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Building a More Accurate Implant Guide: Evidence-Based Strategies for Static Guided Implant Surgery

Background

Static computer-guided implant surgery has become an integral component of modern implant dentistry, improving restorative-driven treatment planning and surgical precision. However, deviations between planned and actual implant positions remain unavoidable due to cumulative errors throughout the digital workflow. Understanding the factors that influence accuracy is critical for improving clinical outcomes.

Objective

To review current evidence on factors affecting the accuracy of tooth-supported static guided implant surgery and provide practical strategies for improving implant placement predictability.

Discussion

Implant accuracy is influenced by guide design, manufacturing, anatomy, and surgical technique. Manufacturing factors such as printing resolution, build orientation, and material properties affect guide stability and dimensional accuracy. Guide design also plays a significant role, with evidence supporting the use of sleeveless and closed-sleeve concepts to reduce deviation. Surgical factors are equally important. Minimizing the distance between the guide and the surgical site and utilizing fully guided protocols improve implant positioning accuracy compared with partially guided or freehand approaches. Patient- and site-related variables, including bone quality, ridge morphology, implant site angulation, and healing status, further influence outcomes. Greater deviations are often observed in anatomically challenging situations and immediate implant placement procedures.

Conclusion

Accurate guided implant surgery requires optimization of the entire digital workflow. Careful attention to guide manufacturing, design, surgical protocol, and site-specific anatomy provides a practical framework for improving implant placement accuracy and achieving more predictable clinical outcomes.

Keywords: dental implants; guided surgery; 3D printing; digital dentistry; implantology

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Biography

Dr. Sompop Bencharit is a board-certified prosthodontist, innovation strategist, and executive consultant specializing in digital transformation, leadership development, and technology integration. He currently serves as Director of Innovation at the Austin Institute of Dental Medicine. Previously, he held leadership roles at High Point University, the Medical University of South Carolina, and Virginia Commonwealth University. A Fellow of the American College of Prosthodontists and recipient of the ACP Distinguished Researcher Award, he has authored more than 100 peer-reviewed publications. Dr. Bencharit is President of AHEADD, founder of Digital Dentistry & Innovation LLC, and advises healthcare, education, and industry organizations on innovation and strategic growth.

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