Subjective Assessment of Chewing Function of Obturator Prosthesis Wearers

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Purpose: Assessments of masticatory performance and occlusal force for wearers of obturator prostheses were performed as clinical objective assessments and reported in an earlier study. The purpose of the present study was to evaluate clinically the chewing function of obturator prosthesis wearers by self-evaluations and to examine their relationship to the objective assessments. **Materials and Methods:** Twenty patients with maxillofacial obturator prostheses who were having a periodic checkup at the maxillofacial rehabilitation clinic in Kyushu University Hospital were recruited for this study. Chewing function was evaluated by 3 assessment tools: a self-assessment mastication scale, a chewing function score, and a mastication score. In addition, correlations among these assessments and objective tests—ie, masticatory performance and maximum occlusal force—were analyzed by the Spearman rank correlation coefficient. **Results:** The mean self-assessment mastication scale was 63.2 (SD 31.8), the chewing function score was 54.0 (SD 30.2), and the mastication score was 51.4 (SD 33.3). There was no statistically significant relationship between the self-assessment mastication scale and each objective test. However, there were significant correlations between each semisubjective score—the chewing function score and the mastication score—and masticatory performance. There was no relationship between each semisubjective score and maximum occlusal force. **Conclusion:** A self-assessment mastication scale was not always in agreement with objective assessments, and assessments made by patients should be taken into consideration when arranging maxillofacial rehabilitation. Conversely, both chewing function and mastication scores corresponded with masticatory performance, and these would be useful as screening tests before performing objective tests. *Int J Prosthodont 2007;20:46–50.*

It is clinically important to evaluate the treatment outcome of prosthodontic procedures. Because objective assessments are considered to be less biased than subjective assessments, they may be recognized as more reliable tools for evaluating treatment outcomes. However, it is also recognized that patients' subjective assessments may reflect their overall satisfaction with treatment and influence treatment success. Hence, many types of semisubjective evaluations and self-evaluations[1,2] have been developed to estimate treatment outcomes easily at chairside. Although their usefulness and effectiveness for denture wearers have been reported, there are fewer data available for patients who have undergone therapeutic methods of maxillofacial rehabilitation to date.

Clinical objective assessments of the chewing function, ie, masticatory performance and maximum occlusal force, for obturator prosthesis wearers were evaluated and reported in an earlier study.[3] Therefore, the purpose of this study was to evaluate the chewing

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function for obturator prosthesis wearers with subjective and semisubjective assessments, and to examine their relationship to the previously reported objective assessment data.

Materials and Methods

Subjects

Twenty maxillofacial obturator prosthesis wearers who had partially edentulous or dentate maxillae were consecutively enrolled among all the maxillectomy patients for whom an obturator prosthesis was made in Kyushu University Hospital between April 2002 and June 2005. These subjects were identical to those in the previous study.[3] For partially edentulous subjects, a prosthesis covered the missing teeth regions and provided artificial teeth to restore complete-arch occlusal contacts.

Each subject was informed about the aim and procedure of this study, and consent to participate was obtained before the procedure.

Self-Assessment Mastication Scale and Semisubjective Scores

One subjective scale and 2 semisubjective scoring procedures were used to evaluate chewing function in the present study. Before periodic follow-up, a clinician who was not an attending practitioner told each subject how to complete questionnaires in the clinic. After receiving the explanation, all subjects filled out 3 questionnaires by themselves.

An original questionnaire,[4] which consisted of 30 items divided into 6 main categories, was developed to evaluate patients' subjective satisfaction with obturator prostheses by visual analog scales. It was based on the questionnaire of Garrett et al for complete denture wearers.[5] In the present study, 1 item about mastication, in which the subjects were asked to grade (via a 100-mm visual analog scale) how well they could chew when wearing a prosthesis, was employed. This scale was called the self-assessment mastication scale (SAMS).

As for semisubjective scores, 2 tools that were developed to estimate chewing ability at chairside with self-recording questionnaires–the chewing function score[1] and the mastication score[2]–were used in the present study. Subjects were asked to select the foods that they could eat easily from a list of typical and popular Japanese foods with different textures. Twenty and 35 kinds of foods were listed in the questionnaires for chewing function[1] and mastication,[2] respectively. The number of marks was counted to calculate the score for each formula (full score = 100).

In the first phase of evaluating chewing function and mastication, the subjects were instructed to judge
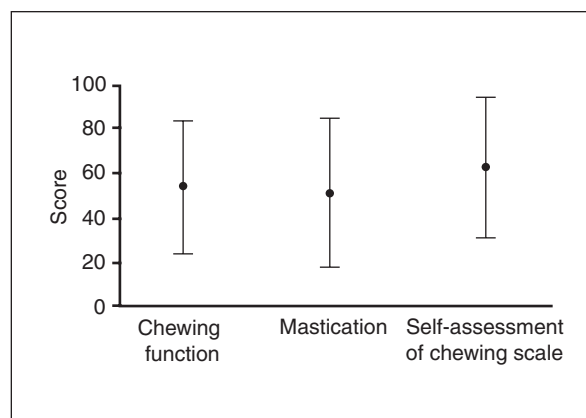

Fig 1   Results of self-evaluation scores (means ± 1 SD) (error bars).

by themselves whether they could eat each food listed in the questionnaire or not. This meant that these 2 scores were subjective. However, in the second phase, the scores were calculated by dividing each predetermined formula by the number of foods the subject could eat. This means that these 2 scores also had an objective property. Therefore these 2 scores were called "semisubjective" assessments, in contrast to the SAMS.

Objective Assessment Data

Detailed methods of measuring masticatory performance and maximum occlusal force were provided in the previous study.[3] Briefly, masticatory performance was measured using a sieve method with a column-shaped piece of hydrocolloid impression material.[6] The subjects were asked to chew a piece of hydrocolloid impression material (column-shaped, 12 mm in diameter, 12 mm in height, and 1.5 g in weight) freely for 10 and 20 strokes. After completion of each chewing session, all the particles were collected into a cup and poured onto 1.70- and 1.40-mm mesh sieves. The number of particles on the 1.40-mm mesh sieve was counted. Masticatory performance was calculated by the following formula: $(B - A)/10$, where A is the number of particles obtained after 10 strokes and B is the number of particles obtained after 20 strokes. This number therefore represented the number of particles increased by 1 stroke.

Maximum occlusal force was measured with pressure-sensitive film (Dental Prescale 50H R-type, Fuji Film Co) and analyzed with Occluzer (FPD703, Fuji Film Co).[7] The measurement was performed with the obturator prostheses in place. Measurements were performed 3 times for each participant, and the means were submitted to data analysis.

Table 1 Correlation Coefficients Among Subjective and Objective Assessments

	Self-assessment mastication scale	Chewing function score	Mastication score	Masticatory performance	Maximum occlusal force
Self-assessment mastication scale	–	.185	.285	.129	–.042
Chewing function score		–	.865***	.616**	.318
Mastication score			–	.758***	.295
Masticatory performance				–	.156
Maximum occlusal force					–

Values represent correlation coefficients (r).
**$P < .01$; ***$P < .001$.

Data Analysis

Correlations between SAMS and each semisubjective score—ie, the chewing function score and mastication score—and objective assessment data—ie, masticatory performance and maximum occlusal force—were analyzed with Spearman rank correlation coefficient. The level of significance was set at .05. All statistical analyses were performed with SPSS 13.0J for Windows (SPSS Inc).

Results

Subject Profiles

Twenty maxillofacial obturator prosthesis wearers (10 male, 10 female, with a mean age of 60.8 years [SD 10.4]) were included in the study. All subjects exhibited at least partially edentulous maxillae, and the oral status varied, including residual teeth, occlusal support, and defect size and location. Defect profiles by Aramany's classification were as follows: 11 subjects (55.5%) had Class I (midline resection), 7 (35.0%) had Class II (unilateral resection), and 2 (10.0%) had Class VI (anterior resection). The status of occlusal support of residual teeth was more variable than defect type in the subjects. This factor was evaluated by the number of contact zones of molar and premolar contacts as follows: one subject (5.0%) had 3 support zones, 12 subjects (60.0%) had 2 zones, 4 subjects (20.0%) had anterior contacts only without premolar and molar contacts, 2 subjects (10.0%) had only 1 zone, and 1 subject (5.0%) had no contact zones.

All subjects were healthy and had attended periodic follow-up appointments every 1 to 3 months.

Assessments of Chewing Ability

Subjective and semisubjective assessment data are shown in Fig 1. The mean SAMS was 63.2 (SD 31.8), with a range of 0 to 100. The mean chewing function score was 54.0 (SD 30.2), with a range of 20 to 100. The mean mastication score was 51.4 (SD 33.3), with a range of 12.8 to 100.0.

The mean masticatory performance was 2.6 (SD 1.2). The mean maximum occlusal force was 625.9 N (SD 299.1 N).

Correlation Among Subjective, Semisubjective, and Objective Assessment Data

The relationships among subjective, semisubjective, and objective assessment data are shown in Table 1. There were statistically significant correlations between the chewing function score and mastication score ($P < .0001$) (Fig 2), between the chewing function score and masticatory performance ($P = .0035$) (Fig 3), and between the mastication score and masticatory performance ($P = .0004$) (Fig 4). SAMS and maximum occlusal force had no statistically significant relationship with the other assessment tools.

Discussion

There is little information on the chewing function of maxillectomy patients when they are wearing obturator prostheses, although it is recognized that such information is essential for evaluating the outcome of maxillofacial prosthesis treatment. To obtain basic information on this point, the chewing function of maxillectomy patients with dentate or partially edentulous
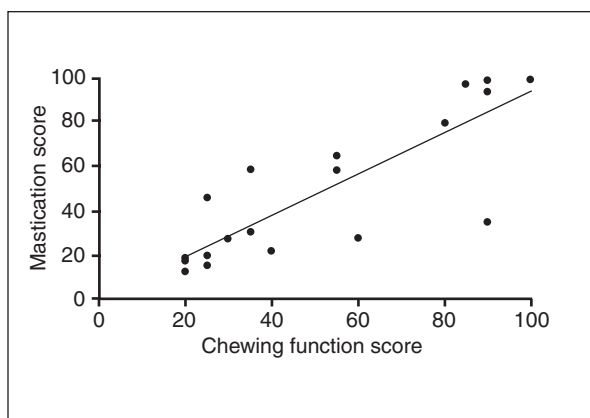
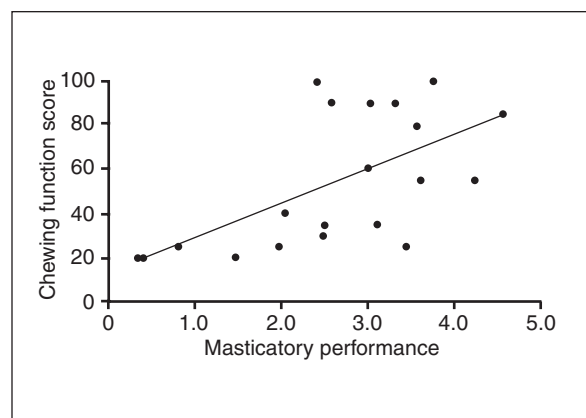**Fig 2** Relationship between chewing function scores and mastication scores (r = 0.865, P < .001).

Fig 3 Relationship between chewing function scores and masticatory performance (r = 0.616, P = .004).

Fig 4 Relationship between mastication scores and masticatory performance (r = 0.758, P < .001).

maxillae was evaluated, while the patients wore their obturator prosthesis, by objective functional tests, ie, masticatory performance and maximum occlusal force, in an earlier study.[3] To summarize, obturator wearers exhibited good chewing function, ie, their masticatory performance was not different from that of healthy young individuals, although their maximum occlusal force was significantly lower.[3]

Subjective assessments, on the other hand, are frequently used to evaluate treatment outcomes, since the application of these assessment tools at chairside is much easier than the use of objective assessment tools. However, the usefulness of these assessment tools for maxillectomy patients has not yet been fully reported to date. Hence, subjective assessments of obturator wearers were investigated in the present study.

The question for SAMS—"How well do you chew?"— was very simple and considered to be the most subjective of the clinical assessment tools used in the present study. It was considered possible that this questionnaire might be more biased by various factors (eg, personality, psychosocial causes) than the other assessment tools.

The chewing function score was developed by Sato et al,[1] who selected 20 foods from a list of 100 foods to evaluate the chewing function of complete denture wearers at chairside. Likewise, the mastication score was developed by selecting 35 foods from 170 typical and popular Japanese foods with various textures. Both the chewing function and mastication scores were semisubjective assessments, because the subjects judged whether they can chew each food by themselves, and then the examiner calculated the scores in accordance with the entries by the subjects.

Sato et al[1] reported that the mean chewing function score of 110 complete denture wearers was 54. According to their study, the mean score of subjects who stated "satisfied" was 58.7, "partly satisfied" sub-
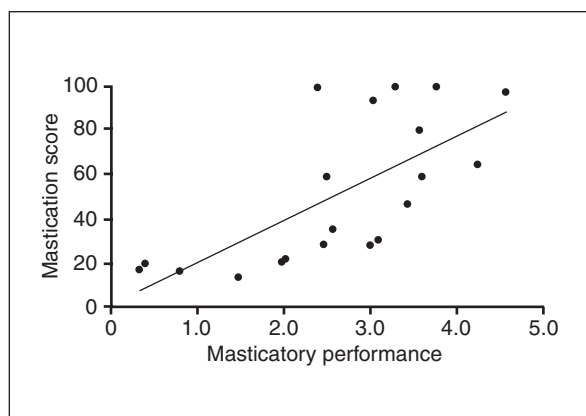
jects had a mean score of 48.5, and "not satisfied" patients had a mean score of 32.4; in the present study, the mean score of obturator wearers was 54.0 (SD 30.2). It was considered that the subjects in the present study on average could chew at the level between the "satisfied" and "partly satisfied" groups for complete denture wearers in the study by Sato et al, although it is difficult to compare these results directly because the distribution of data (eg, SD) for the 3 groups was not provided. Hirai and colleagues also reported that the mean mastication score of 39 complete denture wearers was 60.2,[8] whereas that of obturator wearers was 51.4 (SD 33.3) in the present study. Although the mean age of obturator wearers in the present study (60.8 years) was lower than that of complete denture wearers in the Hirai et al study (68.8 years), the mean mastication score of obturator wearers was 8.8 points lower. However, again, it is difficult to compare these results directly.

There are few studies in which comparisons between subjective and objective assessments have been investigated.[9,10] Furthermore, there are very few reports that have investigated the correlation between subjective and objective assessments.[11] To date, such information is lacking in the field of maxillofacial rehabilitation.

There were significant correlations between chewing function scores, mastication scores, and masticatory performance in the present study. The mastication score was originally developed to confirm correlations between the score and masticatory performance by the sieve method (r = .83, $P <$ .01)[2] using 3 g of peanuts with 20 strokes of mastication. This was considered to be one of the main reasons for the significant correlation (r = .758) between the mastication score and masticatory performance in the present study. The difference in the value of the correlation coefficient might be caused by the difference in the materials used between these 2 tests for estimating masticatory performance (eg, peanuts versus hydrocolloid material).

Likewise, the chewing function score had a significant correlation with masticatory performance in the present study, although the chewing function score was developed without confirming the correlation with masticatory performance in the original study.[1] Because the foods used in each score were selected from several categories with different textures to estimate chewing ability, it seems logical that there was a high correlation between these 2 scores (r = .865, $P <$ .0001).

There was no significant correlation between the SAMS and the objective assessment data. One of the reasons for this result was that the SAMS could be influenced by various things, eg, personality, psychosocial factors, economic conditions.[12] Because subjective assessments could influence the overall treatment outcome and/or patients' life quality, further studies are necessary to determine how these assessments should be incorporated into assessments of treatment outcome.

As previously mentioned, there is little information available in the field of maxillofacial rehabilitation, especially regarding the relationship between subjective and objective assessments. The present study could provide valuable information in this regard. According to the results of the present study, it was suggested that both semisubjective assessments could be useful as screening tests for evaluating the chewing function of obturator prosthesis wearers before obtaining objective assessment data. On the other hand, it should be noted that patients' subjective evaluations had no correlation with objective assessments. However, in clinical situations, it is important that patient-based assessments of satisfaction should be analyzed appropriately.[9] Consequently, it is advisable that the SAMS should be carefully integrated to properly assess treatment outcomes.

Conclusion

The chewing function of obturator prosthesis wearers who had partially edentulous or dentate maxillae was evaluated by subjective and semisubjective assessments, and the correlations among these assessments and objective assessments were analyzed. The obtained results demonstrate:

1. The mean SAMS (visual analog scale) was 63.2, the mean chewing function score was 54.0, and the mean mastication score was 51.4.
2. There were significant correlations in the chewing function score, mastication score, and masticatory performance.
3. The SAMS and maximum occlusal force had no significant correlation with the other assessments.

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