Original Article

Comparison of Post Operative Sensitivity Between a Flowable Composite and A Flowable Giomers: In Non-Carious Cervical Lesion

Qurat Ul Ain, Sheharyar Akhtar Khokhar, Nosheen Sarwar

ABSTRACT

Objective: The objective of the current Randomized control trial is to compare the postoperative sensitivity among Flowable composite and flowable Giomer in NCCL

Study Design: Randomized control trial study

Place and Duration of Study: This study was conducted at the Operative department of PIMS Islamabad from December 2023 to February 2024.

Methods: The 60 participants were equally divided into two groups. Group 1 have patients whose NCCLs were restored with flowable composite and in group 2 flowable Giomer. Both groups were compared for postoperative sensitivity at days 3, 7 and 21.

Results: The study included 60 participants, with 30 individuals assigned to each group. Group 1 had a mean age of 46 years (SD = 14.0), while Group 2 had a mean age of 40 years (SD = 11.0). Teeth distribution comprised 46.67% molars and 16.27% incisors. The mean sensitivity at day 0 was 1.9 for Group 1 and 0.9 for Group 2. At day 21, postoperative sensitivity was 1.00 for Group 1 and 0.93 for Group 2. The chi-square test was utilized to assess associations between variables, such as age, tooth type, and sensitivity levels, across both groups and there was a significant difference among both groups. ($P \leq 0.05$)

Conclusion: Giomer shows a notable decrease in postoperative sensitivity compared to flowable composite, as observed on days 3, 7, and 21 in the Schiff cold test. These results suggest Giomer's have efficacy in managing postoperative sensitivity in non-carious cervical lesion treatments which enhancing evidence-based restorative dentistry and improving patient outcomes.

Key Words: Giomer, flowable composite, NCCL, Restoration, Sensitivity

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INTRODUCTION

Non-carious cervical lesions (NCCLs) refer to pathological changes or defects found near to cervical areas of teeth, typically in the absence of carious activity[1]. These lesions commonly manifest as wedge-shaped defects or abrasions along the tooth surface near the gum line. Non-carious cervical lesions can result from multifactorial etiologies, including mechanical abrasion, erosion, and abfraction[2]. The pathogenesis of non-carious cervical lesions (NCCLs) is multifactorial, influenced by various intrinsic and extrinsic factors.

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Aggressive toothbrushing, improper use of dental instruments, or abrasive toothpaste, significantly contribute to NCCL formation.[3] Biomechanical Stress like Occlusal forces and flexure, particularly at the cervical region of the tooth leads to microfractures and enamel loss. This phenomenon occurs under tensile forces and contributes to NCCL development, especially in individuals with parafunctional habits or malocclusions.[4]

The presence of non-carious cervical lesions (NCCLs) can lead to tooth sensitivity, damage to the pulp, and plaque retention due to cavitation.[5] The choice regarding restorative procedures should be made after thorough consideration of the underlying aetiology and the complex morphology of the lesion. However, the restoration of NCCL can be challenging for the operator due to its unique morphology.[5] The NCCL cavity is usually irregular and has variable depths, shapes, and configurations. These characteristics make it difficult to achieve adequate adhesion and adaptation of restorative materials to the affected tooth structure. The presence

of microfractures and enamel defects further complicates the restoration process.[6]

One of the other problems in the restoration of NCCL is dentine hypersensitivity. NCCLs often involve the exposure of dentin, which is highly innervated. The restoration process can further exacerbate dentin sensitivity due to the manipulation and potential disruption of dentinal tubules[7]. Conventional restorative materials, while effective in addressing the structural integrity of non-carious cervical lesions (NCCLs), often fall short of adequately reducing hypersensitivity associated with these lesions. Addressing hypersensitivity in NCCLs often requires the use of specialized, adhesive systems, or alternative restorative materials that offer enhanced sealing properties[8-9].

Recent developments in dental materials have improved practitioners' treatment possibilities. Flowable composites and Giomers have gained popularity for their ability to provide superior marginal adaptability while reducing the risk of microleakage in NCCL restorations.[10] However, the comparative performance of various materials, particularly in terms of postoperative sensitivity, remains a subject of ongoing research. So, the current study used to compare post-operative sensitivity between a flowable composite and a flowable Giomers in the restoration of non-carious cervical lesions (NCCLs).

METHODS

The current Randomized control trial was conducted at the Pakistan Institute of Medical Sciences, department of operative dentistry from December 2023 to February 2024. The study was conducted after the ethical permission of the Ethical Review Board School of Dentistry (SZABMU) Islamabad. The sample size of the study was 60 patients divided into 2 equal groups. The sample size was calculated through WHO having 30 in each group with a level of significance of 5%. The power of the test is 80% anticipated population proportion for group 1 is 70% and for group 2 is 30%. The sample was raised through Consecutive non-probability sampling and the participants were divided into assigned groups through the lottery method.

A written and verbal informed consent was obtained from all the participants. The study encompasses individuals aged between 18 and 60 years who exhibit non-carious cervical lesions (NCCLs) on either their anterior or posterior teeth. All participants have healthy periodontal status, report prior experiences with tooth sensitivity, express aesthetic concerns, and maintain a low caries index. The study excludes individuals experiencing dental pain, those with concomitant dental caries, individuals with medical conditions that compromise periodontal health, and those who exhibit parafunctional habits. This exclusion criteria ensures that the research focuses specifically on individuals with NCCLs while minimizing confounding factors that could influence the study outcomes.

Treatment procedure:

After taking the medical and dental history complete dental examination was performed. The preoperative periapical radiograph was taken for the tooth undertreatment to know the extent of the defect. Local anaesthesia was given to the patients before the restoration. The isolation was obtained with the help of a retraction cord and cotton rolls. The surface of the cavity is roughed with the help of a round diamond bur (BR-40). In group 1 Flowable composite was used to restore the cavity. The etchant was applied for 20 sec and then rinsed with water and dried with cotton. A rewetting agent was applied and then the resin bonding agent was applied for 20 sec after air drying for 5 sec the bonding was cured for 20 sec. The cavity was restored with flowable composite (Filtek Z350 XT) . Composite finishing strips and a Shofu polishing kit are used to smooth the restorative surface. In Group 2 Giomers (BEAUTIFIL Flow Plus F00) were used as the final restorative material.

To check the sensitivity of restored teeth after treatment, we recalled the patients after 3 days, 1 week and 21 days. The Schiff cold air sensitivity scale was used to evaluate the level of sensitivity. An air blast of compressed air at 40 psi is blown from a three-way syringe for 3 seconds, holding it 2 to 3 cm away. A comparison of postoperative sensitivity scores between both groups was conducted and analyzed.

The data will be analyzed using SPSS-23 software. Frequency and percentage were computed for qualitative variables such as gender, while mean and standard deviation were determined for quantitative variables like age and post-operative sensitivity. A t-test was employed to compare post-operative sensitivity between group 1 and group 2, with a significance level of $P \leq 0.05$.

RESULTS

The study comprised 60 participants, with 30 individuals allocated to each group. In Group 1, the mean age was 46 years with a standard deviation of 14.0, while in Group 2, the mean age was 40 years with a standard deviation of 11.0 (refer to Table 2).

Table No.1: The Schiff cold air sensitivity scale

Score	Interpretation
0	The subject does not react to the air stimulus.
1	The subject reacts to the air stimulus but does not request it to stop.
2	The subject reacts to the air stimulus and requests it to stop or move away from it.
3	The subject reacts to the air stimulus, finds it painful, and requests it to stop.

Table No.2: Demographic details of participants

Variables	Group 1	Group 2
Age	46 (S.D14.0)	40 (S.D 11.0)
Gender		
Male	14 (46.67%)	11 (36.67%)
Female	16 (53.33%)	19 (63.33%)

The distribution of teeth included 46.67% molars and 16.27% incisors among the participants. (Figure 1)

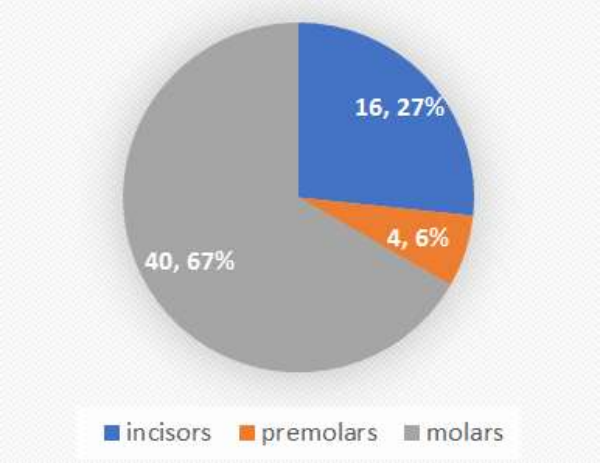

Figure No.1: Distribution of teeth in the study.

Regarding sensitivity levels, the mean sensitivity at day 0 was 1.9 in Group 1 and 0.9 in Group 2. Postoperative sensitivity at day 21 was observed to be 1.00 for Group 1 and 0.93 for Group 2.

To assess the association between variables, the chi-square test was applied. This statistical test is used to determine whether there is a significant association between categorical variables. In this study, there was a significant association of postoperative sensitivity in both groups on days 3, 7 and 21. ($P \leq 0.01$)

Table No. 3: Comparison of sensitivity between Flowable Composite and Giomer.

	Group1 (Flowable composite)		Group 2 (Giomer)		P value
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	
0 day	1.9	1.21	0.9	0.76	0.001
3 days	1.2	0.61	1.03	0.71	0.0001
7 days	1.06	0.71	1.03	0.71	0.0001
21days	1.00	0.74	0.93	0.63	0.0001

***Level of significance is ≤0.05.**

DISCUSSION

This study assessed and compared the clinical efficacy of flowable composite, and Giomers using the Schiff sensitivity scale.[11] These criteria are extensively utilized for the long-term assessment of restorations and are deemed suitable for comparing studies across various observation periods. Restoration of NCCL is very challenging for the dental practitioner. Tooth-colored composite resins are commonly used to restore NCCLs due to their ability to blend with natural tooth colour and provide good aesthetics.[12] Postoperative sensitivity in NCCLs can be due to Inadequate sealing of the restoration margins can lead to microleakage, allowing bacteria and fluids to penetrate the restoration and irritate the dentin-pulp complex, resulting in sensitivity.[13] The type of restorative material used to restore NCCLs can also influence postoperative sensitivity. Some materials may shrink upon polymerization, causing stress on the tooth structure and triggering sensitivity. The current study compares the average postoperative sensitivity among non-carious cervical lesions that have been restored using a flowable composite (Filtek Z350 XT) with those restored using a Giomer (BEAUTIFUL Flow Plus F00). A 6-month clinical trial shows flowable composite has acceptable clinical performance however the survival of Giomer was lower than the composite but there was no difference in the colour match, marginal discolouration and marginal adaptation[3]. Another clinical study shows there is no significant difference between flowable composite and other composite types in hypersensitivity, colour, surface roughness and retention[14].

Giomers represent a valuable material in restorative dentistry offering a unique combination of fluoride release, biocompatibility, aesthetics, adhesion, and durability. Their versatility and favourable properties make them a popular choice for clinicians seeking reliable and esthetically pleasing restorative options[15]. The study of KN Jyothi et al shows there is no statistical difference between Giomer and various types of dental composite concerning colour, and sensitivity these results didn't support our study result in which Giomer has less postoperative restorative sensitivity than flowable composite. However, the Giomer has poorer retention than the composite[10].

Materials with low modulus of elasticity are considered ideal because these are more flexible and capable of withstanding occlusal forces that are concentrated in the cervical regions. An In Vivo Study by Radhika Gupta et al, compared three materials and results show that flowable composite causes more postoperative sensitivity than other resin-based materials in three, seven and 21-day post-operative sensitivity[16]. Another clinical study by Onet et al, shows that both conventional composites and Giomers may be regarded

as effective therapeutic choices for the restoration of non-carious cervical lesions[17].

Our study utilizes the Schiff cold test to determine the post-operative sensitivity. Other similar studies employed the same method to determine post-restorative sensitivity.[18] The scale typically consists of a range of scores, with each score corresponding to a specific level of sensitivity experienced by the patient. The scores are often categorized based on the patient's response to cold air stimulus, ranging from no sensitivity to severe sensitivity.[19] The Schiff cold test for the current study shows significant post-operative sensitivity reduction by Giomer at days 3, 7 and 21.

The study also has limitations. Limited sample size can affect the statistical power of the study and may limit the generalizability of the findings. Larger sample sizes are needed to ensure the reliability and validity of the results. The other limitation is the short-term follow-up periods, which may not capture the long-term performance and durability of the restorations. Longer follow-up periods are necessary to evaluate the stability and longevity of the restorative materials.

CONCLUSION

In conclusion, the findings of this study indicate a significant reduction in postoperative sensitivity when using Giomer compared to the flowable composite, as evidenced by the Schiff cold test results at days 3, 7, and 21. These results suggest that Giomer may offer advantages in managing postoperative sensitivity following restorative treatment for non-carious cervical lesions. These results will contribute to advancing evidence-based approaches in restorative dentistry and optimizing treatment outcomes for patients with NCCLs.

Author's Contribution:

Concept & Design of Study:	Qurat Ul Ain
Drafting:	Sheharyar Akhtar Khokhar, Nosheen Sarwar
Data Analysis:	Sheharyar Akhtar Khokhar
Revisiting Critically:	Qurat Ul Ain, Sheharyar Akhtar Khokhar
Final Approval of version:	Qurat Ul Ain

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