



ORIGINAL ARTICLE

## Skills of undergraduate dental students in performing Atraumatic Restorative Treatment one year survival rate of this restoration.

Aeeza Malik<sup>1</sup>, Qurat-ul-Ain Javaid<sup>2</sup>, Basil Khalid<sup>3</sup>, Fahad Dogar<sup>4</sup>, Omair Anjum<sup>5</sup>, Malik Saleem Shaukat<sup>6</sup>

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**ABSTRACT... Objective:** To assess the skills of the undergraduate dental students in performing Atraumatic Restorative Treatment and the one year survival of this restoration. **Study Design:** Cross sectional study. **Setting:** Department of Community Dentistry, Multan Medical & Dental College, Multan. **Period:** Sept 2021 to Aug 2022. **Material & Methods:** Through convenient purposive sampling selected 2<sup>nd</sup> year dental students were assigned to collect the extracted teeth to perform ART according to the given guidelines using Glass Ionomer Cement. The research supervisor assessed the characteristics of the filling and keeping in view the status of the restoration it has given Alfa, Bravo or Charlie score. The students who scored Alfa were then allowed to perform ART on patients in Out Patient Department. The demographics of the patients along with caries assessment (Class I, II & III) were recorded. Patients were kept on telephonic contact and were recalled after 1 year to evaluate the survival rate. **Results:** A total 100 ART restorations were done on extracted teeth. Around 76 fillings were found to be perfect while 24 fillings were associated with any one or two defects. Later 100 patients were included having any of the 3 classes of caries. Mean age of the patients was 32 years. The success rate of ART restorations at 12 months was found to be 89% with highest success rate of 62% was reported in Class I ART restorations. **Conclusion:** Extraordinary high survivals rates of Atraumatic Restorative Treatment found in this study represented the reliability of this method as an affordable preventive and curative treatment for dental caries particularly in developing countries.

**Key words:** Atraumatic Restorative Treatment, Dental Caries, Defected Restorations, Dental Students.

### INTRODUCTION

Atraumatic Restorative Treatment (ART) embraces the basic concept of Minimal Intervention Dentistry (MID) and supports the holistic approach behind preventive oral healthcare.<sup>1,2</sup> ART was initially developed to provide simultaneous preventive and restorative care to people in low-income countries. However, in the last few years ART gained global popularity as a consequence of increased understanding of preventing dental caries and the developments in the biosphere of adhesive restorative materials.<sup>3</sup> Meta-analysis on ART suggested that it should be a part of a basic package of oral care in which prevention and oral urgent care are also included. ART methodology is a better option for outreach dental preventive programs with restricted resources as it does

not require sensitive techniques and too much equipment.<sup>4,5</sup>

ART basically has two components, first is preventive as it seals caries prone pits and fissures with a sealant. The most important advantage of the ART is that it uses hand instruments only, either to seal pits and fissures or to restore tooth cavities, in conjunction with adhesive materials. While doing ART, hand excavation selectively removes the soft carious tissue and most of the infected dentine. However, research showed that few of the bacteria still remain there and may lead to the future recurrent caries. This may be controlled by sealing the cavity using filling materials which chemically bond to the cavity walls and assist remineralization of the

1. BDS, MDS, Associate Professor Community & Preventive Dentistry, Multan Medical & Dental College, Multan, Pakistan.  
2. BDS, M.Phil, Assistant Professor Pathology, Rashid Latif Medical College, Lahore. Pakistan.  
3. BDS, M.Phil, Associate Professor Oral Pathology, Multan Medical & Dental College, Multan, Pakistan.  
4. BDS, MDPH, Professor Community & Preventive Dentistry, Faryal Dental College, Lahore, Pakistan.  
5. BDS, MSc, Associate Professor Science of Dental Materials, Lahore Medical & Dental College, Lahore, Pakistan.  
6. BDS, MSc, Professor Science of Dental Materials, Bakhtawer Amin Medical & Dental College, Multan, Pakistan.

**Correspondence Address:**

Dr. Aeeza Malik  
Awan House, Opposite, The Smart School,  
New Shalimar Colony, Boson Road, Multan,  
Pakistan.  
aeezamalik@gmail.com

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hard tissues through fluoride release. The ideal dental material having all these properties is high strength Glass Ionomers Cement (GIC).<sup>6,7</sup>

The survival rate of the combination (ART and GIC) is very much similar to conventional amalgam and modern resin composite restorations. Along with demonstrated decrease levels of discomfort and pain during ART, low levels of dental anxiety and distress were also reported associated with this treatment modality. For the same reason it said to a treatment of choice in initial and primary carious lesions.<sup>1,8</sup> Similarly, in both primary and permanent dentitions, more invasive and traumatic dental restorative measures should only be carried out in cases where ART is not indicated. In 2021, a systematic review described increased survival rate in both primary and permanent dentition for single-surface ART fillings in comparison to low survival rate of multiple-surface ART.<sup>4</sup>

Furthermore, in developing countries people with low socio economic status are unable to afford or avail the limited and expensive traditional dental care approaches to treat the highly preventable dental caries and therefore tolerate the consequences of untreated dentinal carious lesions. In this scenario, it is the duty of established dental training institutions to set off from the traditional 'drill and fill' treatment options and train their students to be skill full in performing ART so that in future they may provide this easy and recommended mode of treatment to the victims. This study was planned with an objective to assess the skills of the undergraduate dental students in performing Atraumatic Restorative Treatment and one year survival of this restoration in a private sector dental institute of Pakistan.

## MATERIAL & METHODS

This cross sectional study was conducted over 12 months (September 2021- August 2022) in the Department of Community and Preventive Dentistry, Multan Medical & Dental College, Multan. Permission to conduct the study was obtained from the Institutional Ethical and Review Board (IRB/MDC/-033). Through non-probability convenient purposive sampling, all the enrolled dental students of 2<sup>nd</sup> year were approached.

Among these the students who attended all the lecture presentations and practical demonstration on ART were included while those who were absent in any of those sessions were excluded.

Selected students were assigned to collect extracted teeth with only superficial caries. All these students were then asked to perform ART according to previously demonstrated ART guidelines<sup>9</sup>, in the Preventive Laboratory using Glass Ionomer Cement (Ketac Molar) as the restorative material of choice. The research supervisor assessed and evaluated the restorations according to the ART criteria (Table-I) using a slow speed hand piece and an illumination light. The restorations were sectioned by slow speed hand piece and the characteristics of the filling were critically analyzed. The basic characteristics studied in sectioned teeth included overfilled restoration, under filled restoration, fracture, gross marginal defects (voids, spaces) and tooth selection. Keeping in view the status of the restoration it has given Alfa, Bravo or Charlie score. If the ART restoration has scored all Alfa it is said to be satisfactory whereas, if it scored Bravo or Charlie, is said to be an unsatisfactory restoration.

The students who scored Alfa were then allowed to perform ART on clinical patients in Out Patient Department of the same institution after a verbal consent from the patients. Non-probability convenient purposive sampling was again performed and the demographics of the patients along with caries assessment (Class I, II & III) were recorded on a proforma. The ART restorations were performed by the students using Glass Ionomers Cement (Ketac Molar) and ART hand instruments maintaining all cross infection control protocols. Restorations done were analyzed by a trained and calibrated research supervisor employing ART codes and criteria for assessing restorations (Table-II).<sup>10</sup> The patients were kept on telephonic contact and were recalled after 1 year to evaluate the survival rate based on the same ART codes and criteria. Lost to follow-up cases were also recorded.

The statistical analysis was performed using

SPSS 20. Descriptive analysis of the data was done to obtain the satisfactory or unsatisfactory skills of students in performing ART. Survival assessments for ART restoration were calculated using the Kaplan-Meier method. Log-rank test ( $P \leq .05$ ) was employed for comparing the success rates according to the class of dental caries.

Criteria	Score	Description
Tooth Selection	Alfa	Properly selected (caries in enamel or dentine)
	Bravo	Improperly selected (caries with exposed pulp)
Underfilled/ Overfilled	Alfa	The restoration continuous with normal anatomy of tooth
	Bravo	The surface of restoration >0.5 mm below with normal anatomy of tooth
	Charlie	The surface of restoration >0.5 mm above with normal anatomy of tooth
Fractured \ Loss	Alfa	No fracture
	Bravo	Restoration fractured during sectioning insufficient to expose dentine or base
	Charlie	Restoration fractured during sectioning sufficient to expose dentine or base
Gross Marginal Defects	Alfa	No marginal defects
	Bravo	Voids , spaces

**Table-I. Evaluation criteria for the ART restorations**

**Table-II. ART codes and criteria for assessing restorations**

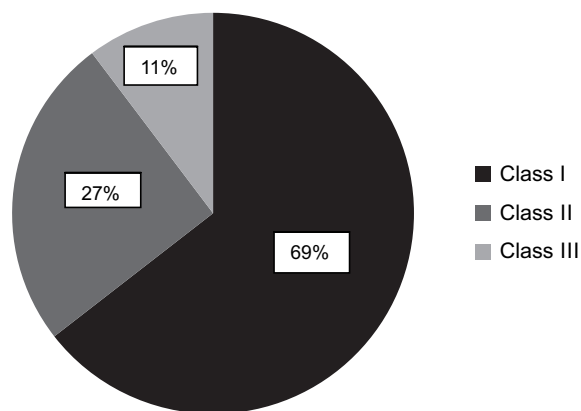
- 0 - Present. Successful, good condition
- 1 - Present. Slight deficiency at cavity margin (< 0.5 mm in depth)
- 2 - Present. Deficiency at cavity margin ( $\geq$  0.5 mm in depth)
- 3 - Present. Fracture in the restoration
- 4 - Present. Fracture in the tooth
- 5 - Present. Over extension of approximal margin (Equal to or greater than 0.5 mm)
- 6 - Not present. Most or all of the restoration is missing
- 7 - Not present. Other restorative treatment performed (amalgam, resin, etc.)
- 8 - Not present. Tooth is not present
- 9 - Impossible to diagnose

## RESULTS

A total of 100 students were selected out of 110 enrolled dental students and therefore 100 ART restorations were analyzed. It has been found that the most common tooth found with enamel/dentinal caries was 2<sup>nd</sup> molar (49%) and mesioocclusal surface was the most frequently affected site (44%).

Around 80% teeth were properly selected and were coded as Alfa while the other 20% were coded as Bravo. When restoration was evaluated for under and over filling, majority (78%) were found to have restoration continuous while rest were >0.5 mm below the normal anatomy of tooth. Just 4% of the restorations were fractured during sectioning sufficient to expose dentine or base while 5% of the restorations showed the marginal defects including voids and spaces. Overall descriptive analysis showed that 76 fillings were found to be perfect and did not show any type defect, however, 24 fillings were associated with any one or two defects.

A total of 100 patients were included having any of the 3 classes of caries. Mean age of the patients was 32 years with an age range of 18 to 43 years. The overall success rate of ART restorations at 12 months was found to be 89%. Figure-1 demonstrate that Class I ART restorations reported the highest success rate of 62%, followed by Class II (27 %) and Class III (11 %). The follow-up attrition was very low as just 2 patients lost to follow-up over 12 months.



**Figure-1. Success rates of ART restorations with respect to Cavity Classes**

## DISCUSSION

This study was aimed to assess the skills of the undergraduate dental students in performing Atraumatic Restorative Treatment and the one year survival of this restoration. The study has reported that majority of the restorations done on extracted teeth were found to be perfect and did not show any type defect along with an extraordinary high one year survivals rate of the fillings done on patients by the same students.

A determined and progressive strategy was put forward for improving the oral health of under privileged groups few years ago. This policy was established on genuine and verified preventive and restorative treatment decorum. The ART measures were of considerable quality and to a large level prevented the initiation of new carious lesions in people of disadvantaged areas. The results after assessing the impact of ART on oral health considered the strong execution of this strategy and took it as an immense achievement in the world of preventive dentistry. Likewise, ART approach should not be limited to the under privileged areas but because of its contributions in minimum invasive dentistry, ART should be made accessible to all the regions of developed and under developed counties.<sup>8,10</sup>

In the current study, the high percentage of Alfa rating for gross marginal defects and overfilled or under filled restorations was mainly because of the satisfactory and comprehensive training of students with ART. Furthermore tooth selection score for ART restorations by the students was above average which reflected adequate clinical experience and training of the operator which actually lead to satisfactory restorations. Contrary results were seen in a study in which the defected ART restorations in primary teeth were 69 and in permanent teeth were 13 out of 100. Few other explanations for improper ART restorations in other researches were associated with the uncontrolled mechanical properties of GIC.<sup>6,11</sup>

The survival rate of ART restorations is essentially dependent on the appropriate technique of placement and correct instrumentation. A defected and poorly placed restoration may have

the one-year survival rate of even less than 50%.<sup>10</sup> In contrast to this, the present study has reported one-year survival rate of 89%. In this the Class I ART restorations described the highest success rate of 62%, followed by Class II (27 %) and Class III (11 %). Similar results were reported by many studies which were cited in a meta-analysis which reported 93.6% and much higher one-year survival rate of ART restorations in dentition of school children of South Africa in comparison to 86.5% and below, which was found for other analogous restorations with the identical restoration evaluation criteria.<sup>10,13,14</sup> The follow-up attrition in this study was found to be negligible as just 2 patients lost to follow-up over 12 months. This is because majority of the patients were among the staff of the same study institute.

The credit of excellent scores of ART restorations in the present study were may be because of proper handling of GIC. As this cement is a highly technique sensitive material, it readily gets affected by ratios and temperatures.<sup>15,16</sup> Lack of experience and training of operator (students) in dealing with GIC may result in bio incompatibility and subsequent fractures in restorations during sectioning to expose dentine or base.<sup>17,18</sup> Furthermore, multiple survival rates in previous studies also confirmed that human hand work and mind set has a strong impact on the final product of ART.<sup>3,19,20</sup>

The dental skills of the under training young dentists need critical documented attention to further improve the operator effects on the final restoration and its survival rates. In present study, some insufficiencies has been observed in the operator skills for ART restorations that may have resulted in few gross marginal defects (voids, spaces) at interface, overfilled & under filled restorations, less marginal adaptation, inappropriate tooth selection, restoration fracture and subsequent loss of restorative material. Therefore, undergraduate and post-graduate quality dental education and training is extremely essential for an everlasting, flawless and immaculate dental restoration.

## CONCLUSION

Extraordinary high survival rates of Atraumatic Restorative Treatment found in this study represented the reliability of this method as an affordable preventive and curative treatment for dental caries particularly in developing countries. **Copyright© 13 Apr, 2023.**






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### AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Aeeza Malik	Basic conception, designing, data collection and write up.	
2	Qurat-ul-Ain Javaid	Basic conception, designing, data collection and write up.	
3	Basil Khalid	Basic conception, designing, write up.	
4	Fahad Dogar	Data entry, data analysis, literature search, write-up, give final approval.	
5	Omair Anjum	Data entry, data analysis, literature search, write-up, give final approval.	
6	Malik Saleem Shaukat	Data analysis, results interpretation, critically reviewed the manuscript, gave final approval.	