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Association between masticatory performance and maximal occlusal force in young men

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Abstract

SUMMARY The purpose of this study was to examine the relationship between masticatory performance and maximal occlusal force in dentate subjects, using test foods of varying hardness. Subjects were 20 young males with natural dentitions. Gummy jellies with two different degrees of hardness have been used as test foods to evaluate masticatory performance. Masticatory performance was evaluated by the increase of the surface area of expectorated pieces of comminuted gummy jelly that was calculated from the concentration of gelatin. Maximal occlusal force was measured with pressure sensitive sheets (DENTAL PRESACLE™ 50H R type). The results suggested that maximal occlusal force had a significant positive correlation to the masticatory performance both with soft gummy jelly and hard gummy jelly. The correlation coefficient (r) with hard gummy jelly tended to be larger than with soft gummy jelly.

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Association between masticatory performance and maximal occlusal force in young men

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SUMMARY The purpose of this study was to examine the relationship between masticatory performance and maximal occlusal force in dentate subjects, using test foods of varying hardness. Subjects were 20 young males with natural dentitions. Gummy jellies with two different degrees of hardness have been used as test foods to evaluate masticatory performance. Masticatory performance was evaluated by the increase of the surface area of expectorated pieces of comminuted gummy jelly that was calculated from the concentration of gelatin.

Maximal occlusal force was measured with pressure sensitive sheets (DENTAL PRESSCALE™ 50H R type). The results suggested that maximal occlusal force had a significant positive correlation to the masticatory performance both with soft gummy jelly and hard gummy jelly. The correlation coefficient (r) with hard gummy jelly tended to be larger than with soft gummy jelly.

KEYWORDS: dental prescale, food's hardness, gummy jelly, masticatory performance, maximal occlusal force

Introduction

The aim of mastication is to comminute food and to increase the surface area of the food to be exposed to digestive juices. There have been several objective measures of masticatory functions, such as masticatory performance, swallowing threshold and occlusal force. While Geertman *et al.* (1999) reported that an improvement in masticatory performance does not imply the same improvement in chewing experience and vice versa, measurement of masticatory performance and maximal occlusal force may provide essential information that could make an appropriate diagnosis regarding masticatory function.

Previous studies have reported on the associations between masticatory performance and maximal occlusal force (Tate *et al.*, 1994; Fontijn-Tekamp *et al.*, 2000). However, it has not been determined whether an individual's masticatory performance varies according to a food's hardness.

Real foods, including carrots (Tate *et al.*, 1994; Fontijn-Tekamp *et al.*, 2000), peanuts (Manly, 1951), almonds (Huggare & Skindhøj, 1997) and color-changeable chewing gum (Hayakawa *et al.*, 1998), have been used

to measure masticatory performance. But it is difficult to change hardness with real foods. In other studies, artificial products (e.g. Silicone impression materials as Optocal™*) with different hardness were used (Slagter, Bosman & Van der Bilt, 1993), however, they were not real foods. Gummy jelly (Fig. 1) can provide different hardnesses with the same shape and taste (Yamamoto, 1993; Yoshida *et al.*, 1995). Since its suitability has been demonstrated, gummy jelly has become one of the optimal foods for measuring masticatory performance with different degrees of hardness.

The purpose of this study was to examine the relationship between masticatory performance and maximal occlusal force in dentate subjects, using test foods of varying hardness.

Subjects and methods

Subjects

Subjects were 20 males (28.3 ± 1.9 years old) with natural dentitions and Angle Class I orthodontical normal

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findings suggest that cutting the harder food required larger occlusal force to compensate for the stronger load of food during mastication. While Pearson's correlation coefficients between masticatory performance and maximal occlusal force were 0.55 or 0.66, masticatory performance was not explained by maximal occlusal force alone. Further investigation will be needed in future study.

In conclusion, it was suggested that a larger maximal occlusal force was associated with a higher masticatory performance, especially with harder foods.

References

- FONTIJN-TEKAMP, F.A., SLAGTER, A.P., VAN DER BILT, A., VAN'T HOF, M.A., WITTER, D.J., KALK, W. & JANSEN, J.A. (2000) Biting and chewing in overdentures, full dentures, and natural dentitions. *Journal of Dental Research*, **79**, 1519.
- GEERTMAN, M.E., SLAGTER, A.P., VAN'T HOF, M.A., VAN WAAS, M.S. & KALK, W. (1999) Masticatory performance and chewing experience with implant-retained mandibular overdentures. *Journal of Oral Rehabilitation*, **26**, 7.
- HAYAKAWA, I., WATANABE, I., HIRANO, S., NAGAO, M. & SEKI, T. (1998) A simple method for evaluating masticatory performance using a color-changeable chewing gum. *International Journal of Prosthodontics*, **11**, 173.
- HUGGARE, J. & SKINDHÖJ, B. (1997) A new method for assessing masticatory performance: a feasibility and reproducibility study. *Journal of Oral Rehabilitation*, **24**, 490.
- KUMAGAI, H., SUZUKI, T., HAMADA, T., SONDANG, P., FUJITANI, M. & NIKAWA, H. (1999) Occlusal force distribution on the dental arch during various levels of clenching. *Journal of Oral Rehabilitation*, **26**, 932.
- MANLY, R.S. (1951) Factors affecting masticatory performance and efficiency among young adults. *Journal of Dental Research*, **30**, 874.
- SHIAU, Y.Y., PENG, C.C. & HSU, C.W. (1999) Evaluation of biting performance with standardized test-foods. *Journal of Oral Rehabilitation*, **26**, 447.
- SLAGTER, A.P., BOSMAN, F. & VAN DER BILT, A. (1993) Communion of two artificial test foods by dentate and edentulous subjects. *Journal of Oral Rehabilitation*, **20**, 159.
- SLAGTER, A.P., VAN DER GLAS, H.W., BOSMAN, F. & OLTHOFF, L.W. (1992) Force-deformation properties of artificial and natural foods for testing chewing efficiency. *The Journal of Prosthetic Dentistry*, **68**, 790.
- SUZUKI, T., KUMAGAI, H., WATANABE, T., UCHIDA, T. & NAGAO, M. (1997) Evaluation of complete denture occlusal contacts using pressure sensitive sheet. *International Journal of Prosthodontics*, **10**, 386.
- TATE, G.S., THROCKMORTON, G.S., ELLIS, E III & SINN, D.P. (1994) Masticatory performance, muscle activity and occlusal force in preorthognathic surgery patients. *Journal of Oral and Maxillofacial Surgery*, **52**, 476.
- YAMAMOTO, M. (1993) Evaluation of masticatory function in complete denture wearers by masticatory efficiency, electromyographic activities and mandibular movement. *The Journal of Osaka University Dental Society*, **38**, 303.
- YOSHIDA, M., YAMAMOTO, M., NOKUBI, T. & FURUYA, M. (1995) Evaluation of masticatory performance in denture wearers by using the testing Gummy jelly. In: *Brain and Oral Functions* (eds T. Morimoto, T. Matsuya & K. Takada), pp. 411–415. Elsevier Science, Amsterdam.

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