ABSTRACT

Ceramo-metal restorations have been widely used in the dental practice. The porcelain fused to metal technique has proven to be a reliable treatment option for fixed partial dentures (FPD). The most crucial requirement for the success of such restorations is the presence of a chemical and thermal compatibility between the metal and ceramic to allow complete adhesion of the two different materials at the interface during ceramic sintering and also when the restoration is in service.

This study was carried out to compare, in vitro, the shear bond strengths value of low-fusing pressable ceramic and feldspathic porcelain fused to two types of base metal alloys, cobalt-chromium and nickel-chromium. In addition, to evaluate different veneering ceramic and different types of base metal alloys and their effect on the ceramo-metal bond strength.

A total of thirty-six metal discs were casted according to the manufacturer’s recommendations. The metal discs were of two types; Group I: Cobalt-chromium alloy and Group II: Nickel-chromium alloy. Each group was further subdivided into two subgroups, i.e, Ia, Ib, IIa and IIb; where each subgroup consisted of nine specimens. The metal specimens of each subgroup received either pressable ceramic or feldspathic porcelain and were fused to metal according to the manufacturer’s instructions.

After fabrication of the bilayered ceramo-metal specimens, they were placed in a thermocycling apparatus then were subjected to the shear testing. Shear bond testing was conducted on a universal testing machine and the failure rates were recorded. After the bond strength test was carried out, the data were collected, bond strength values were calculated and statistically analyzed.
Following shear debonding of the specimens, each specimen was examined using a stereomicroscope and the modes of failure were evaluated using imaging software. They were classified into: adhesive failure, cohesive failure or mixed (adhesive-cohesive failure). Two representative samples from each of the four groups of the ceramo-metal systems were examined using Scanning Electron Microscope for comparison between the different types of ceramic and metal used at the ceramo-metal interface.

There were no statistical significant differences for the shear bond strength between the four groups of specimens. Scanning electron microscope revealed no difference in the metal surface between cobalt-chromium and nickel chromium and minor differences were seen between pressable ceramic and feldspathic porcelain.

Within the limitations of this study, the following conclusions were drawn:

1. No statistical difference was found between the shear bond strength of low-fusing pressable leucite-based glass ceramic fused to metal and feldspathic porcelain fused to metal.
2. Pressable ceramic fused to metal showed no significant bond strength difference compared to feldspathic porcelain.
3. There was no statistical difference in the shear bond strength between cobalt-chromium and nickel-chromium base metal alloy.
4. Surface analysis of failure mode demonstrated that the pressed ceramic to metal showed the most cohesive type of failure in comparison to feldspathic porcelain fused to metal.
**Recommendations:**

The reasons for the clinical fractures of porcelain in ceramo-metal systems are multifactorial. As in the oral medium, frequently repeated stress can be found during masticatory functions and parafunctional habits, if existed. Moreover, the influence of saliva and fatigue caused by cyclic loading is considered an important factor in the durability of this restorations. Although in vitro testing does not exactly reproduce in vivo conditions. This study can be useful guide for clinical application since pressing ceramic on metal framework will lessen some of the factors leading to failure of a ceramo-metal restoration.

In the future, studies can be performed to evaluate shear bond strengths of restorations with different combinations of cores and veneering materials. The effect of different thermocycling protocols and different ceramic application techniques should also be conducted. In addition different methodologies to evaluate shear bond strength might be considered. Further clinical studies must be conducted for more clinically relevant results.