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Comparing shear bond strength of a composite resin to PEEK and titanium

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ABSTRACT

Title: Comparing shear bond strength of a composite resin to PEEK and titanium

Purpose

The aim of this study is to compare the shear bond strength (SBS) of composite resin to PEEK and titanium, and to compare the failure mode (adhesive, cohesive, mixed) from the shear testing.

Materials and methods

Milled PEEK and Titanium blocks (n=51) were grounded with 600-1000grit silicon carbide paper. Then they were surface treated through sandblasting with 110µm aluminium oxide particles and application of an MDP-containing adhesive (One Coat 7Universal, Coltene, Switzerland). A composite resin (Gradia ® Plus Heavy body paste, GC, Europe) was bonded to the treated PEEK and titanium surfaces. Shear bond testing was done using a universal testing machine (Instron, UK) with a crosshead speed of 1mm/ min. Thereafter, the sheared interface was examined under a stereo microscope (Nikon SMZ 1500) at 16Xmagnification.

Results

The Shapiro Wilk test for normality showed that the data was normally distributed for all the variables (p-value >0.05). Descriptive statistics by way of the mean and standard deviation were used to summarise the SBS for PEEK and titanium. The average SBS for titanium and PEEK was 25.99±6.12 MPa and 20.76±6.90 MPa respectively. With the test value at 0, a one sample t-test of the mean difference between PEEK and titanium showed that there was a statistically significant difference and therefore shows that the two measurements are significantly different from one another(p-value=0.00).The titanium specimens showed mostly cohesive failure (61%) and PEEK showed predominantly mixed failure (65%).

Conclusion

The SBS of composite resin to titanium was greater than that of composite bonded to PEEK when the surfaces are pre-treated with sandblasting and a universal adhesive containing MDP. PEEK results exceeded the minimum

clinically acceptable bond strength. The use of MDP-containing adhesive systems creates the greatest bond between composites and titanium.