

Study the Relationship Between Masticatory Performance Using A Gummy Jelly and Masticatory Movement

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ABSTRACT

Background: Clinical practice of dentistry is primarily aimed at restoring and maintaining the masticatory function. In general, masticatory function is evaluated by analyses of the occlusal force, masticatory performance, masseter muscular activity, masticatory movement, etc. **Aim of the study:** To study the relationship between masticatory performance using a gummy jelly and masticatory movement.

Materials and methods: The study was conducted in the Dental institute. Prior to commencement of the study, ethical clearance was obtained from the ethical board of the institute. An informed written consent was obtained from the participants after explaining them verbally about the protocol of the study. For the study, fifty male subjects were selected for the study. Test food that was included in the study was cylindrically shaped gummy jelly containing glucose. Subjects were asked to chew the glucose the glucose containing gummy jelly for 15 seconds on their habitual chewing side. After chewing, the subjects were asked to hold 10 ml of distilled water in their mouth for a moment and to spit into a cup with a filter.

Results: A total of 50 patients were included in the study. We observed that mean value for masticatory performance 176.21 mg/dl. Mean opening distance was 17.65 mm. Mean masticatory width was 3.31 mm. Mean opening time was 181.3 ms and mean closing time was 185.65 ms. Mean value for stability of path was 9.41 and for stability of rhythm was 24.21.

Conclusion: Within the limitations of the present study, it can be concluded that there is a close relation between masticatory performance and masticatory movement, and that the masticatory performance could be increased by rhythmic, rapid and stable mastication with a large opening distance.

Keywords: Gummy jelly, mastication, masticatory movements.

INTRODUCTION

Clinical practice of dentistry is primarily aimed at restoring and maintaining the masticatory function. In general, masticatory function is evaluated by analyses of the occlusal force, masticatory performance, masseter muscular activity, masticatory movement, etc. ^{1, 2} Masticatory performance is an important parameter for objective evaluation of the masticatory function. For many years, the masticatory performance has been measured by the sieving method, in which the

subject chews a test food for a specific number of times, and the crushed test food is collected from the oral cavity and divided by sieving according to the degree of crushing. ^{3,4} This method, however, is beset with problems related to the complex manipulations needed and the long time taken for the test. ^{5,6} Hence, the present study was conducted to study the relationship between masticatory performance using a gummy jelly and masticatory movement

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MATERIALS AND METHODS

The study was conducted in the Dental institute. Prior to commencement of the study, ethical clearance was obtained from the ethical board of the institute. An informed written consent was obtained from the participants after explaining them verbally about the protocol of the study. For the study, fifty male subjects were selected for the study. It was made sure that participants do not have any abnormality in their mastication and had natural dentition.

Test food that was included in the study was cylindrically shaped gummy jelly containing glucose. Subjects were asked to chew the glucose the glucose containing gummy jelly for 15 seconds on their habitual chewing side. After chewing, the subjects were asked to hold 10 ml of distilled water in their mouth for a moment and to spit into a cup with a filter. The glucose concentration in the filtrate was measured using a glucose measuring device as the amount of glucose extraction, which was used as a quantitative parameter of the masticatory performance. The movement of the mandibular incisal point during mastication of the test food for 20 s on the habitual chewing side was recorded with a mandibular kinesiograph.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student's t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistical significant.

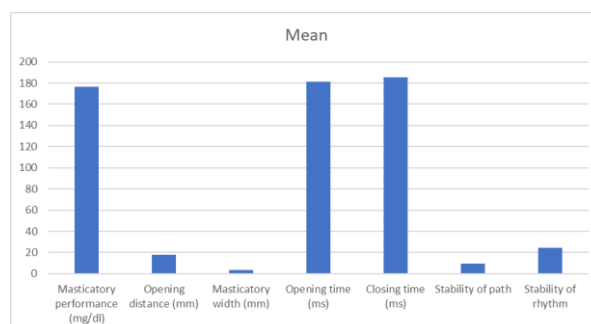
RESULTS

A total of 50 patients were included in the study. Table 1 shows mean value for masticatory performance and masticatory movements. We observed that mean value for masticatory performance 176.21 mg/dl. Mean opening distance was 17.65 mm. Mean masticatory width was 3.31 mm. Mean opening time was 181.3 ms and mean closing time was 185.65 ms. Mean value for stability of path was 9.41 and for stability of rhythm was 24.21.

Table 1: Mean value for masticatory performance and masticatory movements.

Parameters for masticatory performance and masticatory movements	Mean
Masticatory performance (mg/dl)	176.21
Opening distance (mm)	17.65
Masticatory width (mm)	3.31
Opening time (ms)	181.3
Closing time (ms)	185.65
Stability of path	9.41
Stability of rhythm	24.21

Fig 1: Mean value for masticatory performance and masticatory movements



DISCUSSION

In the present study, mean value for masticatory performance was 176.21 mg/dl, mean opening distance was 17.65 mm. Mean masticatory width was 3.31 mm. Mean opening time was 181.3 ms and mean closing time was 185.65 ms. Mean value for stability of path was 9.41 and for stability of rhythm was 24.21. Uesugi H et al conducted a study to clarify the relationship between masticatory performance using a gummy jelly and masticatory movement. Thirty healthy males were asked to chew a gummy jelly on their habitual chewing side for 20s, and the parameters of masticatory performance and masticatory movement were calculated as follows. For evaluating the masticatory performance, the amount of glucose extraction during chewing of a gummy jelly was measured. For evaluating the masticatory movement, the movement of the mandibular incisal point was

recorded using the MKG K6-I, and ten parameters of the movement path (opening distance and masticatory width), movement rhythm (opening time, closing time, occluding time, and cycle time), stability of movement (stability of path and stability of rhythm), and movement velocity (opening maximum velocity and closing maximum velocity) were calculated from 10 cycles of chewing beginning with the fifth cycle. The relationship between the amount of glucose extraction and parameters representing masticatory movement was investigated and then stepwise multiple linear regression analysis was performed. The amount of glucose extraction was associated with 7 parameters representing the masticatory movement. Stepwise multiple linear regression analysis showed that the opening distance, closing time, stability of rhythm, and closing maximum velocity were the most important factors affecting the glucose extraction. From these results it was suggested that there was a close relation between masticatory performance and masticatory movement, and that the masticatory performance could be increased by rhythmic, rapid and stable mastication with a large opening distance.^{7,8}

Komino M et al conducted study to clarify the change in mandibular movement during chewing of foods with different hardness, 20 healthy subjects were asked to chew 3 types of gummy jellies (containing 6, 8, and 10% gelatin), and the masseter muscular activity and the mandibular movement were recorded. The indicators representing the muscular activity (integral value of masseter muscular activity), the mandibular movement (opening distance, masticatory width, cycle time, opening maximum velocity and closing maximum velocity), and the stability of masticatory movement were calculated, respectively, and compared among the three foods. The integral value of masseter muscular activity was smallest for the 6% gelatin and significantly increased in order as the content of gelatin increased to 8, 10%. The value of each indicator for the mandibular movement increased gradually as the food got harder. The value for all indicators was significantly larger for the 10 than the 6%. However, between the two foods, no significant change was observed for the several indicators. The mean ratio of the 10% gelatin to the 8% gelatin for the cycle time was extremely small, being 1.01, but was between the range of 0.89–1.07

showing aspects of changes within each individual. The other indicators showing small ratio were similar in this aspect. The parameters representing stability of movement showed the lowest values for the 8% gelatin. It was suggested that the hardness of food affected mandibular movement during mastication, but the movement changed variously according to the hardness and exerted muscular activities. Shiga H et al conducted a study where twenty patients wearing complete dentures were asked to chew a gummy jelly, and their glucose extraction was measured. Two types of masticatory scores (MS1 and MS2) were calculated using a food intake questionnaire. The relationship between masticatory scores and glucose extraction was investigated. The values of masticatory scores were large when the amount of glucose extraction was also large, and there were significantly positive correlations between the two. There was also a positive correlation between MS1 and MS2. It was suggested that the food intake ability was high when the masticatory performance using a gummy jelly was high. Kuninori T et al investigated the effect of maximum bite force on masticatory jaw movement in subjects with normal occlusion. Thirty young adults (22 men and 8 women; mean age, 22.6 years) with good occlusion were divided into two groups based on whether they had a relatively high or low maximum bite force according to the median. The maximum bite force was determined according to the Dental Prescale System using pressure-sensitive sheets. Jaw movement during mastication of hard gummy jelly (each 5.5 g) on the preferred chewing side was recorded using a six degrees of freedom jaw movement recording system. The motion of the lower incisal point of the mandible was computed, and the mean values of 10 cycles (cycles 2-11) were calculated. A masticatory performance test was conducted using gummy jelly. Subjects with a lower maximum bite force showed increased maximum lateral amplitude, closing distance, width and closing angle; wider masticatory jaw movement; and significantly lower masticatory performance. However, no differences in the maximum vertical or maximum anteroposterior amplitudes were observed between the groups. Although other factors, such as individual morphology, may influence masticatory jaw movement, our results suggest that subjects with a lower maximum bite force show increased lateral jaw motion during mastication.^{9, 10}

CONCLUSION

Within the limitations of the present study, it can be concluded that there is a close relation between masticatory performance and masticatory movement, and that the masticatory performance could be increased by rhythmic, rapid and stable mastication with a large opening distance.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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