Chapter 2
Periodontal Treatment and Computerized Occlusal Analysis

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ABSTRACT
This chapter addresses the ongoing controversy regarding occlusion’s role in the progression of periodontal disease. Occlusal force has been considered a non-factor in the initiation of periodontal attachment loss. However, the absence of a validated measuring device or quantifying method for analyzing the occlusion has contributed to the confusion that still exists in the scientific community today about the relationship between periodontal disease and occlusion. The development of the T-Scan occlusal measurement technology, which is independent of a clinician’s occlusal contact force level subjective assessment, may change the scientific opinion about occlusion’s role in periodontal disease. This chapter illustrates how the T-Scan 8 system aids in treating patients who have tissue loss and occlusal issues. Notably, after the major etiologic risk factors of periodontal disease have been controlled, adjusting the occlusion with the T-Scan improves healing outcomes resulting in less inflammation, decreased probing depths, and bone level stability.

INTRODUCTION
The Periodontium is characterized by several tissues:

- Soft tissues such as the keratinized gingiva,
- The free gingiva,
- The periodontal ligament (PDL),
- The hard tissues around the teeth such as bone and cementum.

Periodontal diseases are multifactorial and considered to be of host deficiency origin, which are characterized by the presence of gingival pockets and progressive loss of attachment, with bone resorption occurring around teeth. It is possible to ensure the periodontal health of the patient by keeping these
pockets shallow. Clinicians are therefore perpetually faced with the need for probing pocket depths of any detected periodontal pockets.

Clinicians also check for two groups of potential Periodontal disease risk factors, which include:

- Innate human factors (age, sex, ethnicity, genetic predisposition).
- Acquired factors (microbiological factors, smoking, and other systemic disease states).

The link between occlusion and impaired periodontal health has always been a matter of great debate (Green & Levine, 1996). However, occlusion is not generally considered to be a risk factor for periodontal disease, but is rather viewed as an aggravating factor, in the same way as is tobacco use. Despite that in everyday practice, clinicians observe obvious links between occlusion and periodontal parameters, the absence of an “evidence based” occlusal force analysis makes difficult the demonstration of these interrelationships. The T-Scan 8 system (Tekscan, Inc., S. Boston, MA, USA), could help to address unanswered questions. The aim of this chapter is to review how computerized occlusal analysis can be integrated into periodontal practice, and how it can greatly aid the clinician in the treatment of Periodontal Disease.

**BACKGROUND**

Interrelations between periodontal disease and occlusal forces have been usually defined by the term Occlusal Trauma. Stillman was the first to define occlusal trauma, as a traumatic state of the tissues supporting the teeth resulting from the movement of the jaws towards the closed position (Stillman, 1917). In 1978, the World Health Organization (WHO) defined occlusal trauma as a periodontal traumatism caused by stress on the teeth induced directly or indirectly by contacting the teeth present in the other arch (Lindhe, Karring, & Lang, 2008). The American Academy of Periodontology (AAP) defined occlusal trauma as damage to the dental support tissues caused by an excessive occlusal load (Gher, 1996).

There are 2 classifications of periodontal damage resultant from occlusal trauma:

- **Primary**: Primary trauma affects teeth with normal periodontal tissue height (Figure 1).
- **Secondary**: Secondary trauma affects teeth with reduced periodontal tissue height (Figure 2).

With patients who demonstrate the differing periodontal risk factors, secondary occlusal trauma makes treatment more difficult because the compromised teeth are often embedded in a damaged periodontium. When force is applied to the crown of a tooth that has reduced tissue support, the tooth’s center of rotation translates more apically, which creates a major lever-arm resultant from the occlusal loading (Figure 2).

**Definition of Occlusal Trauma**

Occlusal trauma is the term used to describe changes in periodontal state due to the applied force of the masticatory muscles (Sanz, 2005).

When evaluating occlusal trauma on a patient, a number of clinical and radiographic signs and symptoms may be present (Hallmon, 1999; Parameter on occlusal traumatism in patients with chronic periodontitis. American Academy of Periodontology, 2000).