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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: In dentistry, luting cements (Zinc phosphate and Zinc polycarboxylate) are utilised to create a strong bond between teeth. **Materials & methods:** In this analysis, one hundred freshly extracted maxillary first molars were used. All samples had been sterilized as well as stored inside sterile saline until they could be used. After the cavity preparation was complete for each specimen, castings were poured using type IV dental stones. The casting process began with a wax pattern. Finishing, polishing, and devesting the castings came next. The samples were divided as follows for the studies: Group A consists of zinc phosphate, while Group B consists of zinc polycarboxylate. To get an average tensile strength, a standard testing instrument was employed. After compiling the data in a Microsoft Excel spreadsheet, we ran it through the SPSS application for analysis. The degree of significance was determined by student t-test. **Results:** The average tensile strength of Group A samples was 4.85 MPa, while Group B specimens was 4.09 MPa. When comparing the average tensile strength of samples from groups A and B, statistically significant differences were found. **Conclusion:** The results showed that when comparing zinc phosphate cement to zinc polycarboxylate cement, zinc phosphate cement has a much greater mean tensile strength.
Key words: Dental cement, Tensile strength

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INTRODUCTION

When it comes to prosthetic dentistry, complete veneer restorations, whether as a stand-alone restoration or part of a fixed partial prosthesis, play a crucial role. Cementation and use of a suitable luting agent are also crucial to the clinical success of fixed prostheses. In order to prevent bacteria from seeping through the space between the tooth as well as the restoration, dental cement must be utilized to create a tight seal.[1] This bond could be chemical, mechanical, or a combination of the two.[2]

Despite its well-known drawbacks—like increased solubility in saliva, absence of chemical bonding, as well as a low setting pH—zinc phosphate cement has been the most extensively employed luting agent. Cement made from polycarboxylates hardens quickly thanks to an acid-base reaction.[3] Polycarboxylate cements are not recommended for practice in areas of high masticatory stress due to their much increased plastic deformation after hardening.[4] This cement's biocompatibility with the dental pulp is its greatest clinical advantage.[5] Hence, the goal of the current study was to assess the relative tensile bond strengths of two dental luting cements (zinc phosphate and zinc polycarboxylate).

Materials and Methods

In this analysis, 100 newly extracted maxillary first molars had been used. All samples were sterilized as well as stored in sterile saline until they could be used. After the cavity preparation was complete for each specimen, castings were poured using type IV dental stones. The casting process began with a wax pattern. Finishing, polishing, and devesting the castings came next. The samples were divided as follows for the studies: Group A consists of zinc phosphate, whereas Group B consists of zinc

polycarboxylate. To get an average tensile strength, a standard testing instrument was employed. After compiling the data in a Microsoft Excel spreadsheet, we ran it through the SPSS application for analysis.The degree of significance was determined by student t-test.

Results

The average tensile strength of Group A samples was 4.85 MPa, while that of Group B samples was 4.09 MPa. The mean tensile strength was significantly different among groups A and B.

Table 1: Mean tensile strength (MPa)

Groups	Mean tensile strength	p- value
Group A	4.85	0.0000*
Group B	4.09	

*: Significant

Discussion

It is possible to categorize dental luting cements based on their chemical make-up and the procedures they are used for.[5] The chosen material(s) should have a consistency and film thickness that allows for cementation.[6-8] Oil-based, water-based, and resin-based dental cements all exist.[9]

There is a wide variety of temporary and permanent cements on the market today, each with its own unique chemical make-up, set of properties, and clinical uses. It is common for temporary cements to be either oil-based or oil-free. Many of them used to have eugenol, but today it's not used in most of the manufacturing process. Compared to water- and polymer-based cement, these have worse physical qualities and a thicker coating. Before permanent cements are placed, any remaining provisional cements on the tooth must be carefully removed.[10,11] Cement without eugenol is preferred because oil can interfere with the curing procedure of long-term cementation, weakening the bonds.[12-15]

In the current tensile strength of samples of first group had been 4.85 MPa, while that of Group B samples was 4.09 MPa. The average tensile strength was significantly different among groups A as well as B.

David R. Myers[16] as well as Garcia Godoy[17] revealed that the retention ability of zinc phosphate as well as polycarboxylate cements did not differ significantly. Whereas, this research found that zinc phosphate cement had significantly (P 0.05) higher retentive strength than polycarboxylate cement. Zinc phosphate cement doesn't give any chemical bonding to the tooth or metal surfaces, which may account for the difference. Instead, it relies upon mechanical interlocking for the retentive action as well as on close physical adaptation for closing filling margins.

Microleakage of various luting methods was evaluated by White et al.[18] Microleakage was seen in polycarboxylate at the casting/cement interface, the tooth/cement interface, as well as inside the cement layer. Polycarboxylate is relatively weak because the weakest link in the chain breaks fastest under stress. Zinc phosphate cement had a thicker layer than other luting cements, as per White. The higher viscosity of zinc phosphate cement could be responsible for its greater cost effectiveness. The hydrostatic pressure was raised proportionally to the thickness of the film.[19] It was therefore determined that internal pressure has a significant part in avoiding the cast crown from fully seating.

Conclusion

The outcomes revealed that zinc phosphate cement had a much higher mean tensile strength as compared to zinc polycarboxylate cement.

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