cobalt chromium metal surfaces after various surface treatments - an invitro study

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Introduction: The most frequently encountered complication in a metal-ceramic restoration is the fracture of veneering porcelain, becoming an 'esthetic emergency', especially when encountered in the anterior region. The fracture that occur on the prosthetic crown may either be in the ceramic layer or a complete fracture involving the entire metal. This study is designed to compare the shear bond strength of composite repair material with ceramic and cobalt chromium metal surfaces and to evaluate the mode of bond failure by stereomicroscope.

Methodology: 30 samples each of ceramic and cobalt-chromium (10x10x2mm) were prepared. Each group was divided into three sub-groups - CI,CII,CIII for ceramic and M1,MII,MIII for metal. The samples were ground using a fine-grit diamond bur in a high-speed hand piece with water irrigation for 10 seconds. The composite repair resins used were: (1) Conventional composite (control) , (2)SHOFU P & R Ceramic repair kit (3) Ivoclar Ceramic Repair System intro pack after surface modification with intraoral sandblaster. All the samples were stored in distilled water at 37oC for 24 hours. The shear bond strength was performed in a Universal Testing Machine. After de bonding, the samples were examined under a stereomicroscope to determine the type of failure - adhesive, mixed or cohesive. The data collected was statistically analyzed using SPSS.

Result: The Ceramic Group CIII (Ivoclar ceramic repair kit group utilizing intraoral sandblasting) had the highest shear bond strength (19.35 ± 0.53) followed by P and R repair kit (C II)(10.24 ± 0.26). The control group (C I) had the least shear bond strength of (6.84± 0.76) This difference in the shear bond strength among the ceramic groups was significant. In cobalt chromium metal samples, the Ivoclar group (M III) showed the highest shear bond strength of (13.33 ± 0.55) followed by P and R repair kit (M II)(10.24 ± 0.26). The control group (M I) had the least shear bond strength of (6.84± 0.76) and this difference among the cobalt-chromium groups was proved significant. The shear bond strength comparison between ceramic and cobalt chromium groups was also significant with a mean difference of 3.25(95% CI) . The predominant mode of failure among the control group in ceramic and Co Cr metal showed adhesive failure. The second group in which the Ceramic samples(CII) had undergone repair with P and R repair kit showed 50% adhesive and 50% mixed type of failure and cobalt chromium samples(MII) showed 70 %

Comparison of shear bond strength of three different composite resin repair material with ceramic and
adhesive and 30% mixed failure. The third group repaired with Ivoclar repair kit showed 100% mixed failure in ceramic samples (CIII) and the cobalt-chromium (MII) group showed 80% mixed and 20% adhesive failure. Failure type among the three groups was tested by Chi-square test. It was found that significant difference in the failure mode existed among the three sub-groups of both ceramic and cobalt-chromium (p<0.05).

**Conclusion:** The surface modified with intraoral sandblaster and repaired with Ivoclar repair kit showed the most favorable results for both shear bond strength and the failure mode among the ceramic and cobalt chromium samples. The surface modification had a great role in improving the bond strength of composite repair material to metal ceramic restoration and the failure mode improved from adhesive failure in the control group to a greater proportion of mixed failure in the samples repaired with Ivoclar repair kit after surface modification.

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