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A Study on the Physical Sensations of Four Kinds of Trial Toothbrushes and Four Different Toothbrushing Methods

NORIO OTA

Department of Periodontology, Matsumoto Dental College
(Chief : Prof. N. Ota)

YOSHINORI MUSHA

Lion Foundation for Dental Health Laboratory
(Director : T. Kobayashi)

SATOSHI HAYASHI and TAKAICHI ISAKA

Development Laboratories I Lion Corporation
(Director : I. Kadoya)

TAKESHI KONDO

Department of Community Dentistry, Matsumoto Dental College
(Chief : Prof. T. Kondo)

KEIZO IWAI

Department of Prosthodontics II, Matsumoto Dental College
(Chief : Prof. M. Amari)

TOSHIO DEGUCHI

Department of Orthodontics, Matsumoto Dental College
(Chief : Prof. T. Deguchi)

HIDEHIRO KAYA

Department of Endodontics and Periodontics, Fukuoka Dental College
(Chief : Prof. H. Kaya)

Summary

Using 65 students of the hygiene school attached to Matsumoto Dental College (35

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first-year students, 30 second-year students) as subjects, we performed an investigation into the different physical sensations produced when using 4 trial toothbrushes and 4 different toothbrushing methods. The conclusions are as follows:

1. "Length of brush":
There was a tendency to reply that the length of brush seemed slightly shorter when the students brushed with the Roll method, rather than the other three methods.

2. "Stiffness of filaments":
There was a tendency to reply that the bristle was much harder when the students brushed with methods from Group B (Methods that primarily use the tip of the bristle) than with methods from Group A (Methods which use the side of the bristle).

3. "Tooth brush wear":
A large percentage of students replied that the bristle was more durable when using methods from Group B rather than Group A.

4. "Physical sensation on tooth and gingiva":
Brush M and the Open-tufted brush, both classified as "medium" stiffness, were preferred.

5. "Physical sensation of holding the handle":
80-90% of the students, regardless of the toothbrushing method employed, liked the handles of the brushes.

Introduction

Toothbrushing is very important to the prevention and treatment of periodontal disease and it is the toothbrush that is most frequently used in oral hygiene, especially to remove dental plaque. There have been many investigation[1~5] into the functions of the toothbrush, such as plaque removal and gingival improvement. However, investigations into the user's physical sensations have been rare.[6] Thus, the author performed an investigation into the sensations obtained when using various different toothbrushes and toothbrushing methods.

Materials and Methods

1) Sample group of volunteers

65 students of the hygiene school attached to Matsumoto Dental College (35 first-year students, 30 second-year students)

2) Toothbrushing methods and trial brushes

Four toothbrushing methods —— Roll method, Bass method, modified Stillman method, and Scrubbing method — and four kinds of experimental toothbrushes manufactured by Lion company were used for the investigation.

The shapes of the trial brushes are shown in Table 1, Fig. 1. The shape of the handle is the same in each. The diameter, pitch and disposition of the filament holes of brushes S, M, and H are the same, but the thickness and length of the bristles are different. The diameter and disposition of holes and pitch in the open-tufted brush are different from S's, M's, and H's, and its bristled part is rough. The length of the open-tufted brush's filaments is the same as M's.

The stiffness of the bristles was classified as follows:

Brush S : Soft

Brush M and Open-tufted brush : Medium

Brush H : Hard

3) Method of examination

Students used four kinds of tooth brushes and four toothbrushing methods for a fixed time (one week each for first-year students, two weeks each for second-year students). On the final day they completed a questionnaire. There were four items on the questionnaire : "Length of brush", "Stiffness of filaments", "Tooth brush wear", and "Tactile sensation to tooth and gingiva", and "Physical sensation of holding the handle". Each item had five estimation stages.

Results and Discussion

1) "Length of brush"

The length of brushes S, M, and H were 23.6 mm in length, and 24.2 mm for the Open-tufted brush. Because they are all about the same length, then, the results can be summed up according to toothbrushing methods only.

As can be seen in Fig. 2, compared with the other three toothbrushing methods, there was a large response that length of brush seemed short when the students brushed with the roll method. Although with the three other methods students moved the brush horizontally, with the roll method they revolved it vertically. Consequently with the roll method only two or three teeth could be

Table 1. Specification of trial toothbrushes

Items / Tooth-brushes	Diameter of hole(mm)	Pitch(mm)	Arrangement	Diameter * filaments(mil)	Height of filaments(mm)	Length of brush(mm)
S	1.8	3.2	2+3 6+2	6	10	24.2
M	1.8	3.2	2+3 6+2	8	11	24.2
H	1.8	3.2	2+3 6+3	10	12	24.2
Open-tufted	1.8	4.2	2 6	8	11	23.6

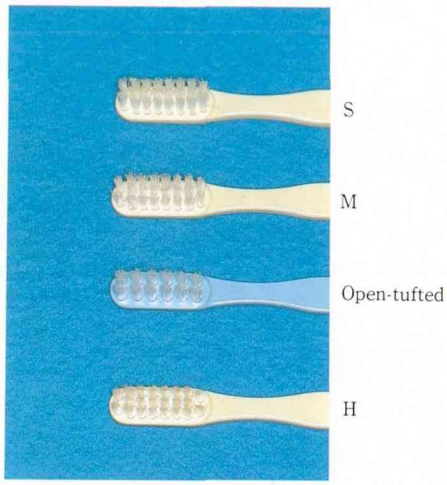

Fig. 1. Four kinds of trial tooth brushes used in the experiment

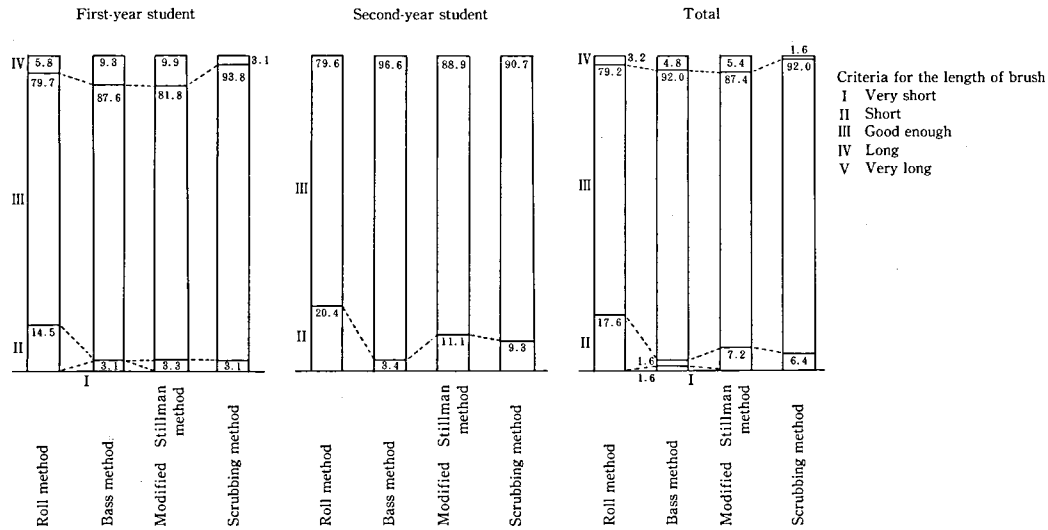

Fig. 2. The results of questionnaire inquiry on length of brush

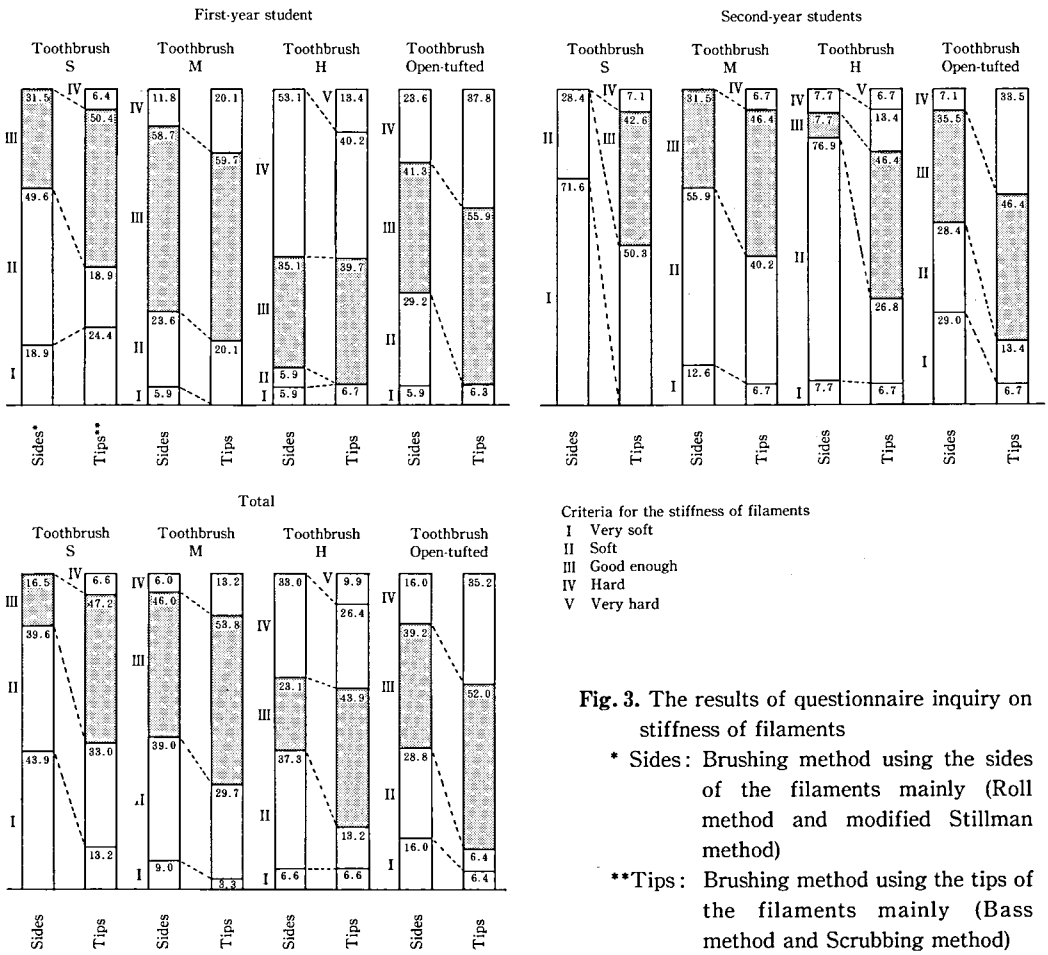

Fig. 3. The results of questionnaire inquiry on stiffness of filaments

* Sides: Brushing method using the sides of the filaments mainly (Roll method and modified Stillman method)

**Tips: Brushing method using the tips of the filaments mainly (Bass method and Scrubbing method)

brushed at a time. Thus it can be considered that the large response was due to the necessity of the student's brushing many times. From the point of view of physical sensation, it was suggested that a more suitable size for the length of brush could be found.

2) "Stiffness of filaments" and "Tooth brush wear"

We classified the four kinds of toothbrushing methods into two groups:

Group A: Methods which primarily use the side of the bristle (roll method and modified Stillman method)

Group B: Methods which primarily use the tip of the bristles (Bass method and Scrubbing method)

As can be seen in Fig .3 and 4, whichever toothbrush was used, there was a tendency among both first-and second-year students to reply that the bristles were harder when using methods from Group B. They also replied that the tooth brush wear was better when they brushed with methods Group B. Thus we can suggest that the proper stiffness for bristles when using the Bass and scrubbing methods should be a little softer than for the Roll and modified Stillman method.

3) "Tactile sensation on tooth and gingiva"

Results are shown in Fig. 5.

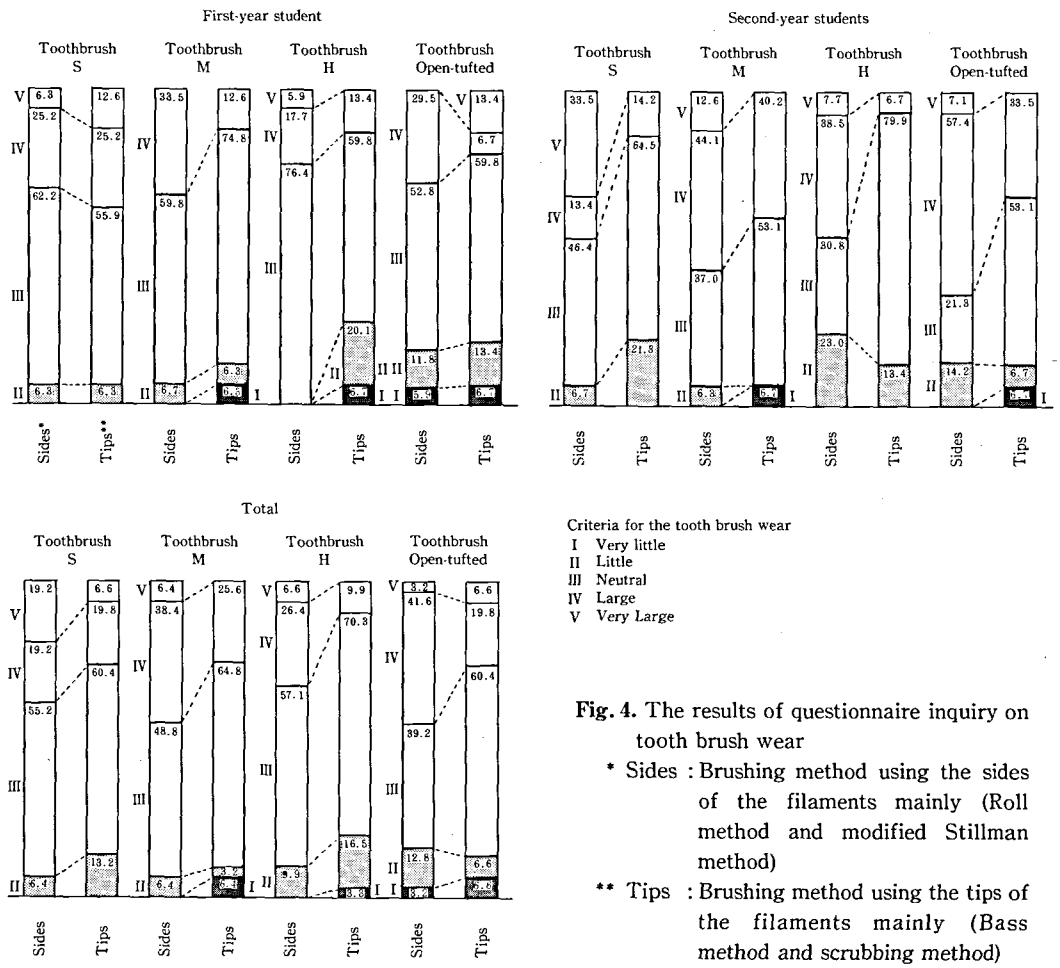

Fig. 4. The results of questionnaire inquiry on tooth brush wear

* Sides : Brushing method using the sides of the filaments mainly (Roll method and modified Stillman method)

** Tips : Brushing method using the tips of the filaments mainly (Bass method and scrubbing method)

Both first—and second—year students preferred brush M and the open-tufted brush to brushes S and H. The strength of the filaments, which indicates the stiffness of the bristle, was 6.16 kg/cm², in brush M, and 7.62 kg/cm², in the open-tufted brush. Both of these can be classified as "medium" stiffness: thus, our results support the general theory that "medium" stiffness is preferred by a majority of users.

4) "Physical sensation of holding the handle"

As the shapes of the handles of all four test brushes were the same, the results can be considered to represent only the differences among toothbrushing methods. As Fig. 6 shows little difference was recognized in the physical sensations of holding the handle when the toothbrushing method was changed. 80—90% of the subjects seemed to like the brushes' handles.

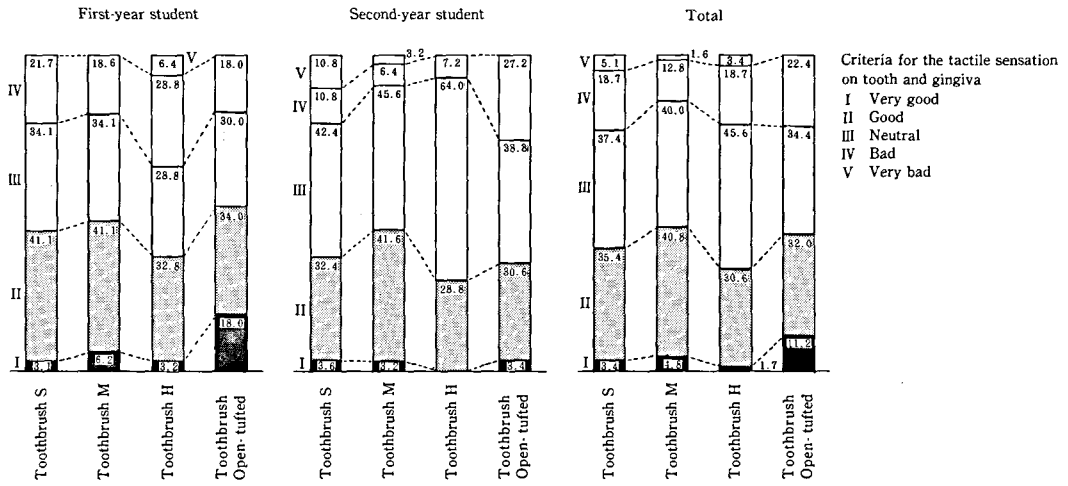

Fig. 5. The results of questionnarie inquiry on the tactile sensation to tooth and gingiva

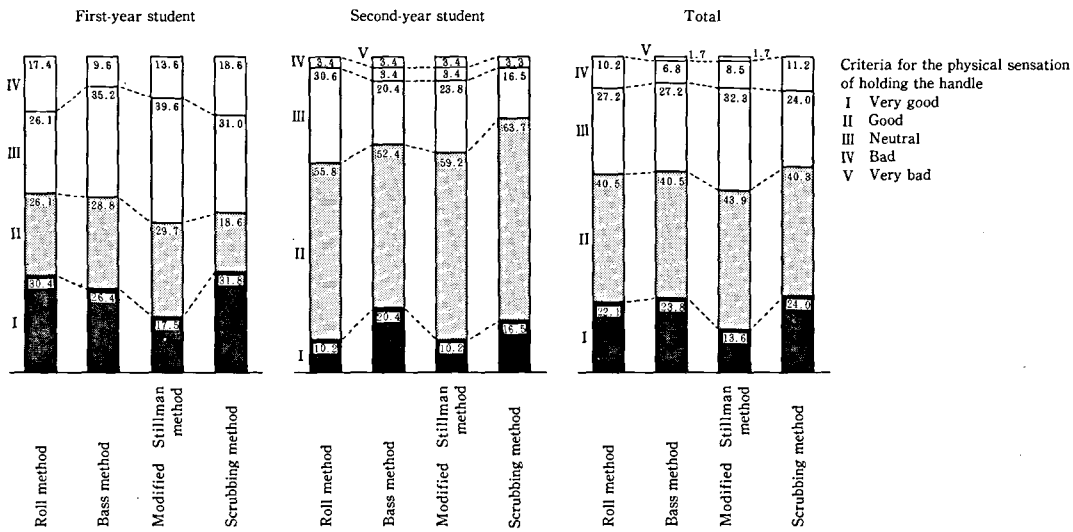

Fig. 6. The results of questionnaire inquiry on the physical sensation of holding the handle

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