

# **COMPARATIVE EVALUATION OF HARDNESS OF SILVER AMALGAM, SDR POSTERIOR BULK FILL, CENTION N, ZIRCONOMER – AN IN VITRO STUDY.**

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## **Abstract**

**Introduction:** There are many options available for the dentist now. These options range from amalgams as well as composites resins. For the dentists the option of Amalgam materials are one of the oldest filling materials with good clinical success. Glass ionomer cement was introduced in dentistry in 1970s and Composite resins got recognition in 1980s. Further in 1990s the compomers came into existence due to modification glass ionomers. **Materials-**A 5mm diameter straw was taken and cut to 3 mm in length for preparing the cylindrical plastic moulds. Sample got distributed into four groups. Group 1 –silver amalgam, Group 2- SDR posterior bulk fill, Group 3- Cention N, Group 4- Zirconomer. **Result-** It is observed that, there is a statistically significant difference of mean values among all groups for microhardness ( $p < 0.0001$ ). **Conclusion:** It can be concluded that zirconomer showed highest hardness values which can be a good option as a restorative material to be used clinically. It is also found that SDR posterior bulk fill showed relatively inferior results.

**Keywords:** Silver Amalgam, Sdr Posterior Bulk Fill, Cention N, Zirconomer

## **INTRODUCTION:**

There are many options available for the dentist now. These options range from amalgams as well as composites resins. For the dentists the option of Amalgam materials are one of the oldest filling materials with good clinical success. Glass ionomer cement was introduced in dentistry in 1970s and Composite resins got recognition in 1980s. Further in 1990s the compomers came into existence due to modification glass ionomers. In current there are many bulk fill and flowable composites resins are available in market.<sup>1</sup> Glass ionomer and amalgam can be considered as basic filling materials because they are long standing, simple, cost effective easy in application. There is no need of any primers and they do not need any costly dental equipment.<sup>1</sup>

Numerous researches have been carried out on direct filling materials and researches admit about the advancement but yet no one deny the importance of amalgam as well as the glass ionomer. Increasing demand for better tooth colored restorative materials to replace missing tooth structure and to enhance facial esthetics leads to evolutionary development of filling materials.<sup>2</sup>

Presently, composites are in wider application. Composites as the name suggest are the resultant of mixing multiple materials affecting the final properties as per the materials used.<sup>3</sup> Cention N at the same time is yet another option. It is an alkasite with having colour similar to tooth. It has been used as the basic filling

material and can be used as material for direct restorations. The significant aspect in this case is the self-curing property.<sup>1</sup>

Hardness of the material is considered as the one of the important property which is related to compressive strength, abrasion resistance and degree of conversion.<sup>4</sup> The parameter (hardness) here help to get an idea about the wear resistance of a material.<sup>5</sup> Low values of hardness are usually linked to poor wear resistance and susceptibility material to scratching. In such cases fatigue strength got affected leading further the failure of restoration.<sup>6</sup>

**MATERIALS AND METHODS:**Preparation of samples:

A 5mm diameter straw was taken and cut to 3 mm in length for preparing the cylindrical plastic moulds.

Sample distribution:

Group 1 –silver amalgam

Group 2- SDR posterior bulk fill

Group 3- Cention N

Group 4- Zirconomer

Vicker’s Hardness Test:

The microhardness indenter started in the center of the sample and three indentations linear to the four cardinal points with a distance of 4mm between each other.

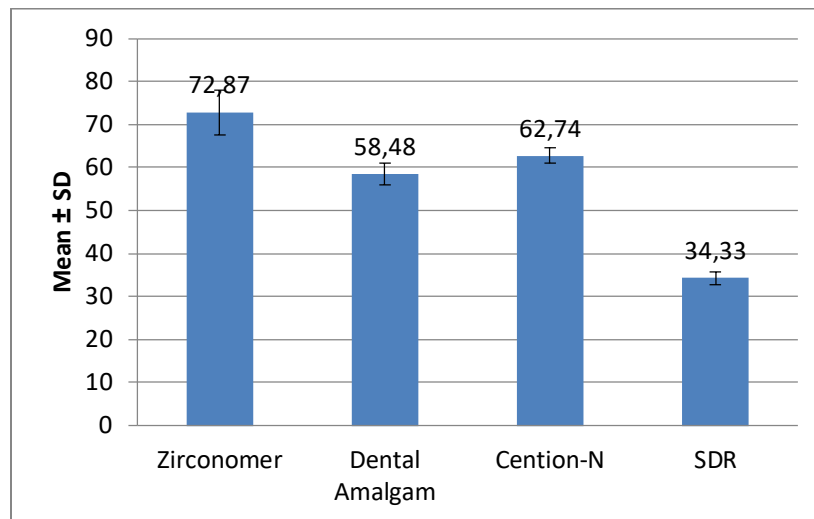
**RESULT:**

Statistical Analysis: Descriptive statistics such mean and SD was used. Comparison of microhardness was done by using ANOVA test (table.1) followed by Post Hoc Tukey-Kramer Multiple Comparisons Test. A p-value less than 0.05 were considered as significant.

It is observed that, there is a statistically significant difference of mean values among all groups for microhardness ( $p < 0.0001$ ). All the values of hardness of tested materials is summed up in table no. 1. In present study zirconomer (Figure 1) showed the highest hardness values followed by cention n, dental amalgam and SDR posterior bulk fill. It is also found there is significant difference between all test groups hence the null hypothesis was rejected.

Table-1: ANOVA test done for comparison between groups

Group	N	Mean	SD	SE of mean	F-value	p-value
Zirconomer	8	72.87	5.26	1.86	215.76	<0.0001
Dental Amalgam	8	58.48	2.53	0.89		
Cention-N	8	62.74	1.79	0.63		
SDR	8	34.33	1.50	0.53		



**Figure 1:** Comparison of micro hardness between SDR, Amalgam, Zirconomer, and Cention-N

**DISCUSSION:**

Hardness is often used as the parameter, as it is one of the important property for the restorative materials to have clinical success in the oral cavity. It is defined as the resistance of a material to indentation or penetration into its surface<sup>7</sup>. Thus decrease in the hardness of a material can also decrease in premature failure of a restoration requiring its replacement.<sup>8</sup>

Amalgam is one of the best filling material in dentistry. The various factors can affects the success of silver amalgam which includes proper cavity preparation having undercuts, proper condensation technique, anatomical characteristics of tooth, and final finish and luster. Improper manipulation of amalgam can cause it to expand or contract. Severe contraction can cause many other problems too. Dental amalgams offer a good clinical success and strength but has disadvantages like poor esthetics and mercury.<sup>9-11</sup>

The availability of Cention-N both in the powder as well as the liquid form. The liquid form use to have dimethacrylates along with initiators. The powder form is having the glass fillers, initiators along with pigments.<sup>12-13</sup>

Flowable composites are an innovative class of dental composite materials, which are developed to simplify the placement of direct composites. They include low-viscosity, flowable, and high-viscosity material types. They can be efficiently cured at depths up to 4-5 mm and cause low polymerization shrinkage stress at the same time. For restorations in posterior teeth, bulk fill flowable composites can used along with traditional composites so as to lower polymerization shrinkage, easy placement, better marginal adaptation, and reduced microleakage. In addition, they have a low modulus of elasticity which can reduce the stress on the cavity walls hence providing support to the tooth structure.<sup>14-15</sup> Owing to these reasons the SDR is included in the present study. Zirconomer is zirconia modified glass ionomer cement, which display superior mechanical properties while maintaining the release of fluoride of GICs. According to the manufacture, it exhibits strength consistent with amalgam and is more esthetically pleasant. In order to attain optimum particle size and characteristics, the glass components of this high-resistance ionomer undergoes through fine controlled micronization process. Particles of zirconia have been homogenously incorporated into the glass to strengthen the material for long lasting success and high resistance to occlusal load. Polyalkenic acid and glass components were also specially processed to high-strength glass ionomer superior mechanical as well as handling properties.<sup>16-19</sup>

It contains zirconium oxide, glass powder, tartaric acid (1%–10%), polyacrylic acid (20%–50%), and deionized water as its liquid. The filler zirconium oxide strives to possess excellent strength, durability, and sustained fluoride release, thereby combining and retaining the benefits of both amalgam and conventional GICs.<sup>20</sup> There are certain limitations of this study which includes only one physical property was tested on a limited number of materials polymerized with one type of unit. More clinical research on the use of other materials and multiple combinations of polymerization modes is required. The results of the study only

apply to these materials and shades under the testing conditions stated. The test were performed in cylindrical moulds, different results may be obtain in case of clinical tooth preparation. One another limitation is that different types of cavity designs are required for different restorative materials, which can be an important factor in determination of hardness of a restoration. More in vivo research involving the use of the materials and multiple combinations of polymerization modes and various techniques are needed.

## CONCLUSION:

In Present study zirconomer showed highest hardness among silver amalgam, cention n and SDR bulk fill. Probably high hardness values of hardness zirconomer could be due to high filler content of zirconia particles. Within the limitations of the present in vitro study it can be concluded that zirconomer showed highest hardness values which can be a good option as a restorative material to be used clinically. It is also found that SDR posterior bulk fill showed relatively inferior results.

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