



JPD Digital: A Multimedia Resource from The Journal of Prosthetic Dentistry is an innovative video-based platform to advance skills and knowledge in prosthodontics

JPD DIGITAL

Complications related to digital technologies in treating edentulous patients with implant-supported prostheses. Part 1: Digital data collection and surgical planning stages



Wei-Shao Lin, DDS, PhD, MBA^a

SUMMARY

A complication involves deviations from the intended treatment course, whether symptomatic or asymptomatic. Although complications can be caused by human error, they may also occur despite following best practice. Clinicians should have the capability to recognize complications at an early stage to prevent further harm to their patients.¹ Complications related to the use of digital technologies can often be subtle initially until the errors develop into considerable clinical problems. This 2-part presentation shows the author's clinical experience and available evidence on how to detect and prevent complications related to the use of digital technologies at critical steps in implant treatment for edentulous patients. Starting from the digital data collection, clinically satisfactory complete dentures can be used for the double-scan procedure, optimizing the visualization of the maxillofacial anatomical structures and prostheses in a 3-dimensional virtual patient,^{2,3} facilitating prosthodontically driven surgical planning. Regardless of the digital methods used, it is essential that accurate data set and registration results be obtained.^{4,5} Accuracy is the foundation of subsequent digital planning, and commonly seen data collection complications and solutions are discussed. Secondly, static computer-aided implant surgery (s-CAIS) has been used to interface the surgical and prosthetic treatment steps,

ABSTRACT

The treatment of complete or single arch edentulism remains a significant priority for dental clinicians. Patients often request immediate loading for complex complete arch treatments with shorter treatment times and fewer appointments, and digital technologies can be leveraged to provide more effective treatments. This part 1 presentation focuses on the discussion of commonly seen complications related to using digital technologies in treating edentulous patients during the data collection and surgical planning stages. Complications related to digital technologies can be prevented or corrected during these stages, preventing future complications in the clinical (surgical and prosthetic) stages. (*J Prosthet Dent* 2023;129:674-5)

providing clinicians with an accurate pathway to transfer the digital surgical planning to the implant placements, which would be beneficial to the prosthetic treatment outcomes.⁶ Multiple computer-aided design and computer-aided manufacture (CAD-CAM) surgical templates including fixation pin placement templates, bone reduction templates, implant placement templates, and immediate loading prostheses with various designs and manufacturing methods have been proposed.⁷⁻⁹ The design of CAD-CAM surgical templates for edentulous treatment is discussed to minimize future intraoperative surgical complications while improving implant placement accuracy. Alternative to the fixation pin, commonly used in computer-guided surgery, are discussed, for the prevention of intraoperative complications in patients with reduced anatomic structures.¹⁰

REFERENCES

1. Higgins MCSS, Herpy JP. medical error, adverse events, and complications in interventional radiology: liability or opportunity? *Radiology*. 2021;298:275-283.

^aProfessor, Program Director, and Chair, Advanced Education Program in Prosthodontics, Department of Prosthodontics, Indiana University School of Dentistry, Department of Prosthodontics, Indianapolis, Ind.

2. Verstreken K, Van Cleynenbreugel J, Marchal G, Naert I, Suetens P, van Steenberghe D. Computer-assisted planning of oral implant surgery: a three-dimensional approach. *Int J Oral Maxillofac Implants*. 1996;11:806–810.
3. Scherer MD. Presurgical implant-site assessment and restoratively driven digital planning. *Dent Clin North Am*. 2014;58:561–595.
4. Vercruyssen M, Fortin T, Widmann G, Jacobs R, Quirynen M. Different techniques of static/dynamic guided implant surgery: modalities and indications. *Periodontol*. 2000 2014;66:214–227.
5. Morton D, Phasuk K, Polido WD, Lin WS. Consideration for contemporary implant surgery. *Dent Clin North Am*. 2019;63:309–329.
6. Joda T, Derksen W, Wittneben JG, Kuehl S. Static computer-aided implant surgery (s-CAIS) analysing patient-reported outcome measures (PROMs), economics and surgical complications: a systematic review. *Clin Oral Implants Res*. 2018;29:359–373.
7. AlQallaf H, Lin WS, Yang CC. Using a digital dentistry integrated planning and manufacturing service in completely edentulous treatment. *Compend Contin Educ Dent*. 2021;42:f1–f4.
8. Makarov N, Pompa G, Papi P. Computer-assisted implant placement and full-arch immediate loading with digitally prefabricated provisional prostheses without cast: a prospective pilot cohort study. *Int J Implant Dent*. 2021;7:80.
9. Yang JW, Liu Q, Yue ZG, Hou JX, Afrashtehfar KI. Digital workflow for full-arch immediate implant placement using a stackable surgical guide fabricated using slm technology. *J Prosthodont*. 2021;30:645–650.
10. Orgev A, Pellerito J, Polido W, Morton D, Lin WS. Bead-anchored surgical templates for static computer-assisted implant surgery: a dental technique. *J Prosthodont*. 2022;31:722–727.

Corresponding author:

Dr Wei-Shao Lin
Department of Prosthodontics
Indiana University School of Dentistry
1121 W. Michigan Street, Office: DS-S406
Indianapolis, IN 46202-5186
Email: weislin@iu.edu

Copyright © 2023 by the Editorial Council for *The Journal of Prosthetic Dentistry*.
<https://doi.org/10.1016/j.prosdent.2023.01.010>



If you are reading this article via the journal's homepage, www.thejpd.org, or via ScienceDirect, www.sciencedirect.com/journal/the-journal-of-prosthetic-dentistry, click on the video to access via Supplementary Data.

If you are reading this article in the print edition of the journal scan the QR code to access the video or go to this URL: www.thejpd.org/video-do.