

## **Occlusion, Parafunction, and Restorative Dentistry**

Restorative dentistry is doomed to failure if the patient bruxes, this is particularly apparent with cervical restorations, here just a couple of literature references.

- Joergensen KD, Matrano R, Shimokobe H. Deformation of cavities and resin fillings in loaded teeth. *Eur J Oral Science* 2007;84(1):46-50
- Fruits TJ, Vanbrunt CL, Khajotia SS, Duncanson Jr. MG. Effect of Lateral Forces on Microleakage in Cervical Resin Restorations. *J Dent Res* 1999; Abstr.2260:388
- Heymann HO, Sturdevant FR, Bayne SC. Tooth flexure: effects on cervical restorations: a two-year clinical study. *JADA* 1991;122:41-7

## **Correlations**

According to evidence based dentistry, there are no statistically valid correlations between occlusion and any kind of symptoms. Scientifically, occlusal therapy (restorative or equilibration) is not indicated for treatment of CMD.

- Koh H and Robinson PG. Occlusal adjustment for treating and preventing temporomandibular joint disorders. *J Evid Based Dent Pract* 2006;6:167-8
- Forssell H, et.al. Occlusal treatments in temporomandibular disorders: a qualitative systematic review of randomized controlled trials. *Pain* 1999;83:549-60
- Tsukiyama Y, et.al. An evidence-based assessment of occlusal adjustment as a treatment for temporomandibular disorders. *J Prosthet Dent* 2001;86:57-66

Naturally, this “science” contradicts the clinical experience of nearly every dentist in the world. Probably no other area in dentistry is so screwed up by bad science and misconceptions.

Wear facets are frequently used as the primary diagnostic indicator of bruxism, which is complete nonsense. There is a strong inverse correlation of wear facets with symptoms.

- Gesch D, et.al. Association of Malocclusion and Functional Occlusion with Subjective Symptoms of TMD in Adults: Results of a Study in Pomerania. *The Angle Orthodontist* 2004, 508-11
- Visser A, Naeije M, Hansson T. The temporal/masseter cocontraction: an electromyographic and clinical evaluation of short-term stabilization splint therapy in myogenous craniomandibular disorder patients. *J Oral Rehabil* 1995;22:387-9

Naturally, you cannot find correlations if you begin with incorrect assumptions and improper patient selection.

## **Diagnosis**

Correct diagnosis depends on the presence of specific signs and symptoms and their interrelation. The signs and symptoms, together with the position of the mandible and an analysis of the centric and eccentric occlusal contacts determine if occlusal adjustment or splint therapy is indicated and how treatment will proceed. We need to put pieces of the puzzle together.

## Signs and Symptoms

**Signs:** angular Class 5 lesions, masseter hypertrophy, scalloped lateral border of the tongue, lingual mandibular tori, short clinical crown length of posterior teeth, isolated anterior wear facets, IID < 30 mm. We could also add asymmetrical mandibular movement and unilateral function, particularly if this correlates with the sleep position.

**Symptoms:** pain on opening, neck and shoulder pain, headaches, cervical sensitivity to temperature, and naturally TMJ and/or masticatory muscle pain.

Cervical lesions are one of the main diagnostic criteria for bruxism, the lesion morphology and the distribution provide important information for understanding “how” the patient parafunctions.

- Mayhew RB, Jessee SA, Martin RE. Association of occlusal, periodontal, and dietary factors with the presence of non-carious cervical dental lesions. *Am J Dent* 1998;11(1):29-32

## Cervical lesions

Class 5 lesions cannot be caused by a toothbrush and toothpaste alone, despite claims to the contrary.. Erosion lesions are caused by the combination of an acid (dietary or bacterial) together with the toothbrush.

- Gross D, Lindner S, Mayer R. Der Einfluss von Zahnputztechniken und Zahnpasten auf die Entstehung von Zahnhalsdefekten. *ZWR* 1996;105:108-11
- Radentz WH, Barnes GP, Cutright DE. A survey of factors possibly associated with cervical abrasion of tooth surfaces. *J Periodontol* 1976;47:148-54
- Joiner A, Pickels MJ, Tanner C, Weader E, Doyle P. An in situ model to study the toothbrush abrasion of enamel. *J Clin Periodontol* 2004;31:434-8
- Swinnseth PN, Gjerdet NR, Lie T. Abrasivity of toothpastes. An in vitro study of toothpastes marketed in Norway. *Acta Odontol Scand* 1987;45:295-302
- Jaeggi T, Lussi A. Toothbrush abrasion of erosively altered enamel after intraoral exposure to saliva: an in situ study. *Caries Res* 1999;33:455-61
- Ganss C, Schlueter N, Friedrich D, Klimek J. Efficacy of waiting periods and topical fluoride treatment on toothbrush abrasion of eroded enamel in-situ. *Caries Res* 2007;41(2):16-51

Angular cervical lesions are caused by the combination of acid and the toothbrush and parafunction. The location of the occlusal contacts determines lesion morphology. The correlation of the occlusal contact location with the signs and symptoms determines whether the occlusion should be altered. Mobile teeth do not have angular lesions as a rule.

Allow me one pedantic point. The true elasticity modulus of dentin is NOT the commonly cited 18 GPa, which was determined with dry dentin at room temperature. The modulus varies with the position of loading, and is approximately 14 GPa in the mesio-distal direction but only 8 GPa if the teeth are bent orally or vestibularly. Additionally, a thin layer of dentin at the DEJ has a modulus of approximately 4 GPa. (The modulus of maple wood is approximately 14 GPa., teeth are much more flexible than most types of wood.)

- Zaslansky P, Currey JD, Friesem AA, Weiner S. Phase shifting speckle interferometry for determination of strain and Young's modulus of nimeralized

biological materials: a study of tooth dentin compression in water. J Biomed Opt 2005;10(2):020420

FEA with anatomically correct modelling under consideration of the anisotropy of enamel and dentin correlates extremely well with the clinical incidence of angular Class 5 lesions. Two dimensional or simulated 3-D FEA studies are misleading. Interferometry studies which utilize natural teeth confirm a stress localization corresponding to both position and incidence of clinical lesions.

- Kuroe T, Itoh H, Caputo AA, Nakahara H. Potential for Load-Induced Cervical Stress Concentration as a Function of Periodontal Support:, Journal of Esthetic Dentistry 1999;11(4):215-22
- Borcic J, Anic I, Catic A, Miletic I, Ribaric S. 3-D finite element model and cervical lesion formation in normal occlusion and in malocclusion. Journal of Oral Rehab 2005;32(7):504-10

Here again, I believe everyone is aware of the contributions of Lee and Eakle, McCoy, and Grippo, so I need not cite them separately.

Parafunction can be characterized with three components: intensity, duration, and frequency, with high contraction intensity being the predominate cause of symptoms. High intensity precludes mandibular movement, and no movement means no wear facets. Cervical lesions (and CMD) correlate with the force of occlusal contact.

- Takehara J, Takano T, Akhter R, Morita M. Correlation of noncarious cervical lesions and occlusal factors determined by using pressure-bite detecting sheet. J Dent 2008;36(10):774-9

The position of the teeth determines which symptoms the patient will get. "Correcting" the occlusion does not eliminate parafunction in the majority of cases, the elimination of one symptom may only exacerbate others. Some problems can be solved with occlusal therapy, some cannot, the challenge is to know when and where.

## **Stress**

The primary cause of parafunction is psychological stress, there is a strong correlation of anxiety or depression with CMD. The muscles of mastication and a few neck muscles have sympathetic motor innervation.

- Manfredini P, et.al. Mood disorders in patients with bruxing behaviour. Australian Dental Journal 2004;33:485-90
- There are also multiple references in the bible concerning psychological stress and bruxism. (Matthew 8, 22, 25. Job 16. Lucas 13)

Relaxation techniques, biofeedback and physical therapy have demonstrated success rates equal to or exceeding dental splint therapy for treatment of CMD. The placebo effect may be responsible for >50% of treatment success. Basically, an interdisciplinary approach is required.

- Crider AB, Glaros AG. A meta-analysis of EMG biofeedback treatment of temporomandibular disorders. J Orofac Pain 1999;13:29-37
- McNeely ML, et.al. A systematic review of the effectiveness of physical therapy interventions for temporomandibular disorders. Phys Ther 2006;86:910-1
- Medicott MS, Harris SR. A systematic review of exercise, manual therapy, electrotherapy, relaxation training, and biofeedback in the management of temporomandibular disorder. Phys Ther 2006;86:955-73