

Chapter 11

Combining the Air Indexing Method With the T-Scan System to Detect and Quantify Cervical Dentin Hypersensitivity

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ABSTRACT

This chapter introduces the air indexing method for detecting and quantifying cervical dentin hypersensitivity (CDH) as a companion to the T-Scan Occlusal Analysis System which evaluates force and timing values for occlusal contacts of teeth. This chapter will also highlight an evidence-based retrospective investigation undertaken between 1979 and 1996 that evaluated associations and/or correlations between diagnosed CDH and its resolution following occlusal adjustment. This retrospective's method described the detection, diagnosis, and treatment of the signs and/or symptoms of the common clinical finding amongst patients with CDH. Stress physics will illustrate how small occlusal contacts magnify the impact that applied occlusal contact force has on the cervical regions of teeth. This resultant cervical stress is etiologic for how non-carious cervical lesions (NCCLs) form and degrade tooth roots. This chapter also explains how biocorrosion from endogenous and exogenous sources produces loss of dentin's protective proteins, glycoproteins, and cementum, which add to the effects of applied occlusal force, thereby creating CDH symptoms and NCCLs. CDH appears resultant from the co-factors of occlusal forces that produce cervical stress, along with biocorrosion, that are both modified by occlusal surface friction. The air indexing method of CDH diagnosis is an objective diagnostic means to detect and quantify CDH symptoms during the formation of cervical lesions. This chapter presents the clinical benefits of melding the T-Scan Occlusal Analysis System with the Air Indexing Method when clinically assessing and treating cervical hard tissue pathologies. The clinician gains significantly more occlusal insight as opposed to using either methodology alone, when air indexing is combined with T-Scan's occlusal contact force and timing data. Lastly, this chapter introduces two case reports of how T-Scan guided occlusal adjustments can be effective at reducing CDH and prohibiting the progression of gingival recession.

DOI: 10.4018/978-1-5225-9254-9.ch011

INTRODUCTION

This chapter discusses the detection, diagnosis, and treatment of the clinical signs and/or symptoms resultant from chronic dental microtrauma. The presence of CDH often indicates there is ongoing excessive stress being applied to the cervical regions of teeth which occurs during function, parafunction, and/or deglutition. There are two primary mechanisms that initiate and promulgate the presence of CDH. They are “stress” and “biocorrosion”, which occur simultaneously, making etiologic determination somewhat clinically complex. A physical science discussion of applied stress has been included within the chapter, to explain how cervical stress from occlusal microtrauma plays a role in creating NCCLs that are frequently preceded by attaining a CDH threshold response. Other sections of this chapter will define occlusal disease (OD) as it relates to active or inactive findings of premature clinical pathology from microtrauma. The Air Indexing Method of CDH detection and quantification will also be described and illustrated. The last portion of the chapter discusses the combining of Air Indexing with the T-Scan Occlusal Analysis System (Tekscan, Inc. S. Boston, MA, USA). When melded together, these two objective methods synergistically improve the clinician’s ability to detect and quantify active occlusal microtrauma with measured occlusal intervention which can predictably reduce or eradicate CDH symptoms.

BACKGROUND

Cervical stress distant from applied occlusal forces may result from chronic *microtrauma* or *macrotrauma* (Speck, et al., 1979). Chronic *microtrauma* is defined as the repetitive low force inter-arch contact of teeth over time. This type of trauma occurs during swallowing, habitual function, parafunction, or mastication (Dejak et al., 2003; Grippo, 1991; Grippo et al., 2004; Kydd, 1957; Shore, 1976; Straub, 1960). Microtrauma may exist with or without a food bolus.

Microtrauma may be considered as either physiologic or pathologic, when it results in premature signs and/or symptoms of Occlusal Disease (OD) by disrupting masticatory system health (Grippo et al., 2012-B; Ruiz & Coleman, 2008). The term *Occlusal Disease (OD)* first appeared in the literature in 1990 (Lytle, 1990), was further modified 17 years later (Ruiz, 2007), and then redefined again, one year afterward (Ruiz & Coleman, 2008). Occlusal Disease (OD) includes clinical findings of occlusal wear, fractures of teeth or restorations, hypersensitivity of teeth during mastication, cervical dentin hypersensitivity (CDH) (Coleman et al., 2003; Coleman & Kinderknecht, 2000-A), tooth hypermobility (Harrel et al., 2006), fremitus (Harrel, et al., 2006; Ruiz, 2007), abfractive stress (Coleman, et al., 2003; Grippo, 1991; Ruiz, 2003; 2005; 2007), vertical bone loss, or localized bone destruction (secondary to non-inflammatory or bacterial periodontal disease) (Harrel, et al., 2006), and masticatory muscle or TMJ pain (Gremillion, 2006; Ruiz, 2005; Sipila, et al., 2006). This comprehensive listing of OD conditions appears lastly in a 2008 publication (Ruiz & Coleman, 2008).

Ramfjord and Ash suggested in 1971 that the Central Nervous System (CNS) reflex that stimulated bruxism seemed to emanate from the periodontal proprioceptors, specifically from within the Sharpey’s fiber complex of the periodontal ligament (Ramfjord & Ash, 1971). This “nociceptive reflex” resulted from polysynaptic noxious stimuli (Okeson, 1998). This has been observed during the years when the dentition is transitional, but applies to all ages as a periodontal reflex response to the muscles of mastication, resultant from dental mobility (Okeson, 1998).

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