

Chapter 17

Digital Occlusion's Role in Implant Rehabilitation

Henriette Lerner

HL Dentclinic and Academy, Germany & Johann Wolfgang Goethe University, Germany

ABSTRACT

Contemporary implant rehabilitations are aesthetically driven. Consequently, digital planning and guided surgery deliver higher predictability and precision, than do analog procedures. The aim of this chapter is to show the integration of digital occlusion in the different phases of full arch implant rehabilitation with immediate implant placement and immediate loading procedures. Digital occlusal analysis raises the precision of functional occlusal adjustments, while improving the long-term predictability and stability of both case function and aesthetics. This chapter will present a systematic digital workflow detailing every stage of full arch rehabilitation treatment while showcasing digital occlusal diagnosis with the T-Scan system, to install a precise implant prosthesis occlusal scheme. A full arch rehabilitation case involving immediate implant placement and immediate implant loading will be presented that was occlusally finished with the T-Scan. And, important new mechanical implant complications research that tested T-Scan measured digital occlusion case insertions against articulating paper only case insertions, is also detailed. The authors found that a measured approach with T-Scan to guide the adjusted occlusal contacts statistically lessened common mechanical complications that continue to plague the implant Digital Workflow. The chapter concludes with a detailed pictorial explanation of how to clinically perform the T-Scan + Articulating Paper method that was used in the mechanical complications research study to select the correct articulating paper marks where implant occlusal contacts are force overloaded.

INTRODUCTION

The digital era has created a new dental discipline. Implant rehabilitations that follow a path of immediate placement and loading, which is today a predictable procedure with high success rates (Misch, et al., 2004; Schwarz & Arad, 2012) documented to be 98% success in the mandible, and 97% in the maxilla (Tarnow, et al., 2010).

Lately, the aesthetic and functional criteria that are being considered parameters of success in multiple implant rehabilitations, are also being researched. (Kinsel & Lamb, 2000; Buser & Belser, 2004; Spiekermann, et al., 2009). Experience shows that in implant rehabilitations, a perfectly adapted oc-

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clusion is more important than in the natural dentition, or in dental supported prosthetic constructions. Therefore, an initial, precise diagnosis of the masticatory system components is necessary, as an implant rehabilitation in a compromised functional environment can lead to an irreversible aggravation of the initial dysfunction.

This is based on the fact that an implant supported dentition has structures which lack the physical properties of resiliency, elasticity, and forgiveness. There is no periodontal space around implants, where implant mobility is 4 microns, which is far less than natural teeth loading motilities of 25 - 200 microns. Additionally, E max abutments, and E max (IPS E Max, Ivoclar Vivadent AG, Schaan, Liechtenstein), or Zirconia prosthetic parts, have different moduli of elasticity and resilience compared to natural teeth, such that without resilience, occlusal wear does not exist or adapt.

It has been proven that due to implant overload or incorrect loading, bone loss around implants can compromise the implant reconstruction and lead to peri-implantitis and bone loss (Naert et al., 2012). Often, poor patient occlusal adaptation results from the lack of resilience, which can be followed by the development of muscular disorders and prosthesis structural damage. For sound muscular function and long-term maintenance, a very precise occlusal force profile is necessary.

This chapter will present a systematic digital workflow that utilizes occlusally-focused steps to assure a physiologic reproduction of the initial masticatory and muscular system was transferred onto implant rehabilitated tissues, despite changes in the vertical dimension. These steps are:

- Occlusal and functional diagnosis and registration at the first appointment
- Occlusal adjustment of the provisional, immediate restoration
- Reproduction of the digital contacts in the digital planning procedures of the future reconstruction
- Occlusal control of the final restoration at delivery
- Yearly occlusal and functional maintenance of the implant supported reconstruction over the long-term.

A complete full arch rehabilitation involving immediate implant placement and immediate implant loading, that was occlusally finished with the T-Scan 9 (Tekscan Inc. S. Boston, MA, USA), will illustrate each of these steps, in great detail.

BACKGROUND

Occlusion is the relationship of all the components of the masticatory system in normal function. There is a special reference to the position and contact of the maxillary and mandibular teeth for the highest efficiency during mandibular excursive movements that are essential for mastication (Jablonski, 1992). Occlusion can be dynamic or passive, whether it is registered in centric relation or maximum intercuspation.

Centric Relation is the position of the mandible in relation with the maxilla, where the mandible is aligned such that the mandibular condyles are seated posterior and superior within the glenoid fossa (Dawson, 1995)

Stomatognathic function includes mastication, deglutition, speech and respiration.

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