On Metal Prosthodontic Frameworks and Their Fabrication Accuracy

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- The 1982 Toronto conference on Tissue Integrated Prostheses introduced Brånemark's concept of inducing a controlled interfacial osteogenesis between titanium dental implants and host bone. Since then, implant therapy for partial and complete edentulism has become a predictable, significant, and routine therapeutic procedure.
- Consequently, selected associated biomechanical aspects and biologic treatment consequences have been investigated in an effort to expand and understand even better the scope of this treatment modality. One aspect that is believed to affect the long-term prognosis of the bone-implant interface is the accuracy of a passive prosthesis framework fit. Passivity of fit is defined as a metal-to-metal interface between an implant superstructure that can be made out of diverse materials and the supporting implant abutments.[1] It is believed that the rigid support provided by osseointegrated dental implants requires a controlled mechanical environment to ensure adequate remodeling stimulus for maintenance of the healed interfacial response of osseointegration.
- Failure to produce a passive fit can result in the generation of considerable interfacial stresses in a screw-retained prosthesis. This may then give rise to mechanical failure of prostheses or implants as well as biologic complications in the surrounding tissues. Mechanical complications may include loosening of prosthetic or abutment screws or fracture of the various components. On the other hand, biologic complications may include adverse tissue reactions, manifested as pain, tenderness, marginal bone loss, and even loss of osseointegration.[2,3]
- Although experienced clinicians may not be able to distinguish horizontal margin error in the range of 32 to 230 μm and vertical margin error of 43 to 196 μm,[4] limited animal and clinical studies suggested that both implant components and bone appear to tolerate a degree of interfacial misfit without associated adverse problems. However, in the absence of scientifically established quantitative and tolerated fit guidelines, it seems prudent to optimize fit by using a combination of the best available clinical and laboratory methods and materials when fabricating implant frameworks.
- Because most conventional castover framework distortions occur during the laboratory fabrication process, numerous materials and mechanized or computer-aided design/computer-assisted manufacture techniques for the fabrication of implant–prosthodontic frameworks have been described. These modifications are attempts to improve the accuracy of fit of frameworks by reducing the dentist's dependence on varying degrees of consistency in technician skills and by eliminating some of the laboratory steps that are known to cause distortion and subsequent misfit. Controlling these factors means the ability to provide patients, especially those with severely resorbed edentulous jaws, with an implant-supported fixed prosthesis that is lighter in weight, fits well, and costs less than conventional castover frameworks with large amounts of gold alloy.[5]
- However, even state-of-the-art framework materials and leading-edge clinical and laboratory techniques introduce errors that make it impossible to obtain a dental implant superstructure with complete passive fit. Therefore, choosing framework materials and fabrication techniques, clinicians should base their decisions on the four pillars of sound treatment decision making: *(1)* sound scientific evidence, *(2)* patient-mediated concern, *(3)* professional judgment and capabilities, and *(4)* production circumstances.
- Long-term prospective clinical trials investigating the effect of using various framework materials, fabrication techniques, and degrees of misfit on the clinical outcome of implant therapy are still necessary and strongly recommended.

References

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