



The Effect of Recasting Pure Titanium and Titanium Alloy on the Fit of Cast Restorations

Thesis

Submitted in partial fulfillment of the requirements for the Master of Science degree in dentistry at the college of dentistry, King Saud University

By

AHMAD A. AL-NAZZAWI, BDS.

Postgraduate Student in Prosthodontics

College of Dentistry

King Saud University

Supervised By

KHALID A. AL WAZZAN, BDS, MS.

Associate Professor

Prosthetic Dental Science Department

College of Dentistry

King Saud University

June 13, 2005
6 Jumada I 1426H

Thesis Abstract

The use of titanium in dentistry has increased considerably in the past few years because of titanium's superior biocompatibility, corrosion resistance, desirable physical and mechanical properties, and low cost. There have been several investigations in the effect of recasting on the physical and clinical properties of the type III gold, high-palladium, cobalt-chromium, and nickel-chromium alloys. The guidelines for recasting gold alloy vary from adding no new metal, to some new metal, to 50% new metal with previously used one. The effect of combining new and recast commercially pure titanium (CPTi) and titanium alloy (TiA) on the accuracy of the final cast restoration was not yet investigated. The purpose of this in vitro study was to investigate the effect of recasting of CPTi and TiA on the marginal accuracy and internal fit of complete cast crowns and 3-unit Fixed Partial Dentures.

CPTi and TiA were used to cast 36 single crowns and 36 3-unit Fixed Partial Dentures. Three techniques were used, namely as-received metal, 50% reused metal and 100% reused metal. A traveling microscope was used to measure the marginal gap and the internal fit discrepancies. Three, 2 and 1-way ANOVA were used to find the effects of the marginal and internal fit discrepancies, the tested metal used and the applied technique.

The results showed that the as-received metal demonstrated significantly smaller marginal and internal fit discrepancies than the 50% reused and the

100% reused metals when utilized to cast 3-unit Fixed Partial Denture ($P < 0.018$). However, the marginal fit discrepancies were in the clinically accepted range ($< 100 \mu\text{m}$) except for 100% reused CPTi. The single crown fit discrepancies were significantly smaller than 3-unit Fixed Partial Denture which was true for both the CPTi and the TiA ($P < 0.001$). TiA demonstrated significantly better fit than CPTi ($P < 0.001$). For the marginal fit discrepancies, the mesial of the premolar and distal of the molar units of the 3-unit Fixed Partial Denture presented the greater marginal discrepancies than other sites. While for the internal fit, the mid occlusal internal fit demonstrated the greatest readings.

Within the limitations of this study, it was concluded that the used CPTi and TiA could be re-melted and utilized for casting of single crown restorations with acceptable fit. The 100% reused CPTi better not be utilized to cast Fixed Partial Denture.