Original Article

Conventional Cavity Preparation Versus Atraumatic Restorative Treatment (ART) Technique: A Clinical Evaluation Revealing the Success of Glass Ionomer Cement (GIC) in Mandibular Molars Having Class 1 Carious Lesions

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ABSTRACT

Objective: To assess and evaluate how successful is glass ionomer cement restorations while tooth being restored either by the conventional cavity preparation using air turbine or the atraumatic restorative treatment (ART) technique.

Study Design: Descriptive study.

Place and Duration of Study: This study was conducted at the Department of Operative Dentistry, Akhtar Saeed Medical College Lahore from October 2018 to March 2019.

Materials and Methods: A total of 161 patients was selected who received the high viscosity glass ionomer restorations in mandibular molars having Black's class 1 carious lesion in mandibular molars. 71 patients received the restorations with the conventional cavity preparation while 90 patients were treated using the ART technique All the patients were having the age between the 25-40 years. Success ratio of the restorations was scored according the WHO criteria having 0-8 score. The data was analyzed using the chi square tool in order to test the hypothesis.

Results: The Chi square statistic value obtained with degree of freedom 1 (df) is 1.1949. The result is not significant at $p<0.05$. So the null hypothesis is not rejected.

Conclusion: There is no difference in terms of restoration success in mandibular molars having class 1 carious lesions prepared either by atraumatic restorative treatment technique or using air turbine and restored by high viscosity glass ionomer cement.

Key Words: Atraumatic restorative treatment, Air turbine Class 1 cavity, Tooth preparation, Chemical bond, Remineralization

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INTRODUCTION

The word caries in dentistry refers to the disintegration of the tooth tissue due to bacterial action leading to cavitations or defect in the teeth. This caries can be prevented by a number of prophylactic measures including the improvement of oral hygiene, and uptake of certain remineralization agents like Casein Phospho-peptide-Amorphous Calcium Phosphate (CPP-ACP), combination of CPP-ACP and fluoride, tri calcium phosphate etc. these agents arrest the caries since its inception. But when there is an actual loss of tooth structure leading to cavitation. It might be troublesome for the patient and needed to be restored at earliest. However whatsoever the cause of the defect is present, it needs special protocol to restore. It involves removal of all the diseased portion of the tooth making it bacteria free and then restoration of that very lost portion. As far as the removal of the diseased portion is concerned, currently a number of techniques are available like air turbine rotary system, air abrasion, lasers, ultra sonic instrumentations and fusty atraumatic restorative treatment (ART) techniques.

The method of cavity preparation devised by G V Black long ago is still in practice and followed widely. It briefs all the steps of cavity preparation. Extension for prevention is an important step of this cavity preparation method. However, due to current research in dentistry and with the innovation of certain modern

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restorative materials, the main focus is primarily given to preserve what is present as much as possible. Here the difference lies between the older and the newer concept. When we want to conserve the tooth, only the diseased portion is removed. In addition this minimally invasive technique of ART can equally be employed to get the desired outcome. In this technique a hand instrument is used manually to remove the carious part and then filled with the appropriate restorative material. All the movements are well controlled even in the deep lesions. While in case of conventional cavity preparation with the air turbine, skating on thin ice sometimes may lead to unnecessary tooth removal. All the preparation guidelines are followed in addition to the caries removal. Some portion of the sound tooth structure can be removed if needed to have a comprehensive design. The development of the high viscosity glass ionomer cement (GIC) has made it possible to restore the teeth in this way. Clinicians could see the handwriting on the wall when going to start the procedure. An exemious key factor of these cements is their ability to make the chemical bond to the tooth structure and release the fluoride ions over prolonged time.[1] These are very biocompatible and having good coefficient of thermal expansion which is close to the teeth.[2] There is an ionic exchange that happens between the tooth and material.[3]. The release of the fluoride ions not only makes the teeth stronger but also prevents the recurrent caries.[4,5] Moreover it has anti bacterial properties having the potential to remineralize the tooth.[6,7]

MATERIALS AND METHODS

This descriptive study was conducted at Department of Operative Dentistry, Akhtar Saeed Medical College Lahore from 1st October 2018 to 31st March 2019.. A total number of 161 patients were selected. These were divided into two groups randomly. All the patients had good oral hygiene having all the mandibular molars including the third molar. The patients had class 1 carious lesion in any of the mandibular molars. The radiograph was taken before initiating the operative procedures and complete dental and medical history was recorded.71 patients were treated by the conventional cavity preparation with air turbine while 90 patients got the ART treatment approach. In this technique only the dental excavator was used to remove the caries. After the cavity preparation the material was mixed according to manufacturers' instructions and was placed in the cavity following the isolation. We used the high viscosity glass ionomer cement for permanent restorations. All the cavities were evaluated at three and six months interval and were evaluated using the WHO criteria having 0-8 score for the restoration success**8**. The restorations having the 0-2 scores were declared as successful while 3-6 were dropped in the failures. Score 7 and 8 were given to the exclusion of the cases. We assumed a null hypothesis (Ho) which says that there is no difference between the methods of cavity preparation on the success for the restoration. The alternative hypothesis (Ha) says that there is difference between the modes of cavity preparation and the success of the restoration. Chi square test was applied to judge the outcome and to test the hypothesis. The level of significance is 0.05.

RESULTS

There were 95 male patients and 66 were female patients (Table 1). The Chi square statistic value we got with degree of freedom 1 (df) is 1.1949. The p-value is 0.27434. The result is not significant at $p<0.05$ (Table 2).

Table No.1: Frequency of genders in both groups

Gender	Conventional Method		ART Method	
	No.	%	No.	%
Male	55	34.2	40	24.9
Female	35	21.7	31	19.2

Table No.2: Frequency of successful and failure of patients in both groups

Method	Successful		Failure	
	No.	%	No.	%
Conventional Method	57	35.5	14	8.6
ART Method	78	48.5	12	7.4

DISCUSSION

A unique feature of the glass ionomer cement is it capability to bond with the tooth structure. There is no other cement available that makes bond with the tooth structure. The historic back ground reveals that zinc polycarboxylic cement was initially formulated in which the poly acrylic acid was used. It was invented by Dennis Smith in 1963.[9]

The recently used glass ionomer is a later invention with some modifications. Since amalgam is more popular restorative material yet it always remained a hub of controversy among the clinicians having different school of thoughts regarding the mercury toxicity. The currently available glass ionomer cements (GICs) have the two components i.e. powder and liquid. On mixing these together an acid base reaction occurs that leads into precipitation in the form of gel that hardens within a few minutes. The chemical bond type that is formed is the covalent bond which is stronger than other types of bonds. There is also a preparation named resin modified that has been marketed exclusively these days. This modification has an improved strength and bonding. Our objective revolves around the basic theme of chemically bonding to the tooth structure and the mode of tooth preparation. In our study total 71 teeth were prepared with conventional air turbine preparation while 90 teeth were prepared with the help of atraumatic method using the hand excavator only. 57 teeth were declared as successful in the conventional preparation while 78 teeth were successful in the atraumatic restorative preparation. The high viscosity glass ionomer cement

has even the same failure rate as compared to the amalgam in the posterior permanent teeth that gained ART approach for the glass ionomer restoration, according to work of Mickenautsch.[10] This result corresponds to our research work that the success ratio between the two modes of preparation is almost same. Not only in the glass ionomer, these minimally invasive technique has also proved to be beneficial for the increased micro tensile bond strength for the single bottle self etch adhesive bonding on the dentine according to work of Naik.[11] This is also in accordance gto our work in terms of success rate. It has also been recommended that the older patients should be provided with the minimally invasive technique to preserve the naturally present tooth in order to maintain the maximum permanent teeth.[12] This is in fact responsible for the longer longevity as well.

Whenever we take the clinical aspect of the diseased tooth, it is also important to consider that the portion of the tooth that is healthy and caries free is more important as compared to the diseased one which is to be removed. Currently invented materials have more potential towards the micro and macro mechanical retentions for the restorations. The all new modern concepts incline towards the preservation of what is available instead the extension for prevention. This atraumatic restorative technique has also been vital in the dental treatments of children. There is less chance of fear, non cooperation by the child, less anxiety and preservation of maximum bulk of tooth tissue.[13] There is handsome clinical evidence that the ART approach using the high viscosity glass ionomer cement has the equal acceptable effectiveness even in comparison to the bulk filled resin composites in the posterior teeth. According to Cruz Gonzalez the conventional tooth preparation has a more successful rate and is highly significant, however the ART approach has also been found to be equally effective having the 81% of survival rate during the whole study period. Although a number of restorative materials are present in the market for the ART approach yet the low priced materials may have certain shortcomings. Also the other materials have a distinct physical and mechanical properties.[14]

CONCLUSION

The ART technique of cavity preparation being a steal in the mandibular molars with class 1 cavity is no longer has a significant difference in terms of success rate as compared to successful restorations prepared by conventional cavity preparation method. In our work both methods went smooth sailing producing a fructified successful ratio.

Author's Contribution:

Concept & Design of Study:	Dilawar Sultan
Drafting:	Zuhair Arif, Kashif Nayyar
Data Analysis:	Anas Muhammad, Syed Moiz Ali and Saad Zafar Rana
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