

PP-246 Weibull Characteristics and Modulus Calculation in Adhesion Studies: A Methodological Investigation

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OBJECTIVE: This study aimed to determine the minimum number of specimens required to obtain statistically reliable conclusions in adhesion studies using the Weibull statistic and to estimate the probability of failure under defined conditions.

MATERIALS-METHODS: Specimens (N=160) were prepared from resin composite (RC: Brilliant, Coltene), lithium disilicate (LD: IPS e.max Press, Ivoclar), zirconia (YZ: Z-CAD, Metoxid AG), and titanium (TI: Ti CP Grade 4, Permascand). RC, YZ, and TI were air-abraded (50 μm Al_2O_3 , 2.5 bar, 10 s), and LD was etched with 5% hydrofluoric acid (20 s). Resin cement cylinders ($\varnothing=3\times 4$ mm) were bonded using one of the following: Variolink Esthetic DC (Ivoclar), Panavia V5 (Kuraray Noritake), Panavia 21 (Kuraray Noritake), or Multilink Automix (Ivoclar). The combinations tested were as follows: RC-Variolink Esthetic DC/Panavia V5; LD-Variolink Esthetic DC/Panavia V5; YZ-Panavia 21/Multilink Automix; TI-Panavia 21/Multilink Automix. Half of the specimens were stored at 37 °C for 24 h; the other half underwent thermocycling ($\times 6000$, 5-55 °C). Shear bond strength was tested (1 mm/min), and failure modes were assessed under digital microscopy. Weibull analysis

evaluated bond reliability for 10, 20, 30 and 40 specimens in each group. Maximum likelihood estimation and 95% confidence intervals determined differences.

RESULTS: For RC, Variolink Esthetic DC showed higher characteristic strength (η) at $n=10$ and 20 vs. $n=30$ and 40. Panavia V5 showed a significant decrease from $n=10$ to 40 only in the non-aged condition. In LD, both cements showed decreasing η with increasing n . In YZ and TI, both Panavia 21 and Multilink Automix showed reduced characteristic strength with increasing n . Failures were mainly cohesive in LD but adhesive with the other materials.

CONCLUSIONS: Increasing sample size reduced characteristic strength (η) across all materials, indicating that small sample sizes overestimate adhesive performance. Larger samples yield more reliable estimates. The Weibull modulus (β) remained stable or increased slightly after aging, especially for zirconia.

Keywords: Adhesion, Dental Materials, Prosthodontics, Weibull, Methodology

PP-247 Zirconia Implant-Supported Monolithic Restoration in the Management of Titanium Hypersensitivity

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INTRODUCTION: This case report presents the prosthetic and surgical management of a patient who has documented titanium allergy. In light of the hypersensitivity, a highly biocompatible alternative treatment approach was adopted, involving the placement of a zirconia implant followed by a monolithic zirconia restoration.

Case Report: A 66-year-old patient who has lost his right 2 molars presented to the Gazi University Faculty of Dentistry. Clinical and radiographic examinations revealed the absence of teeth #46 and #47 in the mandibular right posterior region. The treatment plan involved implant placement in the edentulous area.

Detailed anamnesis revealed a known hypersensitivity to titanium is making titanium-based implants contraindicated. As an alternative, two zirconia implants (Z-Systems®, Switzerland) were selected due to their favorable biocompatibility. The implants were surgically placed, and 3-month osseointegration period was allowed.

Prosthetic Procedure: Following osseointegration, an intraoral digital impression was taken using a Trios 5 scanner (3Shape®, Denmark) and compatible Z-Systems® scan bodies. The digital data were transferred to Exocad® software for prosthetic design.

Based on the design, a monolithic zirconia bridge was milled from a zirconia block (Aidite-Aizir®, China). The bridge was fabricated according to zirconia abutments and cemented extraorally using a resin-based adhesive cement (G-CEM ONE®, GC Corp., Japan), following the manufacturer's bonding protocol.

The abutments were torqued to the zirconia implants according to the Z-Systems® protocol using an occlusal screw until tactile resistance (screw fracture point) was reached. Screw access holes were sealed with teflon tape and a flowable composite resin (Wave®, SDI, Australia). After occlusal adjustment, the final prosthesis was delivered to the patient.

CONCLUSION: This case highlights the clinical viability of zirconia implants in patients with titanium hypersensitivity. Digital workflows combined with all-ceramic materials allow for precise, biocompatible, and esthetically pleasing outcomes. Zirconia implants represent a strong alternative for selected patients when titanium is contraindicated.

Keywords: titanium allergy, zirconia implants, zirconia abutment, monolithic, digital workflow