Chapter 9
Computerized Occlusal Analysis in Occlusal Splint Therapy

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ABSTRACT

Occlusal splints are used to protect teeth, relieve orofacial pain, and preview the patient response to a simulated occlusal correction. This chapter outlines proper occlusal splint fabrication that employs T-Scan analysis to verify a therapeutic occlusion. The T-Scan provides objective relative occlusal force and timing data that guides the refinement of a splint's occlusal scheme. Therefore, this chapter explains adjusting an occlusal splint's contact pattern with ink ribbon followed by the T-Scan. It also addresses the controversy regarding the existence of, or lack thereof, a relationship between occlusal interferences and masticatory muscle dysfunction. The author postulates that the research studies that argue against the existence of a relationship are absent of occlusal measurement and lack a scientific basis to deny a relationship exists. Lastly, recommendations are made to include the T-Scan in Temporomandibular Disorder treatment studies with both occlusal splints and natural teeth, so that researchers might resolve this controversy for dental clinicians.

INTRODUCTION

Optimal dental care is based on making a thorough diagnosis, followed by patient education detailing all of the patient's problems and their solutions, prior to determining an individualized, and appropriate treatment plan. Occlusal analysis is an integral part of the comprehensive dental examination. Mounted diagnostic casts show the size and location of occlusal interferences. T-Scan 8 (Tekscan, Inc. S. Boston, MA, USA) computerized occlusal analysis specifies the location, timing, and the relative force of differing occlusal contacts. This digital diagnostic modality accurately identifies the locations of problematic occlusal contacts that are not always visualized by direct clinical observation, or with ink ribbon markings.

Occlusal splint (OS) therapy is a conservative and reversible modality to verify a diagnosis, and treat occlusal problems. OS therapy is commonly used in the protection from bruxism-related attrition, the preservation of porcelain restorations, and in the treatment of myogenous orofacial pain (Okeson,

Kemper, & Moody, 1982; Clark, 1984a). Proper fabrication of the OS that fulfills all the requirements of stability and comfort to both the teeth and soft tissues, while establishing an optimum occlusion, is essential to obtain a predictable, therapeutic result. By using a properly designed OS, the clinician and patient can then assess the physiologic effects of a corrected occlusion, that could be later attained with occlusal adjustment (OA), orthodontics, or comprehensive restoration.

The recommended OS physical design features should provide for full arch coverage, made from a hard methylmethacrylate resin. The occlusal requirements are to develop even, bilateral posterior tooth contacts coincident with physiologic condylar seating, smooth anterior guidance contacts whereby the anterior portion of the appliance immediately discludes the opposing posterior teeth, and no anterior teeth contact heavier than the posterior teeth (Barker, 2004).

After all the details of a conventional OS delivery are completed, the T-Scan can be used to guide the refinement of the splint's occlusion. Scans can be recorded in maximum intercuspation (MIP), during guided centric relation closures (CR), and during all mandibular excursions, in the same way as can be accomplished on natural teeth. This author's clinical experience with splint occlusal refinement using the T-Scan system, consistently shows there is a lack of optimal occlusion design achieved when adjustments are performed with ink ribbon marking combined with patient occlusal "feel" feedback. Because a predictable therapeutic result cannot be expected from an incomplete adjustment of the splint's occlusion, the T-Scan is essential for achieving excellence with occlusal corrections performed during OS therapy.

The T-Scan clearly shows to the patient, their pre-operative occlusal problems and their post-operative changes resultant from their receiving optimum care. By showing the T-Scan graphics to the patient, the patient immediately gains a visual understanding of their own occlusal problems through the 2-Dimensional and 3-Dimensional ForceViews. This facilitates the patient's involvement, and raises their appreciation of the clinician's work required to achieve excellence in OS therapy.

OS therapy has also been used to study the physiology of occlusal contacts, and to test the clinical effects of various occlusal designs (Manns, Chan, & Miralles, 1987; Manns, Miralles, Santander, & Valdivia, 1983). Because an OS can be readily modified to test differing non-invasive occlusal contact schemes, they can be worn by the same patient, and evaluated for levels of adaptive comfort. Computerized occlusal analysis can provide verification of the actual occlusion tested, both in clinical patient care, but during research studies, as well, where occlusal problems are being treated. A lack of documentation of the true before and after measured occlusal status has been a significant failing of many published occlusal studies (Dao, Lavigne, Charbonneau, Feine, & Lund, 1994; Pullinger & Seligman, 2000; Truelove, Huggins, Mancl, & Dworkin, 2006; Kidder & Solow, 2014). The T-Scan technology offers a new standard for the validity of occlusal research, because of its time and force measurement and capabilities.

OCCLUSAL ANALYSIS AND THE PHILOSOPHY OF OPTIMAL CARE

Optimal dentistry may be defined as, the education, diagnosis, and treatment that provides a patient with the highest level of comfort, function, and esthetics over the long term, requiring minimal maintenance (Solow, 2011). Codiagnosis, or patient education, is a conversation during which each aspect of the patient's health or disease is shown to, and discussed with the patient. This conversation is the starting point for success, whether the goal is simply to better prevent bacterial problems through improving the patient's oral hygiene technique, or to perform a sophisticated reconstruction because there are many lost

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