

AN ASSESSMENT OF THE RETENTION OF ANTERIOR COMPOSITE RESTORATIONS — A 5 YEARS CLINICAL STUDY

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ABSTRACT

Restoring the esthetic and functional characteristics of anterior teeth predictably and reliably has been an important goal for clinicians. Resin-based composites are the material of choice for the restoration of anterior teeth because of their adhesive and esthetic properties. The objective of this study was to assess the retention of composite restorations placed in anterior teeth. In this study 200 patients were included with both gender of age ranging from 15 to 70 years among which 100 were males (50%) and 100 were females (50%). Out of 200 patients, 165 (82.5%) showed success and 35 (17.5%) showed failure of retention of anterior composite restorations after a follow up period of 5 years. In conclusion, the anterior composite restorations have very good retention rate and age and gender of the patients have no significant effect on the retention of anterior composite restorations.

Key Words: Anterior composite restoration, longevity, retention, esthetics.

INTRODUCTION

Restorative dentistry is one of the main disciplines in dentistry and one important aspect of this specialty is the esthetics. Esthetic dentistry may range from non invasive to the more invasive options for treatment. Anterior teeth are mostly affected by the carious¹, noncarious lesions² and trauma. There are also other conditions both systemic and localized that may involve dentition. Some of these conditions include amelogenesis imperfecta, dentinogenesis imperfecta, fluorosis, localized infection and trauma.

According to review article³ the staining of teeth is broadly classified into three categories. They can be extrinsic, intrinsic or internalised stains. Extrinsic stains are those that occur on the outer part of tooth. While those that involve the internal dental structures of tooth are referred as intrinsic stains. Internalized stains are the incorporation of extrinsic stain within the internal tooth substance after tooth development.

On the basis of the staining and etiology many restorative treatments can be proposed. When we talk about esthetics there is a long list of modalities, starting from resin infiltration (least invasive) to the

direct and indirect composite/ porcelain veneers. Other esthetic treatment variables are bleaching (intrinsic and extrinsic), Microabrasion / macroabrasion and localized composite restorations.⁴

Direct composite veneers or localized restorations are one of the economical treatment options. Retention of such restorations accounts for the long term success. For the composites, factors affecting the retention of restoration are the type of cavity, surface roughness, types of composites available⁵ and the patient related factors.⁶

There are also the clinician based factors that affect the retention of restoration. These include lack of skill and experience of the dentist. Specialty and the dexterity for the dental composites also play a significant role.⁷ Retention and longevity also depend on the patient-related aspects like the carious attack, dietary habits and the occlusion. Gender is not the very appreciable factor but anterior/posterior guidance may add to it.⁸

Since the evolution in composites, their retention also remain an area of concern. As many generations were evolved so the type of composite also contributes to its longevity because retention is concerned by composites ability of wear, marginal leakage and polymerization shrinkage.⁹

Tooth related factors and the type of technique are also responsible for stability of composites on anterior teeth. A comparative study¹⁰ on bonding durability of resin composite restorations in class I, II and V cavities showed the significance of these factors. The technique is

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also important like in cases of class III cavities. Beveling of anterior tooth enhance the esthetics and longevity of composites which is shown by a study of 11 years survival rate of the anterior composite restorations.¹¹ The purpose of this long duration clinical study is to evaluate the retention of anterior composite restoration for the esthetically compromised teeth.

METHODOLOGY

Patients were selected from the outdoor department of de'Montmorency college of dentistry/Punjab Dental Hospital, Lahore. Two hundred patients were included in this study. They were divided into two groups 100 (males) in group A and (100) females in group B. The cases were selected by the Fellows of Operative dentistry that met the following criteria.

- 1 Carious lesion involving class III, IV and V
- 2 Patients presenting with amelogenesis Imperfecta
- 3 Fluorosis
- 4 Traumatized teeth
- 5 Discoloured nonvital teeth
- 6 Teeth having non-carious cervical lesions (Abrasion and Abfraction).

The patients that had poor oral hygiene, orthodontically malpositioned teeth, periodontically compromised teeth, patients with habits of bruxism and erosion were excluded during sample collection.

The patients selected were first evaluated by both intraoral and extraoral examination. Proper history and signed informed consent (for pictures also) were obtained. History forms explained the complete restorative treatment plan with follow up appointments. For all the procedures pre-operative pictures were obtained from the patients and kept confidential. Every restorative procedure for composite restoration started by isolation with rubber dam completing proper protocol of placement. Teeth were first cleaned with pumice (excluding the carious ones) in order to make the diagnostic mock up. This was shown to the patients to evaluate the final outcome and shade selection mostly from Vita shade guide. Putty impression was obtained for an equal reduction of tooth. Stained teeth were treated with direct composite veneers as planned. Reduction was done with wheel reduction burs starting from 0.3mm on cervical portion to 0.7mm on incisal portion of the tooth without involving the margins. After preparation the putty impression index was used to evaluate the preparation. After that etching was done with by application of 37% phosphoric acid, washed and dried. Primer was applied and cured (according to manufactures instructions). Proper composite shade darker one on cervical area and translucent on the incisal edges was applied and then cured. After that finishing /polishing was done and occlusion adjusted. For the carious lesion of class

III, IV and V carious lesion proper cavity was made with retention and resistance features. Mylar strip was placed and composite was placed in increments and cured. Occlusion adjusted. Patients were recalled for follow up on every 6 months and assessed by using the United States Public Health Service Criteria (Table 1) for the retention of the restorations. They were assigned scores of alpha, bravo and Charlie depending on the basis of retention.

The data of 200 patients was entered in SPSS version 20 (Inc., Chicago, IL, USA) and the variables of males and females were made. The independent t-test was used to compare the means of males and females, level of significance was set at 0.05. The p value less than 0.05 was considered significant.

RESULTS

A sample of 200 patients was selected. Males were allocated to group A (100) and females (100) to group B. The mean age of patients was 25 years. The overall success of restorations among both groups (male and females) was 82.5%. Only 17.5% of the restorations showed failure. Among the gender the success rate in males was 85% while in females it was 80% (difference not significant, p value = 0.457). Table 2 elaborates the success depending upon the retention of restorations at the end of 5 years. Table 3 shows that age has no effect on retention of restorations (p-value= 0.991).

DISCUSSION

With the evolution of evidence based approach to treatment planning, it has been important for patient and the dentist to know the retention or longevity of restorations being given to the patients. The retention of composite restorations has been a topic of discussion for many years. The available literature does not lead to a consensus among authors regarding the retention of anterior composite restorations.

At present, longevity of restorations is estimated by three kinds of clinical studies: a prospective study; a retrospective longitudinal study; and a retrospective cross-sectional study. Although the prospective studies can provide more reliable evaluation than the retrospective studies, prospective clinical trials are limited in number since they require many years with regular recalls in order to achieve sufficient clinical validation. As the retrospective studies are less defined than prospective ones,¹³ so the present study conducted is a prospective study with 5 year clinical follow up in order to provide a more reliable evaluation.

Many variables affect the retention of resin composite restorations, including patient, operator, materials and tooth-related factors. The main factors include patient caries risk, size of restoration, tooth position, type of material and experience of operator.¹²

TABLE 1:

| Criteria | Test procedure | SPHS score | |
|---------------------------|---|--|-------------|
| Retention | Visual inspection with mirror at 18 inches | Complete retention of the restoration | Alpha (A) |
| | | Mobilization of the restoration, still present | Bravo (B) |
| | | Loss of the restoration | Charlie (C) |
| Colour match | Visual inspection with mirror at 18 inches | Restoration is perfectly matched for color shade | Alpha (A) |
| | | Restoration is not perfectly matched for color shade | Bravo (B) |
| | | Restoration is unacceptable for color shade | Charlie (C) |
| Marginal integrity | Visual inspection with explorer and mirror, if needed | Absence of discrepancy at probing | Alpha (A) |
| | | Presence of discrepancy at probing, without dentin exposure | Bravo (B) |
| | | Probe penetrates in the discrepancy at probing, with dentin exposure | Charlie (C) |
| Marginal discoloration | Visual inspection with mirror at 18 inches | Absence of marginal discoloration | Alpha (A) |
| | | Presence of marginal discoloration, limited and not extended | Bravo (B) |
| | | Evident marginal discoloration, penetrated toward the pulp chamber | Charlie (C) |
| Surface texture | Visual inspection with explorer and mirror, if needed | Surface is not rough | Alpha (A) |
| | | Surface is slightly rough | Bravo (B) |
| | | Surface is highly rough | Charlie (C) |
| | | Surface is not staining | Alpha (A) |
| Surface staining | Visual inspection with explorer & mirror, if needed | Surface is slightly staining | Bravo (B) |
| | | Surface is highly staining | Charlie (C) |
| Postoperative sensitivity | Ask patients | Absence of the dentinal hypersensitivity | Alpha (A) |
| | | Presence of mild and transient hypersensitivity | Bravo (B) |
| | | Presence of strong and intolerable hypersensitivity | Charlie (C) |
| Gingival bleeding | Visual inspection with explorer and mirror, if needed | Gingival tissues are perfect | Alpha (A) |
| | | Gingival tissues are slightly hyperemic | Bravo (B) |
| | | Gingival tissues are inflammation | Charlie (C) |
| Secondary caries | Visual inspection with explorer & mirror, if needed | No evidence of caries | Alpha (A) |
| | | B. Evidence of caries along the margin of the restoration | Bravo (B) |

USPHS = United States Public Health Service criteria

TABLE 2: SUCCESS BASED UPON RETENTION OF RESTORATIONS

| | | Retention | | | Total | Percent |
|---------|-----------------------|--------------------|--------------|-----------------------|-------|---------|
| | | Complete retention | Mobilization | Loss of the retention | | |
| Success | Restoration present | 136 | 29 | 0 | 165 | 82.5 |
| | Restoration dislodged | 0 | 0 | 35 | 35 | 17.5 |
| Total | | 136 | 29 | 35 | 200 | 100.0 |

TABLE 3: SUCCESS VERSUS AGE

| | | Age | | | | Total |
|---------|-----------------------|-----|----|----|----|-------|
| | | 15 | 20 | 25 | 30 | |
| Success | Restoration present | 42 | 41 | 41 | 41 | 165 |
| | Restoration dislodged | 8 | 9 | 9 | 9 | 35 |
| Total | | 50 | 50 | 50 | 50 | 200 |

In the present study the retention of composite restorations has found to be 82.5% and this finding is in line with the study carried out by de Mora et al in 2011 which concluded that 85% of composite restorations were present satisfactorily at the end of 3 years.¹⁴

In a review by Kubo S in 2011, prospective studies and retrospective longitudinal clinical studies on resin composite restorations were systematically searched and it was concluded that at least 60% of resin composite restorations would survive more than 10 years when proper materials are applied correctly. These findings compare favorably with that of our study in which 82% of the restorations were present at the end of 5 years.¹³

In the present study 17.5% of composite resin restorations failed as they were dislodged at the follow up. One reason of failure could be the size of restoration such as in case of restorations that involve incisal angle also, the size is usually greater. With the increase in restoration size, there is more surface area in which recurrent caries, fractures and restoration failures can take place. As in the study by da Rosa et al, they found that the survival rate of anterior restorations was considerably higher for restorations that include incisal angle in contrast to the restorations without it (91.8 and 77.8%, respectively) and confirms the influence of the restoration size on survival probability.¹⁵

In 2015 a study was carried out by Demarco FF et al in which the literature was systematically reviewed to investigate the clinical longevity of anterior composite restorations and the survival rates were found to vary from 53.4% to 100%.¹⁶ The result of this study matches with our study.

The present study revealed that no association is present between composite restoration retention and gender and age of the patients. So this finding that the age and gender of the patient has no effect on the longevity of composite restorations is also proved by many other studies.^{13,17} On the contrary, this finding differs from the study carried out by McCracken MS et al who found that restoration failure rate for children was less as compared to older patients. In this study the data was collected from various dentists and pediatric dentists had a higher success rate than did general dentists. So the pediatric dentist may have a younger population biased toward restoration success and this could be the reason for contradictory results among the two studies.¹²

In this study the cases of fractured anterior teeth and diastema closure for esthetic purpose were also included and the good success rate of the study (82.5%) shows that direct composite restorations placed for traumatized teeth and for diastema closure exhibit satisfactory survival rates. It is also proved by other researchers who found retention rates to be 91% and 88.3% respectively.^{18,19}

On the other hand, the limitations of this study include patient factors that were not reflected in the statistical analysis or data collection, such as socio-economic factors and oral hygiene status, and other confounding variables, such as patient education. These confounding variables may limit the application of these data somewhat to any given dental population.

Overall the study can be more reliable as compared to most of the above mentioned studies because most of these studies are retrospective with data representing restorations placed by a wide variety of practitioners while in present study all the procedure is carried out by a single operator who is a specialist. So the results of this study can also contribute to the evidence base for clinical decisions.

CONCLUSION

It was concluded from this study that the retention of anterior composite restorations for esthetically compromised teeth is very high that is 82.5% after 5 years of clinical evaluation and is independent of gender and age of the patient.

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CONTRIBUTIONS BY AUTHORS

- 1 **Saira Yousuf Dar:** Performed all the procedures and made results and conclusion
- 2 **M Bader Munir:** Supervised all the procedures and made contribution in writing the discussion part
- 3 **Salman Rashid:** Introduction writing