

## Original Research

### 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:** The present study was conducted for comparatively evaluating the tensile bond strength of 2 distinct luting cements (Zinc phosphate and Zinc polycarboxylate) used in dentistry. **Materials & methods:** 100 freshly extracted maxillary first premolars were utilized. To be used later, the samples were all carefully cleaned and stored in sterile saline. After the cavity preparation was completed, castings consisting of type IV dental stones were put into each specimen. For casting, wax patterns were utilized. Two study groups were formed: Group A is composed of zinc phosphate, whereas Group B is composed of zinc polycarboxylate. The mean tensile strength was measured using a universal testing apparatus. **Results:** The specimens belonging to Group A and Group B were found to have mean tensile strengths of 3.23 MPa and 2.99 MPa, respectively. Significant findings were found when comparing the mean tensile strength between groups A and B by statistical analysis. **Conclusion:** It had been concluded that the mean tensile strength of Zinc phosphate cement is much higher as compared to Zinc polycarboxylate cement.

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

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#### INTRODUCTION

For over a century, dentists have employed zinc phosphate cement. It is utilized in several therapeutic applications, including the cementation of onlays and the luting of crowns and bridges.<sup>1,2</sup> It is a member of the acid-base cement group and has an acidic component made up of 45–65% phosphoric acid solution with additional zinc (up to 10%) and aluminum (1–3.1%). By producing the proper proportions of phosphates in a solution, zinc and aluminum play a crucial role in regulating the rate of reaction. This raises the pH of the acid solution and lowers its reactivity.<sup>3</sup> Set cements do not undergo phase separation during the setting process; instead, water is present in some chemical mixture. Because the concentration of phosphoric acid in the original solution is crucial to the chemical and mechanical properties of the completely reacted cement, it is imperative that the liquid component not be permitted to acquire or lose water to the atmosphere.<sup>4,5</sup> Hence; this study had been carried out for comparing the tensile bond strength of 2 distinct luting cements

(Zinc phosphate and Zinc polycarboxylate) employed in dentistry.

#### MATERIALS AND METHODS

In the current investigation, one hundred freshly extracted maxillary first premolars were utilized. To be used later, the samples were all carefully cleaned and stored in sterile saline. After the cavity preparation was completed, castings consisting of type IV dental stones were put into each specimen. For casting, wax patterns were utilized. The castings were then polished, devested, and completed. The following is how the specimens were divided into two research groups: Group A is composed of zinc phosphate, whereas Group B is composed of zinc polycarboxylate. The mean tensile strength was measured using a universal testing apparatus. The results were all assessed using the SPSS software and then combined into a Microsoft Excel spreadsheet. A student t test was employed to evaluate the degree of significance.

## RESULTS

The specimens belonging to Group A and Group B were found to have mean tensile strengths of 3.23 MPa and 2.99 MPa, respectively. Significant findings were found when comparing the mean tensile strength between groups A and B by statistical analysis.

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

Groups	Mean tensile strength	p- value
Group A	3.23	0.0000*
Group B	2.99	

\*: Significant

## DISCUSSION

Dental luting cements can be categorized based on their use and chemical makeup. Whichever material is used, they must exhibit consistency and film thickness that are appropriate for cementation. Dental cement may be based on resin, water, or oil.<sup>6</sup> There are several different long-term and provisional cements on the market right now, and they vary in terms of their chemical makeup, characteristics, and medical uses. Typically, temporary cements are either oil-based or oil-free.<sup>7</sup> In the past, eugenol was present in the majority of them; however, these days, it is mostly made without it. Compared to cement based on water and polymers, these cements have stronger film thickness and worse physical characteristics. Prior to applying final cements, the tooth should be completely free of any remaining provisional cements. Since oil can interfere with long-term cementation's curing process, lowering bond strength and supporting the usage of cement devoid of ethanol, its presence is being minimized.<sup>8,9</sup>

In this study, the samples belonging to Group A and Group B were found to have mean tensile strengths of 3.23 MPa and 2.99 MPa, respectively. Significant findings were found when comparing the mean tensile strength between groups A and B by statistical analysis. David R. Myers<sup>10</sup> and Garcia Godoy<sup>11</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>12</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 analysed.

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 had been concluded that the mean tensile strength of Zinc phosphate cement is much higher as compared to Zinc polycarboxylate cement.

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