

32nd Asia Pacific

DENTAL AND ORAL HEALTH CONGRESS

July 23- 24, 2018 Sydney, Australia

Shear bond strengths between polydopamine-coated stainless steels and poly methylmethacrylate

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Magnetic attachments have been widely used as stud attachments for implant-retained overdenture rehabilitation. The connection of polymethylmethacrylate (PMMA) with magnetic assemblies relies on the mechanical undercut. However, detachment of PMMA from magnetic assemblies is a frequent problem. Polydopamine has been reported to have high affinity to metal. As the magnetic attachments are enveloped by stainless steel, the aim of this study was to enhance the bond strengths between stainless steel and PMMA using polydopamine and compare with alloy primer (10-MDP, Kuraray) and quick monomer (4-META, Sun Medical). Stainless steel discs (5.5 mm in diameter and 2.5 mm in thickness, Aichi Steel Corp.) and PMMA (Unifast Trad, GC Dental Corp.) were used. For polydopamine group, the discs were immersed in dopamine solution (2 mg of dopamine per milliliter of 10 mM tris, pH 8.5) for 24 hours at room temperature. MDP and 4-META were applied on stainless steel discs using microbrush. Subsequently, the discs were mounted in molds and PMMA (powder/liquid 2:1) was filled. They were placed in 60 °C oven for 6 hours. The shear bond strengths were measured using Instron at crosshead speed of 1 mm/min. The debonded surfaces were examined using X-ray Photoelectron Spectroscopy (XPS). The results showed that 10-MDP group exhibited the highest bond strengths (9.8 ± 1.6 MPa) followed by 4-META group (3.5 ± 0.4 MPa) and polydopamine group (1.9 ± 1.6 MPa). XPS analysis revealed that the major fracture surfaces took place at PMMA and coating materials (polydopamine, 10-MDP, 4-META).

Biography

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