

METAL-BAR REINFORCEMENT OF LONG-SPAN ZIRCONIA FRAMEWORKS

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Abstract

Long-span zirconia fixed dental prostheses (FDPs) are widely used due to their excellent esthetics and biocompatibility. However, their clinical reliability may be compromised by mechanical failure, mainly due to tensile stress concentration in connector areas. While zirconia exhibits high compressive strength, its brittle behavior under tensile loading remains a key limitation in extended-span restorations.

This presentation evaluates the effect of incorporating a metal-bar reinforcement within zirconia frameworks, illustrated through four clinical cases of long-span FDPs. The concept is supported by biomechanical principles and evidence from in vitro and computational studies. Key parameters assessed include stress distribution, connector integrity, flexural resistance, and clinical performance under functional loading.

The incorporation of a metal bar helps redistribute occlusal forces, reducing tensile stress in critical regions, particularly in connectors. As a result, reinforced frameworks demonstrate improved load-bearing capacity and a reduced risk of crack initiation and propagation. The ductile nature of the metal component enhances energy absorption and contributes to greater structural resilience.

Clinically, all four cases showed stable, long-term outcomes without significant complications. The restorations maintained excellent esthetics, favorable soft tissue response, and high patient satisfaction.

Conclusion:

Metal-bar reinforcement is a reliable strategy for improving the strength, longevity, and esthetic performance of long-span zirconia FDPs, providing predictable and durable results in complex prosthodontic rehabilitations.