



## **Comparative evaluation of tensile bond strength of two different luting cements (Zinc phosphate and Zinc polycarboxylate) used in dentistry**

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### **Abstract**

**Background:** To compare the comparing the tensile bond strength of two different luting cements (Zinc phosphate and Zinc polycarboxylate) used in dentistry

**Materials & methods:** One hundred freshly extracted maxillary first premolars were used in the current study. The samples were all meticulously cleaned and preserved in sterile saline for further use. All specimens had their impressions taken after the cavity preparation was finished, and then casts made of type IV dental stones were poured. Wax patterns were used for casting. After that, the castings were finished, polished, and devested. The specimens were split into two research groups as follows: Zinc phosphate makes up Group A, while zinc polycarboxylate makes up Group B. A universal testing device was used to determine the mean tensile strength. All of the results, which were compiled in a Microsoft Excel spreadsheet, were evaluated using the SPSS programme. A student t test was used to assess the significance level.

**Results:** Mean tensile strength of specimens of Group A, and Group B was found to be 3.64 MPa and 3.13 MPa respectively. While analysing statistically, significant results were obtained on comparing the mean tensile strength in between group A and group B.

**Conclusion:** It was concluded that the mean tensile strength of Zinc phosphate cement is quite higher in relation to Zinc polycarboxylate cement.

**Key words:** Dental cement, Tensile strength

## **Introduction**

Zinc phosphate cement has been used in dentistry for more than a century. It is used for various clinical applications, such as luting crowns and bridges and cementing onlays.<sup>1,2</sup> It belongs to the acid–base cement group and its acidic component consists of a solution of phosphoric acid (45–65%), which also contains aluminium (1–3.1%) and zinc (up to 10%).<sup>3</sup> Aluminium and zinc play a critical role in controlling the rate of reaction, which they do by forming appropriate amounts of phosphates in a solution, and these increase the pH of the acid solution and reduce its reactivity. Set cements contain water in some sort of chemical combination, there being no phase-separation as the cement sets. The chemical and mechanical properties of the fully reacted cement are critically dependent on the concentration of the phosphoric acid in the initial solution, and for this reason the liquid component must not be allowed to gain or lose water to the atmosphere.<sup>4,5</sup>

Many studies have investigated the retention of stainless steel crowns and clinicians have suggested that dental cement alone was responsible for retention of stainless steel crowns on primary molars.<sup>6,7,8</sup>

Hence; the present study conducted for comparing the comparing the tensile bond strength of two different luting cements (Zinc phosphate and Zinc polycarboxylate) used in dentistry.

## **Materials and Methods**

One hundred freshly extracted maxillary first premolars were used in the current study. The samples were all meticulously cleaned and preserved in sterile saline for further use. All specimens had their impressions taken after the cavity preparation was finished, and then casts made of type IV dental stones were poured. Wax patterns were used for casting. After that, the castings were finished, polished, and devested. The specimens were split into two research groups as follows: Zinc phosphate makes up Group A, while zinc polycarboxylate makes up Group B. A universal testing device was used to determine the mean tensile strength. All of the results, which were compiled in a Microsoft Excel spreadsheet, were evaluated using the SPSS programme. A student t test was used to assess the significance level.

## **Results**

Mean tensile strength of specimens of Group A, and Group B was found to be 3.64 MPa and 3.13 MPa respectively. While analysing statistically, significant results were obtained on comparing the mean tensile strength in between group A and group B.

### **Table 1:** Mean tensile strength (MPa)

Groups	Mean tensile strength	p- value
Group A	3.64	0.0000*
Group B	3.13	

\*: Significant

## Discussion

Dental luting cements can be classified according to their chemical composition and application.<sup>9</sup> Regardless of the selected material, they should present consistency and film thickness compatible with cementation.<sup>10-12</sup> Dental cement can be oil-, water-, or resin-based.<sup>13</sup>

Currently, there are numerous provisional and long-term cements available, and they differ from each other in their chemical composition, properties, and clinical applications. Provisional cements are usually oil-based or oil-free. Previously, most of them contained eugenol, while nowadays they are mainly produced without it. These cements have weaker physical properties and greater film thickness than water- and polymer-based cement. Residual provisional cements should be thoroughly removed from the tooth before the application of final cements.<sup>14,15</sup> The presence of an oil component is being reduced since it can affect the curing process of long-term cementation, reducing the bond strength and justifying the use of eugenol-free cement.<sup>16-19</sup>

In this study, mean tensile strength of specimens of Group A, and Group B was found to be 3.64 MPa and 3.13 MPa respectively. While analysing statistically, significant results were obtained on comparing the mean tensile strength in between group A and group B.

David R. Myers<sup>20</sup> and Garcia Godoy<sup>21</sup> reported that no significant difference was found between zinc phosphate and polycarboxylate cements in the retention ability of the cements. Whereas in this study, zinc phosphate cement showed better retentive strength than polycarboxylate cement, which was statistically significant ( $P < 0.05$ ). The difference may be due to the fact that zinc phosphate cement lies on mechanical interlocking for its retentive effect and on close physical adaptation for sealing restorative margins, but it does not provide any chemical bonding to tooth or metal surfaces.

Parameswari BD et al<sup>22</sup> compared the tensile bond strength and marginal fit of complete veneer cast metal crowns using various luting agents. The study is divided into four groups

with 10 samples for each of the luting cement taken up for testing TBS and four groups with 5 samples for each luting agent chosen for assessing marginal fit. The results were tabulated and statistically analyzed. The TBS of luting cements, and marginal fit in relation to luting cements were tested by using appropriate testing devices. The TBS of cement is measured using universal testing machine, and the results are tabulated. The marginal gap that exists between the margin of the cast metal crown, and the finish line is measured using travelling microscope before and after cementation. The difference between these two values gives the discrepancy that is due to the film thickness of cement used for luting the restoration. The TBS value of zinc phosphate cement and glass ionomer cement were found to be almost same.

### **Conclusion**

It was concluded that the mean tensile strength of Zinc phosphate cement is quite higher in relation to Zinc polycarboxylate cement.

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