Local Factors Associated with Parafunction and Prosthodontics

Kiyoshi Koyano, DDS, PhD ª Yoshihiro Tsukiyama, DDS, PhD ^b Rika Ichiki, DDS, PhD ^c

^a Professor and Chair, ^b Associate Professor, ^c Research Associate

Department of Removable Prosthodontics Faculty of Dental Science Kyushu University Fukuoka, Japan

What Do We Know and Not Know?

Methods to Assess Parafunction

There are several ways to assess parafunctional activity. Questionnaires are the most commonly used method. Clinical examination and observations of tooth wear are also widely used in clinical settings. The reliability of these methods is questionable. In addition, the wear on occlusal splints¹ and interarch contacts and force² are measured. Portable electromyographic recording of the masticatory muscles during sleep³ is a more objective method to assess bruxism. Polysomnography in a sleep laboratory⁴ is currently considered the most specific method of analysis. The former recording method has limitations in data size and in the number of channels for sampling compared with the latter. However, the latter is expensive, and the subject's parafunctional activity might be affected by the unfamiliar conditions of the sleep laboratory.

Parafunction and Tooth Wear

A number of systems to classify and assess tooth wear have been reported. Many of these use a five-point scale based on the severity of tooth wear, as determined from study casts.^{5,6} Intra- and interexaminer reliability are keys to the usefulness of these methods, and the reliability of these approaches has been confirmed in many studies. However, no method is universally accepted. In addition to these rating systems, sophisticated methods, such as digitization of the amount of wear⁷ and observation by scanning electron microscopy, have been introduced. However, the usefulness of such methods in a clinical setting or for large samples is questionable.

Over a 2-year observation period, bruxers developed more tooth wear than did nonbruxers.⁷ Tooth wear is associated with many factors, and parafunctional activity can cause tooth wear.⁷ However, the presence of attrition cannot be used as a criterion to define the bruxer group.⁶ In general, the incidence and severity of tooth wear are thought to increase with age. However, the prevalence of nocturnal grinding decreases with age after 50 years of age.⁸

Parafunction and Occlusion

The mean amplitude and duration of bruxism events were 22.5 kgf and 28.5% of the maximum conscious clench,

respectively. The maximum bruxing force (15.6 to 81.2 kgf) generally does not exceed the maximum conscious clench, although it can exceed the maximum conscious bite force in some individuals.² The occlusal force during nocturnal bruxism can easily exceed the level during normal function such as chewing.

Although occlusal interference has historically been regarded as a cause of bruxism, evidence countering this historic concept has been reported: Experimental occlusal interference reduces muscle activity during sleep³; occlusal

adjustment does not stop bruxism, although it might be a cause of bruxism; no significant difference in occlusion is seen in bruxism and control groups; moreover, there is no difference in the effect on bruxism by an occlusal splint covering the occlusal surface of the dentition or not.⁹

Parafunction and Myofascial Pain/Temporomandibular Disorders

Bruxism is thought to cause or be a risk factor for myofascial pain/temporomandibular disorders (TMD). Although there are many reports associating bruxism and myofascial pain/TMD, there is no strong evidence for a cause-andeffect relationship between bruxism and myofascial pain/TMD.^{10,11}

There are many reports on the prevalence of TMD, and most agree that TMD is more prevalent in women than in men. By contrast, the studies on gender differences in bruxism do not show a constant result–while some studies reported no gender difference in the incidence of bruxism,¹² others reported diverse gender differences.¹³ A twin study with a large sample size reported that more women have bruxism than men, and that the incidence of bruxism increases with age from 30 to 50 years.¹⁴ It is also controversial whether there is a gender difference in jaw muscle pain experimentally induced by clenching.¹⁵

Parafunction and Prosthodontic Treatment

Parafunction and factors such as restorative materials, restoration design, implant design and location, occlusal vertical dimension, and periodontically compromised dentition are thought to be important in prosthodontic treatment. Few data are available on these topics. Some studies report that bruxism may not be a primary factor, but it contributes to the wear of restorative materials,¹⁶ tooth survival in

periodontitis,¹⁷ cracks in posterior teeth,¹⁸ implant failure,¹⁹ and complications with fixed partial dentures on implants.²⁰ Most of the studies in this field define a bruxer according to the subject's reports or tooth wear. However, such definitions are unreliable.

What Research Strategies Are Needed?

First, we need to establish valid criteria and a method of defining a bruxer that will be used universally. An objective measurement of bruxism, which can be used in clinics, should also be devised.

Studies on the role of bruxism in the etiology of myofascial pain/TMD from the perspectives of cause-and-effect relationships and the role of bruxism in perpetuating or aggravating TMD are needed.

The following questions should be answered. Is there a gender difference in the prevalence of bruxism? Is there a typical natural course for bruxism over a lifetime? Why does the incidence of bruxism decrease after middle age? Is there a gender difference in experimentally induced muscle pain?

The effects of bruxism on prosthodontic treatment, especially on prosthesis longevity, need to be studied. The following studies are therefore suggested:

- 1. Wear of teeth and restorative materials and surface characteristics of materials
- 2. Wear/destruction of restorative materials and bruxism
- 3. Restoration design and bruxism
- 4. Implant design and location and bruxism
- 5. Periodontally compromised dentition and bruxism
- 6. Occlusal vertical dimension and bruxism

To conduct such studies, bruxism must be defined using a reliable, possibly quantitative, method.

What Needs Highlighting in Educational Programs?

Better understanding of the definition, causes, pathophysiology, consequences, and management of parafunction and associated health conditions should be included in dental education. Students should be taught how to recognize bruxism in clinical assessment. The effects of bruxism on pain, dysfunction, and prosthodontic treatment need to be emphasized in prosthodontic education.

Acknowledgment

The authors would like to thank Dr Glenn T. Clark for his valuable suggestions.

References

- Pierce CJ, Gale EN. Methodological considerations concerning the use of Bruxcore Plates to evaluate nocturnal bruxism. J Dent Res 1989;68: 1110-1114.
- Nishigawa K, Bando E, Nakano M. Quantitative study of bite force during sleep associated bruxism. J Oral Rehabil 2001;28:485-491.
- Rugh JD, Barghi N, Drago CJ. Experimental occlusal discrepancies and nocturnal bruxis. J Prosthet Dent 1984;51:548–553.
- Velly-Miguel AM, Montplaisir J, Rompre PH, Lund JP, Lavigne GL. Bruxism and other orofacial movements during sleep. J Craniomandib Disord Facial Oral Pain 1992;6:71–81.
- Smith BGN, Knight JK. An index for measuring the wear of teeth. Br Dent J 1984;156:435–438.
- Seligman DA, Pullinger AG, Solberg WK. The prevalenceof dental attrition and its association with factors of age, gender, occlusion and TMJ symptomatology. J Dent Res 1988;67:1323–1333.
- Pintado MR, Anderson GC, DeLong R, Douglas WH. Variation in tooth wear in young adults over a two-year period. J Prosthet Dent 1997;77: 313–320.
- Ekfeldt A, Hugoson A, Bergendal T, Helkimo M. An individual tooth wear index and an analysis of factors correlated to incisal and occlusal wear in an adult Swedish population. Acta Odontol Scand 1990;48:343–349.
- Ichiki R, Koyano K, Tsukiyama Y. Effect of occlusal splint designs on nocturnal masticatory muscle activities [abstract 330]. J Dent Res 1999;78 (special issue):147.
- Dao TT, Lund JP, Lavigne GJ. Comparison of pain and quality of life in bruxers and patients with myofascial pain of the masticatory muscles. J Orofac Pain 1994;8:350–356.
- Magnusson T, Egermark I, Carlsson GE. A longitudinal epidemiologic study of signs and symptoms of temporomandibular disorders from 15 to 35 years of age. J Orofac Pain 2000;14:310–319.
- Lavigne GJ, Montplaisir JY. Restless legs syndrome and sleep bruxism: Prevalence and association among Canadians. Sleep 1994;17:739–743.
- Gross AJ, Rivera-Morales WC, Gale EN. A prevalence study of symptoms associated with TM disorders. J Craniomandib Disord 1988;2:191–195.
- Hublin C, Kaprio J, Partinen M, Koskenvuo M. Sleep bruxism based on selfreport in a nationwide twin cohort. J Sleep Res 1998;7:61–67.
- Plesh O, Curtis DA, Hall LJ, Miller A. Gender difference in jaw pain induced by clenching. J Oral Rehabil 1998;25:258–263.
- Ekfeldt A. Incisal and occlusal tooth wear and wear of some prosthodontic materials. An epidemiological and clinical study. Swed Dent J Suppl 1989;65:1–62.
- McGuire MK, Nunn ME. Prognosis versus actual outcome. III. The effectiveness of clinical parameters in accurately predicting tooth survival. J Periodontol 1996;67:666–674.
- Ratcliff S, Becker IM. Quinn L. Type and incidence of cracks in posterior teeth. J Prosthet Dent 2001;86:168–172.
- Ekfeldt A, Christiansson U, Eriksson T, et al. A retrospective analysis of factors associated with multiple implant failures in maxillae. Clin Oral Implants Res 2001;12:462–467.
- Brägger U, Aeschlimann S, Burgin W, Hämmerle CH, Lang NP. Biological and technical complications and failures with fixed partial dentures (FPD) on implants and teeth after four to five years of function. Clin Oral Implants Res 2001;12:26–34.

Copyright of International Journal of Prosthodontics is the property of Quintessence Publishing Company Inc. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.