Clinical Assessment: Short Term Retention of Giomer and Compomer Restorations in Class V Non-Carious Cervical Lesions

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Authors’ contributions

This work was carried out in collaboration among all authors. Author AQKD designed the study, wrote the protocol and wrote the first draft of the manuscript. Author IHD collected data and performed all the restorations. Author MM managed the analyses of the study. Author BB, MAB and SB managed the literature search and references. All authors read and approved the final manuscript.

ABSTRACT

Objective: To compare the retention rate of giomer and compomer in Class V restorations in non-carious cervical lesions (NCCL).

Materials and methods: In this experimental study patients with non-carious cervical lesions were divided in to two groups (Group A and B). In group A (n=60), restoration was done with Giomer
type of material and in group B (n=60) Compomer type of material was used for filling by the same operator. Cvar & Ryge Criteria were used to evaluate the retention of both materials as: Alpha (restoration fully retained), Bravo (restoration partially retained) and Charlie (restoration completely missing) at follow-ups 1st, 2nd, 3rd, 4th, 5th and 6th months. The data was analyzed using SPSS version 17.

**Results:** Males were 72% and females were 28%. The Mean age was 30.62 ±3.89 ranges from 13–85 years. Charlie score was observed at 5th and 6th months. The comparison between Giomer and Compomer at follow-up of 1st, 2nd, 4rd, 4th, 5th and 6th showed no statistical difference.

**Conclusion:** Giomer and compomer both have same retention rate in clinical trials.

**Keywords:** Non-Carious Cervical Lesions (NCCL); giomer; compomer; ryge criteria.

### 1. INTRODUCTION

A non-carious cervical lesion (NCCL) is defined as the tooth substance loss at the cementoenamel junction (CEJ), which is not caused by dental caries process; while tooth wear defined as any pathological tooth tissue loss by a disease process other than dental caries [1]. The prevalence of NCCL is up to 85% mentioned in the literature, which is very high [2]. The underlying cause of these lesions is multifactorial and often this multifactorial etiology leads to diagnostic and restorative problems for dentists [1].

Historically, the NCCLs have been classified on the basis of its etiology and pathogenesis as abrasion, erosion, and abfraction/tooth flexure [3]. Some researchers have classified these lesions according to their shape and appearance. These lesions may appear as wedge-shaped, disc-shaped, flattened, irregular, or smooth [4]. Sometimes the early clinical appearance of abrasive lesions is horizontal groove across the buccal surface of the crown, above the CEJ. In later stages these early lesions progress into a V-shape lesion as the adjoining walls of the lesion axially converge at an acute angle, and they look like abfraction lesions. Abfraction lesions have sharp margins and wedge-shaped outline. Although in both abrasion and erosion lesions the underlying dentin surface appears shiny; but in erosive lesions adjacent dentin is less demarcated from the actual lesion [5].

Non-carious tooth surface loss poses a real concern in routine dental practice. There are no specific clinical guidelines in literature regarding their prevention and restoration. Reviews on this topic mostly focused on its etiology and prevalence but are silent on restorative protocol. Therefore; there is a need to set up a more sorted out methodology concerning restoration of non-carious cervical lesions (NCCL). In these lesions the effectiveness of restorative treatment and selection of material has not always proven to be predictable. Availability of variety of dental materials present further confusing factor to select proper material for NCCL restoration [1]. While restoring the NCCLs, dentists must address the associated etiological factors to get maximum retention of the restorative material, just supplanting lost tooth structure may not be beneficial for the patients. Some clinicians suggest preventive measures to control tooth loss, other suggest early interception [6-8]. For restorative procedure the longevity and clinical performance of any restoration depends on the factors like proper restorative material selection, operator’s skills, and the cavity dimensions. Regarding material selection the size of the cavity, esthetic demands, the thickness of remaining dentin, and the cavity outline (buccolingual and occlusogingival) are key aspects [9].

Currently to restore NCCL, the materials in use are composites, glass ionomer cement (GIC) and their modifications like resin modified glass ionomer cement (RMGIC). All these materials have advantages and disadvantages, for example the longevity of GIC in bruxers showed compromised results as repeated para-functional loadings breaks it at cervical edge [7,8,10]. Comparison to GIC the composite and its different forms offer superior results in cervical restorations [7,8,11]. Clinician are using hybrid materials (combination of composite and GIC) successfully over the years in these situations. Compomer is one of them, it contains polyacid modified composite resin. Compomer has combined advantages of composites and GIC. These materials are easier in placement and polishing with excellent esthetics. They release fluoride more than composites but less than GIC. But certain disadvantages, like difficulty in handling, and matrix expansion due to water sorption affects its physical properties. Giomer is
a newer type of hybrid material marketed to provide GIC properties (fluoride release and fluoride recharging), claimed to be better than other resin containing materials. It prevents recurrent caries, provides excellent aesthetics, easily polishable, biocompatible, excellent surface finish, antiplaque effect, less microleakage scores and harder than composite, RMGIC, and compomer in experimental studies [12-15]. Giomer uses a resin base and pre-reacted glass ionomer (PRG) technology. The PRG filler is manufactured by the reaction of the fluoride containing acid reactive glass with polyalkenoic acid in water prior to incorporation into the resin materials. PRG filler technology has two types i.e. surface-reacted PRG filler (S-PRG filler) technology and fully reacted PRG filler (F-PRG filler) technology. Giomers of the second generation are manufactured from the S-PRG filler technology that avoided water absorption tendency and expansion which was associated with first generation giomer (F-PRG filler) [14,15,16,17]. But researchers still believe that more clinical studies are required for the assessment of the success rate of restorative materials including gionmers [18,19].

So the objective of authors was to assess retention issues with different types of restorative materials used for the restoration of NCCLs. This study was conducted at local level to compare the retention rate of giomer and compomer in Class V restorations associated with NCCLs.

2. MATERIALS AND METHODS

This experimental study was, conducted at Department of Operative Dentistry, Liaquat University of Medical and Health Sciences and hospital, Jamshoro/ Hyderabad, Sindh, Pakistan, from September 2016 to August 2017. The patients were recruited with random sampling method. Total 120 patients with NCCL were selected after written informed consent. The sample size was calculated using online Rao software by taking margin of error as 5%, confidence interval as 95% and prevalence or response distribution of NCCL as 8.5% [20]. The sample size was calculated 119 but one more patient was added to the calculation to make it 120 to round off the figure and for equal distribution in two groups. The patients were divided into two groups (Group A and B). In group A (n=60), restoration was done with giomer type of material, and in group B (n=60) compomer type of material was used for restoration by same operator. All the clinically vital teeth having proper occlusion and intact proximal contacts with wedge-shaped asymptomatic NCCL above the ages of 13 years of either gender with good oral hygiene were included in this study. The exclusion criteria was class V carious cervical lesions, extremely sensitive to thermal stimuli, already restored teeth and patients with chronic parafunctional habits. The diagnosis of NCCL was done through its clinical characteristics. Demographic data including age, gender and hospital registration was recorded in proforma.

For Group A, after rubber dam application the teeth were cleaned with slurry of pumice and water, and beveled at the cavo-surface of the occlusal/incisal and proximal walls with flame shaped diamond bur. After that Giomer primer/adhesive of giomer Restorative System (Beautifil II-Shofu, Dental Corporation) was applied to the enamel and dentin for 30 seconds. Surfaces were kept wet for full time and dried gently for 5-10 seconds. Giomer primer/adhesive was light-cured for 10 seconds. Then Giomer restoration was placed incrementally, each increment was light-cured for 40 seconds, then finished and polished with Sof-Lex finishing and polishing system. For Group B same clinical protocol was repeated as of Group A. Only the cavity was restored with Compomer (3M™ F2000).

All patients of both groups were evaluated by two experienced examiners at 1st, 2nd, 4rd, 4th, 5th and 6th months follow-ups every month for six months to check retention by modified USPHS (United States Public Health Service)/ Cvar & Ryge Criteria, as: Alpha (restoration is intact or fully retained), Bravo (restoration is partially retained with some portion of restoration still intact) and Charlie (restoration is completely missing) [21].

2.1 Data Analysis

Data analysis was done with statistical packages for social sciences (SPSS) version 17.0. The continuous variable was presented by mean and standard deviation; categorical variables were computed in frequencies and percentage and chi-square test was applied to find the P Value (> 0.05).

3. RESULTS

Males were 72% and females were 28% (Fig. 1). The Mean age was 30.62 ±3.89 ranges from 13–85 years (Table 1).
In our monthly clinical evaluation alpha score (98%) was observed in both groups for initial 4 months. At the end of 6 months we found alpha score with Giomer (73%) and alpha score with Compomer (73%). Bravo scores of Giomer were 22% and Compomer scores were 8.3% at the end of 6 months. Charlie score was observed at 5th and 6th months. The comparison between Giomer and Compomer at follow-up of 1st, 2nd, 4rd, 4th, 5th and 6th months showed no statistical difference (Table 2).

![Gender Distribution](image)

**Fig. 1. Gender distribution**

<table>
<thead>
<tr>
<th>Table 1. Descriptive statistics of age of the patients N=120</th>
</tr>
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<tbody>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Years</td>
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<table>
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<tr>
<th>Month</th>
<th>Material</th>
<th>Alpha</th>
<th>Bravo</th>
<th>Charlie</th>
<th>Total</th>
<th>P- value</th>
</tr>
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<tbody>
<tr>
<td>1st</td>
<td>Giomer</td>
<td>59 (98.3%)</td>
<td>1 (1.7%)</td>
<td>-</td>
<td>60 (100%)</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Compomer</td>
<td>59 (98.3%)</td>
<td>1 (1.7%)</td>
<td>-</td>
<td>60 (100%)</td>
<td>1.00</td>
</tr>
<tr>
<td>2nd</td>
<td>Giomer</td>
<td>59 (98.3%)</td>
<td>1 (1.7%)</td>
<td>-</td>
<td>60 (100%)</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Compomer</td>
<td>59 (98.3%)</td>
<td>1 (1.7%)</td>
<td>-</td>
<td>60 (100%)</td>
<td>1.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Giomer</td>
<td>58 (96.7%)</td>
<td>2 (3.3%)</td>
<td>-</td>
<td>60 (100%)</td>
<td>0.559</td>
</tr>
<tr>
<td></td>
<td>Compomer</td>
<td>59 (98.3%)</td>
<td>1 (1.7%)</td>
<td>-</td>
<td>60 (100%)</td>
<td>1.00</td>
</tr>
<tr>
<td>4th</td>
<td>Giomer</td>
<td>55 (91.7%)</td>
<td>5 (8.3%)</td>
<td>-</td>
<td>60 (100%)</td>
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<td>Compomer</td>
<td>56 (93.3%)</td>
<td>4 (6.7%)</td>
<td>-</td>
<td>60 (100%)</td>
<td>0.153</td>
</tr>
<tr>
<td>5th</td>
<td>Giomer</td>
<td>47 (78.3%)</td>
<td>11 (18.3%)</td>
<td>2 (3.3%)</td>
<td>60 (100%)</td>
<td>0.101</td>
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<tr>
<td></td>
<td>Compomer</td>
<td>54 (90.0%)</td>
<td>4 (6.7%)</td>
<td>2 (3.3%)</td>
<td>60 (100%)</td>
<td>0.101</td>
</tr>
<tr>
<td>6th</td>
<td>Giomer</td>
<td>44 (73.3%)</td>
<td>13 (21.7%)</td>
<td>3 (5%)</td>
<td>60 (100%)</td>
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<tr>
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<td>Compomer</td>
<td>53 (83.3%)</td>
<td>5 (8.3%)</td>
<td>2 (3.3%)</td>
<td>60 (100%)</td>
<td>0.101</td>
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</table>
4. DISCUSSION

Often its very difficult to compare the clinical outcome of various studies when the available literature is short. As there are many in vitro studies are available on giomer but clinical trials are few to compare retention and longevity of giomer restorations, especially in NCCL. Some clinical factors also make it hard to compare the different studies accurately. These factors include morphological variations of the teeth, cavity shapes, amount of remaining tooth structure, type of remaining dentin, skill and experience of the dentist, associated etiological variables of the lesion, and most importantly difference in physical properties of the material selected for particular restoration [19].

In vivo studies researchers has assessed and compared the clinical significance of giomer, and RMGIC in class V non-carious lesions using with USPHS criteria; currently available criteria with frequently used for long-term assessment and observe the restorations materials. Both filling giomer and RMGIC were not completely lost; but decreased their alfa rating (87.5%) in both materials at the 1 year and is quite disillusioning compared to other studies [7].

Clinical studies conducted on giomers showed good clinical performance with a smoother surface than a GIC, compomer and a resin composite [22]. However; both giomer and compomer have same retention ability. Sunico at al in their two-year clinical trial of two types of giomers showed good success rates. In class V lesions surface reaction giomer (Beautifil) showed 80% and 71% in a full-reaction giomer (Reactmer) success rate, while in class I restorations it showed 100% success rate. They used same USPHS criteria which we used in our study [23]. Same criterion was used by Jyothi et al in their research work on NCCL to compare the giomer with RMGIC restorations. Teeth with non-carious cervical lesions were restored with giomer showed good surface finish as compared to RMGIC with equal postoperative sensitivity and marginal discoloration/staining. Both giomer restoration and RMGIC fillings showed equal retention ability in NCCL; but RMGIC showed slightly decreased alfa rating for marginal adaptability but not statistically significant compared to giomer. Both giomer and RMGIC showed equal retention ability in class 5 NCCL [24]. Findings of above studies are partially (retention rate) in agreement with our findings.

Our results also partially match the results of the study of Eldesouky et al who recommended giomer as appropriate material for the restoration of class II carious lesions especially in children. Although the results of their study showed no significant difference between giomer and compomer restoration but they observed that giomer had less microleakage scores as compare to compomer [16], we used same materials but in class V, NCCL and found no significant difference between these two materials.

Pecie et al compared the giomer with conventional GIC and resin-modified GIC and found that giomer was statistically better in terms of surface finish and esthetics. Findings of these researchers are in partial agreement with our study [25]. AL-Ghada at al also observed identical results with above studies and with our findings, as they found no significant difference between giomer, compomer and RMGIC restorations [26]. Intihhas et al observed the highest clinical and radiological success rate with giomer group [27]. Abdel-karima tested varieties of giomers in class I posterior restorations for three years and they observed that this material exhibited good marginal seal, less amount of discoloration, and surface roughness [28].

Contrary to our results Turkoglu et al showed that giomer, flowable giomer, and compomer restorations were not successful in terms of retention rate in comparison to nano-composite, flowable nano-composite, and flowable compomer, as later group of materials demonstrated superior clinical performance and survival rate in NCCL [29].

In literature, the majority of restoration loss has been reported in the early period. Most of the giomer and compomer restorations were lost in the first six months [29]. Results of Behda et al are also in contrast with our results. They found resin-modified glass ionomer cement (RMGIC) restorations were better retained in NCCL, while some of the outcomes of their study are in accordance to our observations i.e. giomer restorations showed superior surface finish [30].

In the light of limitation of this study as our sample size and evaluation period was comparatively short. We recommend more studies on this topic with larger sample size for longer period of time to check the retention ability of these newer materials in NCCL.
5. CONCLUSION

In this clinical study, it is concluded that giomer and compomer both have almost same retention rate. More multi centered clinical studies with larger sample size for longer duration of time are required.

CONSENT

As per international standard or university standard, patients’ written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES


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