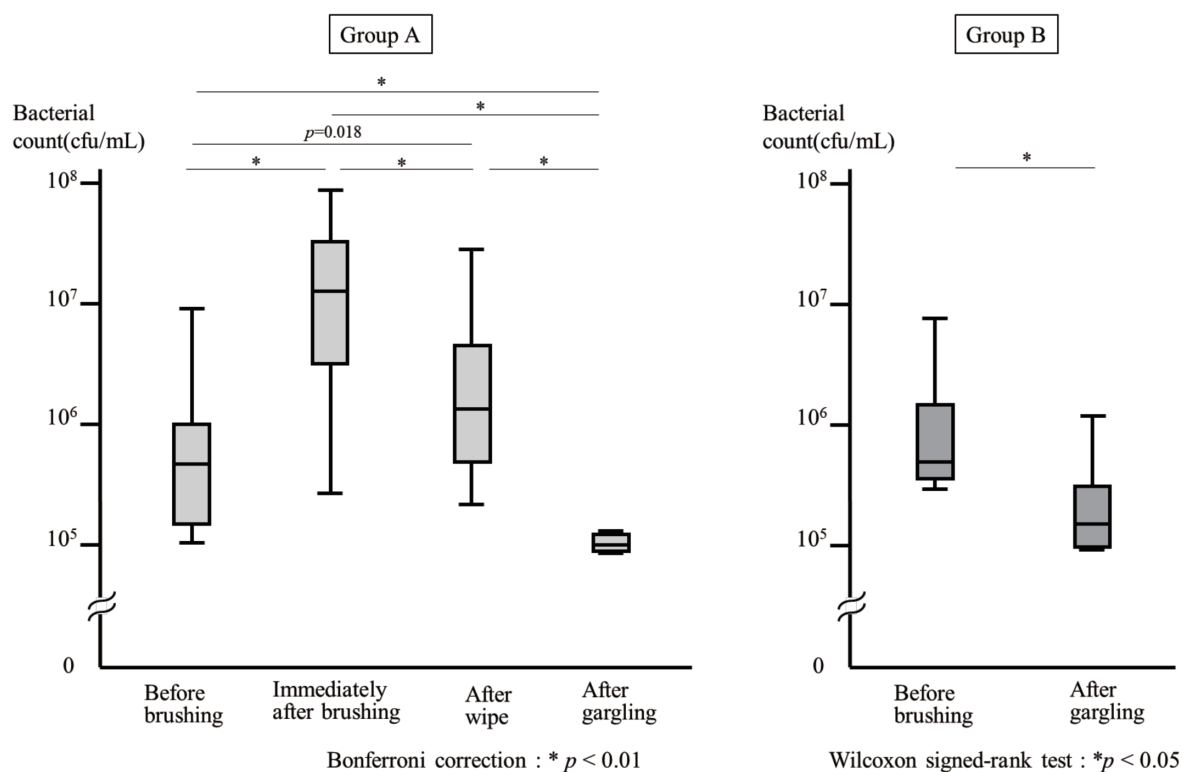


Fig. 1. Change of number of bacteria in saliva before, after tooth brushing, oral wiping

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成果発表：(予定を含めて口頭発表、学術雑誌など)

「Oral Science in Japan 2020」 <http://stomatol.umin.jp/journal/book.html>

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