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Original Article

Clinical Evaluation of Glass-Lonomer Cement and Giomer for the Management of Cervical Caries

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Abstract

Background: *Giomer is a unique class of restorative material has been introduced as the true hybridization of Glass Ionomer (GI) and composite resin and has the distinguishing feature of a stable surface pre-reacted glass ionomer. Glass Ionomer Cements (GIC) are also unique restorative materials with many uses in clinical practice and provide for caries-protective fluoride releasing at the margins of restorations, as well as their ability to have the fluoride within their chemical matrix recharged by outside exposure to other fluoride-containing materials. The present study aim at clinically evaluate the comparison between the glass Ionomer cement and Giomer for the management of cervical caries.*

Materials and methods: *The study was a cross sectional comparative study which was carried out from 01 December 2018 to 31 November 2019 in the Department of Conservative Dentistry and Endodontics, Bangladesh Dental College, Dhanmondi, Dhaka. Total number of cases was 80. The patients were divided into two groups, half of the patient (Group-1) was treated with Glass Ionomer cement and half of the patient (Group-2) was treated with Giomer restoration. The post-operative sensitivity discoloration, dislodgement of filling material and secondary caries formation were recorded. All the patients were assigned and the data were analyzed statistically by SPSS version 21. p-value < 0.05 was taken as significant.*

Results: *The study reveals 60% of the study population was within 41 to 50 years of age group (Group-1) and 62.5% were 51 to 60 years (Group-2) 45% in (Group-1) and 10% in (Group-2) had history of post filling sensitivity, 12% in (Group-1) and 5% in (Group-2) had discoloration after restoration, 2.5% had history of dislodgement of the filling in (Group-1), no history of dislodgement of the filling in (Group-2), 2.5% had history of secondary caries formation in (Group-1) and no history of Secondary caries formation in (Group-2).*

Conclusion: *Patients were more approachable for Giomer restoration than Glass ionomer for the management of cervical caries over a period of 12 month.*

Key words: Cervical caries; Giomer; Glass Ionomer.

INTRODUCTION

The development of restorative materials presents the modern dentist with several choices when selecting the best restorative material to restore cervical cavities on teeth. Composite resin (In different formulations) glass ionomer, resin modified glass ionomer, giomer and compomer may all be considered appropriate restorative materials for restorations of cervical tooth surface loss[1].

Restorative dentistry is mainly based on good adhesion between restorative materials and dental substrates, while adhesion to enamel is generally reliable, adhesion to dentin is less predictable because of the presence of dentinal tubules and the perfusion

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of liquid from it. Adhesion to dentin requires demineralization of peritubular and intertubular dentin to replace the demineralized layer of dentin with monomers[2]. The main role of adhesive materials is to insure good adhesion between tooth tissues and restorative materials while maintaining good marginal seal. Formation of hybrid layer between adhesive material and dentin depends on penetration of monomers through collagen fibers, this can be seen with total etch adhesive techniques.

The obstacle with this technique is the collapse of collagen fibers due to rinsing and air drying procedures after the application of acid which makes the use of total etch adhesive technique sensitive and results in poor penetration of monomers to the full depth of the demineralized layer of dentin. Because of the complexity and sensitivity of total etch adhesive technique, a new generation of dental bonding was needed and self-etch adhesive was introduced[3].

Giomer is a unique class of restorative material. It has been introduced as the true hybridization of Glass Ionomer (GI) and composite resin and has the distinguishing feature of a stable Surface Pre-Reacted Glass Ionomer (S-PRG) which is coated with an ionomer lining incorporated in a resin matrix. This arrangement aids in the protection of the glass core from moisture, adding to long-standing aesthetics, durability, physical and handling properties of composite resins with fluoride release, and recharge property like the fluoride cements[2].

Glass ionomer cements (GIC) are also unique restorative materials with many uses in clinical practice. What differentiates GIC from other restoratives is their chemistry, which allows them to be self-adhesive to enamel and dentin and provide for caries-protective fluoride release at the margins of restorations, as well as their ability to have the fluoride within their chemical matrix recharged by outside exposure to other fluoride-containing materials[2].

Cervical caries mainly occurs on the gingival line. Classical symptoms like hypersensitivity to hot, cold and sweet are not observed at the initial stages of the disease progression. The signs of the disease can be noticed in external changes that are the enamel darkens and white spots emerge. This disease is dangerous because of its rapid progression to the root of the tooth. Moreover, the affected tooth acquires a bad esthetic appearance. Adhesive restoration materials like Glass ionomer cement and Giomer are frequently used now a day[3].

With patient's desire to keep their teeth for lifetime, there has been an increased challenge to treatment plan and restore Class V cervical carious lesions. These lesions can be located solely in enamel or, many times after gingival recession, initiate on the root surfaces. The choice of restorative options is often not an easy one to make because the etiology of these lesions affects the durability and clinical success of the restorative materials used.

Cervical carious lesions occur both in the esthetic and non-esthetic zones. Non-esthetic options for restoration of Class V lesion are dental amalgam. Esthetic options may include adhesive composite resins, conventional and resin modified glass ionomer, Giomer and compomer.

In recent years, increased attention has been placed on the role of carbonated beverages, sports drinks, and their high sugar content in their combined chemical erosive effect on dentin. When the etiology of Class V lesions in the esthetic zone is due to poor patient oral hygiene and a high sugar diet, oral hygiene instruction and dietary counseling are important after restorative treatment[4].

Cervical caries can affect individuals in different ways: some individuals have no symptoms, others show transient sensitivity and others can experience a more serious painful condition affecting the tooth vitality. In some instances, the severity of the dentin hypersensitivity can affect the individual's quality of life. Hypersensitivity is related to the flow of fluid in open dentin tubules exposed during the progression of the lesion. At what point a cervical carious lesion requires the dentist's intervention remains controversial, and information on this matter is as diverse as the materials available for such interventions. However, when symptoms are present it is important to be able to decide how best to treat these lesions. Recommend early restorative intervention, and others suggest gingival grafting or some type of periodontal surgery. Practitioners have reported in surveys that the choice of restoration procedure is determined by the severity and sensitivity of the lesions. Patients' aesthetic concerns also appear to influence the decision about whether carious lesion should be restored. Some literature suggests that active treatment is necessary and that restoring the teeth is important for several reasons.

The ultimate success of any restorative treatment is to in a large extent, dependent on how long the treatment lasts before it needs replacement or fail. Especially, long term retention, esthetic view, prevention of discoloration of the filling material, post- operative sensitivity and secondary caries formation of at cervical caries area has not yet been established. To increase the longevity of restoration at cervical caries, Glass-ionomer Cement and Giomer have been introduced in the dental clinic. However, their long term clinical success at cervical caries area is still controversial.

MATERIALS AND METHODS

This cross sectional comparison hospital based Analytic study and was conducted in the Department of Conservative Dentistry and Endodontics at Bangladesh Dental College and Hospital. Dhanmondi, Dhaka, from December 2018 to November 2019. A total of 80 carious cervical lesions were selected. Of them, 40 patients were treated with Glass-ionomer (Group-1) according to manufacturer`s instructions and another

40 patients were treated with Giomer (Group-2). This study design aimed to focus on clinical evaluation and comparison between the Glass-ionomer cement and Giomer for the management of cervical caries. The patients were selected on the basis of certain inclusion and exclusion criteria.

Inclusion and Exclusion criteria:

All the patients attending the Dept of Conservative Dentistry & Endodontics having cervical caries, between ages of 20-60 years & willing to participate in the study were included in the study. On the other hand, Patients ages less than 20 years and more than 60 years and not willing to participate in the study were excluded. Clinical procedure was carried out after obtaining a verbal consent.

At first appointment the teeth were isolated, caries was removed from the cervical area, teeth were polished and GIC was placed (group-1). Whereas in Group-2, the teeth were isolated, removal of the caries done in the same way, Giomer (BEAUTIFIL II manufactured by Shofu Inc. Kyoto, Japan) was placed and light cured for setting the restorative material. The post-operative Sensitivity, discoloration, dislodgement of filling material, secondary caries formation and post-operative pain were recorded. Progression of caries was recorded as none, weak, strong. Tooth surface lost due to caries was recorded as mild, moderate, severe were evaluated. All the patients were assigned and the data were collected by the researchers themselves through face to face interview.

Distribution of observation was visualized frequency table and bur diagram. The association between frequencies was determined by Chi-square test. The analysis was carried out with the help of SPSS (Statistical Package for Social Science) version 21 windows software program. p Value <0.05 was taken as significant.

RESULTS

Table I : Distribution of Secondary caries formation & discoloration (n-80)

	Glass ionomer		Giomer	
	Frequency (n=40)	Percent (%)	Frequency (40)	Percent (%)
Yes	1	2.5	00	00.0
No	39	97.5	40	100.0
Total	40	100.0	40	100.0

$\chi^2 = 1.01$, DF = 1, p-value = .31

Table II : Distribution of the Patients Tooth surface loss due to caries (n= 80)

	Glass ionomer		Giomer	
	Frequency (n=40)	Percent (%)	Frequency (40)	Percent (%)
Mild	23	57.5	24	60
Moderate	15	37.5	15	37.5
Severe	2	5	1	2.5
Total	40	100	40	100

$\chi^2 = .35$, DF = 2, p-value = .83

Table III : Table Distribution of the Patients secondary caries progression (n=80)

	Glass ionomer		Giomer	
	Frequency (n=40)	Percent (%)	Frequency (40)	Percent (%)
None	38	95	39	97.5
Weak	1	2.5	1	2.5
Strong	1	2.5	0	100.0
Total	40	100	40	100

$\chi^2 = 1.01$, DF = 2, p-value = .60

Table I shows that 97.5% sample don't developed any secondary caries and subsequent discoloration in group-1 population, whereas, group-2 population shows no sample developed any caries and discoloration.

Table II shows 57.5% (Group-1) & 60% (Group-2) had mild tooth surface loss due to caries; 5% (Group-1) & 2.5% (group-2) had moderate tooth surface loss.

Table III shows 95% in Group-1 & 97.5% in Group-2 respondents had no history of progression of secondary caries and only 2.5% respondent had weak history of secondary caries progression in both groups.

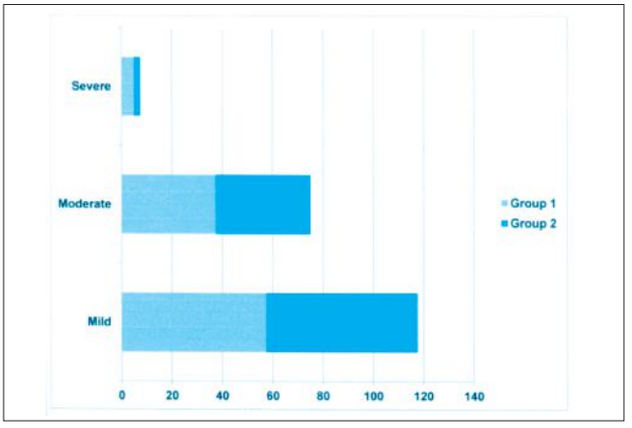

Figure 1: Distribution of Post-operative sensitivity of the Patients (n=80)

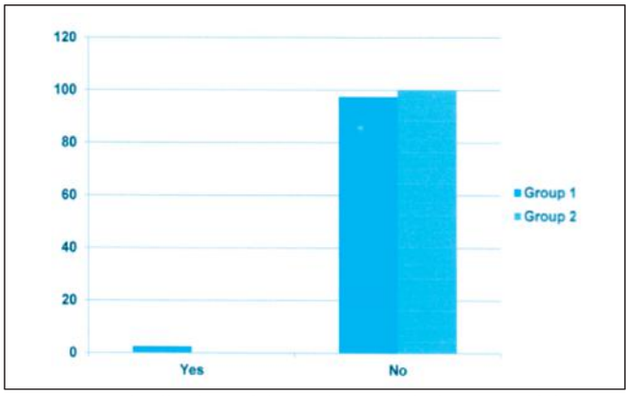

Figure 2 : Distribution of the Patients Dislodgement of the restoration (n-80)

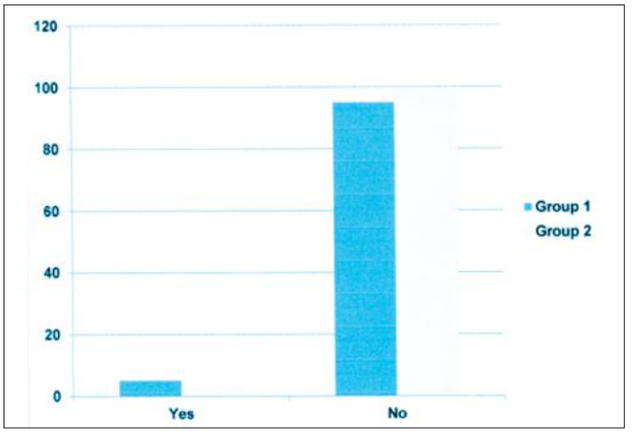

Figure 3 : Distribution of the Patients Post-operative pain (n=80)

Figure 1 shows that only 57.5% (Group-1) & 60% (Group-2) had mild post-operative sensitivity, 37.5% (Group-1, 2) patients had moderate sensitivity and 5% (Group-1) and 2.5% in group-2 had severe post-operative sensitivity.

Figure 2 shows 97.5% had no history of filling dislodgement in Group-1& in group-2 no respondents showed it.

Figure 3 shows 95% had no post-operative pain in Group-l and 97.5% had no post-operative pain in Group-2.

DISCUSSION

In a study, the researcher reported that as patients grow older, their gums recede and root surfaces are exposed, making them more susceptible to cervical caries. Any caries-prone patient having gingival recession can develop cervical caries[5].

The present study supports this observation where 60% of the study population was within 41 to 50 years of age and they were treated with Glass ionomer and 62.5% of the population was 51 to 60 years of age treated with Giomer.

Another study describes the restoration of decayed tooth to its form and function is one of the major treatment needs in dentistry. The ideal requisites for a restorative material are that it should have good color stability, biocompatibility, Co-efficient of thermal expansion similar to that of natural tooth Structure, excellent marginal seal and the ability to adhere chemically to both enamel and dentin[6].

Again a study describes the anti-microbial nature of the giomer materials is particularly beneficial at the restoration of dentinal and cavosurface interfaces helping to maintain an environment needed to promote long term restoration success. With the added benefit of ion recharge and re-release and thorough curing before bulk filling material is placed, the ability to promote restoration longevity exists[7].

In this study, it is reported that only 2.5% had history of dislodgement of filling and tooth discoloration after restoration in case of Glass ionomer and there was no history of filling dislodgement and discoloration in case of Giomer.

A study mentioned in Sturdevant`s that Glass-Ionomer Cements (GIC) are known for their fluoride releasing and chemical bonding Properties. However poor physical properties such as tendency to underwent surface deterioration, low fracture resistance and esthetics limit its use. Conventional GIC used as tooth colored restorative materials also have poorer esthetics compared to composite resin in order to expand the clinical uses of GIC, resin was added to the formulation.

Giomers are a new type of restorative material with properties of both glass ionomer (Fluoride release & recharge) and composite (Excellent esthetics, easy polishibility and biocompatibility). The term Giomer is combinations of glass-ionomer and composites. Their manufacturers claim they have properties of both glass-ionomer (Fluoride release, fluoride recharge) and resin composites (Excellent esthetics, easy polishibility and biocompatibility). Giomers are similar to compomers and resin composites in being light activated and requiring the use of a bonding agent to adhere to tooth structure. Giomers contain both of the essential components of glass-ionomer cements and resins but they cannot be classified as compomers, in which a variable amount of dehydrated poly alkeonic acid is incorporated in the resin matrix and the acid does not react with the glass until water uptake occurs[8].

A 13-year follow-up to an in vitro study of giomer-based restorative material found a 66% retention rate and a secondary caries rate of only 7%[9].

A study conducted to compared the fluoride release and recharge between different fluoride releasing materials and reported that the fluoride release and recharge was maximum for giomer products[10].

In this study, it is reported that only 2.5% respondent had history of caries progression in both Glass-ionomer & Giomer, only 2.5% had history of secondary caries formation in case of Glass ionomer and no history of secondary caries formation in case of giomer, due to release of fluoride.

LIMITATIONS

Because the study was conducted in a particular private hospital, the finding could not be extrapolated generally. Relatively small sample size was another limitation. All cases selected were permanent tooth with class v cavity. So, the result may not be reflects the outcomes of all types of defects.

CONCLUSION

This study was a cross sectional comparative hospital based study effort to highlight the management of cervical caries by using glass-ionomer cement and Giomer. Giomer demonstrated less post filling pain, discoloration, sensitivity rate in the restoration of cervical carious lesions than glass-ionomer over a period of 12 month. Giomer have very low polymerization shrinkage than GICs and are thermally compatible with tooth structure. These materials can bond to dentin surfaces without removing the smear layer and their biological compatibility is well proved. They maintain adhesion for long periods and are the material of choice to be placed in the cervical area of the teeth.

It must be emphasized that all patients with cervical caries should periodically return to their dentists even if the lesions had been restored with effective materials, not only to evaluate the lesions, but also to maintain restorations in a good shape and prevent future dental tissue loss.

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RECOMMENDATIONS

Further research and investigations with large samples are required to find out the more accurate results and wide spread applications.

DISCLOSURE

All the authors declared no competing interest.

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