CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Lindsey Jergensen

Project Number
J1310

Project Title
Will That Break My Braces?

Abstract

Objectives/Goals
The objective of this project is to determine if the type of porcelain conditioner has an effect on the bond strength of orthodontic brackets when bonded to porcelain.

Methods/Materials
Methods: Porcelain crowns were obtained from dentists that had not been placed on patients teeth. These teeth were then mounted in dental stone prior to using various porcelain conditioning agents to prepare the surface of these crowns for the bonding of orthodontic brackets. Six different groups were tested with ten samples in each group. The porcelain conditioning agents were common orthodontic conditioning agents used by orthodontists. A testing machine was fabricated to which weight could be added to determine the force needed to break the bond. This data was then analyzed to get the results.
Materials: Porcelain crowns, dental stone, latex gloves, orthodontic metal brackets,Hydrofluoric acid etch, APF etch, Silane coupling agent, Phosphoric acid etch, composite, curing light, scaler, handpiece, sheer bond strength testing machine.

Results
Mean bond strengths (N): Group 1 (Bonding agent)- 36.87; Group 2 (Silane)- 62.72; Group 3 (HF + bonding agent)- 56.62; Group 4 (HF + silane)- 77.53; Group 5 (APF + bonding agent)- 66.63; Group 6 (APF + silane)- 57.29.
Adhesive Remnant Index Scores: Group 1: 0-4,1-1,2-3, Porcelain Fracture-0; Group 2: 0-0,1-2,2-5,3-3, Porcelain Fracture-0; Group 3:0-1, 1-4, 2-4, 3-1, porcelain fracture-0; Group 4: 0-1, 1-3, 2-5,3-1, porcelain-0; Group 5: 0-1, 1-7, 2-2, 3-0 porcelain fracture-0; Group 6: 0-1, 1-6, 2-3, 3-0, porcelain fracture-0.

Conclusions/Discussion
Silane when combined with hydrofluoric acid etch gave a greater bond strength between the orthodontic bracket and porcelain crown. This was shown by the force in Newtons that was needed to cause a bond failure. Silane when combined with the normal etch increased the bond strength to the porcelain as demonstrated by the ARI score which showed more adhesive on the porcelain crown than on the bracket. This indicated in another fashion greater bond strength than just in the 'force needed' test. This experiment demonstrated that the type of porcelain conditioner used in preparing the crown does make a difference. This is helpful to an orthodontist and patient in that it will decrease emergency appointments and subsequent costs.

Summary Statement
This project was to determine which porcelain conditioning agent will create the highest bond strength between orthodontic brackets and porcelain.

Help Received
Brother helped me design my testing apparatus; Dad helped me prepare the crowns and helped me perform the experiment; Mom helped me put my display board together; Other brother took pictures; Worker at metal fabrication shop made my testing apparatus; Teacher helped with graphs.