Republic of Iraq
Ministry of Higher Education
and Scientific Research
University of Baghdad
College of Dentistry

Shear Bond Strength and Base Morphology of Ceramic Self-Ligating Bracket After Different Reconditioning Procedures (An in-Vitro Study)

A thesis
Submitted to the Council of the College of Dentistry/University of Baghdad in Partial Fulfillment of the Requirements for the Degree of Master of Science in Orthodontics
By

Zain Alabideen Ahmed
B.D.S.

Supervised by
Assist. Prof.
Mustafa M. Al-Khatieeb
B.D.S., M. Sc. (Orthodontics)
Baghadad-Iraq

A.D 2020 **A.H 1442**

Abstract

Failure of orthodontic bracket bonds and the necessity for repositioning of the some brackets during therapy is a common occurrence throughout orthodontic treatment; therefore there is a need for an economic, available in-office and short chair side option for recycling these brackets without damaging their bases.

The aim of this study was to evaluate the effects of different recycling methods on shear bond strength and morphological changes of debonded mechanically retentive self-ligating ceramic brackets.

Sixty Damon® Clear™ self-ligating ceramic brackets with a mechanical retentive base were divided into two groups, the first group involved twelve new ceramic brackets which were represented the control group, while the second group contained forty-eight new brackets which were bonded to unetched and slightly wet buccal tooth surface to allow an easy debonding of these brackets by tweezer, these debonded forty-eight brackets then divided into four experimental groups (12 per group): recycled by flaming, sandblasting , irradiation by an Er, Cr: YSGG laser and irradiation by CO_2 laser.

After recycling, the brackets were bonded to the new teeth again following standardized bonding procedure. The teeth were stored in distilled water at 37˚ C for 24 hours, then thermal cycling was performed between 5˚ C and 55˚ C for 500 cycles.

The shear bond strength of all specimens was determined with a universal testing machine at a crosshead speed of 0.5 mm/min until bond failure occurred. The debonded brackets and the enamel surface of each teeth groups were inspected under a x10 magnifying lens to assess the amount of adhesive remaining on the tooth surface and the site of bond failure, the enamel surface were scored according to Wang classification 1997. Morphological

examinations of the recycled ceramic bracket bases were conducted with scanning electron microscopy.

The result of shear bond strength showed that the control group had the highest value, followed by Er, Cr: YSGG laser group, then sandblasted group, after that flame group, while CO_2 laser group had the lowest value of mean shear bond strength. Also the results suggested a significant difference in Adhesive Remnant Index (ARI). Scanning electronic microscope (SEM) photographs of ceramic brackets processed by flaming showed some residual adhesive at the base of the bracket and micro structures was maintained, sandblasting removed all adhesive, but destroyed the bracket bases as the micro structures was smoothed, in Er, Cr: YSGG group, a little adhesive remnants were observed underneath the meshwork and maintained the integrity of the micro structure of the bracket's base, while the brackets that reconditioned by CO_2 laser revealed residual adhesive in the hollows of the micro structure, while keeping its structure unchanged.

In conclusion, Er, Cr: YSGG recycling method was effectively removing the adhesive from the bases of ceramic brackets without damaging them and result in a clinically acceptable shear bond strength.