Egyptian Dental Journal, 51, 1925 : 1933, October, 2005

BOND STRENGTH OF PORCELAIN TO TITANIUM AND TITANIUM ALLOY, A COMPARATIVE STUDY WITH CONVENTIONAL METAL-CERAMIC SYSTEMS

Khalid A. Al Wazzan* and Ibrahim Al Hussaini**

ABSTRACT

Purpose: Titanium metal's affinity for gaseous element such as oxygen may affect the titanium-ceramic bonding. The purpose of this study was to evaluate the bonding potential between a low fusing porcelain and commercially pure titanium and titanium alloy, and to compare the bond strength with those of two conventional metal-ceramic systems.

Materials and Methods: Forty specimens were fabricated, 10 specimens for each group. Titanium casting unit was used to cast the commercially pure titanium and titanium alloy (Ti-6Al-4V) specimens and Noritake low fusing porcelain was applied to them. The gold-based and the Ni-Cr alloys were melted and cast with an automatic centrifugal casting machine and Vita VMK 95 conventional porcelain material was applied to them. A universal testing machine was used to perform the 3-point bending test. The metal-ceramic interfaces were subjected to scanning electron microscopic examination.

Results: The mean bond strength values obtained with the four different metals were 33.12 ± 6.16 MPa for the commercially pure titanium, 14.01 ±5.63 MPa for the titanium alloy, 44.73 ± 5.63 MPa for the gold-based alloy and 40.76 ± 7.62 MPa for the Ni-Cr alloy. The gold-based alloy exhibited significantly greater bond strengths compared to the commercially pure titanium ($P<.001$). Furthermore, the commercially pure titanium group showed significantly greater bond strength than the titanium alloy group ($P<.0001$). There was no significant difference in the bond strength between the gold-based and the Ni-Cr groups ($P=.503$).

Conclusions: The bond strength of the conventional metal-ceramic combination was significantly greater than the bond strengths of the cast commercially pure titanium-Noritake ceramic combinations. Noritake porcelain showed significantly higher bonding strength to commercially pure titanium than to titanium alloy.