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COMPARATIVE EVALUATION OF COMPRESSIVE STRENGTH AND SHEAR BOND STRENGTH OF CENTION N AND ZIRCONOMER IMPROVED

Endodontics

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ABSTRACT

Aim: To evaluate the compressive strength and shear bond strength of Cention N and Zirconomer Improved. **Materials and Methods:** Fifteen samples each of Cention N and Zirconomer Improved were prepared for testing the compressive strength and shear bond strength. Cylinders of the samples measuring 1 cm diameter and 6 mm height were prepared for compressive strength and shear bond strength. For shear bond strength, these samples were embedded into acrylic blocks of dimensions 2 cm × 2 cm. Testing of shear bond strength and compressive strength was done by mounting the samples in a universal testing machine with a crosshead speed of 1 mm/min. **Statistical Analysis:** The results analyzed were statistically significant with p-value of <0.05. The data obtained subsequent to compressive strength testing were analyzed using one-way ANOVA, Mean and standard deviations were calculated for each group and analyzed using Student's t-test. **Conclusion:** Highest compressive strength was exhibited by Zirconomer Improved than Cention N, shear bond strength of Cention N was higher than Zirconomer Improved.

KEYWORDS

compressive strength; shear bond strength; Cention N; Zirconomer Improved

INTRODUCTION

The initial signs of dental caries include surface softening, however, when the lesion progresses to the point of breaks in the continuity of the enamel surface, microcavitations occur. Once cavitations occur, it is a critical stage in caries process as bacteria can easily invade into the dentin.[1]

The objective of the use of any restorative material is to substitute the biological, functional and esthetic harmony of the lost tooth structure.[2] Evolution of restorative materials is imperative for better delivery of treatment. Thus, the newer materials should exhibit significantly better properties than its predecessors.[3]

The compressive strength of a material is any important factor to be considered in relation to masticatory forces. This property is the resistance exhibited by a restorative material against intraoral compressive and tensile forces which are produced both in function and para function.[4]

Recently, a tooth-colored, filling material for direct restorations, Cention N, has gained importance in restorative dentistry. It is self-curing with optional additional light-curing. The alkasite Cention N thus redefines the basic filling, combining bulk placement, ion release, and durability in a dual-curing, esthetic product – satisfying the demands of both dentists and patients. Cention N has been suggested to have strength comparable to amalgam and the esthetics of GIC.[5]

A new class of restorative glass ionomer that provides the strength and durability of amalgam is evolved as a recent posterior restorative material called Zirconomer Improved. The inclusion of Zirconia fillers in glass component of Zirconomer Improved reinforces the structural integrity of restoration and imparts superior mechanical properties in posterior load-bearing areas.[6]

MATERIALS AND METHODS

A custom made stainless-steel mould was utilized to fabricate cylindrical samples of the materials measuring 1 cm diameter and 6 mm height. A total number of thirty samples were fabricated according to two experimental groups (n = 15): Group I – Cention N (Ivoclar Vivadent), Group II – Zirconomer Improved (Shofu Inc., Japan).

For shear bond strength, these samples were embedded into acrylic blocks of dimensions 2 cm × 2 cm. The samples were embedded to a height so that 2 mm of the sample was above the acrylic block. Following this, the samples were stored in distilled water for 24 h.

Testing of shear bond strength and compressive strength was done by mounting the samples in a universal testing machine with a crosshead speed of 1 mm/min.

STATISTICALANALYSIS

The data collected were tabulated accordingly and were subjected to statistical analysis using Statistical Package for the Social Sciences, version-20 (IBM SPSS). The results analyzed were statistically significant (P <0.05). The data obtained subsequent to compressive strength testing were analyzed using one-way ANOVA, Mean and standard deviations were calculated for each group and analyzed using Student's t-test.

Table 1: One way ANOVA comparison of compressive strength (MPa) between the study groups

Group	N	Mean	Standard Deviation	Minimum	Maximum
Group I – Cention N	15	130.51	0.23	128.32	132.68
Group II – Zirconomer Improved	15	303.16	0.94	300.11	306.22

Table 2: Comparison of shear bond strength between the study groups

Group	N	Mean±SD
Group I – Cention N	15	8.5480±0.6071
Group II – Zirconomer Improved	15	3.4644±1.1845

The results of the study show that Group II – Zirconomer Improved has the highest compressive strength mean value of 303.16±0.94 (Table 1), whereas Group I – Cention N has shown the highest shear bond strength mean value of 8.5480±0.6071 (Table 2). A statistically significant p-value of <0.05 was exhibited.

DISCUSSION

The availability of variety of restorative materials in the field of dentistry results in continual scrutiny of the properties of the material. This is to ensure the right choice of the material for clinical purposes which would adhere optimally to the tooth structure and which can withstand the masticatory forces.[7] Compressive strength testing is commonly used as a measure by which clinicians and researchers predict the performance of a restorative material in oral environment. Zirconomer Improved which exhibited better compressive strength than Cention N as per manufacturer's claims have the durability of amalgam. The material reinforced with nano- zirconia fillers is responsible for imparting enhanced mechanical properties especially making it suitable for posterior load bearing areas as per various studies. Homogeneity of the glass particles further reinforces the durability of the material and the strength to withstand occlusal load.[8,9] In this study Zirconomer Improved exhibited compressive strength values of over 300 MPa after 24 hours as per the limit set by ISO for

materials to be used as posterior restoratives.

Cention N, a tooth-colored, basic filling material for direct restorations, is self-curing with optional additional light-curing. It is available in the tooth shade A2, is radiopaque, and releases fluoride, calcium, and hydroxide ions.[5]

The clinical success of restorative material depends on a good adhesion with dentinal surface so as to resist various dislodging forces acting within the oral cavity. Shear bond strength is important to the restorative material clinically because of the fact that the major dislodging forces at the tooth restoration interface have a shearing effect.[10] Therefore, higher shear bond strength implies better bonding of the material to tooth. In a study by Mazumdar et al, Cention N was also found to have a better bond strength as compared to Nano hybrid composite.[11] The results of the present study suggest that the shear bond strength of Cention N was comparatively higher as than that of Zirconomer Improved.

Limitations: The results of the present study, cannot be extrapolated directly to the clinical situations. It can be expected that if a restorative material shows a lower bond strength under optimal laboratory test conditions, it is very possible that it may not be successfully maintained in the oral cavity, so additional retention criteria are considered when clinically applied.

CONCLUSION

Within the limitations of the present study, it was concluded that the Zirconomer Improved was exhibited highest compressive strength than Cention N, whereas, Cention N was exhibited highest shear bond strength than that of Zirconomer Improved.

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