Retentive forces, tensile strength and deflection fatigue of Acetal clasp thermoplastic material in comparison with cobalt-chromium clasp

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Abstract

Removable partial dentures are an effective and affordable treatment option for partially edentulous patients. Nowadays there is an increasing of the emphasis on aesthetic, dentist have been concerned about providing aesthetics and functional removable partial dentures to their patients and this was make the mission more difficult because of the goal now is achieving optimal aesthetic of the denture - while maintaining retentive, stable, and conservative to the health of supporting tooth and supporting tissue.

The traditional use of metal clasp like cobalt-chromium, gold, stainless-steel and titanium hampers esthetics because of its obvious display conflicts with patient's prosthetic confidentiality. Cobalt-chromium was the most reliable material for removable partial dentures until the introduction of thermoplastic material. With the efforts which had been carried out to find alternatives which are more attractive esthetically and effective functionally. Acetal resin (poly oxy methylene) may be used as alternative denture clasp material. This material was promoted primarily on the basis of its superior esthetic.

Another factor for partial denture success was the durability and life time of the denture. because any partial denture will be subjected to hundreds times of insertion and removal during its use by the patient. So the clasp made of different materials should be evaluated to determine its deformation resistance because clasp deformation will be adversely affect on the retentive properties of removable partial denture.

In this study, four wax models of two premolars and two molars were surveyed to have 0.25mm and 0.5mm undercut depth for each one of them. These wax models was casted to metal. Then these models was duplicated with poly vinyl siloxsane duplicating material and then poured with type IV stone for waxing and injecting of acetal clasps. While it was invested with phosphate-bonded investment material, for waxing and casting of co-cr clasps. eighty clasps were prepared and tested with Tinius-Olsen universal testing machine to measure the load required to dislodge acetal clasps of 2mm. thickness (for premolar and

molar) and two different undercut depths (0.25 and 0.5mm) from the metal models, furthermore measuring the load required to dislodge cobalt-chromium clasps of 2mm thickness (for premolar and molar) and two different undercut depths (0.25 and 0.5mm) from the metal models. The values for both were compared.

Beside the retentive force, a comparison of the amount of deflection needed to deform acetal resin and co-cr samples was done. Tensile Dumbbell shape samples were prepared for both acetal resin and co-cr according to ASTM 638/type V/2. Tensile values will be used in special formula to calculate the amount of deflection. All samples were tested also by Tinius- Olsen universal testing machine to determine the tensile strength of each sample. The resulted data revealed that the mean tensile strength for cobalt-chromium was 659.2Mpa while for acetal it was found of mean 55.232Mpa.The recorded values of the tensile force have been used in special mathematical formula to determine the values of deflection for each sample.

The results of this study revealed that acetal resin can be used with limitation as an alternative for metal co-cr clasps because acetal resin had lower retentive force than co-cr even with increasing the depth of undercut and changing in the form of the tooth. Also acetal had lower values of the tensile strength as compared to co-cr alloy but it had higher deflection value than co-cr and it can withstand higher deflections than those of co-cr before having permanent deformation or fracture.