



COMPARATIVE EVALUATION OF COMPRESSIVE STRENGTH OF THREE BULK FILLED COMPOSITE RESTORATIVE MATERIALS –AN IN-VITRO STUDY

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Conflicts of Interest: Nil

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Abstract:

Aim of the study: Aim of this study is to Evaluate and Compare the compressive strength of three different bulk filled composite restorative materials: Beautifil II LS, Cention N and Filtek Z250.

Methodology: Three commercially available composite restorative materials were divided into 3 groups i.e. GROUP 1- Beautifil II LS, GROUP 2- Filtek Z250 and GROUP 3-Cention N. A Customised Aluminium cylindrical moulds of dimension 6mm height and 4mm diameter was used to fabricate 10 samples each of Beautifil II LS, Filtek Z250 and Cention N. Samples were cured according to the manufacturer's instructions and were stored in Distilled water at 37 degrees for 24 hours. The samples were then tested for evaluation of compressive strength using Universal Testing Machine (UTM). This was then connected to load measuring cell, which continuously recorded the load applied to the samples at a crosshead speed of 0.75+-0.25mm per 1 minute till the sample fractures.

Statistical Analysis: One way Anova and Boneferri Post Hoc Test were used for statistical analysis.

Results: The values were recorded and subjected to statistical analysis for comparison of compressive strength. The results showed that Beautifil II LS has highest compressive strength followed by Filtek Z250 and the least was seen in Cention N.

Conclusion: Within the limitations of this study, it can be concluded that Beautifil II LS can be used as a superior alternative to Filtek Z250 and Cention N as its Compressive strength was found to be Significantly High. However, long term clinical studies are required to draw any substantial conclusion.

Keywords: Beautifil II LS, Cention N, Filtek Z250, Compressive strength.

Introduction

The eventual objective of dental restorative material is to substitute three properties of healthy tooth structure – Biological, Functional and Aesthetics^{1,2}. With the Evolutionary Development of filling materials there has been an increase need for better tooth colored restorative materials to replace missing tooth, to modify tooth color and to modify tooth contour which enhances the facial aesthetics³.

In last few decades there has been increase demand for aesthetics which has led to development of resin composite materials for Direct Restorations with improved physical and mechanical properties, aesthetics and durability.²

In clinical settings restorations are subjected to endless forces like Compressive stress, Tensile stress and shear stress which influences Durability of the restoration.⁴

Methodology

A Customized Aluminum cylindrical moulds of dimension 6mm height and 4mm diameter was fabricated. Three commercially available composite restorative materials were divided into 3 groups of ten samples each i.e.

GROUP1- Beautifil II LS, GROUP 2- Filtek Z250 and GROUP 3-Cention N. Samples were then cured according to the manufacturer's instructions and were stored in Distilled water at 37 degrees for 24 hours. The samples were then tested for evaluation of compressive strength using Universal Testing Machine (UTM). This was then connected to load measuring cell, which will continuously record the load applied to the samples at a crosshead speed of 0.75+-0.25mm per 1 minute till the sample fractures.

Results:

Statistical analysis was drawn using descriptive statistics and intergroup comparison was done using Bonferri Post hoc test (P value<0.001 statistically highly significant). The mean and standard deviation values obtained for various studygroups have been summarized in Table 1. A statistically significant difference was observed between the compressive strength of three bulk filled composite restorative materials. It was observed that Beautifil II LS had the highest compressive strength, followed by Filtek Z250 whereas Cention N showed minimum compressive strength.

On comparing the compressive strength between the groups using Boneferri Post hoc test, it was found that

Group III differed significantly with Group I and II. However However also Group II differed significantly with Group I. (Table 2).

Discussion:

Compressive Strength is one of the Major mechanical property of restorative material.⁵ BEAUTIFIL II LS is a GIOMER, an esthetic restorative nanohybrid composite that combines the characteristics of both Glass Ionomer Cement and composite. It is resin-based, containing filler particles that are derived from S-PRG (Surface Pre-reacted Glass Ionomer) Technology which simulates the internal structure of Natural tooth. The Particle size is 0.06-0.4 μm . Beautifil II LS is indicated for Class I-V Restorations⁶

FILTEK Z250 is a visible light activated Nanohybrid Composite. Which contains Nanomer sized particles and Nanocluster Formulation which Minimizes the interstitial spacing of Filler particles, therefore Contributes to the strength. It has Filler load of 80 wt%. The Particle size is 0.01-3.5 μm . Filtek Z250 is indicated in All Direct Restorations, core built up and splinting.⁷

CENTION N is an "ALKASITE" restorative material which utilizes alkaline filler, capable of releasing Acid neutralizing ions. It is a tooth colored, resin based, self curing alkaline filling material.⁹ It has Filler Load of 78.4 wt% and Particle size is 0.1- 35 μm

According to studies done by Lu H et al¹, Mechanical property such as Compressive Strength to resist the intraoral forces depends upon the Amount of Filler Load and particle size present in the inorganic phase. The result of the present study are in accordance with studies done by Lu-et al¹ and Hegde –et al² where Mean Compressive strength of Filtek Z250 – 309.65 MPa and Mean Compressive strength of Cention N – 292.59 MPa.

According to studies, Mechanical property such as Compressive Strength depends upon the Amount of Filler Load and particle size present in the inorganic phase.⁹

The difference obtained in Compressive Strength between the various study groups can be explained by the Amount of Filler Load (wt%).² Beautifil II LS has the Highest Filler content (83.3 wt%) followed by Filtek Z250 (80 wt%) and the least Filler content is seen in Cention N (78.4 wt%).



Distilled water



Curing Light



Universal Testing Machine



Ten Samples each of Beautifil II LS, Filtek Z250 and Cention N



Beautifil II LS



Filtek Z250



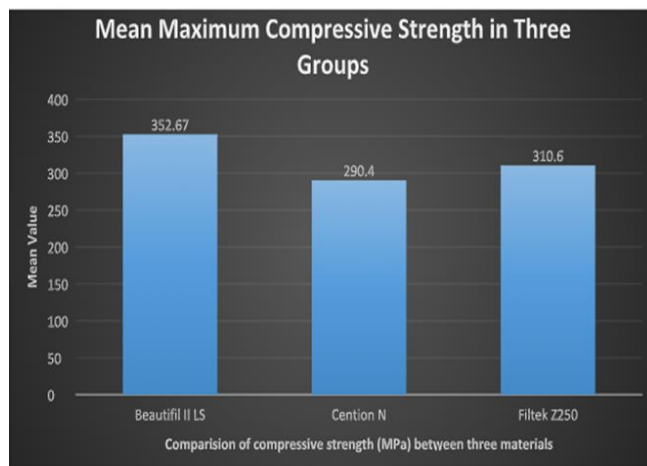
Cention N

Table 1: Mean and standard deviation values for compressive strength

Material	N	Mean± SD	95% Confidence Interval		Minimum	Maximum	P value
			Lower	Upper			
Beautifil II LS (I)	10	352.67± 8.3	349.965	358.0425	337.46	361.23	>0.001**
Cention N(II)	10	290.4± 3.2	288.707	232.377	285.91	296.42	
Filtek Z250 (III)	10	310.6± 7.7	306.02	317.51	299.62	321.47	

Table 2: Multiple comparisons using Bonferroni Post Hoc Tests.

Group (A)	Group (B)	Mean Difference (A-B)	P Value
III	I	-41.971	0.000**
	II	20.222	0.000**
II	I	-62.193	0.000**



Conclusion

Within the limitations of this study, it can be concluded that the compressive strength of the 3 restorative material

is in the order: **BEAUTIFIL II LS > FILTEK Z250 > CENTION N, (352.67 MPa > 310.6 MPa > 290.4 MPa)**

Hence **BEAUTIFIL II LS** can be used as a superior alternative to FILTEK Z250 and CENTION N as its Compressive strength was found to be Significantly High. However, long term clinical studies are required to draw any substantial conclusion.

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