

Section 7
T-Scan 10 Applications in Orthodontics

Chapter 19
Orthodontic Case Management
and Finalization With T-Scan
Computerized Occlusal Analysis

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ABSTRACT

This chapter reviews T-Scan use in orthodontics from diagnosis to case finishing, and then in retention while defining normal T-Scan recording parameters for orthodontically treated subjects versus untreated subjects. T-Scan use in the case-finishing process is also described, compensating for occlusion changes that occur during “post-orthodontic settling,” as teeth move freely within the periodontium to find an equilibrium position when the appliances have been removed. T-Scan implementation is necessary because, often despite there being a post-treatment visually ‘perfect’ Angle’s Class I relationship established with the orthodontic treatment, ideal occlusal contacts do not result solely from tooth movement. Creating simultaneous and equal force occlusal contacts following orthodontics can be accomplished using T-Scan data to optimize the end-result occlusal contact pattern. Several tools of the T-Scan software aid the Orthodontist in obtaining an ideal occlusal force distribution and timing during case-finishing. These are the 2 and 3-Dimensional ForceView windows, the Force Percentage per tooth, arch half, and quadrant, the Center of Force (COF) trajectory and icon, the Occlusion Time (OT), and the Disclusion Time (DT). Fortunately, most orthodontic cases remain asymptomatic during and after orthodontic treatment. However, an occlusal force imbalance or patient discomfort may occur along with the mal-occlusion that needs orthodontic treatment. Symptomatic cases require special documentation at the baseline, and careful monitoring throughout the entire orthodontic process. The clinical use of T-Scan in these “fragile” cases of patient muscle in-coordination, mandibular deviation, atypical pain, and/or TMJ idiopathic arthritis, are illustrated by several case reports. The presented clinical examples highlight combining T-Scan data recorded during case diagnosis, tooth movement, and in case finishing, with patients that underwent lingual orthodontics and orthognathic surgery, orthodontic treatment using clear aligners, or conventional fixed treatment with a camouflage treatment plan, which require special occlusal finishing (where premolars are extracted in one arch only). In addition, a few recent publications will be highlighted that address whether tooth movement with aligners or fixed appliances result in better overall occlusal contact endpoints.

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INTRODUCTION

The dental occlusion develops progressively, under the guidance of functional and genetic influences throughout the differing stages of dental arch morphogenesis, and then subsequently through a variety of adaptations made notably to the Temporomandibular Joint and the masticatory muscles.

When dealing with complex malocclusions, Orthodontists modify all dental contacts to achieve a new position of occlusal equilibrium, and take responsibility for its functional integration. Fully aware of these implications, they devote special attention to the quality of the final occlusion of their treated cases, whatever the therapeutic occlusal philosophy is that they ascribe to follow. It is uniformly understood and agreed upon, that at the completion of orthodontic treatment the occlusal contacts of all teeth should demonstrate simultaneous contact timing and be of equal force intensity, thereby creating a uniform and symmetrical distribution of masticatory force. It has been recommended that the anterior teeth be slightly less loaded than the posterior teeth (Roth, 1970; Dawson, 2006).

In Orthodontics, and other dental medicine disciplines as well, such as Prosthodontics and Periodontics, the assessment of occlusal quality has relied mostly on the visual inspection of occlusal contacts by:

- Evaluating the intercuspation of stone dental casts
- Subjectively Interpreting articulating paper marks
- Subjectively Interpreting Shim stock removal “feel”, of the perceived resistance of withdrawing the film from between opposing contacting teeth
- Listening to oral patient “feel” feedback

Alternative, but more time-consuming occlusal indicator techniques have been described, that are often employed within research studies. These alternative occlusal indicator methods are:

- Observing imprints in high fluidity impression materials
- Analyzing force distribution statically within pressure sensitive wax - Dental Prescale 50H (Fuji Photo Film Corporation, Tokyo, Japan) and its analyzing apparatus (Occluzer™ FPD703, Fuji Photo Film Corporation, Tokyo, Japan).

After the patient imprints the above static dental material indicators, the created imprints require digital scanning, followed later by computer processing to retrieve and analyze their force data. Unfortunately, their effectiveness in generating force distribution representations is offset by the significant chair time used to complete data retrieval. Furthermore, neither of these techniques gives the clinician information about the “timing” of the contacts. They offer no indication as to the location of the first contact, the sequence of contacts from 1st contact through until maximum intercuspation, nor the distribution of contacts within the maximum intercusped position. Therefore, with these methods, the clinician does not have the required tools to properly evaluate the ‘simultaneity’ or ‘timing’ of the-occlusal contacts.

Orthodontic End-Result Occlusal Function

Several questions have arisen about orthodontic treatment completion and the established end-result occlusal function:

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