

Marginal and Internal Adaptation of Commercially Pure Titanium and Titanium-Aluminum-Vanadium Alloy Cast Restorations

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Abstract

Aim: The purpose of this *in vitro* study was to investigate the marginal accuracy and internal fit of complete cast crowns and three-unit fixed partial dentures (FPDs) cast with commercially pure titanium (CPTi) and Titanium-Aluminum-Vanadium alloy (Ti-6Al-4V).

Methods and Materials: CPTi and Ti-6Al-4V alloy were used to cast twelve single crowns and twelve three-unit FPDs. A traveling microscope was used to measure marginal gap and discrepancies in internal fit. Two and one-way analysis of variance (ANOVA) analyses were used to determine the effects of the marginal and internal fit discrepancies.

Results: The Ti-6Al-4V alloy demonstrated a significantly smaller marginal gap than CPTi ($P < 0.0001$). The recorded marginal discrepancies for both metals were within a clinically accepted range ($< 100 \mu\text{m}$). The single crown fit discrepancy was significantly smaller than the three-unit FPD for both the CPTi and the Ti-6Al-4V alloy ($P < 0.0001$). For the internal fit discrepancy, the occlusal surface showed the greatest gaps.

Conclusions: The Ti-6Al-4V alloy demonstrated a better fit than CPTi. Single crowns showed an improved fit when compared with the three-unit FPD. Mid-occlusal internal gap demonstrated greater values than the axial internal gap.

Clinical Implications: This *in vitro* study suggested marginal fit of complete crowns and three-unit FPDs cast by CPTi or Ti-6Al-4V alloy were within the range of what is clinically acceptable for longevity of restorations.